



Wilbur and Orville Wright, 1897
Photographs courtesy Library of Congress

Historic Furnishings Report

Wright Cycle Company Building

Carillon Historical Park
Dayton, Ohio

U.S. Department of the Interiors/National Park Service

HISTORIC FURNISHINGS REPORT

WRIGHT CYCLE COMPANY BUILDING
Carillon Historical Park
Dayton, Ohio

by

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ADMINISTRATIVE INFORMATION

Carillon Historical Park in Dayton, Ohio was established in 1940 by Col. and Mrs. Edward A. Deeds. The park's first attraction was the Deeds Carillon, which rang its inaugural peal over the city of Dayton on April 23, 1942. The Carillon was the gift of Mrs. Deeds, who, with her husband, National Cash Register Company (NCR) board chairman Col. Edward A. Deeds, was an important civic supporter of Dayton. In addition to creating the Carillon and its distinctive tower, Colonel and Mrs. Deeds selected the original 35 acres of land on which the park is located. The site, bounded roughly by South Patterson Boulevard, the Great Miami River and Calvary Cemetery, was reclaimed from mosquito-infested swampland, thereby improving public health as well as increasing recreational opportunities for the citizens of Dayton.

Mrs. Deeds initially purchased three acres of the property from NCR for the site of the thirty-two bell Carillon. She then deeded the land to Educational and Musical Arts, Incorporated, which was a newly formed subsidiary of The Dayton Foundation, developed to support the creation of a "perpetual monument" for the people of Dayton. Mrs. Deeds supported the entire cost of the structure and the land, and provided an endowment for the maintenance and operation of the Carillon.¹

After the Carillon was completed, Colonel Deeds began to pursue his vision of a historical park dedicated to celebrating the contributions of Dayton and the Miami Valley to American industry and transportation. As part of his project, Deeds planned to include a building commemorating the work of Orville and Wilbur Wright. Deeds and Orville Wright were acquainted, and Wright suggested that Deeds feature the 1905 Wright Flyer, or Wright Flyer III, at the new park. The 1905 model was the Wright brothers' third power-driven plane, and by late 1905 it could turn, circle, and stay aloft for as long as it had gas. In addition to giving the Wrights valuable piloting experience, the increased maneuverability and reliability of this aircraft resulted in the world's first truly practical airplane.

Deeds gathered the remaining parts of the plane from Orville Wright, residents of Kitty Hawk, North Carolina, and the Berkshire Museum in Pittsfield, Massachusetts, which had salvaged pieces of the flyer from the Kitty Hawk camp in 1911. By late 1947 he had returned more than three-quarters of the original components of the 1905 Flyer to Dayton. Former Wright brothers' mechanic Harvey Geyer worked on the plane under the supervision of Orville Wright himself until Orville's death in January 1948. The restored flyer and Wright Hall, the "fireproof brick building" specially designed to house the artifact, were completed in 1949.²

In addition to the Wright Flyer, the new Carillon Park exhibited significant transportation collections, an original canal lock, a restored covered bridge, and the reconstructed Deeds

¹ *NCR Factory News*, May 1940, pp. 2-4, and *The Deeds Carillon and Carillon Park*, (Dayton, Ohio: The National Cash Register Company), June 3, 1950, pp. 1-3 and p. 15.

² "The 1905 Wright Flyer," by Tom Crouch, in *The Wright Brothers at Carillon Historical Park*, (Dayton, Ohio: Carillon Historical Park, Inc., 1997), pp. 16-30, and A.S. Kany, "Orville Wright Suggested Restoration of Plane, Helped Rebuild It," in *The Dayton Herald*, February 25, 1948.

Barn, where Deeds and partner Charles F. Kettering had developed their improved automobile ignition system. The park opened to the public on June 3, 1950. Colonel Deeds funded acquisition of collections and the reconstructed buildings on land donated by NCR to the Miami Conservancy District. The Miami Conservancy District, the City of Dayton, the Civilian Conservation Corps and the Works Progress Administration also supported the project.³ In 1955 the Miami Conservancy District sold the land to Educational and Musical Arts, Inc.; eventually the park totaled 65 acres in size.⁴

On April 16, 1968, the 101st anniversary of the birth of Wilbur Wright, Carillon Historical Park announced the construction of a reproduction of the Wright brothers' bicycle shop, which was originally located at 1127 West Third Street in Dayton.⁵ The Wrights' shop at West Third Street was their sixth and final cycle shop in Dayton, and was the site of most of the construction of their first flyer. The building was probably constructed in the mid-1870s, and by early 1897 the residential property was owned by Charles Webbert, who converted it into a commercial building. The Wright brothers operated their bicycle shop in the building until 1909 and retained office space there until 1916.

In 1936, Henry Ford removed the original Wright Cycle Company to Greenfield Village, his outdoor history museum in Dearborn, Michigan. Although detailed records of the transfer and reconstruction were not kept, Orville Wright was involved in the reconstruction of the building in Dearborn, and was satisfied with its construction and appearance when it opened to the public on the seventy-first anniversary of Wilbur Wright's birth, April 16, 1938.⁶

The Wright Cycle Company building at Carillon was planned to complement Wright Hall and was expected to be "a most interesting and outstanding attraction for Carillon Park." Discussion about the idea between park director Joseph A. Usellis and various trustees was well underway by 1967, with support offered by the city, as well as the Chamber of Commerce. The building was dedicated on May 6, 1972 in a ceremony featuring the mayor of Dayton, representatives from the Wright family and a cycle tour by the Wheelmen, a national cycling organization.⁷

The reproduction cycle shop consists of five exhibit rooms. The front two rooms were used as sales areas in the original building, the center two rooms were used for cycle repair and storage, and the rear section, added in 1901, was a small machine shop. The west front room was rented by undertakers during the Wright brothers' tenancy, and the east room was used as a showroom and sales area for the bicycle business. The Carillon Park reconstruction of the cycle shop utilized a combination of historically furnished period settings and traditional

³ A.S. Kany, "Orville Wright Suggested Restoration of Plane, Helped Rebuild It," in *The Dayton Herald*, February 25, 1948 and "Carillon Historical Park Facts Timeline," February, 2000, Carillon Historical Park research files.

⁴ "Carillon Historical Park Facts Timeline," February 2000, Carillon Historical Park research files.

⁵ "Wright Brothers Bicycle Shop to Be Rebuilt in Carillon Park," *Dayton Daily News*, April 16, 1968.

⁶ Allan Fletcher, "The Wright Brothers' Home and Cycle Shop in Greenfield Village" (master's thesis, June 30, 1972) pp. 55-59, Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁷ Norvell Clarkson, Manager, Aviation Department to G. Whitney Shartzler, Assistant City Manager, March 30, 1967; Joseph A. Usellis to Samuel L. Finn, May 2, 1967, and Joseph A. Usellis to Samuel L. Finn, April 27, 1972, Carillon Historical Park research files.

exhibits to interpret the careers and accomplishments of Orville and Wilbur Wright. Most recently the showroom on the west side housed "Wheels of Innovation," an exhibit opened in 1997, which highlighted the bicycle industry in Dayton. Other exhibits have included "The African American Experience in Dayton: The First Century" and "Wright and Wright, Printers." The sales area and office space in the front of the building, and the machine shop in the rear have contained historic furnishings installations since the opening of the building, although the front sales area has also been used for an exhibit on cycling.

In 1990, the 1905 Wright Flyer was designated a National Historic Landmark. On October 16, 1992 Congress established Dayton Aviation Heritage National Historical Park (PL 102-419). The national historical park includes the 1905 Wright Flyer and Wright Hall, in addition to the original Wright Cycle Company building at 22 South Williams Street in West Dayton, the nearby Hoover Block and Paul Laurence Dunbar State Memorial and Huffman Prairie Flying Field at Wright-Patterson Air Force Base. In support of operational and interpretive goals established for the national park and to commemorate the upcoming 2003 centennial of flight, Carillon Historical Park has determined to develop and implement a historic furnishings plan for the reproduction 1127 West Third Street building.

As part of Carillon Park's overall plan, two new buildings are being constructed to flank Wright Hall — the Wilbur Wright Wing on the east side, and the Orville Wright Wing on the west. Visitors begin their tour in the 1127 West Third Street building and exit into the recently completed east wing. Here, a number of interactives and an object theater featuring some of the park's significant Wright artifacts will engage the visitor and explain the importance and significance of the 1905 Wright Flyer. Visitors then continue to Wright Hall, where the 1905 Wright Flyer is on display. Finally, they exit through the west wing, where additional Wright artifacts and audiovisual components interpret the Wright brothers' lives after 1905 and their rise to international fame.

This report will address historic use, occupancy and furnishing of the original Wright brothers' cycle shop at 1127 West Third Street. Evidence documenting the four rooms in the original building will be used to develop the furnishings plan for the reproduction building. Much of the documentation of the original building at 1127 West Third Street is located in the research files at the Henry Ford Museum and Greenfield Village. The files include letters from Orville Wright with comments and recommendations on furnishings for the exhibit. In addition to the correspondence, notes and other information about the transfer of the original building to Dearborn in the 1930s, the archive at the museum contains useful documentation about the reinterpretation and reinstallation of the cycle shop in the early 1980s.

The Wright brothers' papers held at the Library of Congress include family correspondence, which contains brief references to their bicycle business at 1127 West Third Street as well as the Wrights' business journals and ledgers from the 1890s through 1907. The ledgers contain an inventory of the cycle shop taken before the Wright Company was incorporated on November 22, 1909. This inventory provides the best evidence as to the tools, machinery, furniture and office supplies used in the shop. Two photographs from the collection at the Library of Congress also provide some excellent details of Orville and Wilbur at work in their workshop, although the exact location of the work areas shown in the photographs is not

absolutely certain. Nonetheless, these photographs contain valid information as to the type of work the brothers were doing, the tools they had on hand and the arrangement of the shop area.

S.D.V. Burr's 1896 *Bicycle Repairing*, referenced in the Greenfield Village research files, provides good information on typical activities and equipment used in a modest bicycle repair establishment of the period. This handbook provides a great deal of detail as to the day-to-day operation of a bicycle repair shop and the objects that made up its furnishings. A comparison of the tools in the 1909 inventory and the list of tools titled "Equipment for \$100" in the manual shows that the brothers did indeed own almost all of the equipment recommended, and the layout of their shop at 1127 West Third Street was similar to that suggested in the manual.

Finally, the E. H. Hall Company catalog of bicycle parts and accessories provides examples of the types and brands of bicycle supplies available to and purchased by the Wrights. In an October 1900 letter, Orville tells his sister Katharine to use the Hall catalog they had on hand at the store and to order supplies from the Rochester, New York, company.⁸ Tools and equipment mentioned in all of the above sources are included as recommended furnishings in the historic furnishings plan.

Interpretive Objectives

The National Park Service has completed a General Management Plan and an Interpretive Plan for Dayton Aviation Heritage National Park. The General Management Plan (GMP) guides the park's development, management and operations and the Interpretive Plan, a component of the GMP, outlines desired visitor experiences and overall interpretive goals for the site. The 1997 Interpretive Plan outlined several interpretive themes to be addressed by Carillon Historical Park. The following themes can be interpreted especially well through the use of historic furnishings in the Wright Cycle Company building:

- Wilbur and Orville Wright's willingness to question accepted scientific data and their confidence to act upon their own data enabled them to succeed.
- The Wright brothers' achievements established Dayton as the birthplace of aviation.

The machine shop in particular will highlight the exciting work done at 1127 West Third Street. The reproduction wind tunnel exhibited in the shop will afford interpreters the opportunity to discuss the Wrights' research methods and explore the significance of their reliance on their own data collection and their own results. The rudders under construction in the machine shop will suggest that the brothers applied skills necessary to their trade of bicycle making to construct a totally new form of transportation. The tools and machinery the Wrights used in both the repair area and the machine shop were simple, common and inexpensive. Interpreters can stress this idea to reinforce the notion that it was the Wright brothers' unique combination of imagination, desire and determination that unlocked the secrets of flight, rather than the use of sophisticated equipment or costly materials.

⁸ Orville Wright to Katharine Wright, October 14, 1900 in Marvin W. McFarland, ed., *The Papers of Wilbur and Orville Wright*, vol. 1, 1899-1905, (McGraw Hill Book Co., 1952), pp. 28-29.

The interpretive period for the bicycle shop is the winter of 1901-02. During this time the brothers collected their own data, correcting errors in calculations made by earlier experimenters and refining their own hypotheses. They also kept their "day jobs" selling, making and repairing bicycles to fund their experiments. As Tom Crouch wrote:

Each day was filled with a sense of discoveries waiting to be made. 'Wilbur and I could hardly wait for morning to come,' Orville would recall, 'to get at something that interested us. *That's* happiness!' ... They were treading absolutely new ground — and they knew it.... The need to rely on the work of others was replaced by facts and figures they had verified themselves, hard numbers that they could trust. ... The prize was within their grasp.⁹

In the unfurnished interpretive area next to the repair room, exhibit panels and first person interpretation can discuss the Wright brothers' printing business, which was operated from a second floor office in the building. Interpretation should emphasize that it was in the original West Third Street building that the Wrights pursued three separate careers — operating a printing business; building, repairing and selling bicycles; and envisioning and constructing the first airplane.

After exploring the furnished areas of the reconstructed Wright cycle shop, visitors pass through exhibit areas and into Wright Hall, where the 1905 Wright Flyer is displayed. The juxtaposition of the bicycle shop and the airplane will emphasize the connection between tools and product. In other words, the same tools and similar materials could produce either a reliable bicycle or the first machine capable of sustained flight. It required only perseverance, patience and perhaps genius — the combination of which, together, Wilbur and Orville Wright surely possessed.

Operating Plan

Carillon Historical Park is open seasonally from April 1 to November 1. Operating hours are Tuesday through Saturday from 9:30 AM to 5 PM and Sunday 1 PM to 5 PM. The park is open on holiday Mondays. Visitors will access the Wright Cycle Company building through the west showroom — the site of the undertaker's business in the original 1127 West Third Street building. The entrance room will hold an exhibit on Dayton Aviation Heritage National Historical Park, orienting visitors to the connection between the aviation collection in the John W. Berry, Sr. Wright Brothers Aviation Center at Carillon Historical Park and other aviation sites throughout Dayton.

Visitors next enter the furnished bicycle showroom and sales area on the east side of the building. The counter and office wall separate visitors from furnishings in the sales area. Visitors then enter the interpretive area, which is not furnished. This area will be used as a gathering place for groups and may include some seating. The repair area east of the interpretive area will be visible through two doorways on the east wall. Visitors may enter the northeast doorway and walk diagonally through the room into the machine shop in the rear of the building.

⁹ Ivonette Wright Miller, "Character Study," in Ivonette Wright Miller, ed., *Wright Reminiscences*, (Dayton, Ohio: Privately printed, 1978), p. 60, quoted in Tom Crouch, *The Bishop's Boys: A Life of Wilbur and Orville Wright*, (New York & London: W.W. Norton and Company, 1989), pp. 227-28.

Barriers will be installed to guide visitors through the repair area, and will be installed in the machine shop to allow visitors to walk through the south end and exit into the Wilbur Wright Wing exhibit area or return to the interpretive area. The cycle company building will be staffed with an interpreter at all times. All furnishings in the sales area, repair area and machine shop are period pieces or reproductions.

HISTORICAL INFORMATION

History of the Structure

This section includes a brief survey of the construction, modification and reinstallation of the original 1127 West Third Street building, followed by a discussion of the fabrication and use of the reproduction building at Carillon Historical Park.

The Wright brothers entered the bicycle business in the spring of 1893. They rented their first cycle shop in December 1892 and apparently rented four more locations before they arrived at 1127 West Third Street in 1897. In addition to building and repairing bicycles, the Wright brothers also operated a printing business, first publishing a regular weekly paper in 1889.¹⁰ The building that would eventually be numbered 1127 on West Third Street was constructed around 1875, when members of the Zearing family owned the property. The original house was a two-story rectangle with a floored attic. It probably contained four window bays with a central door. Charles Webbert bought the property in early 1897 for \$5,000. Webbert made alterations to the dwelling to accommodate small businesses and rented the east half of the ground floor and the entire second floor to the Wright brothers in the autumn of 1897.¹¹

The Wright brothers operated their bicycle shop at 1127 West Third Street from September 1897 through November 1909. Although Wilbur Wright wrote a letter to his father on the new Wright Cycle Company letterhead printed with the 1127 West Third Street address on June 2, 1897, the brothers wrote their last check to J.H. Hohler, their landlord at 22 South Williams Street, on September 8. The Wrights' check register shows that at the beginning of the month they paid the previous months' rent, so the September payment would have covered the month of August. The Wrights' first rent payment to Webbert was recorded on November 4, 1897 for the sum of \$74.44, which covered rent to November 1 and other accounts to that date.¹²

¹⁰ Charlotte K. and August E. Brunsman, *Wright and Wright, Printers: The Other Career of Wilbur and Orville*, (Kettering, OH: The Trailside Press, 1989), p. 7. The Wright brothers probably had six cycle shops or showrooms in Dayton. The second location at 1015 West Third Street is relatively new to Wright historians; the discovery of this address, printed in a series of 1893 newspaper advertisements, is outlined in *The Wright Brothers: From Bicycle to Biplane*, by Fred C. Fisk and Marlin W. Todd.

¹¹ Although it is not known exactly when the building on West Third Street was constructed, it was built no earlier than 1861. See Fletcher, "The Wright Brothers' Home and Cycle Shop," pp. 20-26.

¹² Wilbur Wright to Milton Wright, June 2, 1897, Library of Congress, Wright Brothers Papers, Box 6 and Check Stub Books, April 29, 1897-May 4, 1898, Wright Brothers Collection, Wright State University Special Collections and Archives.

In addition to their bicycle business, the Wright brothers continued to operate their printing business at 1127 West Third Street. The printing office and printing shop were on the second floor. As the Wrights' bicycle business and aeronautical research began to consume an ever-greater amount of time, Edwin Sines, the brothers' long-time friend and business associate, assumed greater responsibility for the printing business. When Sines injured his knee in 1899, he accepted a new job and the Wright brothers sold their printing business and equipment to Stevens and Stevens, another Dayton printing company.¹³

The brothers continued to use the second floor for building bicycles and for office space until they closed the cycling business in 1909. For several years after they moved their business to a larger factory building they retained the space as an office, which was operated by their older brother, Lorin. Orville also used the second floor office space. A delicatessen, a florist's shop, a shoe repair company and a wallpaper company occupied the ground floor of the building at West Third Street in the years before Henry Ford purchased it from Webbert and removed it to Greenfield Village. When Ford purchased the building, a barbershop occupied the site of the cycle shop and the second floor rooms had been converted to apartments.¹⁴

Henry Ford purchased the 1127 West Third Street building on July 2, 1936 and moved it to Dearborn on November 5, 1936.¹⁵ Before the new year the brick foundation had been completed and within several months the scaffolding and protective canvas shelters had been removed to reveal the two-story brick building with cornice and window embellishments in place.¹⁶ The interior had been modified to a significant extent in the years since the Wright brothers had rented the space. With Orville Wright's guidance, later additions of woodwork and wall finishes were removed and partitioning was restored to its 1897-1909 appearance. Large pieces of machinery and other original objects were also located with the help of current and former employees of the Wrights. Objects that were not located were reproduced from specifications drawn or designed by Orville Wright. The restored cycle shop opened to the public on April 16, 1938, the 71st anniversary of Wilbur Wright's birth.¹⁷

Thirty years later, Carillon Historical Park announced plans to reproduce the reconstructed Wright Cycle Company building exhibited at the Henry Ford Museum and Greenfield Village. Discussion of the project between Joseph A. Usellis, Executive Director of Carillon Park, and various trustees and city managers had begun as early as 1967. Dayton was in the midst of urban renewal and expressway construction projects at the time, and park administration planned to use as much material as possible from the demolition of local structures of the same period. Brick was to be stored at Carillon Park, but an estimated 20' x

¹³ Brunsmann and Brunsmann, *Wright and Wright, Printers*, pp. 15-16.

¹⁴ Fletcher, "The Wright Brothers' Home and Cycle Shop," pp. 26-27 and "Historic Wright Workshop Will Be a Michigan Shrine," by James V. Piersol in *The Detroit News*, July 3, 1936 in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

¹⁵ Fred C. Fisk and Marlin W. Todd, *The Wright Brothers from Bicycle to Biplane: An Illustrated History of the Wright Brothers*, (West Milton, OH: Miami Graphic Services, 1990), p. 51.

¹⁶ Fletcher, "The Wright Brothers' Home and Cycle Shop," p. 53.

¹⁷ *Ibid.*, pp. 55-56. See also Orville Wright to Fred L. Black, The Edison Institute, November 4, 1937, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

20' storage area was needed for salvaged doors, windows, frames and other materials. It is unclear whether these materials were stored at the park or at a city facility.¹⁸

Staff at the Henry Ford Museum and Greenfield Village were supportive of the Carillon Park project and hosted Charles Prentice, NCR's Plant Construction Engineer, and Joseph A. Usellis on a research trip, as well as James Dunham, Construction Foreman and Joseph Rose, an architect in the Construction Department at NCR. The latter group documented design elements such as brackets and rosettes, sketching, measuring and photographing the building thoroughly.¹⁹ By the end of 1968, preliminary planning for construction of the building was complete, but research on materials and furnishings was still underway, so the park delayed its groundbreaking from April 1969 to April 1970.²⁰

The Educational and Musical Arts, Inc. board of trustees approved the project at an estimated cost of \$57,000 in February 1970, although this estimate was later increased. A contract was awarded to the F. A. Requarth Company for the highly specialized millwork and trim in the building in early 1971, but construction did not begin until sometime after October of that year.²¹ The total cost for construction came to nearly \$77,000, while \$1,000 was spent on furnishings for the opening on May 6, 1972. A sum of \$2,100 was budgeted to complete furnishings.²² Meanwhile, the Dayton Chamber of Commerce provided support to the project by soliciting its members to donate "machinery, equipment and artifacts" from the period and circulating a list of desired acquisitions to furnish the new Wright Cycle Company building.²³

Historical Occupancy

Wilbur and Orville Wright

Wilbur Wright was born in Millville, Indiana, on April 16, 1867. His two older brothers, Reuchlin and Lorin, were also born while the family was living in Indiana, the birthplace of his father, Milton, a leader in the United Brethren in Christ church. Susan Koerner Wright, Wilbur's mother, was born in Loudon County, Virginia, although her parents moved to Indiana when she was an infant.

Within a few years after Wilbur's birth, Milton was elected editor of an influential church publication, and the family moved to Dayton, Ohio, site of the United Brethren Printing Establishment. Orville was born at the family home at 7 Hawthorne Street on August 19,

¹⁸ Samuel L. Finn to Joseph Usellis, April 5, 1967; Norvell Clarkson, Manager, Aviation Department to G. Whitney Shartzer, Assistant City Manager, March 30, 1967; Joseph Usellis to Samuel L. Finn, May 2, 1967, and Norvell Clarkson to Samuel L. Finn, April 5, 1967, Carillon Historical Park research files.

¹⁹ Joseph A. Usellis to Dr. John Still, Assistant to the Chief Curator, Henry Ford Museum and Greenfield Village, September 7, 1967, Carillon Historical Park research files.

²⁰ Samuel Finn to Norvell Clarkson, December 26, 1968, Carillon Historical Park research files.

²¹ Joseph Usellis to Samuel L. Finn, October 14, 1971, Carillon Historical Park research files. Note that in 1904 the F.A. Requarth Company supplied the Wright brothers with spruce for airplane ribs and uprights. See "Companies that did business with the Wright Cycle Co.," by Susan Bushouse, February 10, 1984 in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

²² Joseph Usellis to Samuel L. Finn, May 3, 1972, Carillon Historical Park research files.

²³ Robert J. Barth, President, Dayton Area Chamber of Commerce to "Member," July 27, 1970, Carillon Historical Park research files.

1871, and the brothers' youngest sibling, Katharine, was born there exactly three years later.²⁴ In 1878 Milton moved his family to Iowa and several years later they returned to Indiana. The family's 1884 return to Dayton effectively completed Wilbur's schooling although Orville attended Dayton public schools through 1889.

The brothers gained their first experience with the printing trade when they were small children visiting their father's Dayton office, located in the same building as the United Brethren's printing operation. By 1881, Bishop Wright was publishing his own religious periodicals in Richmond, Indiana. After the family's return to Dayton, they acquired a printing outfit from a neighbor, and Orville and his friend Edwin Sines formed "Sines and Wright," a printing company, in 1884. In 1888, Orville and Wilbur built a larger press, and by 1889 Orville began printing *West Side News*, a weekly newspaper. In April of that year the brothers rented an office at 1210 West Third Street and Orville published the paper with Wilbur as editor.

In April 1890 the brothers determined to publish a daily paper, *The Evening Item*, which ran until July of that year. Before Thanksgiving they moved their printing business into a new commercial building, the Hoover Block, located at West Third and Williams Street. By this time they were doing a great deal of job printing and by July 1890 they closed *The Evening Item* because "More money can be made with less work in other kinds of printing ..."²⁵ The brothers printed yet another newspaper, however, for Orville's former classmate Paul Laurence Dunbar, who published at least three issues of *The Tattler*, and printed their own magazine titled *Snap Shots at Current Events*, beginning in October 1894. By February 1896 the title was shortened to *Snap Shots*, and the publication became an advertising tool for the brothers' new bicycle business, which they had begun in the spring of 1893.²⁶

Orville and Wilbur maintained their printing shop in the Hoover Block while opening the first Wright Cycle Exchange at 1005 West Third Street. The brothers were caught up in the enthusiasm for cycling that swept the nation beginning in 1887, and hit Dayton by 1892. While both brothers rode, only Orville raced. He won second place in a June 1894 race at the Dayton Montgomery County Fairground and took three medals at the YMCA Wheelmen Club races several days later. Orville and Wilbur were also members of the League of American Wheelmen and participated in the Ohio Division's annual meet in the summer of 1896.²⁷ The Wrights' mechanical talents were already known in West Dayton and friends and cyclists came to them for repairs. Their existing printing business continued to turn a profit, but did not provide much challenge — a bicycle business seemed a natural outlet for their talents.

²⁴ Crouch, *The Bishop's Boys*, pp. 37-48.

²⁵ *The Evening Item*, 30 July 1890, p. 2, microfilm edition, vol. I, F201, Ohio Historical Society, quoted in Brunsman and Brunsman, *Wright and Wright, Printers*, p. 11. See also Brunsman and Brunsman, pp. 3-11 and "The Wright Brothers' Printing Career," by Charlotte K. and August E. Brunsman in *The Wright Brothers at Carillon Historical Park*, pp. 5-10.

²⁶ "The Wright Brothers' Printing Career," pp. 5-10.

²⁷ "The Wright Brothers' Bicycle Business," by Fred C. Fisk, in *The Wright Brothers at Carillon Historical Park*, pp. 11-15

The shop sold new bicycles and bicycle parts, but the brothers expected the bulk of their business to be bicycle repair. Business was good, and the brothers soon moved their operation to 1015 West Third Street and then to 1034 West Third Street, renaming it the Wright Cycle Company. At the end of the cycling season in autumn 1894, business fell off as usual and Orville and Wilbur closed the West Third Street shop. They reopened two stores in the spring of 1895, a cycle shop in downtown Dayton and a combination cycle company and print shop at 22 South Williams Street, around the corner from their home on Hawthorne Street.

While at the 22 South Williams Street location the Wright brothers decided to manufacture their own brand of bicycle. They installed a basic machine shop in the building and proceeded to design an engine to power the line-shafting, as well as a welding apparatus to build bicycle frames, an oil-retaining wheel hub and their own model coaster brake. By 1897 the brothers had become moderately successful, earning a small profit at the printing business and larger profits with the bicycle operation.²⁸

In May or June 1897 they moved the bicycle company to its final location — 1127 West Third Street. The bicycle showroom and repair rooms were on the ground floor, and the printing office and shop were on the second floor. By 1899 the brothers had sold the printing business and in 1901 they built an addition on the rear of the building to house a light machine shop. With the machine shop they were able not only to build and repair bicycles, but also to pursue their interest in building a flying machine.

Wilbur's interest in flying is usually noted as being piqued by the death of German aviation pioneer Otto Lilienthal in 1896, but both brothers were "seriously interested in the problem of human flight" by 1899.²⁹ After surveying the available literature Wilbur determined that three principle problems needed to be solved in order to construct a machine that could fly. A flying machine required wings that would lift it into the air, a power source to move the machine forward "with sufficient speed so that the air flowing over the wings would generate that lift," and control over the machine once it was in the air.³⁰

Treatment of the Wright brothers' research and investigation into the problem of human flight is beyond the scope of this report. However, a complete and readable description of the Wright brothers' experiments and their step-by-step progress in developing their flying machines is in Tom D. Crouch's biography *The Bishop's Boys: A Life of Wilbur and Orville Wright*. Most pertinent to the historic furnishings report, though, is that the brothers gathered their own data from experiments conducted at the 1127 West Third Street shop; built the kites and gliders that preceded the construction of the first airplane; and constructed the earliest power-driven, heavier-than-air flying machines with the tools, materials and machinery they selected and used in this building.

²⁸ Crouch, *The Bishop's Boys*, pp. 104-16 and Fisk and Todd, *The Wright Brothers: From Bicycle to Biplane*, pp. 45-51.

²⁹ Wilbur Wright, "Brief and Digest of the Evidence for Complainant on Final Hearing," *The Wright Co. vs. Herring-Curtiss Co. and Glenn H. Curtiss in Equity No. 400*, pp. 4-25, quoted in Crouch, *The Bishop's Boys*, p. 161.

³⁰ Crouch, *The Bishop's Boys*, pp. 159-66.

As early as July 1899, Wilbur determined that "wing warping was the answer to control in the roll axis," a theory central to the brothers' eventual success. Relating observations of birds in flight to the problem, Wilbur twisted an empty rectangular inner-tube box from the cycle shop to illustrate the effect of applying a helical twist to a single wing unit. Within a week Wilbur was at work in the shop constructing a kite incorporating this principle.³¹

In August 1900 the brothers began working on a full-sized glider, building ash ribs along with other wooden components, cutting and sewing fabric for the wings and acquiring other locally fabricated parts. Their chosen test site was Kitty Hawk, on North Carolina's windy, sand-covered Outer Banks.³² They learned from the first glider, abandoning it in the sand after their trials were completed in October. Their second glider was constructed at the shop between completion of the revised design in mid-May 1901 and their departure for Kitty Hawk in early July.³³

Wilbur and Orville's experiments with the 1901 glider led to more questions and serious doubts as to the accuracy of "lift tables" determined by earlier aeronautical experimenters. These tables were used to calculate lift using an equation incorporating velocity, surface area, a variable coefficient and a constant coefficient. The Wright brothers questioned the established value for the coefficient and set about verifying its accuracy. As part of their testing, they mounted two airfoils onto a bicycle wheel mounted horizontally on bicycle handlebars and created wind by riding the bicycle down the street. Their investigation revealed an error in earlier calculations.

They then developed a small wind tunnel to confirm the results achieved on the bicycle and to provide accurate and reliable measurements. To elaborate on their initial findings, the brothers decided to test not only earlier wing designs but to test and develop new shapes and sizes. In order to manage this testing they built a second wind tunnel, a wooden and metal box with a fan at one end, which was powered by a gas engine attached to a grinder. This setup provided a smooth stream of air over balances constructed from hacksaw blades and bicycle spokes. The two balances, which measured different aspects of lift, were visible through a window in the top of the tunnel.

Orville and Wilbur created small sheet-steel airfoils in varying sizes and shapes and tested them with both balances. From November 22 to December 7, 1901 they systematically tested various surfaces and recorded the results. The brothers were soon able to correct the coefficient error in the lift tables and determine the best wing surface to use for flight.³⁴ The brothers predetermined a limited amount of time in which they would conduct the tests, and: "having set a time for the experiments to cease, we stopped when the time was up."³⁵ They observed a strict procedure for operating the wind tunnel in order to obtain consistent results:

³¹ Tom D. Crouch, *A Dream of Wings: Americans and the Airplane, 1875-1905*, (New York and London: W.W. Norton and Company, 1981), pp. 230-31 and *The Bishop's Boys*, pp. 172-73.

³² Crouch, *The Bishop's Boys*, p. 183.

³³ Crouch, *The Bishop's Boys*, pp. 203-5.

³⁴ See Crouch, *The Bishop's Boys*, pp. 219-26, for a detailed explanation of the testing. See also McFarland, pp. 131-217 and Appendix II, pp. 547-57.

³⁵ Wilbur Wright to Octave Chanute, December 15, 1901, in McFarland, p. 180.

“... we allowed no large object in the room to be moved and no one except the observer was allowed to come near the apparatus, and he occupied exactly the same position beside the trough [the tunnel] at each observation.”³⁶

After the testing was completed in late 1901, the brothers constructed the new glider frame in the shop, sewing the fabric wing-covering in their home in the summer of 1902. They departed for Kitty Hawk at the end of August. By their return to Dayton at the end of October, they had logged in hundreds of flights in the new-model glider, and had begun calculations for a powered aircraft.

Through the winter of 1902-03 they developed a design for a double propeller system, then proceeded to work on their power source — a gasoline-powered engine. With machinist Charlie Taylor, hired in 1901 to work in the bicycle shop, Orville designed and built the engine in the machine shop. They started in December 1902 and, after one failure that led to a ruined crankcase, had the engine up and running by May 1903. At the same time they began construction of the flying machine itself, although because of the increased size of this model, it was never assembled in Dayton.

In September the brothers departed for Kitty Hawk, and by November 5 they had assembled the flyer and were ready to test it. The first test damaged the propeller shafts, which were sent back to the cycle shop for Charlie Taylor to repair. More than two weeks later the parts were returned, but a week after that another problem with the propeller shaft prompted Orville to return to the Dayton shop to fabricate totally new shafts. Orville returned to Kitty Hawk on December 11, and Wilbur piloted an unsuccessful trial on December 14. On December 17, with Wilbur running alongside the launching rail, Orville flew the brothers' aircraft for the first time.

Orville and Wilbur returned home to Dayton before Christmas and began working on a new flying machine. At this point they turned over the operation of the bicycle business to Charlie Taylor and began working exclusively on an aircraft that would improve upon their first flyer. The 1903 aircraft was tipped over and ruined by a stray wind soon after the brothers' historic flights on December 17. They soon determined to select a practice site closer to home, and obtained permission to use Huffman Prairie — a flat, isolated field just outside Dayton — which was accessible by trolley line. They worked there through 1904 and 1905, reworking their flyer until by October 1905 they had developed a machine they could safely fly and land, maintaining control in flights lasting over half an hour.³⁷

During this period, the machine shop at 1127 West Third Street remained their base of operations, although assembly of the flyers took place in the hangar they built at Huffman Prairie. The Wright brothers secured their first patent on the flying machine in 1906, and by 1908 had entered into contracts to provide Wright airplanes to the United States Signal Corps and to a French company. During 1907 and 1908 the brothers spent time on and off in

³⁶ Wilbur Wright to Octave Chanute, January 19, 1902, in McFarland, p. 204.

³⁷ Crouch, *The Bishop's Boys*, pp. 236-41, 244-45, 259-61, and 278-279. See also Tom D. Crouch, “The 1905 Wright Flyer,” in *The Wright Brothers at Carillon Historical Park*, pp. 16-27.

Europe, but late in 1908 they returned to Dayton to work on the airplane in the machine shop and on their brother Lorin's property.

In November 1909 the Wrights incorporated their airplane manufacturing company and moved their operation to a building rented from the Speedwell Motor Car Company. Construction began on their own airplane factory west of the cycle shop in early 1910. Charlie Taylor continued to build and test engines at 1127 West Third Street, and Lorin continued to use some of the second-floor rooms as offices for several more years, but the bicycle business was closed down. By September 1911 Taylor left the employment of the Wright brothers, so presumably the machine shop was no longer used after that time.³⁸

Setting up the airplane business and dealing with patent litigation consumed much of Wilbur and Orville's time and effort during the next few years, and in fact probably undermined Wilbur's health. He fell ill in April 1912 and died of typhoid fever on May 30. Orville carried on with the support of the rest of his family and continued with the brothers' joint business ventures, having inherited patent rights and interest in their companies.³⁹

The following March a great flood raged through Dayton. At this time personal papers and records documenting the invention of the airplane were still stored in the second floor offices of the building at 1127 West Third Street. The ground floor of the bicycle shop was ruined but the 1903 plane itself, crated and stored in a shed behind the cycle shop, survived. Orville continued to lease the West Third Street property, using his second-floor office over the former cycle shop when he became president of the Wright Company after Wilbur's death.

In 1915 Orville Wright's sale of the Wright Company made him a wealthy man. He soon built himself a laboratory several blocks from the cycle company, on land he and Wilbur had purchased for the purpose in 1909. In November 1916 he moved into the laboratory, giving up the lease on the cycle shop at 1127 West Third Street after nearly twenty years.⁴⁰

The Wright Family

In addition to providing the moral, emotional and intellectual underpinnings for Wilbur and Orville Wright's remarkable achievements, the Wright family was a significant presence, if not in the day-to-day operation of the cycle shop, then in the life of the West Dayton community and in the daily lives of the brothers. Although their mother, Susan Koerner, had died well before Orville and Wilbur leased the 1127 West Third Street cycle shop, their father, Bishop Milton Wright, was an involved and loving father, despite many long absences required by his career. In fact, Orville did not leave his father's house until he completed Hawthorn Hill, the home he built on land he and Wilbur had purchased in 1911. Even then, his father and sister Katharine moved with Orville to the new home. Bishop Wright lived with Orville until his death; Katharine lived at Hawthorn Hill until her late-in-life marriage in 1926.

³⁸ Howard R. DuFour with Peter J. Unitt, *Charles E. Taylor: The Wright Brothers Mechanician*, (Dayton, Ohio: Prime Printing, 1997), pp. 49-54 and 61.

³⁹ Crouch, *The Bishop's Boys*, pp. 450-451.

⁴⁰ Crouch, *The Bishop's Boys*, pp. 453-468.

Although just 15 at the time, Katharine had managed the house on Hawthorne Street after her mother's death, and then attended Oberlin Preparatory School and Oberlin College, graduating in 1898. She returned to her father's house in Dayton to run the Wright household and teach school until 1908.

Beginning in the autumn of 1900, Katharine supervised and managed the cycle shop while her brothers were at Kitty Hawk. On their first trip, the brothers hired a man named Dillon to work in the store and Cord Ruse to work on repairs while they were gone. Katharine and older brother Lorin acted as "managers." Within two weeks Katharine had fired Dillon, and Orville sent her instructions for ordering parts and supplies.⁴¹ During the brothers' second trip to Kitty Hawk in the summer of 1901 they hired Charlie Taylor to run the shop, and Katharine, although no fan of Taylor's, commented that he "managed the business well."⁴² By the next summer her dislike of Taylor had grown to the point that when he was in charge she would "steer clear of the store," even to the point of ignoring him when she went in to use the telephone.⁴³

Though Wilbur, Orville and Katharine had no children of their own, their nieces and nephews were frequent visitors to the cycle shop. Their oldest brother, Reuchlin, lived in Kansas with his family, but the second Wright son, Lorin, had returned to Dayton in 1889 after sampling life in the west. Lorin and his wife Ivonette had four children — Milton, Ivonette, Leontine and Horace — who were frequent visitors to the cycle shop and to the Wright home on Hawthorne Street. Ivonette recalls her mother dropping the children at the cycle shop so that the uncles could care for them, and Orville's candy-making skill was long remembered.⁴⁴

The brothers were kind to other children, as well. In a 1984 interview Mae Voris recalled bringing her bicycle in to the shop for repairs when she was a girl. She noted that she and her cousin visited the brothers frequently: "Any little thing, we'd take our bike in, and they'd fix 'em for us." She also pointed out how patient the brothers were with the children: "[Wilbur] was very quiet. But the other brother, Orville, talked to us and was very nice to us. For I think we must have been little pests."⁴⁵

Employees

One of the first people the brothers employed in the 1127 West Third Street cycle shop was Edwin Sines, Orville's boyhood friend and business partner. As mentioned above, Sines worked at the Wright Cycle Company premises for only about two years. By the time they moved to West Third Street, the printing business was becoming something of a sideline, managed in large part by Sines. Not surprisingly, the brothers frequently used it to advertise and promote their cycle business.

⁴¹ Katharine Wright to Bishop Milton Wright, September 26, 1900 and Orville Wright to Katharine Wright, October 14, 1900 in McFarland, pp. 27-29.

⁴² DuFour, *Charles E. Taylor*, p. 14.

⁴³ Katharine Wright to Orville Wright, October 5, 1902, Box 4, Wright Papers, Library of Congress, in Crouch, *The Bishop's Boys*, p. 121.

⁴⁴ Crouch, *The Bishop's Boys*, p. 125.

⁴⁵ Interview with Mae Voris, July 19, 1984, Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

In June of 1899 Sines accepted a position as business manager with a local religious publication, although he remained connected with the Wrights' *West Side News* as "solicitor," or sales representative, at least through July. Later that year the Wrights sold their equipment to another printing company and Sines left their employment altogether. The relationship between Sines and the brothers continued, however, and during Dayton's June 1909 celebration of the Wright brothers' achievements, Sines rode in the carriage along with his friends and former employers.⁴⁶

Charlie Taylor was a later employee who became significant in the realization of the Wrights' vision and was an important figure at the Wright cycle shop. Taylor was a machinist whose brother-in-law, Charles Webbert, owned 1127 West Third Street. The Wrights met Taylor in the late 1890s and he did work for them on the oil-retaining wheel hub and the coaster brake that they designed. They hired him in June 1901, just prior to their second visit to Kitty Hawk.

Three weeks after Taylor began work at the cycle shop, the brothers left for North Carolina. Taylor apparently did an acceptable job managing the shop, because he was put in charge the next summer as well. As mentioned above, Katharine Wright was not fond of Taylor, and complained to her brothers about his cigar smoking, his intimate knowledge of the business and his overall attitude.⁴⁷

Taylor and Orville began building the engine for the 1903 airplane around Christmas 1902 and had completed it by June 1903. In October 1903 the Wrights once again departed for Kitty Hawk and left Taylor in charge of the shop. He was in place to receive and repair broken or inoperable airplane parts, although Orville did return once to Dayton to oversee construction of new shafts.

After the successful flights of December 1903, Taylor continued working with the Wrights, collaborating on the engine for the 1904 flyer. In 1907 Taylor traveled to France for several months to assist the brothers with flying demonstrations, and in early 1908 began work in the 1127 West Third Street machine shop on the Wrights' military airplane. Taylor was present at the September 1908 flight at Fort Myer, Virginia, that killed passenger Lieutenant Thomas Selfridge, and narrowly escaped death himself, having been scheduled to accompany Orville Wright for the first time that day.

After the Wright airplane factory opened in 1910, Taylor continued to work at 1127 West Third Street, building and testing all the engines at the shop in the rear. In 1911 Charlie Taylor left the employment of the Wright brothers but returned in the fall of 1912 to work at the Wright Company. He continued to work for Orville Wright until 1928.⁴⁸

⁴⁶ Brunsmann and Brunsmann, *Wright and Wright, Printers*, pp. 15-16 and Fred C. Kelly, *The Wright Brothers* (N.Y.: Ballantine Books, 1966; original copyright 1943 by Fred C. Kelly), p. 158.

⁴⁷ DuFour, *Charles Taylor*, p. 13-14. See also Crouch, *The Bishop's Boys*, p. 204.

⁴⁸ See DuFour's *Charles Taylor* for further detail on Charles Taylor's life and work.

Other employees at the Wright Cycle Company include Cord or "Cordy" Ruse, a friend who carried out bicycle repairs at the shop during the brothers' first trip to Kitty Hawk in the autumn of 1900, and "Dillon" who looked after the shop that fall under the supervision of Katharine and Lorin. In 1908 the brothers hired machinist Fred Kreuzsch and Bob Elliot. Charlie Furnas, also the Wrights' first airplane passenger, was hired before 1908 and assisted with the Fort Myers flight.⁴⁹

EVIDENCE OF ROOM USE AND FURNISHINGS

Bicycle Sales Area: Bicycles, Bicycle Parts and Accessories

By the time they moved to 1127 West Third Street in the spring of 1897, the brothers were manufacturing their own brands of bicycles, the Van Cleve and the St. Clair. They began producing the Van Cleve in May 1896, building and enameling the frames themselves, brazing them for strength and building the wheels. They also designed a special bicycle hub as well as a new type of brake.

The Van Cleve was both dependable and durable and soon became a success in Dayton. The brothers next began production of the St. Clair, a lower-priced model that looked similar to the Van Cleve. This model was discontinued in 1900. In constructing the bicycles, the Wrights used parts such as Palmer, G. & J., B.F. Goodrich, Hartford, Morgan & Wright and Vim tires; Sager brand saddles, Excelsior spokes, Indianapolis and Lefever chains and Kelley handlebars.⁵⁰ These parts were available through companies such as E. H. Hall, a New York bicycle parts company the Wrights used. Locally, they patronized Forrer and Schaeffer on East Second Street.⁵¹

Orville and Wilbur also sold cycles made by other makers, took old bicycles in trade and rented cycles. Business ledgers indicate that between 1897 and 1906 they sold as many as 24 different brands of bicycles, including Crawford, Majestic and Waverly.⁵²

The sales area in the cycle shop was located in the front section, with a show window on West Third Street. The show window consisted of a platform built along the front window, with a yellow silk screen hung on a frame. Note that in the following detailed description of the window arrangement, Orville specifically mentions that bicycles were displayed in the window.

I am sending a sketch showing the general plan of construction of the frame for the screen. [See Appendix F.] If I remember correctly it was made of ¼ inch Bessemer rod, after the manner shown in the sketch. On the top of the uprights were little brass castings somewhat in the shape of acorns. The black dots in the sketch indicate small pins through the uprights to hold the horizontal parts of the frame in place. The screen was in two sections — one section was hinged to the window frame

⁴⁹ Crouch, *The Bishop's Boys*, pp. 188, 358, and 371 and DuFour, *Charles Taylor*, p. 62. See also Kelly, *The Wright Brothers*, p. 25.

⁵⁰ Fisk and Todd, *The Wright Brothers: From Bicycle to Biplane*, pp. 27-28 and 30-31.

⁵¹ Orville Wright to Katharine Wright, October 14, 1900, in McFarland, pp. 28-29.

⁵² "Partial analysis of bicycles sold by the Wright Cycle Shop between 1897 and 1906," by Susan Bushouse, 1983, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

at the door and the other was hinged on the window frame at the wall. Each section consisted of two panels. The panels could be folded up against each other for purposes of changing the window display. The screen stood in about three or four inches from the edge of the platform.

On the wall side one panel was put up tight against the wall and the other extended out half way across the platform, so that the two sections came together at the middle of the platform. The screen stood several inches higher than the saddle and the handlebars of the bicycles. The exact height I do not know, but I suspect between 36 and 40 inches. The silk covering had a heading at the top and bottom one-half to one inch wide. The legs at the bottom were just long enough so that the covering barely reached the floor. I think there was at least twice as much material used as the length of the panels, which threw the fabric into folds. The silk was of a deep yellow color and, as I remember it, was very much like that used in lamp shades today.⁵³

Bicycles were displayed and stored in other parts of the Wright Cycle Shop as well. Ivonette Wright Miller, the Wrights' niece, recalled that bicycles were displayed in the front window and were repaired all over the shop, not just in the repair area.⁵⁴ Mae Voris, who visited the shop frequently as a child, remembered the bicycles being stored just "anyplace" in the shop.⁵⁵ Miller also recalled storage racks in the rear room for bicycles.

The author of *Bicycle Repairing* (1896) recommends storing cycles in a 28-inch-high rack with uprights spaced so that the front wheel of each cycle is held inside a two-inch gap between supports. Bicycles were placed in the spaces alternately on either side of the rack or could also be suspended from the ceiling "for inspection, cleaning or storage" by means of a pulley system.⁵⁶ See figure 18 for illustrations from the manual.

The amount of new stock carried at the Wright Cycle Company is difficult to determine. The Wright brothers' business ledgers indicate that items such as bicycle lamps, bells, pumps, tires, cyclometers and toe clips were carried in the shop, but cycle sales and repair was a seasonal business and after the busy season in the spring and summer, it is likely that the brothers did not carry much stock. When he was in Kitty Hawk in October 1900, Orville cautions Katharine not to stock up: "I do not think it best to buy too much of any one thing this late in the season."⁵⁷

The author of the 1896 manual *Bicycle Repairing* points out that bicycle makers kept duplicate parts of each bicycle in their line in stock and could express ship them to repair shops upon receipt of a telegraph order. The manual also claims that it was usually cheaper and more practical to use manufacturer-made replacement parts, rather than to build the parts at the repair shop. If businesses kept on hand all of the parts for each type of bicycle they carried, they could quickly repair the lines they sold, but "[b]eyond this there is no rule; the

⁵³ Orville Wright to Fred L. Black, The Edison Institute, November 4, 1937, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁵⁴ Interview with Ivonette Wright Miller and Harold S. Miller, June 26, 1983, by Susan J. Bushouse and interview with Ivonette Wright Miller and Harold Miller, [1984?] by Susan Bushouse, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁵⁵ Interview with Mae Voris, July 19, 1984, by Susan Bushouse, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁵⁶ S.D.V. Burr, *Bicycle Repairing*, (New York: David Williams, 1896), pp. 20-21.

⁵⁷ Orville Wright to Katharine Wright, October 14, 1900 in McFarland, pp. 28-29. See also "Analysis of Wilbur and Orville Wright's Business Journals, 1897-1906" in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

judgment of the repairer and the probable requirements of his customers are the only guides."⁵⁸ The cycle shop owner pictured in figure 17 apparently subscribed to Orville's theory of restraint, offering very little stock on his shelves in the winter of 1895.

As Fred C. Kelly points out in his authorized biography of Orville and Wilbur Wright, the shop at 1127 West Third Street did not boast an air pressure-tank, but the brothers offered their customers the use of a hand-pump stored on the wall near the front door. So that they did not have to stop what they were doing in their second-floor workroom and go downstairs to wait on customers who only wanted air, the brothers devised a system that would alert them when the pump was removed from its hook and when it was replaced. Kelly describes the arrangement:

They took an old two-tone bell, intended to be fastened to a bicycle handlebar, and attached it to the wall in their upstairs work-rooms. By means of wires and other mechanism, the opening of the downstairs door yanked the thumb-lever on the bell in one direction, producing one tone; and shutting the door pulled the little lever in an opposite direction to cause the other tone. The hook on which the air-pump hung was also connected by a wire and a spring to a pointer upstairs. ... If [the customer] promptly helped himself to the pump, there probably was no need for anyone to go down. Then when the pointer showed that the pump was back on the hook and the bell signaled the closing of the door, on the caller's departure, the brothers could feel sure they had not missed a sale of any kind ...⁵⁹

Bicycle Sales Area: Office

Although frequently working on the second floor of the West Third Street building, the brothers had an office in the front room on the ground floor, separated from the sales area by a wooden partition topped with glass. Orville Wright described the partition in a 1937 letter to Fred L. Black, who was in charge of the Greenfield Village reconstruction of the cycle shop. Orville explained that the partition walls were painted the same color as the other woodwork in the room, which was done in a light ochre, and the frame was painted in a "light maroon or mahogany color." The partition included an interior shelf with a "money drawer," which was installed to open outward into the shop so that customers could leave payments on their own. They jotted payment information down in the 6-1/2" x 16" notebook located on the drawer.⁶⁰

Inside the office enclosure, the Wrights used a rolltop desk, a swivel chair, a safe and a small table holding a typewriter. The Wrights had two typewriters in the building by 1909 — a Smith-Premier Typewriter No. 1 and a Smith-Premier Visible Writer. Orville Wright donated the desk, chair, safe and table to Greenfield Village for use in the reconstructed Wright Cycle Company building in 1938. He also contributed a Smith-Premier No. 2 typewriter, though it was not the one used in the shop. According to Greenfield Village

⁵⁸ Burr, *Bicycle Repairing*, p. 15.

⁵⁹ Kelly, *The Wright Brothers*, p. 23.

⁶⁰ Orville Wright to Fred L. Black, November 4, 1937, and "Report on Wright Cycle Shop, July 20, 1953," by Laura Merwin, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

records the museum received an older Smith Premier model, which had belonged to Bishop Wright in the early 1890s.⁶¹

The 1909 inventory of the Wright Cycle Company lists a great deal of additional office furniture located in the West Third Street building, but for the most part does not indicate in which rooms it was used. One lot of matting is noted as being in the office, but the entry could refer to the office area on the ground floor or the offices on the second floor. Similarly, other furnishings such as a jardiniere stand, two file cases with top and base, six plain file cases, two rocking chairs and three unidentified chairs are listed without reference to location in the building. The rocking chairs are of particular interest, as Orville won a \$10 rocking chair as a prize in a June 1894 bicycle race. A ten-dollar rocker of this period was probably fairly elaborate, with an oak or mahogany frame upholstered in velour or tapestry, and although it would have made an unusual addition to a commercial establishment, may have been used somewhere in the cycle shop.⁶²

Orville Wright was an interested amateur cyclist and Dayton was a center of cycling competition in the 1890s and early into the 20th century. During the 1901 interpretive period and before, the brothers were involved with the Dayton cycling community and it is likely that in their shop they would have flyers, advertisements and other information about events at the Colosseum, the Dayton cycling track newly constructed in 1901 and host to frequent professional bicycle races. The brothers were also associated with the Dayton Bicycle Club and the YMCA Wheelmen, a national organization.⁶³

Ivonne Wright Miller remembered a hole cut into the wall between the partitioned-off office area and the repair shop to the rear. This hole or passage was not included in the Greenfield Village reconstruction overseen by Orville Wright, but his niece clearly recalled "a hole where they put papers through that they wanted to send to the other rooms in the back." Ivonne supposed that her uncle "had it boxed up" because it was "just something made for their convenience." In the same interview, Miller mentions that before they had plumbing installed the Wrights had a "very clean" privy outside the cycle shop.⁶⁴

The shop was heated with stoves, though no firm evidence has survived as to what type of stoves were used. Ivonne Wright Miller recalled that the shop was "always warm enough," and that even in the winter the brothers didn't wear sweaters. At the time of a 1989 interview with Miller, Greenfield Village staff believed that there was a stove in the office and in the

⁶¹ Greenfield Village Guides Study Folder, 1938, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file. See also 1909 inventory of 1127 West Third Street, Wright Cycle Company Business Journals and Ledgers, 1902-10, microfilmed by Library of Congress (hereafter 1909 inventory). Copy at Dayton Aviation Heritage National Historic Park.

⁶² *The Dayton Daily News*, June 30, 1894, and 1909 inventory. Dayton *Daily News* copies in Carillon Historical Park research file. Thanks to Phil Scott, Carillon Historical Park Bicycle Committee, for making this connection between bicycle racing and furnishings.

⁶³ *The Dayton Daily News*, July and August 1901, in Carillon Historical Park research file. See also Crouch, *The Bishop's Boys*, p. 107.

⁶⁴ Interview with Ivonne Wright Miller and Harold Miller, [1984?], in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

machine shop.⁶⁵ This arrangement is practical and is supported by a 1953 memo in the museum files, which notes that the exhibit as it existed then did not include the gas stove “designed and made by the Wrights.” The memo referred to notes made by Orville Wright (not located for this report) that state the stove was not in place when not in use. This memo also pointed out that by 1953 the wind tunnel in the machine shop was located just where the chimney extended from the stove that was in the room.⁶⁶

Lighting

The gas lighting fixtures installed in the 1127 West Third Street building in Greenfield Village are not original, but a 1953 analysis of the exhibit notes “the lighting fixtures are as closely matched as possible,” although the shades on the wall fixtures are “a bit different.”⁶⁷ This passage indicates that perhaps the curatorial staff installing the fixtures knew the appearance of the original lighting, which is possible, since Orville Wright supervised the installation of the furnishings exhibits in the building in 1938. A second possibility is that Greenfield Village curators were trying to match the fixture pictured in figure 1, which shows a single swing-arm burner installed on the wall near two workbenches.

A 1984 analysis of the installation at Greenfield Village notes that according to a 1936 blueprint of the building, there were wall-mounted gas lighting fixtures in the machine shop, as well as outlets for ceiling fixtures.⁶⁸

Wallcovering

The wallcovering used in the bicycle showroom and sales area was a tan oatmeal, or ingrain, paper. Ingrain papers were introduced in the late 1870s and had a textured surface with the color in the pulp of the paper, so that it could be “washed without marring or destroying its color.” Oatmeal papers were similar to ingrain, but had larger specks of white in the pulp.⁶⁹ According to two 1937 letters from Orville Wright, the ingrain was installed after 1900 and a striped paper was installed by 1910 “to conceal marks and spots that came from leaning bicycles against the wall.” The original wall treatment included border and ceiling papers.

When the Wright Cycle Shop was reinstalled in Greenfield Village in 1938, Orville Wright suggested that the walls in the bicycle showroom or “store room” be painted, since ingrain paper was no longer available. He felt that the reproduction wall treatments installed in the 7 Hawthorne Street house, also moved to Dearborn, were not accurate and that “it is a mistake to try to get old papers unless they are exactly the same, or at least give the same effect, as the papers originally used.”⁷⁰

⁶⁵ Interview with Ivonette Wright Miller and Harold Miller, September 17, 1989, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁶⁶ “Report on Wright Cycle Shop,” by Laura Merwin, July 20, 1953, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁶⁷ Ibid.

⁶⁸ “Wright Cycle Co. Shop: Reinstallation Recommendations,” by Susan Bushouse and Kathie Flack, March 19, 1984, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁶⁹ Catherine Lynn, *Wallpaper in America: From the Seventeenth Century to World War I*, (New York: W.W. Norton and Company, Inc., 1980), p. 443. See also p. 303.

⁷⁰ Orville Wright to Fred Black, November 4, 1937 and Orville Wright to Fred Black, December 15, 1937, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

A portion of a patterned border is shown in figure 3, an image of Edwin Sines at work in the second floor printing office at 1127 West Third Street. Sines' presence in the photograph dates the image to sometime before or during the summer of 1899, since Sines left the Wright brothers' employment in the second half of that year.

There was clearly wallpaper available in the Wright cycle shop during the interpretive period, though presumably in rolls rather than on the wall, for the brothers jotted notes about the wind tunnel balances on the back of wallpaper scraps in September 1901. These pieces, now in the collection of the Franklin Institute in Philadelphia, are not from the border shown in the photograph of Sines, nor are they part of the paper described by Orville Wright in 1937. Copies of the pattern, manufactured by the York Card and Paper Company, have been pieced together and though the pattern has certain elements in common with the border on the second floor, it is not the same paper. The positioning and scale of the pattern indicate that this paper was not intended to be used as a border.⁷¹

Repair Room

The Wright brothers' business ledgers list the bicycle parts they sold, but seldom indicate what kind of repairs they performed. Most furnishings evidence for the repair room at 1127 West Third Street is found in S. D. V. Burr's 1896 manual on bicycle repairing. The manual offers a list of bicycle tools under \$100 with which a mechanic could start a small business. (See Appendix A.) The Wright brothers had most of these tools at the time their business was inventoried in 1909. The manual also points out that there are certain tools the bicycle mechanic must purchase, but suggests "many of the devices described in the following pages can be constructed during his leisure moments."⁷²

Though the actual location of the room shown in figure 1 remains unclear, it is still one of the best sources of information about the types of tools the brothers used in repairing bicycles and the ways in which they stored those tools in their work space. The vise, hand drill and hacksaw shown in figure 1 were all used in the shop, appear on the 1909 inventory of the shop, and appear, with other tools recommended in *Bicycle Repairing*, in figures 10 through 16. The photograph also shows a rack supporting four bicycle frames. Directions for constructing such a rack appear in *Bicycle Repairing*, which describes it as "essential in every shop, no matter how large or small."⁷³

The workbench was integral to the repair operation and is visible in the bicycle repair shop interiors illustrated in figures 1 and 10 through 15. *Bicycle Repairing* gives detailed instructions on constructing a workbench of this type, which was to be screwed to the floor and located "where daylight is abundantly supplied by one or more windows."⁷⁴

⁷¹ See December 1999 Division of Historic Furnishings submission to Carillon Historical Park.

⁷² Burr, *Bicycle Repairing*, p. 9.

⁷³ See Appendix A and Burr, *Bicycle Repairing*, pp. 20-21. See figure 18 for illustration of bicycle rack.

⁷⁴ Burr, *Bicycle Repairing*, pp. 13-15.

Second Floor

The ground floor repair area is the only space interpreting the repair function of the shop in the 1127 West Third Street building, but it was not the sole location of all the bicycle construction and repair in the Wright brothers' business. The second floor contained the enameling room, in which the bicycle frames were painted, as well as a workshop.⁷⁵ The enameling operation was located on the second floor because it was important to keep it free of all dust and dirt. As the Burr's bicycle repair manual points out, it was essential to "preserve absolute cleanliness" of the piece to be treated, the enamel itself and the oven in which the piece was baked.⁷⁶ It would be difficult to maintain this standard of cleanliness around a machine shop or in the sales or repair area, which were accessible to customers.

The work area illustrated in figure 1 was probably located in the front room of the second floor of the West Third Street building. During the reconstruction of 1127 West Third Street, Orville wrote to Greenfield Village forwarding a photograph with the following explanation:

UPSTAIRS FRONT ROOM SHOP. I believe I gave Mr. Ryan a photograph of this room last June. Mr. [Charlie] Taylor and Mr. Cutler [who supervised reconstruction at Greenfield Village] seemed to know nothing about it, so I am sending another print. This photograph ought to help in placing the vises, etc.

The photograph seems to show that there was more shelving under the bench than I told Mr. Cutler. The shelves seem to have extended half way across the room.⁷⁷

Orville's description of the shelving under the workbench in the "upstairs front room shop" could easily apply to figure 1. The window illuminating the bench on which Ed Sines is working in this photograph is in the correct location for the front room of the West Third Street shop.

The calendar pictured in figure 1 is dated September 1897, which is probably when the Wrights moved their business to the 1127 West Third Street building. The boxes, bins and basket on the floor and the objects strewn about the bench give this space a "lived in" appearance, however, which is somewhat problematical, as it does not support the idea that this was a brand new work space.

In a 1989 interview, Ivonette Wright Miller claimed that there was no machinery on the second floor, and remembered her father, Lorin Wright, making and repairing airplane ribs on the second floor when the Wright brothers were away. She also recalled the second floor office where her father worked.⁷⁸ In 1938 Charlie Taylor mentioned "a small office and a workroom" on the second floor, and claimed the brothers did "most of their experimenting

⁷⁵ See Second Floor floor plan, J. Broadfoot, in "Greenfield Village Guides Study Folder, Wright Workshop," 1938, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁷⁶ Burr, *Bicycle Repairing*, p. 134.

⁷⁷ Orville Wright to Fred Black, November 4, 1937, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁷⁸ Interview with Ivonette Wright Miller and Harold Miller, September 17, 1989, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

upstairs.”⁷⁹ A 1906 visitor to their shop was shown to the brothers’ second-floor office where he noted the “windows ... covered by white shades, which are drawn down to the sills in fair weather or foul.”⁸⁰

An intriguing photograph, reproduced in figure 4, shows a young Wilbur Wright standing in what appears to be a second-floor doorway, with an engine attached by belt to a grinder in the foreground. The image, which is owned by the Wright family, is spotted and somewhat faded, but it is likely that it was taken on the second floor of the 1127 West Third Street cycle shop.⁸¹ In a 1938 letter to the Edison Institute (now the Henry Ford Museum and Greenfield Village), Orville Wright notes that in 1901 the tunnel’s propeller was attached to the shaft of the emery grinder, but points out that “as the tunnel now [1938] is located in the position in which the tunnel was located in 1903 some other arrangement for the propeller will have to be made.” In 1938 the tunnel was exhibited on the ground floor at Greenfield Village, so in other words, Orville Wright was pointing out that there was not a wind tunnel in that first-floor location until 1903. This letter also supports Tom Crouch’s statement that the wind tunnel experiments were conducted in the back upstairs room of the bicycle shop.⁸²

Machine Shop: Machinery

The first lathe the Wright brothers used in the 1127 West Third Street building was probably a Prentice Brothers model made between 1880 and 1890. This lathe, pictured in figure 2, was replaced on July 22, 1901 by a 14-inch Putnam lathe. The new lathe had a six-foot bed and a factory-installed taper attachment. It also included a set of four riser blocks, which may have come from the Putnam Company, or may have been made by a shop in Dayton. The Wrights purchased the lathe and a 20-inch Barnes drill press with a square base and self-feed with automatic stop from the Patterson Tool and Supply Company in Dayton.

The Barnes model was the second drill press used in the West Third Street shop. The drill press illustrated in figure 2, which was probably used until the 1901 purchase, appears to have been made by the Wrights themselves and is not similar to any commercially produced drill press of the period. The Wrights set up both pieces of machinery by September 1901. Both the lathe and the drill press were used to make the gliders and the 1903 airplane.⁸³

The 26-inch Crescent band saw was purchased on March 27, 1903. It, too, was sold by the Patterson Tool and Supply Company in Dayton. This band saw was used to make parts for the 1903 flyer and continued to be used to make airplanes at the West Third Street shop until

⁷⁹ “Gas Engines in the Wright Cycle Co. shop,” by Susan Bushouse, May 8, 1984, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁸⁰ *St. Louis Republic*, March 11, 1906, in Dayton and Montgomery County Public Library, Wright Brothers Collection, MS001, Box 27, Scrapbook 1890-1916.

⁸¹ The large dot in the center of the image could be a water spot. If the original plate from this print was stored in the 1127 West Third Street building with other glass plate negatives during Dayton’s 1913 flood, it is likely that it suffered water damage.

⁸² Orville Wright to Fred L. Black, February 3, 1938 in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file and Crouch, *The Bishop’s Boys*, p. 225-26.

⁸³ Orville Wright to Fred Black, November 30, 1937 in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file. Also, Katharine Wright to Bishop Milton Wright, September 3, 1901 in McFarland, p. 92. See “Report on the Lathe and Drill Press in the Wright Brothers’ Workshop from 1897-1902,” by William R. Robertson, attached as Appendix C, for further analysis of the early lathe.

July 1909. The lathe, the drill press and the band saw were sold after the Wright Company was incorporated in 1909, but were located by Greenfield Village and installed in the 1127 West Third Street reconstruction in Dearborn in 1937.⁸⁴

The six-inch double-end bench grinder, or emery grinder, was purchased from the Patterson Tool and Supply Company on July 9, 1897. The grinder, which cost \$8.70, was used to operate the wind tunnel. It was retained by Orville Wright and donated to Greenfield Village in 1937. The belt drive line shaft was used to operate the band saw, grinder, lathe and drill press. It was discarded in 1909, although Orville Wright retained two hangers from the system, which were donated to Greenfield Village in 1937.⁸⁵

According to an analysis of furnishings evidence developed by Greenfield Village in 1984, the brothers built two stationary gas engines to power the machine shop at the Wright Cycle Company. The brothers' early lathe and drill press, pictured in figure 2, were belt-driven and required a power source, although nothing was discovered about that early engine for this report. In 1899 the Wrights designed a single cylinder shop engine, which was completed in 1900.⁸⁶

A second engine was designed and built in 1901 and Katharine Wright refers to the brothers' preoccupation with it in a September letter to her father: "We don't hear anything but flying machine and engine from morning till night ... Their machinery has come and they have been working at it, setting it up and getting the engine into working order ..." Later that month, Wilbur referred to completing a new gas engine "on which we have been working for some time."⁸⁷

A summary of a 1937 interview with Orville Wright recorded in the Henry Ford Museum and Greenfield Village Research Center states that the brothers: "made and used two (gas) engines in the bicycle shop. One engine was used on each floor. Mr. Wright still has the base from the engine they used downstairs."⁸⁸ This mention of two engines further supports the use of the wind tunnel on the second floor.

During the reinstallation of the Wright cycle shop at Greenfield Village, Orville Wright supervised Charlie Taylor's reconstruction of the 1900 engine. The original 1900 engine was a "single cylinder air-cooled natural gas engine operated on the hot tube principle,

⁸⁴ "Finding the Machines on Which the First Airplane was Made, May and June 1937," and Orville Wright to Fred Black, November 30, 1937 in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁸⁵ "Finding the Machines on Which the First Airplane was Made, May and June 1937"; Orville Wright to Fred Black, November 30, 1937; see also "Machine Shop" notes, 1983 [?], in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file. "Hangers" are cast iron brackets that hold the bearings that support the line shafting.

⁸⁶ Orville Wright to Fred Black, November 30, 1937 and "Gas Engines in the Wright Cycle Co. shop," by Susan Bushouse, May 8, 1984, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁸⁷ Katharine Wright to Milton Wright, September 3, 1901 and Wilbur Wright to George Spratt, September 21, 190 in McFarland, pp. 92 and 119.

⁸⁸ Wright Scrapbooks quoted in "Gas Engines in the Wright Cycle Co. shop," by Susan Bushouse, May 8, 1984, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

there being no spark plug.” It was discarded sometime after the 1903 flyer was constructed.⁸⁹

Machine Shop: Brazier

The brazier was essential to making and repairing bicycles because it was used to solder metals, such as bicycle frames, together. The manual *Bicycle Repairing* points out: “The integrity and usefulness of the frame, and therefore of the wheel [bicycle] itself, depend upon the degree of perfection of the work done upon the joints.” If brazing is done improperly, “the wheel is doomed to speedy destruction.”

A brazier could be constructed in many different forms, as illustrated in *Bicycle Repairing*. The essential elements are two pipes, one containing air and one containing gas, with regulating valves. The air and gas are mixed before coming out of a single pipe and the flame resulting from their combustion is regulated by the valves.⁹⁰

According to an unauthorized biography by Mitchell Charnley written in 1928, the Wright brothers made the gas brazier they used in the 1127 West Third Street shop themselves.⁹¹ This assumption is supported by a 1984 analysis of the original brazier, donated to Greenfield Village in 1937. The illuminating gas was piped from the wall outlet used for lighting and the air tank was filled using a hand-operated bicycle pump.⁹²

Machine Shop: Hand Tools

As noted above, the Wright brothers owned many of the tools recommended in *Bicycle Repairing* for furnishing a modest bicycle repair establishment. (See Appendixes A and B.) In addition to their own tools, the Wright brothers’ machine shop would have contained tools owned by Charlie Taylor and any other workers hired to work in the shop. Machinists owned their own tools and their own tool chests and brought them with them when they began work at a shop.

The 1909 inventory does not list tool chests for either Wilbur or Orville, but they probably considered their chests personal property, which was not a part of the business transaction in 1909. Charlie Taylor continued to work with the tools and tool chest he used in the Wright Cycle Company shop throughout his career, and in 1940 Henry Ford offered to purchase replacement tools for him if he would leave his original Gerstner tool chest and tools in the reconstructed shop in Dearborn.⁹³ Appendix D lists the tools Taylor used at the Wright brothers’ shop and later traded to Greenfield Village.

⁸⁹ “Finding the Machines on Which the First Airplane was Made, May and June 1937,” in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁹⁰ Burr, *Bicycle Repairing*, pp. 32-35.

⁹¹ Crouch, *The Bishop’s Boys*, p. 517 and Machine Shop notes in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁹² Machine Shop notes (1985?) and “The Wright Cycle Co. Shop: Work Room” discussion with John Bowditch, Curator of Power and Shop Machinery and Susan Bushouse, Researcher, February 15, 1984, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁹³ E. W. Reimer to Frank Campsall, September 27, 1940, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

Appendix E, an excerpt from a detailed explanation of how early 20th-century machinists acquired and used tools, provides additional information about machine tools and tool chests.

Machine Shop: Wind Tunnel

In a 1953 letter to the librarian at the Henry Ford Museum and Greenfield Village, Marvin McFarland, editor of Wilbur and Orville Wright's papers at the Library of Congress, points out the importance of the Wright brothers' wind tunnel to the development of their flying machine:

In any event the important period for the bicycle shop's relationship to the history of aviation is late 1901 and early 1902 when the Wrights conducted their wind-tunnel experiments in it. The fact that parts of the power machine of 1903 were made in the bicycle shop is a relatively unimportant detail compared with the fact that the wind-tunnel experiments, that gave the Wrights the knowledge with which they were able to build and fly the plane, were made there.⁹⁴

As mentioned above, Orville and Wilbur conducted two sets of tests, one with a bicycle wheel mounted on the handlebars of a bicycle and one with a simple wind tunnel, before they constructed their second wind tunnel. The results of these tests showed them that they needed to reassess the two coefficients in the standard equation for determining lift. The wind tunnel tests would first of all ascertain the correct coefficients for the equation, which would change the "lift tables" that had been established by early aeronautical pioneer Otto Lilienthal. Second, the brothers would also use the wind tunnel to test the most efficient shape and size of airfoils.

The wind tunnel was an unvarnished pine box just over six feet long. It measured sixteen inches square inside, and was supported by four legs "made of ordinary two by fours planed on all sides." On one end was a galvanized iron collar that extended around a steel propeller-like blade. A grid or grill across the fan caused the air to move straight through. Wilbur called it a "wind straightener" and with other modifications they "obtained a current very nearly constant in direction." The fan was powered by the single-cylinder gas engine, "which ran the machinery of our shop," and was attached to the spindle of a disused grinder.⁹⁵

A pane of glass was inserted in the top of the wind tunnel so the brothers could observe the movement of the balances inside. The balances themselves were made of bicycle spoke wire and hacksaw blades. There were two of them, one to measure lift and one to measure drag. As Orville pointed out in a 1940 letter, only one balance could be used in the wind tunnel at a time: "To avoid the constant changing of the instruments we would measure the lifts of a series of aerofoils and then change the instruments to measure the drags."⁹⁶

⁹⁴ Marvin W. McFarland, Special Consultant to the Chief, Aeronautics Division, Library of Congress to William H. Distin, Librarian, The Henry Ford Museum and Greenfield Village, August 26, 1953, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

⁹⁵ Orville Wright to Henry B. Allen, Secretary and Directory, The Franklin Institute, October 10, 1945; Orville Wright to Dr. George W. Lewis, National Advisory Committee for Aeronautics, May 10, 1940; Orville Wright to Fred L. Black, The Edison Institute, February 3, 1938, and Orville Wright to Henry B. Allen, May 1, 1946, Wright Brothers papers, Library of Congress, Box 101, and Wilbur Wright to Octave Chanute, January 19, 1902, in McFarland, p. 204.

⁹⁶ Orville Wright to Henry B. Allen, February 22, 1940, Wright Brothers papers, Library of Congress, Box 101.

During the roughly six weeks that the brothers ran tests in the wind tunnel, they tested as many as 200 different types of wing surfaces. The airfoils were made of 20-gauge steel, some of them enameled and some of them thickened with wax and solder. Wilbur Wright's description of the fabrication of the airfoils indicates the tools readily available in the brothers' shop:

... I think that 20-gauge steel would be thick enough for surfaces 2"x12". This thickness of metal can be easily cut with a good pair of tin shears and you can easily shape the curvature to what you want with a hammer. ... With a pair of tin shears, a hammer, a file, and a soldering iron you can get almost any shape you want ... when I came to look at our surfaces again I found them rusting, so I put a coat of enamel on them and put them in the oven to bake but forgot about the solder and let them get too hot.⁹⁷

I recommended [sheet steel] because it is so stiff, so easily formed into any desired shape, and so cheap. In fifteen minutes any curvature desired can be obtained with no other tools than a hammer and anvil, either a plain curve, or spoon-shaped, or bowl-shaped.⁹⁸

As discussed above, the original location of the 1901 wind tunnel is not absolutely certain. If the brothers had two engines, then it is quite possible that they operated the wind tunnel on the second floor. Tom Crouch describes the careful operation of the wind tunnel in a second-floor room:

Procedure was everything. No one but the operator was allowed to stand near the tunnel during a run, nor could any change be made to the upstairs room at the bike shop where the experiments were conducted. They discovered that the tunnel actually set up a circulation of air around the entire room, so that even moving a piece of furniture had an impact on the readings.⁹⁹

An illustration in *The Papers of Wilbur and Orville Wright* showing a replica of the 1901 wind tunnel near the front wall of the reconstructed machine shop at Greenfield Village bears the caption: "Workroom behind Wright bicycle shop, Greenfield Village, Dearborn, Michigan, showing location of the 1901 wind tunnel."¹⁰⁰ The 1938 study folder for Greenfield Village guides notes that the wind tunnel "was placed in the rear of the shop."¹⁰¹ Orville Wright assisted in setting up the exhibits in the reconstructed 1127 West Third Street building at Greenfield Village, so it can be assumed that he concurred with this placement. On the other hand, then as now, the wind tunnel may have been exhibited in the machine shop in order to facilitate interpretation. As noted above, Orville Wright pointed out that in the 1938 Greenfield Village exhibit, the 1901 tunnel was placed in its 1903 location.¹⁰² The remark implies that the tunnel and grinder were not located on the ground floor in 1901.

⁹⁷ Wilbur Wright to George Spratt, January 23, 1902, in McFarland, p. 557.

⁹⁸ Wilbur Wright to George Spratt, February 14, 1902, in McFarland, p. 557.

⁹⁹ Crouch, *The Bishop's Boys*, p. 225. See also Wilbur Wright to Octave Chanute, January 19, 1902, in McFarland, p. 204: "We had found by previous experience that these precautions were necessary, as very little is required to deflect a current a tenth of a degree, which is enough to very seriously affect the results."

¹⁰⁰ McFarland, Plate 116.

¹⁰¹ "Greenfield Village Guides Study Folder: Wright Workshop," 1938, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

¹⁰² Orville Wright to Fred L. Black, February 3, 1938, Wright Brothers Papers, Library of Congress, Box 101.

The 1901 wind tunnel was used until January 1903, and another, larger wind tunnel was constructed in early 1903. The wind tunnel listed on the 1909 inventory could have been either the one built in 1901 or the one constructed later.¹⁰³ The original wind tunnel no longer survives, but reproductions are located in the collections at the Franklin Institute, Carillon Historical Park and Greenfield Village. A reproduction wind tunnel will be exhibited in the machine shop at Carillon Historical Park to enable and encourage interpretation of this important object.

Machine Shop: Rudder

The two-surface rudder developed for the 1902 glider is very similar in appearance to the rudder ultimately used on the 1905 aircraft. Including this version of the rudder in the furnished machine shop, in addition to being accurate to the winter 1901-02 interpretive period, will strengthen the visual link between the glider under construction in the machine shop and the original 1905 aircraft on exhibit in Wright Hall. Interpreters can use this similarity to point out the connection between early models and the successful flyers and explain that because of experiments done in the wind tunnel, the Wright brothers were able to design wings and rudders of workable and efficient shape and surface area.¹⁰⁴

Interpretive Area

This room was used for storage of new and repaired bicycles in the original Wright brothers cycle shop. In the reinterpretation of the Wright Cycle Company building at Carillon Historical Park, this space will be used for first-person interpretation of the three furnished rooms and will serve as a gathering area for groups.

Walls in the interpretive area are painted in Sherwin Williams Paper Lantern SW 1360, eggshell; the ceiling is Sherwin Williams Decor White SW 1361, flat, and the doors and trim are painted Sherwin Williams Buttery SW 1359, gloss. The floors will be covered in 18"x18" Second City carpet tile, color 304 (glazed tile) and limited contemporary seating will be provided.

¹⁰³ McFarland, pp. 550-51 and 1909 inventory and Orville Wright to Henry B. Allen, May 1, 1946, Wright Brothers Papers, Library of Congress, Box 101. For further description of the construction and operation of the wind tunnel and for further explanation of the experiments, see McFarland, Appendix II, pp. 547-77; Kelly, *The Wright Brothers*, pp. 44-45, and Crouch, *The Bishop's Boys*, pp. 220-27.

¹⁰⁴ See Crouch, *The Bishop's Boys*, pp. 235-39 and McFarland, p. 269 for more on the development of the rudder design.

FURNISHINGS PLAN AND RECOMMENDATIONS

Sales Area

| Object/Location | Evidence | Recommendations |
|---|--|--|
| Bicycles, three (in window) | Figure 17. The Wright brothers built and sold Van Cleve bicycles. | Reproduction Van Cleve bicycle acquired for project, F.2000.184. Use C.984.4.163, 1898 "Dayton" model by Davis Sewing Machine Company, hanging in window. Use C.2000.2.3 Spaulding bicycle. Two period pulleys acquired for project, F.2000.122. Acquired new cleat and rope 9/2000. |
| Bicycle stands, two, cast metal (in window) | To display bicycles. | Reproduction stands acquired for project F.2000.110. |
| Bicycle (suspended by pulleys above office area) | Figure 18. | Use C.984.4.10, 1894 Hartford Cycle Co. ladies' safety cycle. Acquired two period pulleys for project, F.2000.122. Acquired new cleat and rope 9/2000. |
| Desk, roll top (in office area) | Figure 17. 1909 inventory. Original donated to Henry Ford Museum and Greenfield Village (hereafter GV), 1938. | Use C.984.4.18. |
| Office chair, revolving (at desk) | Figure 17. 1909 inventory. Original donated to GV 1938. | Use C.984.4.17. |
| Advertisements for Dayton bicycle track and events (on desk and walls) | Common practice. | Acquire reproductions. |
| Lamp, student, with green shade (on desk) | Common practice. | Use C.990.9.3, kerosene lamp in collection. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|--|---|---|
| Clock (on wall over desk) | Per 1953 GV notes on exhibit installation: "The clock in the office, which is an Ansonia wall clock, is one of the period." | Use C.984.4.23. |
| Telephone, wall (mounted on wall in office area) | "... I steer clear of the store. I have been in twice to telephone ...," Katherine Wright to Orville Wright (hereafter OW), October 5, 1902 in Crouch, <i>The Bishop's Boys</i> , p. 121. | Use C.984.4.11, Western Electric Company telephone. |
| Typewriter (on table, below, in office area) | 1901 inventory: "1 Smith Premier Type Writer #1" and "1 Smith Premier Visible Writer." Smith-Premier No. 2 donated by OW to GV 1938. | Use C.984.4.12, Smith-Premier No. 2. |
| Small table, used as typewriter stand (in office area) | GV received a typewriter desk from OW in 1938. 1909 inventory: "Typewriter Desk." | Acquired small oak table for project, F.2000.121. |
| File case with one top and base (in office area) | 1909 inventory. | Use C.987.20.31, four-drawer oak case. |
| Wastebasket, galvanized iron box (in office area) | 1909 inventory. | Acquired substitute wire wastebasket for project, F.2000.119. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|---|---|--|
| Framed prints, two (in office area) | Per 1953 GV notes on exhibit: "The lithograph 'Girl with the Mask' originally hung above the stove. It is now hanging on the back wall." OW letter, Dec. 15, 1937: "The picture on the wall [in the 1910 photograph] is one of two that were on the walls ..." | Use C. 984.4.15 and C.984.4.92, Goodrich Tire advertisements. Reprint from color transparencies supplied by GV. |
| Gas stove (in office area) | 1909 inventory Per 1953 GV notes on exhibit: "The gas stove designed and made by the Wrights is not set up and a photograph is hanging where the stove pipe would fit into the wall. Per Mr. Wright's notes [not located in file] the stove was not in place when not in use." | Do not use. Stove was only used in season, and Wright Cycle Co. building will not be open to the public in the fall or winter. |
| Chairs, two (in office area and behind counter) | 1909 inventory: "3 Chairs." | "University" chair acquired for project, F.2000.23. Wooden straight back chair acquired for project, F.2000.125. |
| Hand bell (in office area) | 1909 inventory. | Use C.985.5.173. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|---|---|---|
| Office supplies: paper fastener, paper clips, scissors, Shannon file, wire baskets, ledgers, blotter, stationary, sales catalogs, calendar, repair tags, pens, pencils, letter file, road map (on desk and table in office area) | Figure 17. 1909 inventory: "6 File Cases." See figure 19 for sample of Wright brothers' repair tag. | Reproduce repair tags in 1896 manual, Wright brothers' repair tag, and Wright Cycle Shop letterhead at CHP Print Shop. Reproduce calendar and sales catalog. Use uncataloged papers on desk. Inkwell acquired for project, F.2000.2 Spindle acquired for project, F.2000.5 Bill clip acquired for project, F.2000.7 Wall-mounted spindles acquired for project, F.2000.9 and F.2000.10 Penholder acquired for project, F.2000.21. Period ledger acquired for project, F.2000.185. Scissors acquired for project, F.2000.123. Wire file basket acquired for project, F.2000.124. |
| Drawing instruments, one set (on desk) | 1909 inventory. | Substitute slide rule in case. Slide rule acquired for project, F.2000.115. |
| Card index case and cards (on desk or typing table) | 1909 inventory. | Card index case acquired for project, F.2000.118. |
| Postal scale (in office area) | 1909 inventory. | "Victor" postal scale acquired for project, F.2000.127. |
| Safe, "Mosler Bahmann & Co., Inc." (in office area) | 1909 inventory. Donated to GV 1938. | Use C.984.4.19. |
| Hooks (on wall) | To hold jackets, hats. | Two hooks mounted on plank acquired for project, F.2000.13. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|---|---|---|
| Cash drawer, with notebook & pencil on string | OW to Fred Black, November 4, 1937: "The book which lay on the money drawer shelf measured 6-1/2 x 13 inches. I believe the shelf itself extended 7 inches out from the 2 x 4 rail of the partition and was 20 to 22 inches long. I believe the front of the drawer when closed was about 3 inches from the front edge of the shelf." | Acquire notebook and pencil. Coin tray insert acquired for project, F.2000.40. |
| Tire storage racks, two (mounted on ceiling) | To store tires. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420. Replicas of racks made for GV. |
| Bicycle racks, three, wood (mounted overhead on wall) | For bicycle and parts storage. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420. Replicas of racks made for GV. |
| Bicycle frames, two (on racks) | Common practice. | Use C.984.4.113, "Joliet Roadster" frame, and C.984.4.144. |
| Pump, air | Fred Kelly to Elizabeth Merwin, 1953. Ivonette Miller: "...there was a place on this side [the right] where they had a pump, for their tires ... And they had that hanging close ... to the door and when people could come in, they'd come and get the pump and take it out." (Interview in GV files.) 1909 inventory: "2 Air Pumps" | Acquired brass tire pump, January 14, 2000. Bell acquired for project, F.2000.114. Rig up bell arrangement at door. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|--|---|--|
| Bicycle tires and rims, 45, new | Figures 11, 13 and 17. Hall catalog. | Reproduce 12-20 wrapped tires. Use wooden wheel rims: C.984.1.153.B; C.984.4.67; C.984.4.51; C.984.4.63; C.984.4.64 (painted); C.984.4.65; C.984.4.66 Acquire six additional rims. Acquire 10 reproduction tires. Use rubber tires: C.984.4.90; C.984.4.55; C.984.4.58; C.984.4.60 |
| Bicycle parts and accessories, various. (in cases and on shelves) To include: Tool kits (five), grips (handles) (two pairs), chains (20), saddles (three), pedals (15), handle bars (10) | Figures 10, 12, 16 and 17. Hall catalog. | Use: Cyclometer C.984.4.4 Cyclist's cup C.993.2.5 Match case C.993.2.4 Leather cycle bag C.995.2.3 Carbide bicycle lamp C.995.2.6 Leather cycle bag C.995.2.7 Main sprocket C.993.2.3 or C.2000.5.1 Ladies' leather cycle bag C.995.2.9 Bicycle tool kit, B.F. Goodrich C.984.4.2 bicycle tool kit, Mossbury Wrench Co. C.984.4.3 Dayton main sprocket C.993.2.3 Bicycle saddle, youth size C.995.2.5 Bicycle crank and sprocket C.995.2.11 Rear hub, "Lester" brand C.993.2.1 Bicycle pump C.995.2.13 Bicycle pump C.995.2.14 Bicycle lamp C.987.4.223 Bicycle lamp C.997.5.1 Bicycle sprocket, "Dayton" brand C.2000.5.1 Two pairs reproduction grips acquired for project, F.2000.112. Two reproduction tire repair tools and boxes acquired for project, F.2000.130. Cyclist's folding cup acquired for project, F.2000.133. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|--|--|---|
| Boxes and tins for parts and accessories (on shelves and in display cases) To include: Search Light gas lanterns (15), Solar Cycle oil lamps (15), Dress Guard Lacing (20), Torrington bicycle nipples & spokes (20), Standard cyclometer for bicycles (five), Wald gun bicycle repair tools (10), Corbin front hub #16 (10), Diamond roller repair link (15), Diamond bicycle chain (20) | Figure 17. Hall catalog. | Reproduce prototypes at GV. Search Light cycle lamp boxes reproduced for project, F.2000.170. Standard cyclometer boxes reproduced for project, F.2000.171. Dress Guard lacing boxes reproduced for project, F.2000.172. Reproduction dress guard laces acquired for project, F.2000.181. Corbin bicycle hub boxes reproduced for project, F.2000.173. Barbour's flax cord box reproduced for project, F.2000.174. Diamond bicycle chain boxes reproduced for project, F.2000.179. Reproduction Torrington bicycle nipple box acquired for project, F.2000.180. |
| Shelving with drawers, wood, painted (against rear wall) | Reproductions at GV were approved by OW in 1937. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420. Replica of shelving made for GV. Stained Sherwin Williams Carob Brown SW1322, gloss. One coat clear sealer. |
| Bicycle, 1901 Van Cleve (on top shelf) | Figure 17. The Wright brothers built and sold Van Cleve bicycles. | Use C.984.4.1. |
| Counter, wood (in center of room) | Reproductions at GV were approved by OW in 1937. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420. Reproductions of counter at GV. Stained Sherwin Williams Carob Brown SW1322, gloss. One coat clear sealer. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|--|--|--|
| Display case, metal and glass with mirrored back (on counter) | 1909 inventory. | Display case acquired for project, F.2000.168. |
| Curtains & hardware for showroom window | 1909 inventory. OW to Fred Black, November 4, 1937: "I am sending a sketch showing the general plan of construction of the frame for the screen. ..." Letter includes sketch and description of hardware for screen and description of installation. Also "silk was of a deep yellow color ..." | Curtains fabricated by Zana Brown, 5522 Farmersville Road, Miamisburg, OH 45342, in "Destiny Bone" medium weight combed cotton; 50% cotton/50% polyester; F.2000.169. Hardware fabricated by James E. Harper, 2145 Keenan Avenue, Dayton, OH 45414. Hardware is reproduction of curtain frame at GV, which was constructed per OW sketch. See Appendix F. |
| Lighting fixtures: Two overhead four-arm gas fixtures (one over office area, one over counter) Two single-arm gas fixtures (over front window display) | Figures 8, 9 and 14. Per 1953 GV notes on exhibit: "The lighting fixtures are as closely matched as possible. The gas wall fixtures are a bit different as far as the shades are concerned." | Two two-arm fixtures, F.2000.176, and two single-arm fixtures, F.2000.175, acquired for project from The Magic Lamp, 200 S. Main Street, Springboro, OH 45066, 513-748-8777. Acquired globes for four fixtures. |

Sales Area, cont.

| Object/Location | Evidence | Recommendations |
|--|--|--|
| Wallpaper, ceiling paper, and border (in sales area only) | See Nov. 1937 OW letter: "The paper after 1900 was what was then called ingrain paper. I believe the same paper now is called oatmeal. It was of a tan color and had no figure. It comes in strips about 30 inches wide". See also Dec. 1937 OW letter for greater detail about the wallpaper. | Room painted July 2000 using the following: Walls: Sherwin Williams Amber Grain SW 1358, eggshell. Doors and trim: Sherwin Williams Buttery SW 1359, gloss. Office partition walls: Sherwin Williams Buttery SW 1359, gloss. Office partition walls trim: Sherwin Williams Carob Brown SW 1322, gloss. Wallpaper by Victorian Collectibles Ltd., 834 Glenbrook Road, Milwaukee, WI 53217, 414-352-6971 installed July 2000. Ceiling paper from the Brillon Collection, "Dayle" design, pattern 21-042a. [24" wide, 12.5" repeat] Border from the Brillon Collection, "Benson" design, pattern 26-068. [9" wide, 15.5" repeat] |
| Awnings, exterior, & hardware (ground floor windows) | Figure 5. | Reproduction awnings & hardware, F.2000.178, acquired for project from Glawe Awning Company, 851 Zapata Drive, Fairborn, OH 45324, 937-754-0064, May 2000. Standard porch awning covers, 3" black and white stripes with black trim by the Dickson Company. Iron pipe frame supplied by Glawe Awning Co. The Glawe Awning Co. supplied the original awnings for 1127 West Third Street. |
| Roller shades, three, green (two in front windows and one in door) | Figure 5. | Reproduction roller shades installed by Anthony Supply Company, 2701 Lance Drive, Dayton, OH 45409, 937-295-7345, September 2000. Kirsch Custom Roller Shades in Viking 84138 Wintergreen fabric, Ring Pull with Eyelet #10 in Dark Ecu. |

Sales Area, cont.

Object/Location

Evidence

Recommendations

Wood floors, ash

Floors cleaned, sanded and stained, July-August 2000 by Simpson Floor Sanding and Refinishing, Inc., 475 New Burlington Road, Wilmington, OH 45177, 937-486-0012. Floor washed with thinner, hand sanded, stained with one coat Dark Walnut. Two coats of polyurethane applied, third coated to be applied winter 2000-01.

Repair Area

| Object/Location | Evidence | Recommendations |
|--|--|--|
| Bicycle, "New Departure," Newhouse Diversey Flier (leaning against shelves) | Figures 1 and 10-17. | Use C.984.4.102, Diversey Flier. |
| Bicycle repair stand (in center of room) | Figures 1 and 15. See <i>Bicycle Repairing</i> , S.D.V. Burr, (New York: David Williams, 1896), pp. 22-28. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420, June 2000. |
| Bicycle frame (on repair stand) | Figures 10 and 11. | Use C.984.4.103, Iver Johnson Arms and Cycle Works frame. |
| Bicycle frame (leaning in corner) | Figures 10 and 11. | Use C.984.4.118, Western Wheel Works frame. |
| Racks for parts, four, three with nails, one with wood pegs (on walls over bench, in between doorways and next to shelves) | Figure 1. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420, June 2000. |
| Bicycle chain guard (hanging on rack) | Figure 1. Hall catalog. | Use C.984.4.101. |
| C-chain guard (hanging on rack) | Figure 1. Hall catalog. | Use C.984.1.153, Gendron "Reliance" c-chain guard. |
| Bicycle frame with fork (hanging on rack) | Figures 1 and 10. Hall catalog. | Use C.984.4.131. |
| Bicycle handlebars (hanging on rack) | Figures 1 and 10. Hall catalog. | Use C.984.4.127. |
| Bicycle sprocket (hanging on rack) | Hall catalog. | Use C.993.2.3, "Dayton" bicycle sprocket. |
| Sewing machine table (in center of room) | 1909 inventory: "1 Sewing Machine Table." | Use C.984.4.125. |
| Wheel truing stand (on sewing machine table) | Figures 10 and 13. Hall catalog. | Truing stand acquired for project, F.2000.126. |

Repair Area, cont.

| Object/Location | Evidence | Recommendations |
|--|---|--|
| Work bench (against wall under windows) | Figures 1 and 10-15. See specifications in <i>Bicycle Repairing</i> , p. 14. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420, June 2000. Stained with Minwax Wood Finish, #221, Ipswitch Pine. |
| Aprons, denim, two (one hanging from rack, one on bench) | Figures 1, 4, 10, 12, 13, 14. | Reproduction aprons acquired for project, F.2000.111. |
| Stool, wood (near bench) | Figures 11 and 13. | Period stool acquired for project, F.2000.116. |
| Vise (attached to bench) | Figures 1, 10, 11, 14, 15. Hall catalog. | Vise acquired for project, F.2000.19 |
| Spindles, two (on bench) | To hold paperwork. | Spindles acquired for project, F.2000.103. |
| Miscellaneous bicycle parts (on bench) | Figures 1 and 11. Hall catalog. | Parts acquired or located in collection for project, F.2000.131. |
| Oil cans, four (on bench) | Common practice. | Use C.988.4.227-.230. |
| Bicycle pump with bracket and bicycle pump (near bench) | Common practice. | Use C.995.2.12 (with bracket) and "Beekman" tire pump C.988.4.225. |
| Wall mounted spindles, two, metal (on wall) | To hold paperwork. | Spindles acquired for project, F.2000.17 and F.2000.19. |
| Coverlet, Jacquard weave (over exterior door) | Documentation in CHP files. | Coverlet acquired for project, F.2000.20. |
| Shelves (on left side of room) | Figures 10 and 11. | Reproduced by Richard Boehner, 2599 Midvale Street, Kettering, OH 45420, June 2000. Stained with Minwax Wood Finish, #221, Ipswitch Pine. |

Repair Area, cont.

| Object/Location | Evidence | Recommendations |
|---|---------------------------------------|---|
| Dust pan, tin (hanging on side of shelf) | Common practice. | Period dustpan acquired for project, F.2000.1. |
| Wooden boxes, crates, or metal cans to hold parts from bicycles being repaired. (on shelves and on benches) | Figures 1 and 10-16. Hall catalog. | Period coffee cans acquired for project, F.2000.3 -.4. Wooden box acquired for project, F.2000.14. Period cheese box acquired for project, F.2000.16. Wooden box, "Maze Made," acquired for project, F.2000.24. Wooden box acquired for project, F.2000.117. Two wooden boxes acquired for project, F.2000.134. Cigar box without cover acquired for project, F.2000.132. |
| Cans, two, patching rubber (on shelves) | Common practice. See Hall catalog. | Cans acquired for project, F.2000.128. |
| Cans, two, rubber solvent (on shelves or bench) | Common practice. See Hall catalog | Cans acquired for project, F.2000.129. |

Repair Area, cont.

| Object/Location | Evidence | Recommendations |
|--|--|--|
| Bicycle tools (on bench and work table) | Figures 1, 2 and 10-16. See <i>Bicycle Repairing</i> , pp. 10-11, "List of Tools for \$100." See also 1909 inventory. Hall catalog. | The following tools were acquired for the project: Mallet, F.2000.27 Ball peen hammer, F.2000.32 Pliers, F.2000.36 Monkey wrench, F.2000.37 Screwdriver, F.2000.42 Pliers, F.2000.49 Hand drill, F.2000.62 Hacksaw, F.2000.64 Bolt cutters and end cutters, F.2000.78 Ball peen hammers, eight, F.2000.90 Claw hammer, F.2000.92 Screw plate set, in case, F.2000.94 Screwdrivers, two, F.2000.150 Hand vise, F.2000.152 Bicycle wrenches, five, F.2000.153 Wire cutters, "Starret #1", three, F.2000.156 - .158 |
| Tires and rims, 20 (stacked around repair area) | Figures 11, 13, 16 and 17. Hall catalog. | Acquire tires. Acquire wrapped and unwrapped rims. |
| Tiring machine (attached to bench) | Figure 10. | Use C.991.24.1, tiring machine, grips and clamp. |
| Tool chest, large painted box (under bench) | Common practice. | Large period tool box acquired for project, F.2000.12. |
| Calendar, wall (over bench) | Figure 1. | Use B&O calendar in collection, F.2000.186. |
| Repair tags (attached to wheels and bicycle parts and on work bench) | Figure 19. See <i>Bicycle Repairing</i> , pp. 154-63. | Original Wright Cycle Company tags reproduced in-house. |

Repair Area, cont.

| Object/Location | Evidence | Recommendations |
|---|--|---|
| Brazing unit (on shelf) | 1909 inventory: "1 Brazing Tank." Original was made by Wright brothers and is at GV. Hall catalog. | Substitute period blowtorch acquired for project, F.2000.165. |
| Lighting fixture, one-arm wall-mounted gas fixture (between windows). | Figures 1 and 7. | F.2000.177 acquired from The Magic Lamp, 200 S. Main Street, Springboro, OH 45066, 513-748-8777. Acquire reproduction reflector as illustrated in figure 1. |
| Window shades, green, three | Common practice. | Reproduction roller shades installed by Anthony Supply Company, 2701 Lance Drive, Dayton, OH 45409, 937-295-7345, September 2000. Kirsch Custom Roller Shades in Viking 84138 Wintergreen fabric, Ring Pull with Eyelet #10 in Dark Ecru. |
| Wall finishes | Common practice. | Walls: Sherwin Williams Amber Grain SW 1358, Egg Shell. Ceiling: Sherwin Williams Decor White SW 1361, flat. Doors and Trim: Sherwin Williams Buttery SW 1359, gloss. |

Repair Area, cont.

Object/Location

Evidence

Recommendations

Wood floors, ash

Floors cleaned, sanded and stained, July-August 2000 by Simpson Floor Sanding and Refinishing, Inc., 475 New Burlington Road, Wilmington, OH 45177, 937-486-0012. Floor washed with thinner, hand sanded, stained with one coat Dark Walnut. Two coats of polyurethane applied, third coated to be applied winter 2000-01.

Barrier, 36" tempered glass and wood rail, from interpretive area to door to machine shop (diagonally across right corner of room)

Barriers fabricated by Brackett Builders. Glass installed by Prestige Glass Company Inc., P.O. Box 1443, Dayton, OH 45401, 937-222-1747.

Machine Shop
Added to building in 1901

| Object/Location | Evidence | Recommendations |
|---|---|---|
| Work bench (left wall) | Figures 1, 11, 12, 13, 14 and 15. 1909 inventory: "1 Bench — Rear Room (machine shop)." | Use C.984.4.104. |
| Shelves (right wall) | Figure 10. 1909 inventory: "1 Set Shelves — Rear Room (machine shop)." | Use shelves in CHP collection. |
| Tools (on work benches and shelves in machine shop) | Figures 1, 2, 10-16. Also 1909 inventory; Charlie Taylor's tool chest inventory (Appendix D); Hall catalog, and list of tools in <i>Bicycle Repairing</i> , pp. 10-11 (Appendix A). | See below. |
| Oil can | 1909 inventory. | Acquired for project, F.2000.6. |
| Torch | 1909 inventory. | Acquired for project, F.2000.166. |
| Rivett sets, two | 1909 inventory. | Acquired for project, F.2000.151 (two). |
| Pipe cutter | 1909 inventory. | Acquired for project, F.2000.149. |
| Nail puller | 1909 inventory. | Acquired for project, F.2000.146. |
| Combination square | C. Taylor tool box. | Acquired for project, F.2000.143. |
| Drill ratchet | Common practice. | Acquired for project, F.2000.142. |
| Gimlet | Common practice. | Acquired for project, F.2000.141. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|---|---|---|
| C-clamps, seven, metal | 1909 inventory. | Acquired for project, F.2000.135 (one), F.2000.136 (three), and F.2000.137 (three). |
| Rulers, five, including depth gauge, square, and protractor | C. Taylor tool box. | Acquired for project, F.2000.105 (five). |
| Die holders, three, on lathe cone centers | Common practice. | Acquired for project, F.2000.101. |
| Sledge hammers, three | 1909 inventory. | Acquired for project, F.2000.91. |
| Tap handles, three | Common practice. | Acquired for project, F.2000.89. |
| Stock holder | Common practice. | Acquired for project, F.2000.88. |
| Wrenches, nine, boxed-end | 1909 inventory. | Acquired for project, F.2000.81. |
| Compound end cutters | 1909 inventory. | Acquired for project, F.2000.58. |
| End cutters | 1909 inventory. | Acquired for project, F.2000.56. |
| Saw set | Common practice. | |
| Surface gauge, Starrett | C. Taylor tool chest. | Acquired for project, F.2000.41. |
| Drill and wire gauge chart | For use with wire and drill bits on 1909 inventory. | Acquired for project, F.2000.30. |
| Tape measure, steel, 100 feet | 1909 inventory. | Acquired for project, F.2000.28. |
| Tape measure, steel | 1909 inventory and C. Taylor tool chest. | Acquired for project, F.2000.162. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|---|---------------------------------------|--|
| Mallet, wooden | 1909 inventory. | Use C.988.21.5. |
| Clamps, wooden, three or more | 1909 inventory. | F.2000.26 acquired for project. Use additional clamps in collection. |
| Wrenches, five | 1909 inventory. | Use C.988.21.18, C.988.21.20, and C.988.21.12, ratchet wrench. Bicycle Wrench acquired for project, F.2000.29. Acquired for project, F.2000.154. |
| Ruler | Common practice. | Acquired for project, F.2000.163 (one). |
| Awls, four | C. Taylor tool chest. | One awl acquired for project, F.2000.139. Three brad awls acquired for project, F.2000.138. |
| Files, 25 | <i>Bicycle Repairing</i> , pp. 10-11. | Use C.988.21.13. Acquired for project, F.2000.43 (one) and F.2000.82 (24). |
| Calipers, inside, 10, 1880s and 1890s patents. | C. Taylor tool chest. | Acquired for project, F.2000.68 (10). |
| Calipers, outside, 12, 1880s and 1890s patents. | C. Taylor tool chest. | Acquired for project, F.2000.69 (12). |
| Gouges, two | 1909 inventory. | Use C.988.21.23-.24. |
| Scribe | Common practice. | Use C.988.21.15. |
| Drill bits, various | 1909 inventory. | Use C.988.21.8 (one.) Use others in collection. |
| Drill bit stand | To hold drill bits. | Acquired for project, F.2000.159. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|--|--|---|
| Scrapers, five (two without handles) | Common practice. | Use C.988.21.22 and F.2000.98 (four). |
| Dies, 12, in wooden box | 1909 inventory. | Acquired for project, F.2000.100. |
| Glue pots, two | 1909 inventory. | Glue pots, F.2000.44, and F.2000.67, and liners (2) F.2000.38 acquired for project. |
| Brushes, glue, three or four | Used with glue pots. | Acquired for project, F.2000.161. |
| Angle plates, two, and fixture | 1909 inventory. | Acquired for project, F.2000.108. |
| Hand drill | 1909 inventory. | Millers Falls breast drill acquired for project, F.2000.34. |
| Saws, four | C. Taylor tool chest and 1909 inventory. | Acquired for project, F.2000.65 (one), F.2000.16 (one compass saw), F.2000.147 (back saw), F.2000.164 (hand saw). |
| Brush, bench | Hall catalog. | Acquired for project, F.2000.144. |
| Punch sets with nine punches, no lid, two | C. Taylor tool chest. | Acquired for project, F.2000.95. |
| Hand punches, two | C. Taylor tool chest. | Acquired for project, F.2000.84. |
| Key cutters, three, in wooden board | 1909 inventory. | Acquired for project, F.2000.86. |
| Blacksmith tongs, two, small | 1909 inventory. | Acquired for project, F.2000.57. |
| Screwdrivers, five, plus lot of old screwdrivers | <i>Bicycle Repairing</i> , pp. 10-11. | Five acquired for project, F.2000.72. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|--|--|--|
| Pipe wrenches, three | 1909 inventory: 14" and 10". | Acquired for project, F.2000.35. |
| Wrenches, open-end, 15 | Hall catalog. | Acquired for project, F.2000.79 (three) and F.2000.80 (12). |
| Screw plate set in wooden case | Common practice. | Acquired for project, F.2000.93. |
| Files, four, ground into scrapers | Common practice. | Acquired for collection, F.2000.98. |
| Pliers, 12 | C. Taylor tool chest and 1909 inventory. | Acquired for project, F.2000.46-.51, F.2000.55, F.2000.70 (two), F.2000.71 (two). Needle-nose pliers acquired, F.2000.53. |
| Milling bits, 14, in wooden box. | 1909 inventory. | Acquired for project, F.2000.85. |
| Ladle | 1909 inventory. | Acquired for project, F.2000.45. |
| Hacksaws, three | 1909 inventory. | Acquired for project, F.2000.66, F.2000.83, F.2000.148. |
| Micrometer set, in wooden box (no lid) | C. Taylor tool chest. | Acquired for project, F.2000.102. |
| Starrett speed indicators, two | 1909 inventory. | Acquired for project, F.2000.63 and F.2000.74. |
| Starrett depth gauge | Common practice. | Acquired for project, F.2000.61. |
| Tri-squares, two | C. Taylor tool chest. | Acquired for project, F.2000.31 and F.2000.52. |
| Hatchet | C. Taylor tool chest. | Acquired for project, F.2000.33. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|--|---|--|
| Monkey wrenches, two | 1909 inventory. | Acquired for project, F.2000.39. |
| Tack puller | Common practice. | Acquired for project, F.2000.59. |
| Tape measure, Fulton | 1909 inventory. | Acquired for project, F.200.145. |
| Plane | 1909 inventory. | Acquired for project, F.2000.25. |
| Micrometer, Brown and Sharp | C. Taylor tool chest. | Acquired for project, F.2000.60. |
| Hacksaw blades, tin shears, hammer, file, and soldering iron (on work bench) | “With a pair of tin shears, a hammer, a file, and a soldering iron you can get almost any shape you want.” Wilbur Wright to George Spratt, January 23, 1902, referring to construction of airfoils. | Use hacksaw blades, hammer, and file above. Tin shears acquired for project, F.2000.77 (two pairs.) Tin snips acquired for project, F.2000.140. Five soldering irons acquired for project, F.2000.160. |
| Anvil (near barrier) | Figure 16. “In fifteen minutes any curvature desired can be obtained with no other tools than a hammer and anvil ...” Wilbur Wright to George Spratt, February 14, 1902. | Use C.984.3.160. |
| Anvil stand, log (on floor near barrier) | Figure 16. | Use C.984.3.138. |
| Gears, three (on shelf) | Common practice. | Use C.984.4.166-168 |
| Planes, two (on shelves) | Common practice. | Use C. 991.23.1. Block plane acquired for project, F.2000.155. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|---|--|---|
| Oil cans, eight, tin (on bench or around machinery) | Hall catalog. | Acquired for project, F.2000.73 (four). Use C.988.4.227 -.230. Use C. 991.21.4 |
| Tin can with lid, Calumet baking powder | Common practice. | Acquired for project, F.2000.104. |
| Kite, 1899 version (hanging on wall) | To illustrate earlier work. See Marvin W. McFarland, editor, <i>The Papers of Wilbur and Orville Wright</i> , vol. II, p. 1183: "This model glider, actually a kite, was flown at Dayton in July or August 1899 by Wilbur Wright. The framework was pine. Shellac was applied to the cloth covering. ... The kite of 1899 was kept in the bicycle shop in Dayton for several years and used in making experiments with an automatic stabilizer. It was broken in one of these experiments and was destroyed about 1905." | Acquired for project, F.2000.182. Reproduced by Ken Hyde, The Wright Experience, P.O. Box 3365, Warrenton, VA 20188, 540-347-1909. |
| Lathe, 14"x 6' Putnam, and accessories (at left window) | 1909 inventory: "1 Putnam 14"x 6' Eng Lathe with Taper attach" | Use C.987.20.92, H. L. Shepard & Co. lathe. Use with Orville mannequin placed in position shown in figure 2, to hide differences in substitute lathe. Original lathe was 14" Putnam purchased by the Wrights in 1901, and was used with "special riser blocks." |
| Chucks, two (with lathe) | Lathe accessory. | Use C.984.4.144 and C.988.4.226. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|---|--|--|
| Lathe face plates, two | Lathe accessory. | Use C.984.4.147 and C.984.4.119. |
| Wrenches, three (on or near lathe) | Lathe accessory. | Use C.984.4.108-.110. |
| Lathe dogs, three | Lathe accessory. | Acquired for collection, F.2000.96. |
| Tool holders, seven, for lathe | Lathe accessory. | Acquired for project, F.2000.97 (seven). |
| Chuck wrenches or "T" wrenches, two | Accessory for lathe. | Acquired for project, F.2000.107 (two). |
| Drill press, 22.5" (near rear wall between two windows) | 1909 inventory: "1 - 20" Barnes Drill Press" | Use C. 991.26.1, a Hoosier brand press from the Glawe Co., Dayton, Ohio, originally purchased c. 1901. Original drill press is a 20" Barnes purchased in 1901 and used in the shop until 1909. |
| Tapered sleeves, 13 (with drill press) | Drill press accessory. | Acquired for project, F.2000.99 (13). |
| Steady rest (on floor) | Figure 2. | Remove from large lathe in collection and set on floor. |
| Stool, wooden, backless (near workbench) | Common practice. | Acquired for project, F.2000.113. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|---|---|--|
| Gas engine, 1899 model (near right wall) | Figure 6. Orville Wright to Fred L. Black, November 30, 1937: "The work on the shop gas engine was started in 1899 and completed in 1900." The engine at GV is a reproduction by Charlie Taylor made under direction of Orville Wright in 1930s. The original made in 1899-1900 was discarded. | Use C.984.4.135, a c.1918 model in CHP collection. |
| Wind tunnel, reproduction (center of room near barrier) | To illustrate experiments done in 1901 period. Wilbur Wright to Octave Chanute, January 19, 1902: "I am sending you herewith photo and description of our pressure testing machine [referring to the lift balance]. The instrument itself was mounted in a long square tube or trough having a glass cover." See McFarland, p. 204. | Use C.990.10.22. Eventually reproduce new wind tunnel using specifications from Orville Wright correspondence. (Copies in CHP files.) Finished with Minwax Wood Finish, 221 Ipswitch Pine. |
| Double-ended bench grinder (attached to post next to wind tunnel) | "Grinder-fan" used to operate wind tunnel. Six-inch model purchased by Wrights in 1897 from Patterson Tool and Supply Co. See "Finding the Machines on Which the First Airplane was Made," May and June 1937, Henry Ford Museum and GV Research Center, EI 186, Wright Cycle Shop file. | Use C.99010.28, period grinder attached to reproduction wind tunnel. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|---|---|---|
| Wind tunnel instruments, two (on wind tunnel) | Wilbur Wright to Octave Chanute, January 19, 1902, referring to the lift balance: "I am sending you ... photo and description of our pressure-testing machine." See McFarland, pp. 204 and 206-207. Wilbur Wright to Octave Chanute, February 7, 1902, referring to the drift balance: "We accordingly before commencing our final test constructed a special machine for [measuring] tangentials." See McFarland, pp. 554-56. | Use C.990.10.23 and C.990.10.27. |
| Air foils, reproduction (on workbench and on wind tunnel) | To illustrate experiments done in 1901 period. | Foils reproduced by Bill Robertson, 26 E. 53 rd Street, Kansas City, MO 64112. |
| Forms, wind tunnel results (on bench and on wind tunnel) | Record keeping for experiments done in 1901. | Reproduced in-house. |
| Tool chest (work bench) | Figures 11 and 12. Each worker had his own tool chest. | Acquired for project, F.2000.167 (one). |
| Spindle (on work bench) | Common practice. | Acquired for project, F.2000.22. |
| Letter clip (on work bench) | | Acquired for project, F.2000.11. |
| Wooden box (on work bench) | | Divided wooden drawer acquired for project, F.2000.15. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|--|--|---|
| Rudder, 1902 version (near work table) | Project Wrights were working on in 1901. | Acquired for project, F.2000.183. Reproduced by Ken Hyde, The Wright Experience, P.O. Box 3365, Warrenton, VA 20188, 540-347-1909. |
| Work table (center of room) | Common practice. | Fabricated for project. |
| Sawhorse, (center of room) | To support rudders and other work. | Use C.990.7.1. |
| Wash pan, granite ware (on floor) | 1909 inventory: "1 Granite Wash Pan" | Acquired for project, F.2000.120. |
| Machine belting (on line shafting) | To operate machinery. | Use C.984.4.157. Belting modified to accommodate new locations for machinery. |
| Belt disengaging tool (propped in corner) | Common practice. | Use C.984.4.156. |
| Pulleys for line shafting (on line shafting) | To operate machinery. | Use C.984.4.121, C.984.4.143 and C.984.4.146. |
| Line-shafting (ceiling) | To operate machinery. | Use C.984.4.175. Ran off gas engine and operated four machines in shop. |
| Lighting fixtures, five single arm, wall-mounted with globes and shades (on walls) | Figures 1 and 7. | F.2000.177 (five fixtures) acquired May 2000 from The Magic Lamp, 200 S. Main Street, Springboro, OH 45066, 513-748-8777. Reproduction globes and shades acquired June-July 2000. New beadboard behind mounting plates finished in custom mixed color using Minwax Wood Finish. |

Machine Shop, cont.

| Object/Location | Evidence | Recommendations |
|--|------------------|------------------------|
| Window shades, green, five, with pulls (on windows) | Common practice. | Use shades in place. |
| Wood chips and sawdust (on floor) | | Fabricate at CHP. |

ILLUSTRATIONS

Figure 1

Edwin Sines & Orville Wright repairing cycles, September 1897. Library of Congress, LC-USZ62-65096.

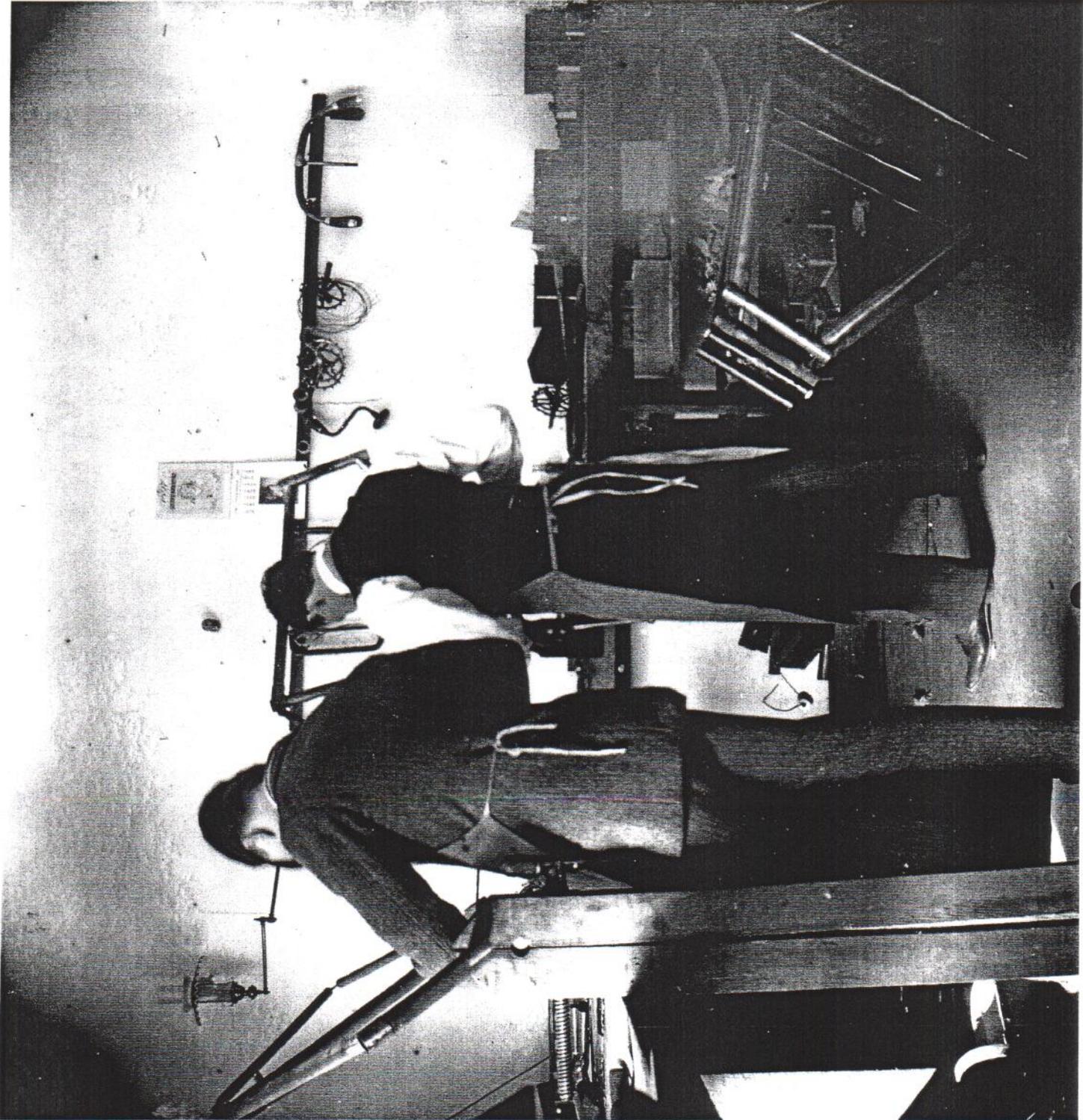


Figure 2

Wilbur Wright at lathe, c. 1897. Library of Congress, LC-USZ62-56241.

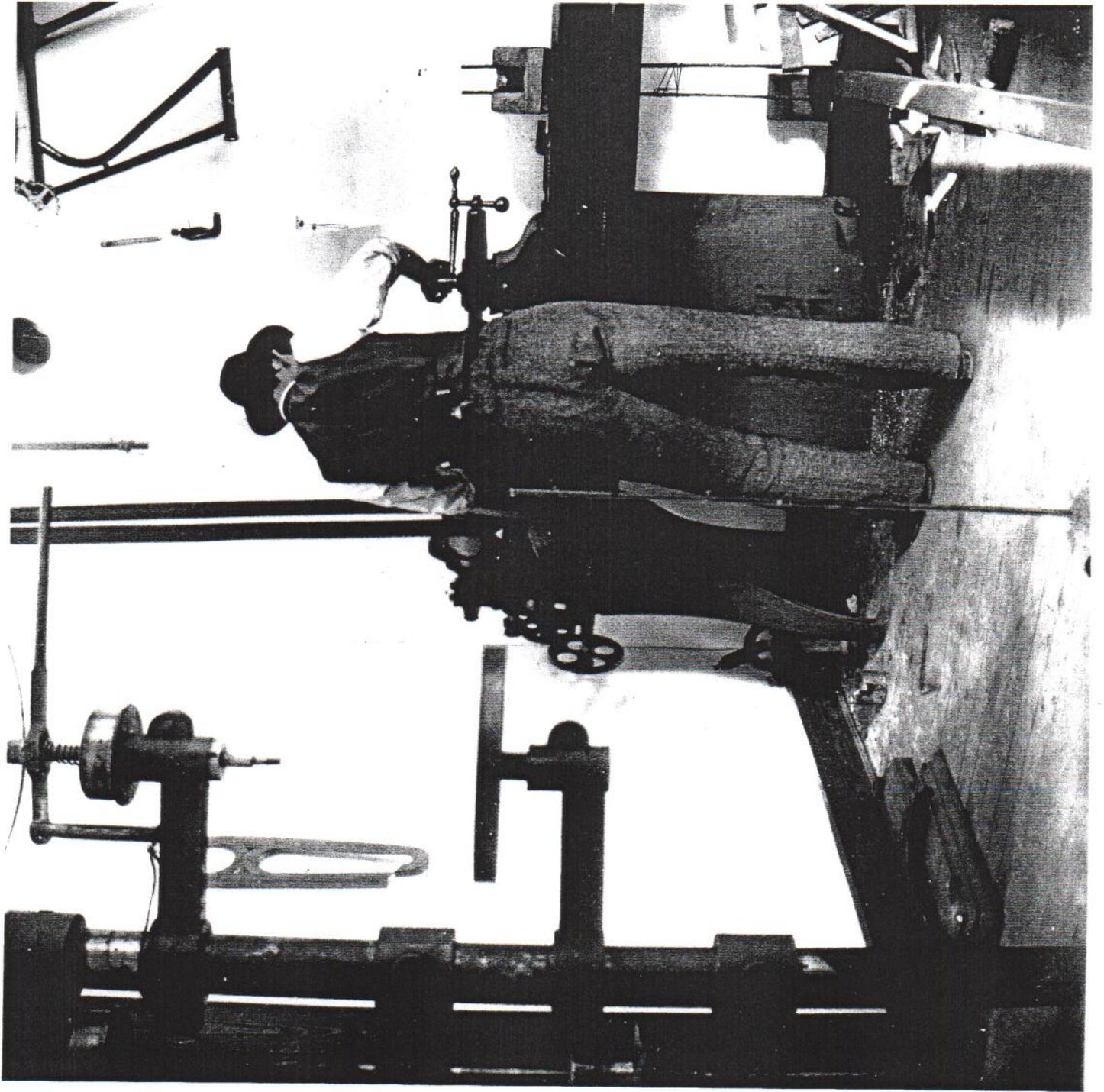


Figure 3

Edwin Sines in printing office, c. 1897. Library of Congress, LC-W851-79.



Figure 4

Wilbur Wright with engine and grinder. Dayton Aviation Heritage National Historical Park collection.

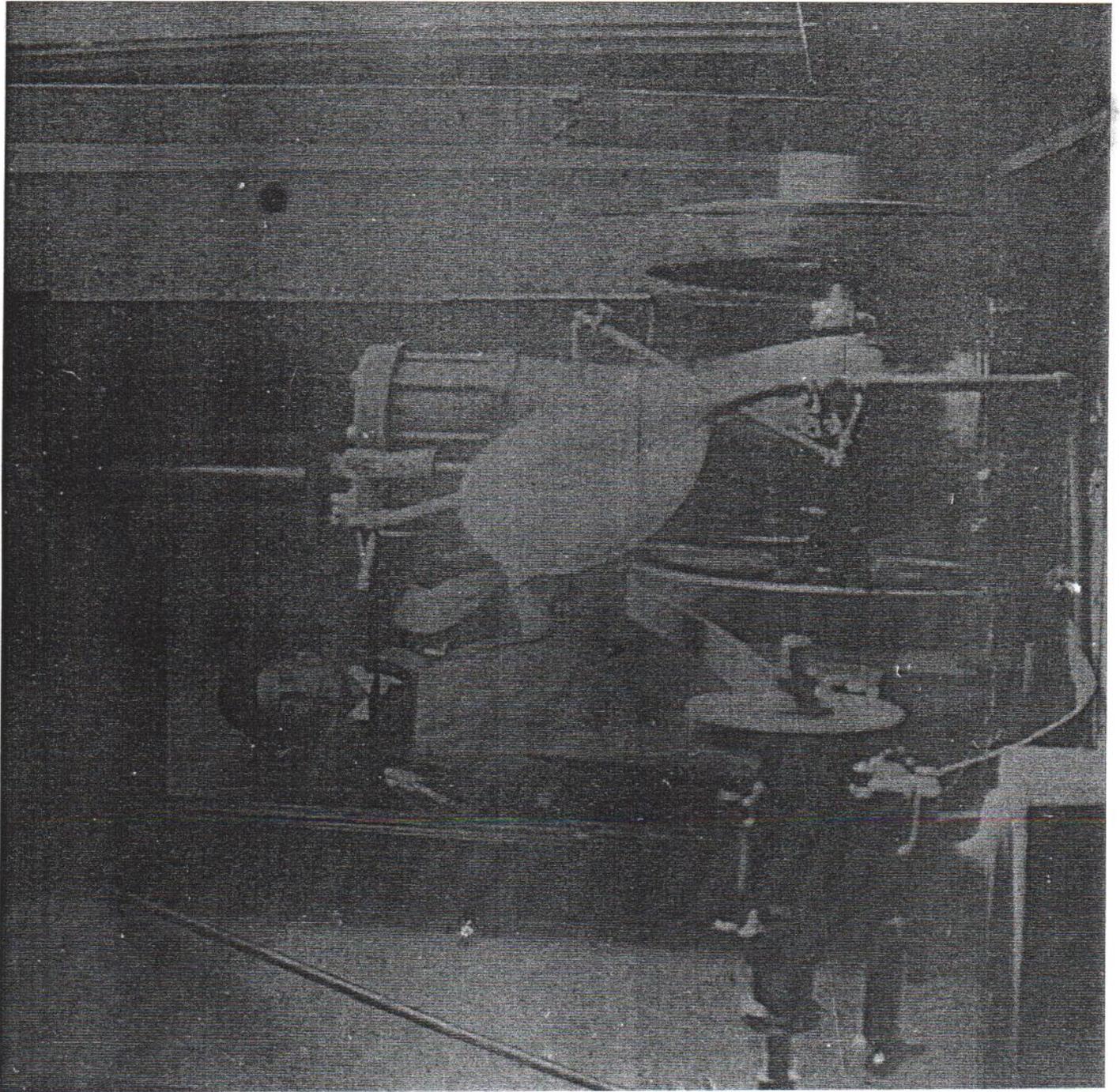


Figure 5

1127 and 1125 West Third Street, c. 1908. Henry Ford Museum and Greenfield Village,
P 188-16081.

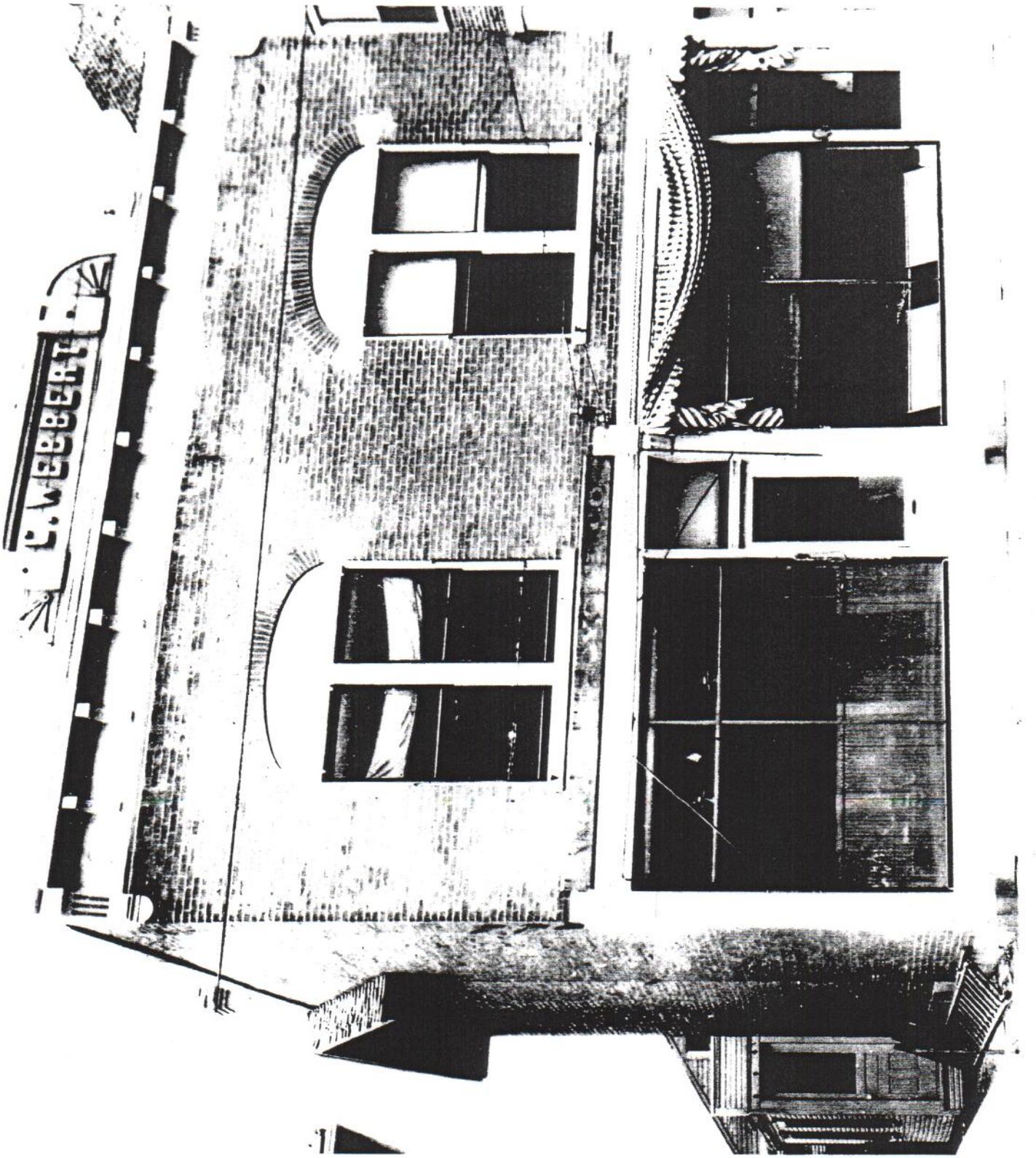


Figure 6
Drawing of Wright natural gas engine. Henry Ford Museum and Greenfield Village,
B-48680.

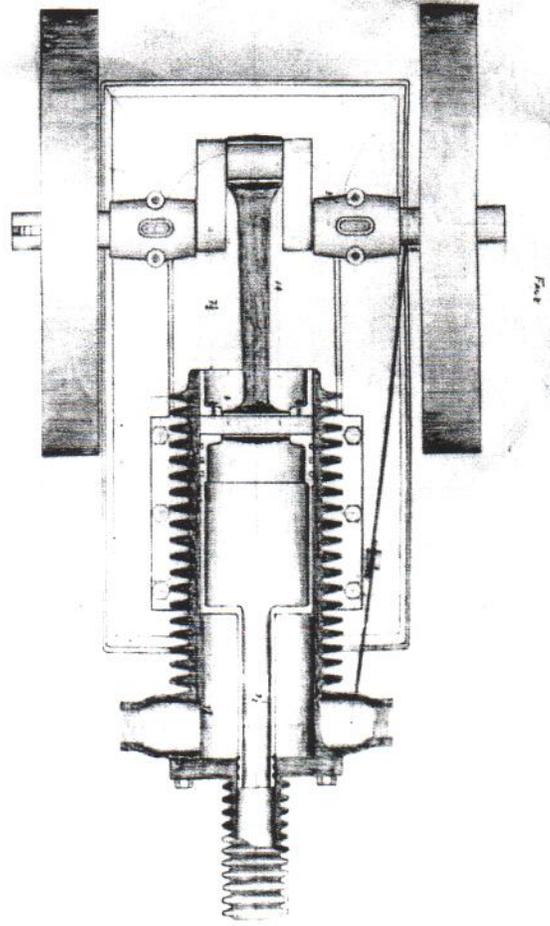
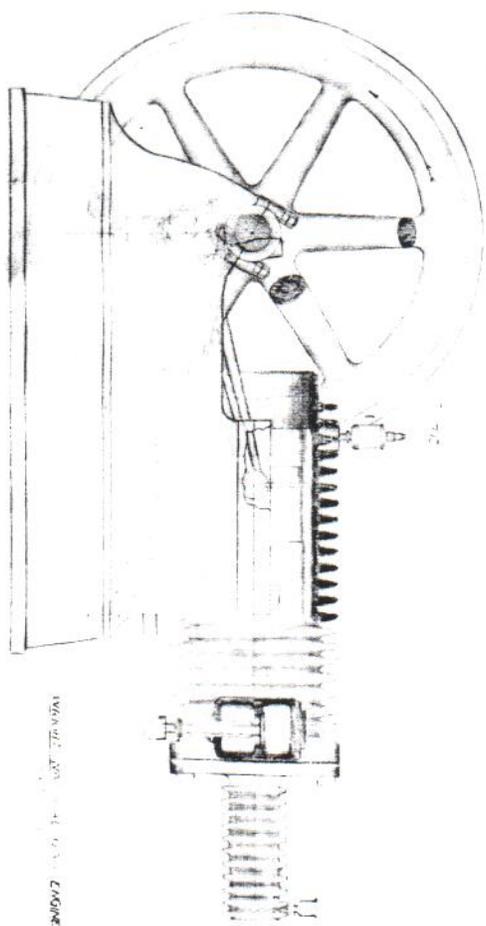
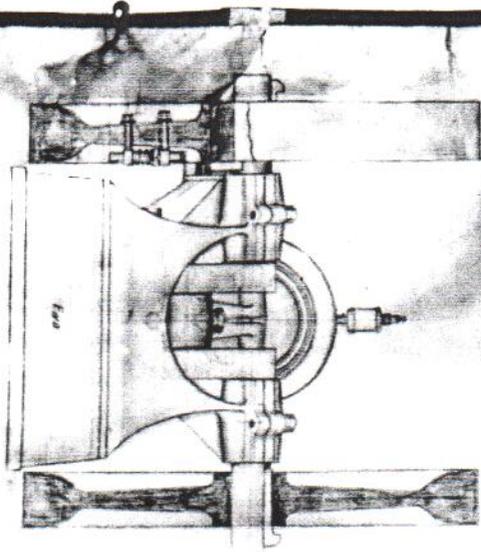


Figure 7

Gas lighting fixture installed in Wright Cycle shop. Henry Ford Museum and Greenfield Village, B-90411.

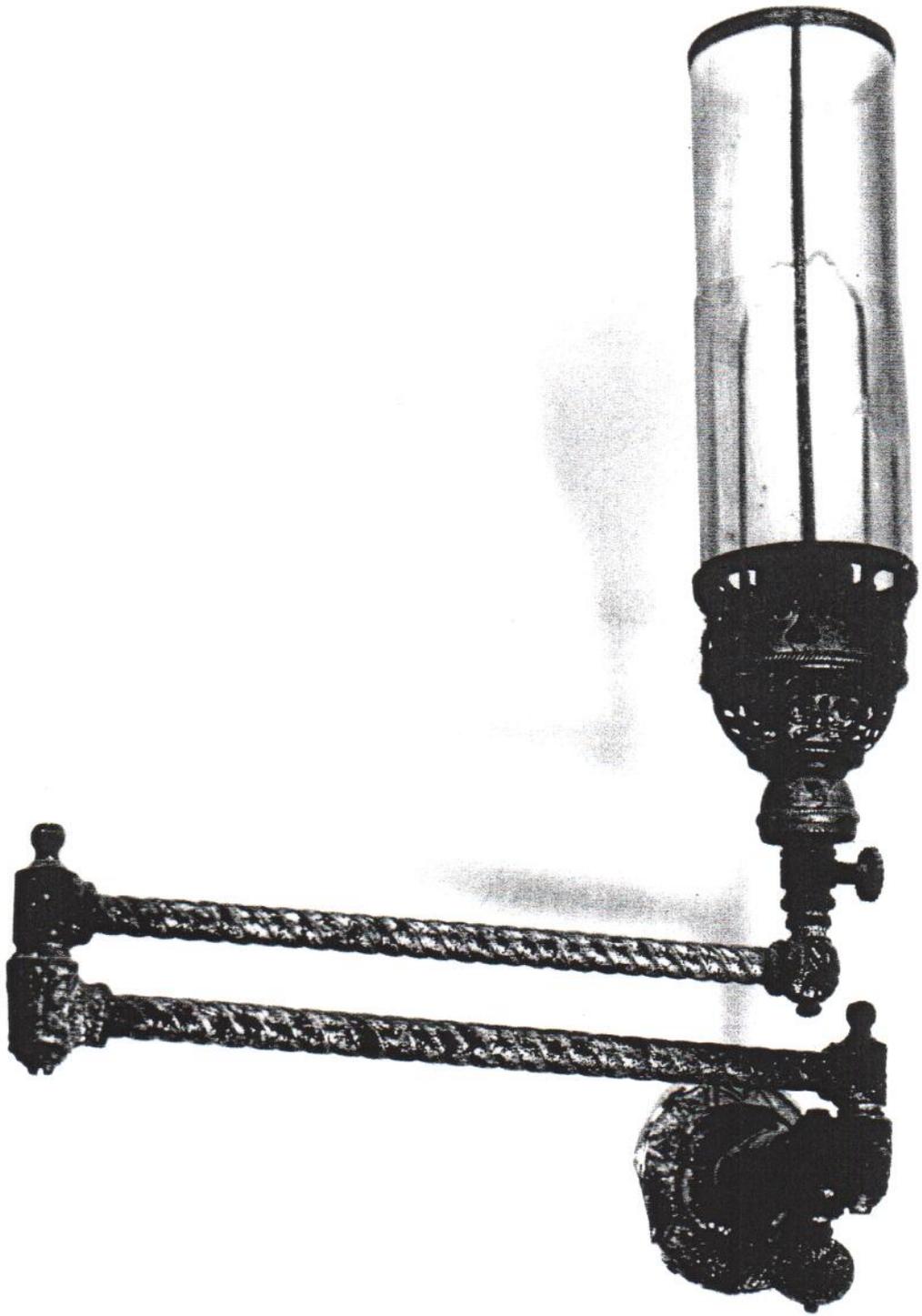


Figure 8

Gas lighting fixture installed in Wright Cycle shop. Henry Ford Museum and Greenfield Village, B-90412.

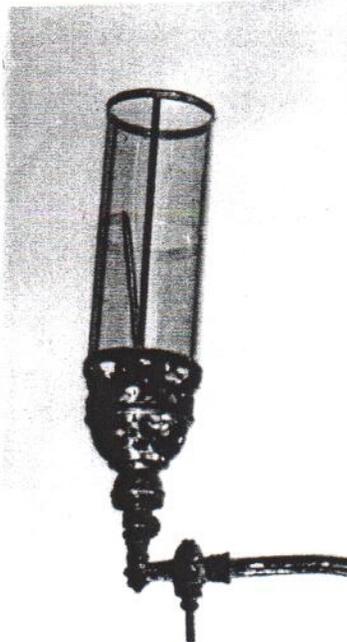


Figure 9

Gas lighting fixture installed in Wright Cycle shop. Henry Ford Museum and Greenfield Village, B-90410.



Figure 10

Bicycle repair shop interior. Courtesy Russell Mamone, Wheelmen.

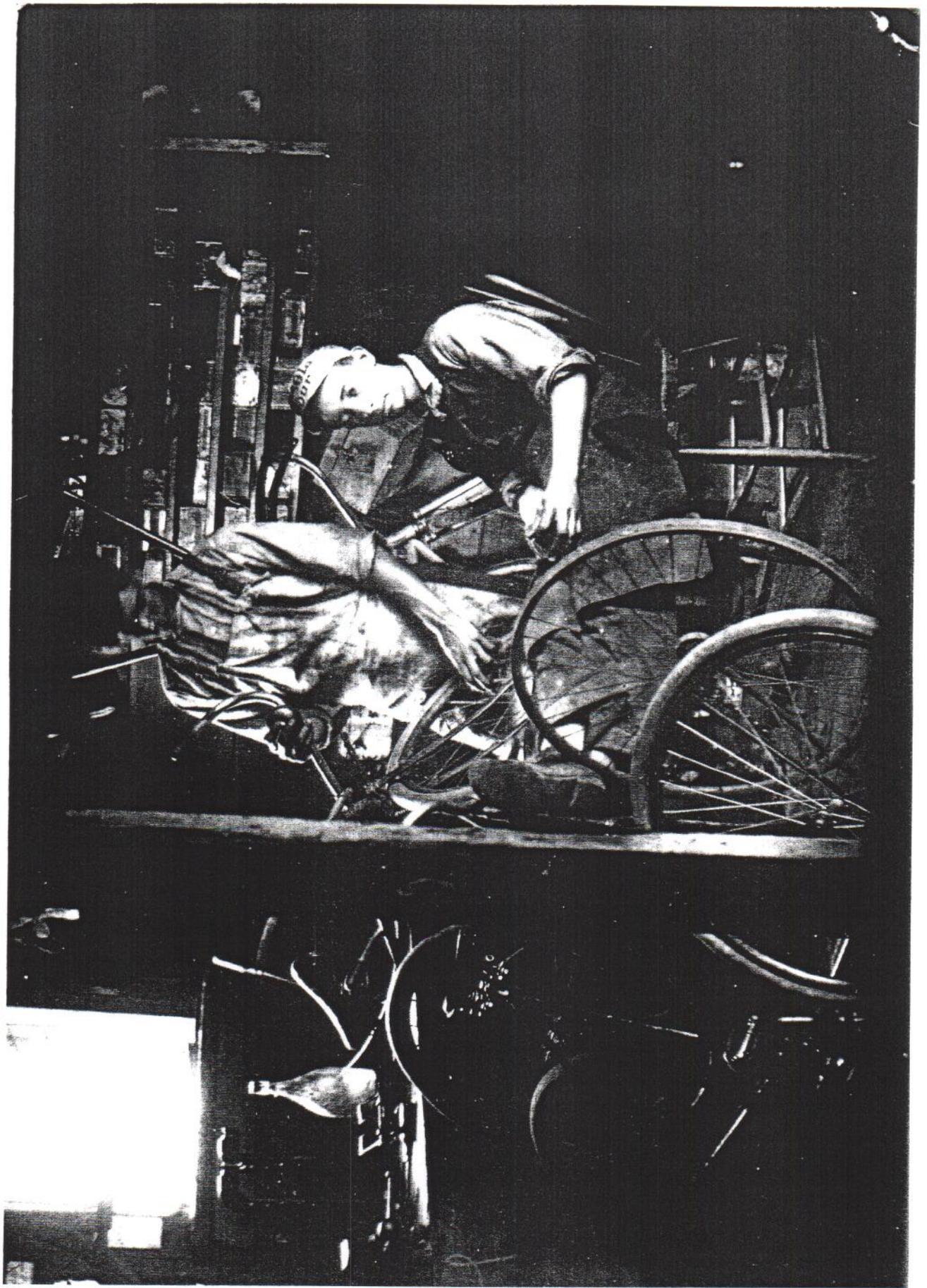


Figure 11

Bicycle repair shop interior. Courtesy Russell Mamone, Wheelmen.

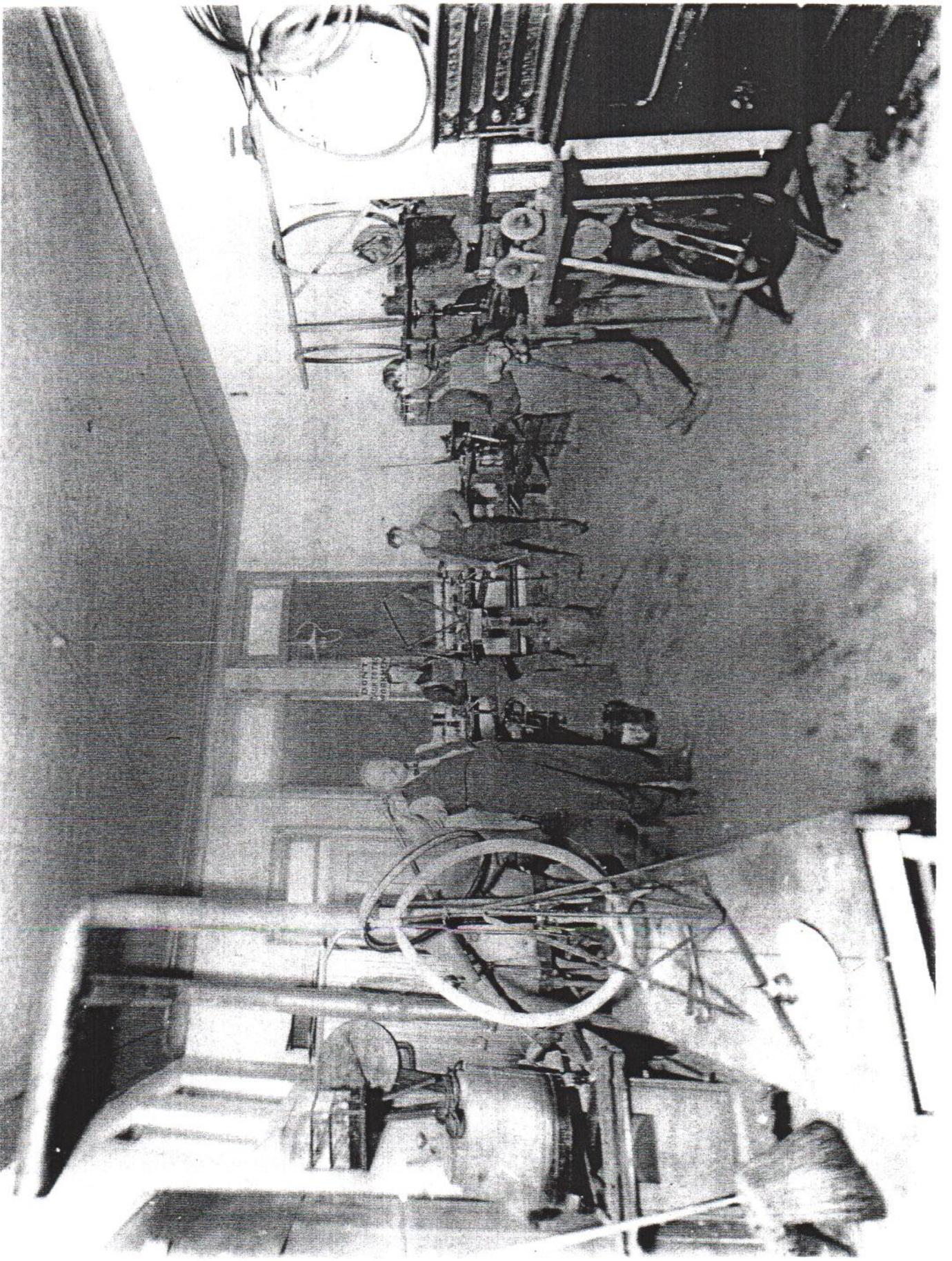


Figure 12
Bicycle repair shop interior. Courtesy Russell Mamone, Wheelmen.

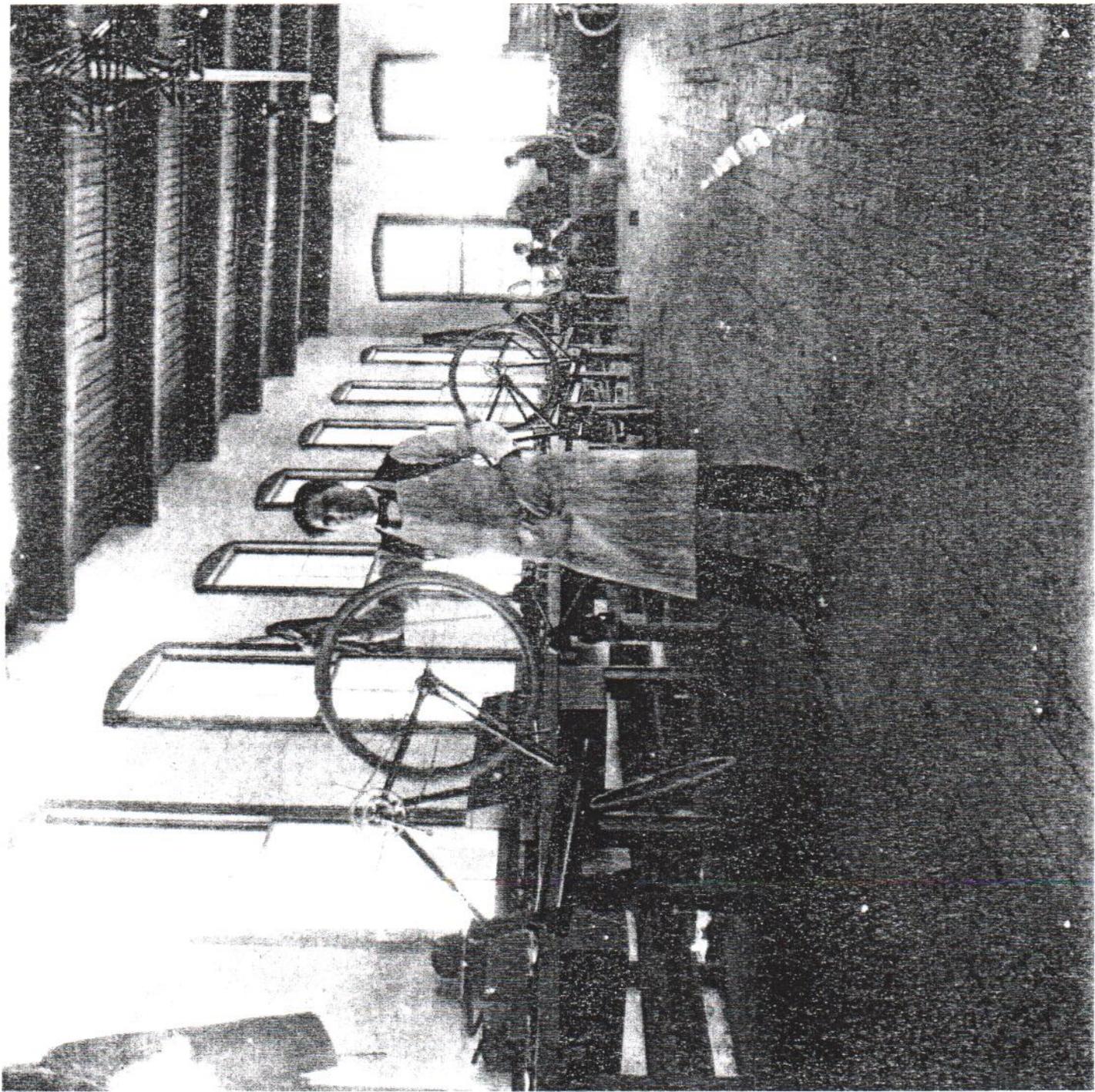


Figure 13

Bicycle repair shop interior. Courtesy Russell Mamone, Wheelmen.

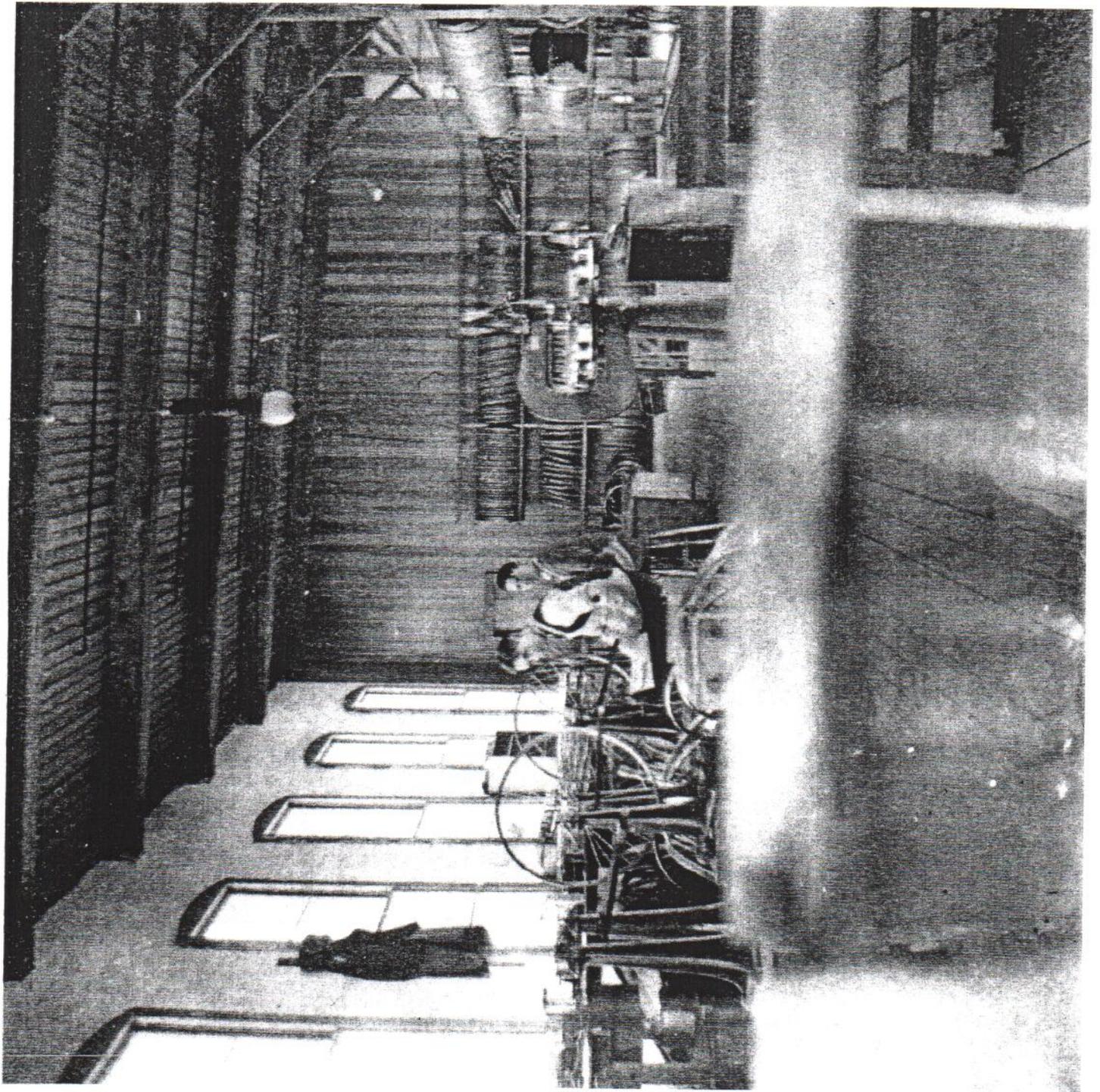


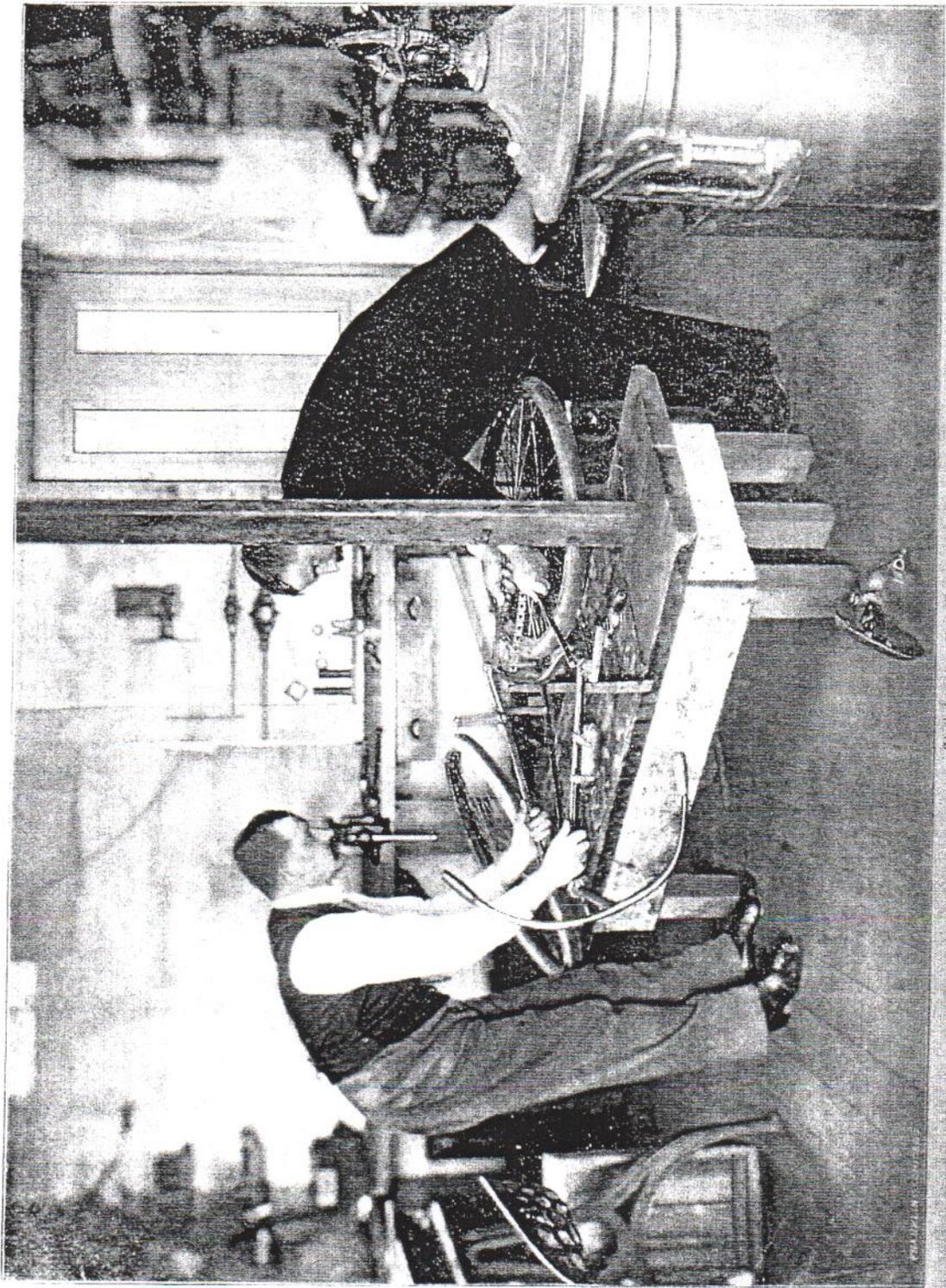
Figure 14

Bicycle repair shop interior in *Wheel Talk*, January 23, 1896. Private collection.



Figure 15

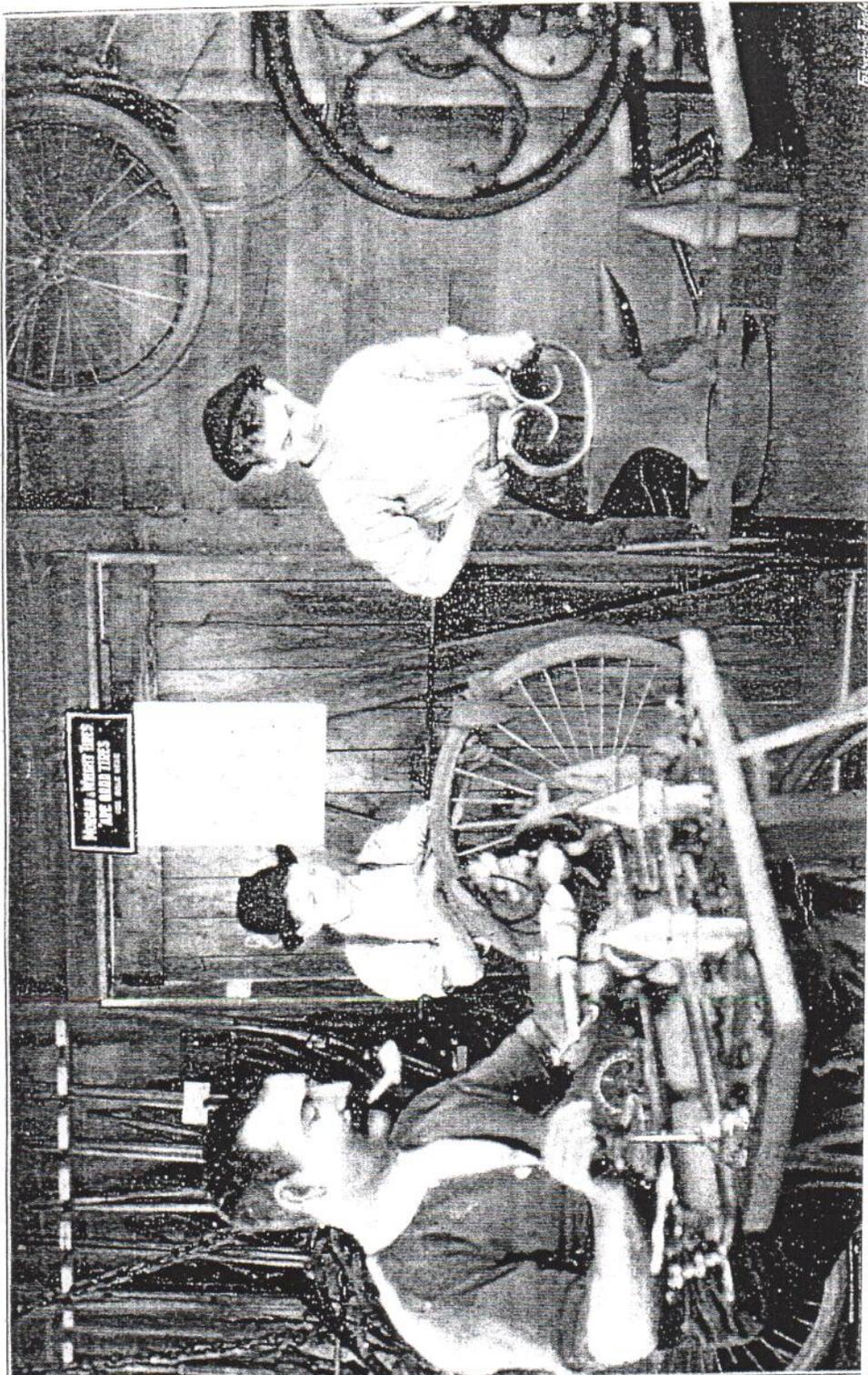
Bicycle repair shop interior in *Wheel Talk*, December 19, 1895. Private collection.



Straightening the Frame

Figure 16

Bicycle repair shop interior in *Wheel Talk*, May 30, 1895. Private collection.



FRANK & PHIL

Figure 17
Bicycle shop interior in *Wheel Talk*, December 12, 1895. Private collection.

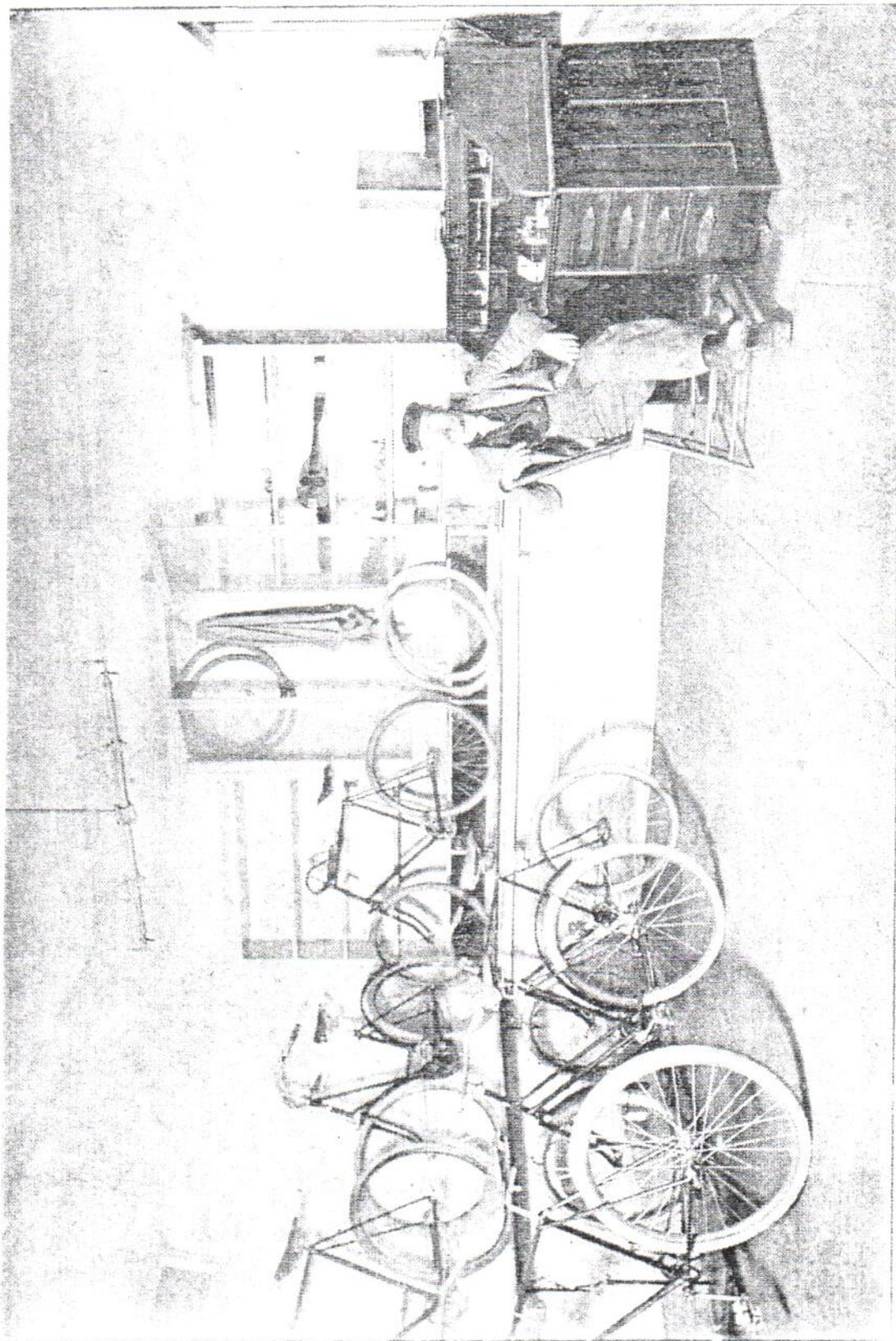


Figure 18

Figures 4 and 5 from *Bicycle Repairing* (S. D.V. Burr, 1896), illustrating a rack for holding bicycles and pulley system for displaying bicycles.

parts kept in stock. The cabinet indicated at the entrance contains all the parts of the wheels for which the repairer is agent. These are carried in order that any needed repair may be made as quickly as possible.

The extension at the right of the rear of the main building is 18 x 20 feet. At one side is a double bank of stalls and at the opposite side a single row. The stalls are placed 18 inches apart, and each is formed of two uprights about 2 inches in

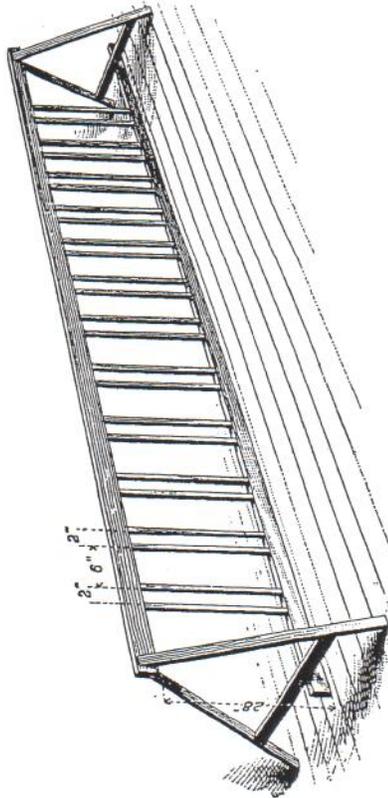


Fig. 4.—Rack for Holding Bicycles.

diameter and spaced just far enough apart to permit the entrance of a wheel between them. In this room the wheels needing repair and those for rent are kept.

Rack for Holding Bicycles.

It is essential in every shop, no matter how large or small, to provide means for holding wheels, whether they are for sale, rent or to be repaired. Preferably, the arrangement should be such that the wheels will occupy the least possible space. The rack shown in Fig. 4 is a very common form and serves the purpose well. It may be made stationary, as in the case of the two shops just described, or movable, as in the illustration. The space assigned to storage purposes may to advantage be fitted with a railing of any desirable length—room permitting, of course—placed so that it will accommodate a row of Bicycles

upon either side. The uprights of the railing are conveniently made of 1-inch stuff, cut about 2½ inches wide and spaced as follows: Two inches between the first pair of uprights, then 6 inches of space; after this another pair of uprights 2 inches apart, then 6 inches of space, and so on over the desired length of railing. There should be horizontal bottom and top railings running the entire length of the structure to strengthen it, also two side braces attached to either end from the upper rail to floor and making the stand more rigid. The railing should be made 28 inches high. The Bicycles are placed with their front wheels in the 2-inch spaces alternately on either side of the rack or railing.

Utilizing the Ceiling.

A method of supporting a Bicycle from the ceiling, either for inspection, cleaning or storage, is shown in Fig. 5. Fixed

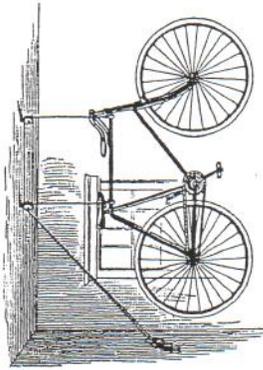


Fig. 5.—Utilizing the Ceiling.

in the ceiling are two small pulleys, one of which, that to the right, is single and the other double. Two cords are strung through these pulleys, as indicated in the drawing, and to the ends of the cords are fastened hooks which hold the wheel. When the wheel has been raised to the desired height the cords are made fast to a cleat on the side wall.

Figure 19

Sample repair ticket from Wright Cycle Company. Henry Ford Museum and Greenfield Village Research Center.

WRIGHT CYCLE CO.

Repair Department.

We guarantee all work;
but complaint must be
made promptly.

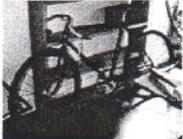
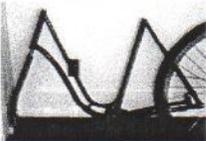
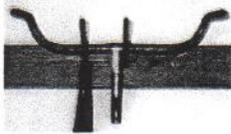
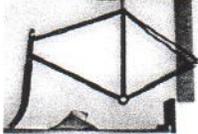
Storage will be charged on
all wheels not called for in
ten days.

KEEP THIS CARD.

No. 1039

OBJECTS LIST

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|----------------|---------------------|---|---|
| WC-Repair Room | C. 984 . 1 . 153 | <i>Reliance Model D:</i> Gendron Wheel Co. |  |
| WC-Repair Room | C. 984 . 4 . 101 | Bicycle chain guard |  |
| WC-Repair Room | C. 984 . 4 . 102 | <i>Men's New Departure:</i> Newhouse Diversy Flier |  |
| WC-Repair Room | C. 984 . 4 . 103 | Bicycle Frame: <i>Iver Johnsons Arms and Cycles Works, Fitchburg,</i> |  |
| WC-Repair Room | C. 984 . 4 . 118 | Bicycle Frame: <i>Western Wheel Works, Chicago, IL</i> |  |
| WC-Repair Room | C. 984 . 4 . 125 | Table |  |
| WC-Repair Room | C. 984 . 4 . 127 | Bicycle Handlebars |  |
| WC-Repair Room | C. 984 . 4 . 131 | Bicycle Frame with fork |  |
| WC-Repair Room | C. 988 . 4 . 225 | Tire Pump: <i>Beekman</i> |  |
| WC-Repair Room | C. 988 . 4 . 227 | Oil Can |  |
| WC-Repair Room | C. 988 . 4 . 228 | Oil Can |  |

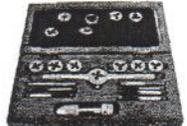
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|----------------|---------------------|--|---|
| WC-Repair Room | C. 988 . 4 . 229 | Oil Can |  |
| WC-Repair Room | C. 988 . 4 . 230 | Oil Can |  |
| WC-Repair Room | C. 991 . 13 . 4 | Floor Polisher: <i>Irvin Paint & Glass Co., Dayton, Oh</i> |  |
| WC-Repair Room | C. 991 . 24 . 1 | Bicycle Tiring Machine |  |
| WC-Repair Room | C. 993 . 2 . 3 | Bicycle Sprocket: <i>Dayton</i> |  |
| WC-Repair Room | C. 995 . 2 . 12 | Bicycle pump & bracket |  |
| WC-Repair Room | F. 2000 . 1 . | Dustpan |  |
| WC-Repair Room | F. 2000 . 3 . | Coffee Can |  |
| WC-Repair Room | F. 2000 . 4 . | Coffee Can |  |
| WC-Repair Room | F. 2000 . 12 . | Tool box |  |
| WC-Repair Room | F. 2000 . 14 . | Old Wooden Box |  |

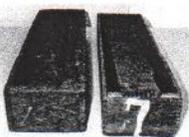
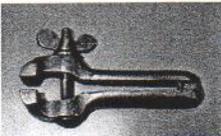
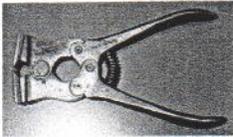
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|----------------|---------------------|----------------------|---|
| WC-Repair Room | F . 2000 . 16 | Cheese Box |  |
| WC-Repair Room | F . 2000 . 17 | Wall-mounted Spindle |  |
| WC-Repair Room | F . 2000 . 19 | Wall-mounted Spindle |  |
| WC-Repair Room | F . 2000 . 20 | Coverlet |  |
| WC-Repair Room | F . 2000 . 24 | Wooden Box |  |
| WC-Repair Room | F . 2000 . 27 | Mallet |  |
| WC-Repair Room | F . 2000 . 32 | Ball Peen Hammer |  |
| WC-Repair Room | F . 2000 . 36 | Pliers |  |
| WC-Repair Room | F . 2000 . 37 | Monkey Wrench |  |
| WC-Repair Room | F . 2000 . 42 | Screwdriver |  |
| WC-Repair Room | F . 2000 . 49 | Pliers |  |

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|----------------|---------------------|--------------------------------------|---|
| WC-Repair Room | F . 2000 . 62 . | Hand Drill |  |
| WC-Repair Room | F . 2000 . 64 . | Hacksaw |  |
| WC-Repair Room | F . 2000 . 78 . | Bolt Cutters (lg) & End Cutters (sm) |  |
| WC-Repair Room | F . 2000 . 90 . | 8 Ball Peen Hammers |  |
| WC-Repair Room | F . 2000 . 92 . | Claw Hammer |  |
| WC-Repair Room | F . 2000 . 94 . | Screw Plate Set in Wooden Case |  |
| WC-Repair Room | F . 2000 . 103 . | 2 Spindels |  |
| WC-Repair Room | F . 2000 . 109 . | Vise |  |
| WC-Repair Room | F . 2000 . 111 . | 2 Aprons |  |
| WC-Repair Room | F . 2000 . 116 . | Stool |  |
| WC-Repair Room | F . 2000 . 117 . | Wood Box |  |

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|----------------|---------------------|--------------------------------|---|
| WC-Repair Room | F . 2000 . 126 . | Bicycle Truing Stand |  |
| WC-Repair Room | F . 2000 . 128 . | (2) Containers-Patching Rubber |  |
| WC-Repair Room | F . 2000 . 129 . | (2) containers Rubber Solvent |  |
| WC-Repair Room | F . 2000 . 131 . | Misc. Bicycle Parts |  |
| WC-Repair Room | F . 2000 . 132 . | Cigar Box without cover |  |
| WC-Repair Room | F . 2000 . 134 . | (2) Wood Boxes |  |
| WC-Repair Room | F . 2000 . 150 . | 2 Screwdrivers |  |
| WC-Repair Room | F . 2000 . 152 . | Hand Vise |  |
| WC-Repair Room | F . 2000 . 153 . | 5 Bicycle Wrenches |  |
| WC-Repair Room | F . 2000 . 156 . | Wire Cutter Starrett #1 |  |
| WC-Repair Room | F . 2000 . 157 . | Wire Cutter Starrett #1 |  |

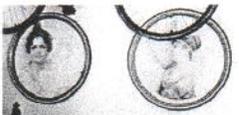
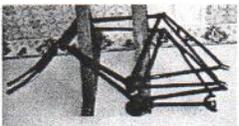
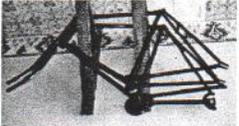
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|----------------|---------------------|---|---|
| WC-Repair Room | F . 2000 . 158 . | Wire Cutter Starrett #1 |  |
| WC-Repair Room | F . 2000 . 165 . | Torch |  |
| WC-Repair Room | F . 2000 . 186 . | Calendar: Baltimore & Ohio RR |  |
| WC-Salesroom | C . 984 . 4 . 1 | 1901 Men's <i>Van Cleve</i> : Wright Cycle Co. |  |
| WC-Salesroom | C . 984 . 4 . 2 | Bicycle Tool Kit: <i>B. F. Goodrich, Akron, OH</i> |  |
| WC-Salesroom | C . 984 . 4 . 3 | Bicycle Tool Kit: <i>Mossbury Wrench Co., Attleboro, MA</i> |  |
| WC-Salesroom | C . 984 . 4 . 4 | Cyclometer |  |
| WC-Salesroom | C . 984 . 4 . 10 | 1894 <i>Ladies Safety</i> : Hartford Cycle Co. |  |
| WC-Salesroom | C . 984 . 4 . 11 | Handcrank Telephone: <i>Western Electric Company</i> |  |
| WC-Salesroom | C . 984 . 4 . 12 | Typewriter: <i>The Smith Premier Typewriter. Smith Premier No.2</i> |  |
| WC-Salesroom | C . 984 . 4 . 15 | Advertisement for Goodyear Tires |  |

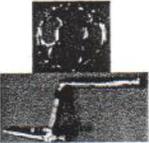
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|--------------|---|
| WC-Salesroom | C. 984 . 4 . 17 | Chair |  |
| WC-Salesroom | C. 984 . 4 . 18 | Desk |  |
| WC-Salesroom | C. 984 . 4 . 19 | Safe |  |
| WC-Salesroom | C. 984 . 4 . 23 | Clock |  |
| WC-Salesroom | C. 984 . 4 . 51 | Bicycle rim |  |
| WC-Salesroom | C. 984 . 4 . 55 | Bicycle tire |  |
| WC-Salesroom | C. 984 . 4 . 58 | Bicycle tire |  |
| WC-Salesroom | C. 984 . 4 . 60 | Bicycle tire |  |
| WC-Salesroom | C. 984 . 4 . 63 | Wheel Rim |  |
| WC-Salesroom | C. 984 . 4 . 64 | Wheel Rim |  |
| WC-Salesroom | C. 984 . 4 . 67 | Bicycle rim |  |

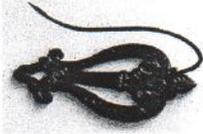
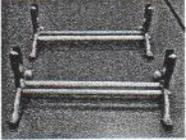
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|---|---|
| WC-Salesroom | C. 984 . 4 . 90 | Bicycle wheel |  |
| WC-Salesroom | C. 984 . 4 . 92 | Goodrich Tire advertisement |  |
| WC-Salesroom | C. 984 . 4 . 113 | Bicycle Frame: <i>Joliet Roadster</i> |  |
| WC-Salesroom | C. 984 . 4 . 144 | Bicycle frame |  |
| WC-Salesroom | C. 984 . 4 . 163 | 1898 Men's <i>Dayton</i> : Davis Sewing Machine Co. |  |
| WC-Salesroom | C. 985 . 5 . 173 | School hand bell |  |
| WC-Salesroom | C. 987 . 4 . 223 | Bicycle Lamp |  |
| WC-Salesroom | C. 987 . 20 . 31 | Filing Cabinet |  |
| WC-Salesroom | C. 990 . 9 . 3 | Kerosene Lamp |  |
| WC-Salesroom | C. 993 . 2 . 1 | Bicycle hub: <i>Lester</i> |  |
| WC-Salesroom | C. 993 . 2 . 5 | Bicycle Cup |  |

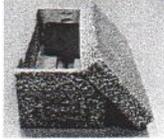
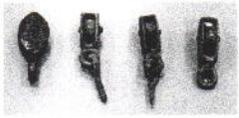
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|--|---|
| WC-Salesroom | C. 995 . 2 . 3 | Bicycle bags |  |
| WC-Salesroom | C. 995 . 2 . 5 | Bicycle saddle - youth size |  |
| WC-Salesroom | C. 995 . 2 . 6 | Bicycle lamp |  |
| WC-Salesroom | C. 995 . 2 . 7 | Bicycle bag |  |
| WC-Salesroom | C. 995 . 2 . 9 | Ladies bicycle bag |  |
| WC-Salesroom | C. 995 . 2 . 11 | Bicycle crank & sprocket |  |
| WC-Salesroom | C. 995 . 2 . 13 | Bicycle pump |  |
| WC-Salesroom | C. 995 . 2 . 14 | Bicycle pump |  |
| WC-Salesroom | C. 997 . 5 . 1 | Bicycle Lamp |  |
| WC-Salesroom | F. 2000 . 2 . | Inkwell |  |
| WC-Salesroom | C. 2000 . 2 . 3 | 1899 Men's <i>Spalding</i> : A.G. Spalding & Bros. Manufacturing |  |

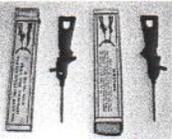
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|--------------------------|---|
| WC-Salesroom | F . 2000 . 5 . | Spindle |  |
| WC-Salesroom | C . 2000 . 5 . 1 | Bicycle Sprocket: Dayton |  |
| WC-Salesroom | F . 2000 . 7 . | Bill Clip |  |
| WC-Salesroom | F . 2000 . 9 . | Wall-mounted Spindle |  |
| WC-Salesroom | F . 2000 . 10 . | Wall-mounted Spindle |  |
| WC-Salesroom | F . 2000 . 13 . | Wall Coatrack |  |
| WC-Salesroom | F . 2000 . 18 . | Tire Pump |  |
| WC-Salesroom | F . 2000 . 21 . | Pen Holder |  |
| WC-Salesroom | F . 2000 . 23 . | Arm Chair |  |
| WC-Salesroom | F . 2000 . 40 . | Coin Tray |  |
| WC-Salesroom | F . 2000 . 110 . | 2 cast brass bikestands |  |

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|------------------------------|---|
| WC-Salesroom | F . 2000 . 112 . | 2 sets of bicycle hand grips |  |
| WC-Salesroom | F . 2000 . 114 . | Store door bells (2) |  |
| WC-Salesroom | F . 2000 . 115 . | Slide ruler with case |  |
| WC-Salesroom | F . 2000 . 118 . | Box for index |  |
| WC-Salesroom | F . 2000 . 119 . | Wire Waste Basket |  |
| WC-Salesroom | F . 2000 . 121 . | Oak Stand |  |
| WC-Salesroom | F . 2000 . 122 . | 4 Cast Pulley's |  |
| WC-Salesroom | F . 2000 . 123 . | Iron Scissors |  |
| WC-Salesroom | F . 2000 . 124 . | Office file basket |  |
| WC-Salesroom | F . 2000 . 125 . | Chair |  |
| WC-Salesroom | F . 2000 . 127 . | Victor Postal Scale |  |

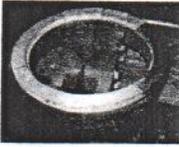
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|-------------------------------|---|
| WC-Salesroom | F . 2000 . 130 . | (2) Tire repair tools & boxes |  |
| WC-Salesroom | F . 2000 . 133 . | Bicycle folding cup |  |
| WC-Salesroom | F . 2000 . 168 . | Display Case |  |
| WC-Salesroom | F . 2000 . 169 . | WC Window Curtains |  |
| WC-Salesroom | F . 2000 . 170 . | Search Light Boxes |  |
| WC-Salesroom | F . 2000 . 171 . | Standard Cyclometer Boxes |  |
| WC-Salesroom | F . 2000 . 172 . | Dress Guard Lacing Box |  |
| WC-Salesroom | F . 2000 . 173 . | Corbin Hub Boxes |  |
| WC-Salesroom | F . 2000 . 174 . | Pure Flax Box |  |
| WC-Salesroom | F . 2000 . 175 . | 2 J-Hook Gas Light Fixtures |  |
| WC-Salesroom | F . 2000 . 176 . | 2 2-Arm Gas Hanging Fixtures |  |

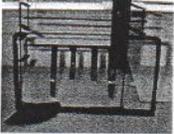
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|-------------------------------|---|
| WC-Salesroom | F . 2000 . 177 . | 6 Wall-Mount Gas Fixtures |  |
| WC-Salesroom | F . 2000 . 178 . | Awnings |  |
| WC-Salesroom | F . 2000 . 179 . | Diamond Chain Company Box |  |
| WC-Salesroom | F . 2000 . 180 . | Torrington Box |  |
| WC-Salesroom | F . 2000 . 181 . | Dress Guard Laces for Bicycle |  |
| WC-Salesroom | F . 2000 . 184 . | Repro Van Cleve Bicycle |  |
| WC-Salesroom | F . 2000 . 185 . | Ledger |  |
| WC-Workshop | C . 984 . 3 . 138 | Anvil stand |  |
| WC-Workshop | C . 984 . 3 . 160 | Anvil |  |
| WC-Workshop | C . 984 . 4 . 104 | Workbench |  |
| WC-Workshop | C . 984 . 4 . 120 | Machine belt |  |

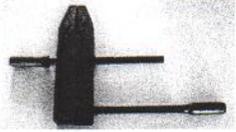
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|--|---|
| WC-Workshop | C. 984 . 4 . 121 | Pulley |  |
| WC-Workshop | C. 984 . 4 . 135 | Stationary engine to power line shaft |  |
| WC-Workshop | C. 984 . 4 . 143 | Pulley |  |
| WC-Workshop | C. 984 . 4 . 146 | Pulley |  |
| WC-Workshop | C. 984 . 4 . 157 | Machine belt |  |
| WC-Workshop | C. 984 . 4 . 166 | Gear |  |
| WC-Workshop | C. 984 . 4 . 167 | Gear |  |
| WC-Workshop | C. 984 . 4 . 168 | Gear |  |
| WC-Workshop | C. 984 . 4 . 175 | Lineshaft |  |
| WC-Workshop | C. 987 . 20 . 92 | Lathe: <i>H. L. Shepard AGT, CIN. O.</i> |  |
| WC-Workshop | C. 988 . 21 . 2 | Draw Knife |  |

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|-------------------------|---|
| WC-Workshop | C. 988 . 21 . 5 | Mallet |  |
| WC-Workshop | C. 988 . 21 . 8 | Drill Bit |  |
| WC-Workshop | C. 988 . 21 . 12 | Ratchet Wrench |  |
| WC-Workshop | C. 988 . 21 . 15 | Scribe |  |
| WC-Workshop | C. 988 . 21 . 20 | Wrench |  |
| WC-Workshop | C. 988 . 21 . 23 | Gouge |  |
| WC-Workshop | C. 988 . 21 . 24 | Gouge |  |
| WC-Workshop | C. 990 . 7 . 1 | Sawhorse |  |
| WC-Workshop | C. 990 . 10 . 22 | Replica Wind Tunnel |  |
| WC-Workshop | C. 990 . 10 . 23 | Wind tunnel instruments |  |
| WC-Workshop | C. 990 . 10 . 27 | Wind tunnel instruments |  |

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|---------------------------------|---|
| WC-Workshop | C . 990 . 10 . 28 | Grinder for Replica Wind Tunnel |  |
| WC-Workshop | F . 2000 . 6 | Oilcan |  |
| WC-Workshop | F . 2000 . 11 | Letter Clip |  |
| WC-Workshop | F . 2000 . 15 | Divided Wooden Drawer |  |
| WC-Workshop | F . 2000 . 22 | Wall-mounted Spindle |  |
| WC-Workshop | F . 2000 . 25 | Plane |  |
| WC-Workshop | F . 2000 . 26 | Clamp |  |
| WC-Workshop | F . 2000 . 28 | Tape Measure |  |
| WC-Workshop | F . 2000 . 29 | Bicycle Wrench |  |
| WC-Workshop | F . 2000 . 30 | Drill & Wire Gauge Chart |  |
| WC-Workshop | F . 2000 . 31 | Tri-Square |  |

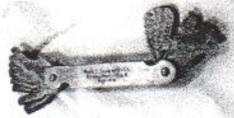
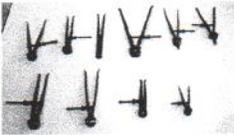
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|---|---|
| WC-Workshop | F . 2000 . 33 | Hatchet |  |
| WC-Workshop | F . 2000 . 34 | Breast Drill |  |
| WC-Workshop | F . 2000 . 35 | Pipe Wrench |  |
| WC-Workshop | F . 2000 . 38 | Inside Liners to Glue Pots F.44 & 67 |  |
| WC-Workshop | F . 2000 . 39 | Monkey Wrench |  |
| WC-Workshop | F . 2000 . 41 | Surface Gauge Starrett |  |
| WC-Workshop | F . 2000 . 43 | File |  |
| WC-Workshop | F . 2000 . 44 | Furniture Makers Glue Pot |  |
| WC-Workshop | F . 2000 . 45 | Ladle |  |
| WC-Workshop | F . 2000 . 46 | Pliers |  |
| WC-Workshop | F . 2000 . 47 | Pliers |  |

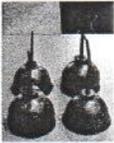
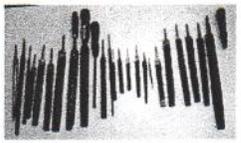
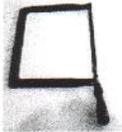
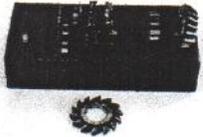
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|----------------------|---|
| WC-Workshop | F . 2000 . 48 | Pliers |  |
| WC-Workshop | F . 2000 . 50 | Pliers |  |
| WC-Workshop | F . 2000 . 51 | Pliers |  |
| WC-Workshop | F . 2000 . 52 | Tri-Square |  |
| WC-Workshop | F . 2000 . 53 | Needle Nose Pliers |  |
| WC-Workshop | F . 2000 . 54 | Saw Set |  |
| WC-Workshop | F . 2000 . 55 | Pliers |  |
| WC-Workshop | F . 2000 . 56 | End Cutters |  |
| WC-Workshop | F . 2000 . 57 | Tongs |  |
| WC-Workshop | F . 2000 . 58 | Compound End Cutters |  |
| WC-Workshop | F . 2000 . 59 | Tack Puller |  |

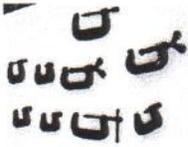
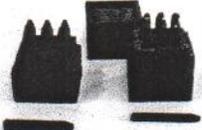
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|---------------------------------|---|
| WC-Workshop | F . 2000 . 60 . | Brown & Sharp Micrometer |  |
| WC-Workshop | F . 2000 . 61 . | Gauge |  |
| WC-Workshop | F . 2000 . 63 . | Speed Indicator |  |
| WC-Workshop | F . 2000 . 65 . | Saw |  |
| WC-Workshop | F . 2000 . 66 . | Hacksaw |  |
| WC-Workshop | F . 2000 . 67 . | Glue Pot |  |
| WC-Workshop | F . 2000 . 68 . | 10 Calipers |  |
| WC-Workshop | F . 2000 . 69 . | 12 Calipers |  |
| WC-Workshop | F . 2000 . 70 . | 2 Pliers (Used 1 & 3 from left) |  |
| WC-Workshop | F . 2000 . 71 . | 2 Pliers |  |
| WC-Workshop | F . 2000 . 72 . | 5 Screwdrivers - Regular |  |

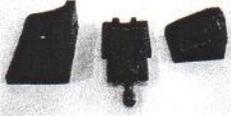
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|---|---|
| WC-Workshop | F. 2000 . 73 | 4 Oil Cans |  |
| WC-Workshop | F. 2000 . 74 | Speed Indicator |  |
| WC-Workshop | F. 2000 . 77 | 2 Tin Snips |  |
| WC-Workshop | F. 2000 . 79 | 3 Open-end Wrenches |  |
| WC-Workshop | F. 2000 . 80 | 12 Open-end Wrenches |  |
| WC-Workshop | F. 2000 . 81 | 9 Boxed-end Wrenches |  |
| WC-Workshop | F. 2000 . 82 | 24 Files |  |
| WC-Workshop | F. 2000 . 83 | Hacksaw |  |
| WC-Workshop | F. 2000 . 84 | 2 Handpunches |  |
| WC-Workshop | F. 2000 . 85 | 14 Milling Bits in partitioned wooden box |  |
| WC-Workshop | F. 2000 . 86 | Used 3 of 11 Keyseat Cutters & Wooden Stand |  |

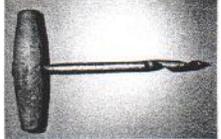
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|-----------------------------------|---|
| WC-Workshop | F. 2000 . 87 | 9 C Clamps |  |
| WC-Workshop | F. 2000 . 88 | Stock Holder |  |
| WC-Workshop | F. 2000 . 89 | 3 Tap Handles |  |
| WC-Workshop | F. 2000 . 91 | 3 Sledge Hammers |  |
| WC-Workshop | F. 2000 . 93 | Screw Plate Set in Wooden Case |  |
| WC-Workshop | F. 2000 . 95 | 2 sets of Punches in Wooden Boxes |  |
| WC-Workshop | F. 2000 . 96 | 3 Lathe Dogs |  |
| WC-Workshop | F. 2000 . 97 | 7 Tool Holders |  |
| WC-Workshop | F. 2000 . 98 | 4 Ground Down Files-Scrapers |  |
| WC-Workshop | F. 2000 . 99 | 13 Drill Sleeves |  |
| WC-Workshop | F. 2000 . 100 | 12 Dies in Wooden Box |  |

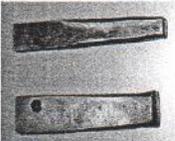
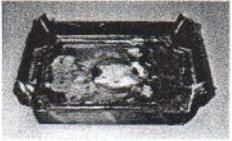
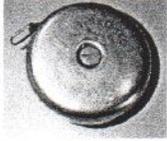
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|--|---|
| WC-Workshop | F . 2000 . 101 . | 3 Die Holders on Lathe Cone Centers |  |
| WC-Workshop | F . 2000 . 102 . | Micrometer Set in Wooden Box |  |
| WC-Workshop | F . 2000 . 104 . | Tin Can |  |
| WC-Workshop | F . 2000 . 105 . | 5 Rulers (from center left: Depth Gauge, Square, Protractor, Ruler |  |
| WC-Workshop | F . 2000 . 106 . | Compass Saw |  |
| WC-Workshop | F . 2000 . 107 . | 2 T Wrenches |  |
| WC-Workshop | F . 2000 . 108 . | 2 Angle Plates & Fixture (in center) |  |
| WC-Workshop | F . 2000 . 113 . | Oak Stool |  |
| WC-Workshop | F . 2000 . 120 . | Dish Pan |  |
| WC-Workshop | F . 2000 . 135 . | C- clamp |  |
| WC-Workshop | F . 2000 . 136 . | 3 C- clamp's |  |

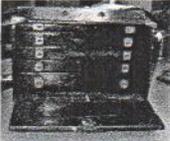
Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|--------------------|---|
| WC-Workshop | F . 2000 . 137 . | 3 C- clamp's |  |
| WC-Workshop | F . 2000 . 138 . | 3 Brad Awls |  |
| WC-Workshop | F . 2000 . 139 . | Awl |  |
| WC-Workshop | F . 2000 . 140 . | Tin Snips |  |
| WC-Workshop | F . 2000 . 141 . | Gimlet |  |
| WC-Workshop | F . 2000 . 142 . | Drill Ratchet |  |
| WC-Workshop | F . 2000 . 143 . | Combination Square |  |
| WC-Workshop | F . 2000 . 144 . | Brush |  |
| WC-Workshop | F . 2000 . 145 . | Tape Measure |  |
| WC-Workshop | F . 2000 . 146 . | Nail Puller |  |
| WC-Workshop | F . 2000 . 147 . | Back Saw |  |

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|--------------------|---|
| WC-Workshop | F . 2000 . 148 . | Hacksaw |  |
| WC-Workshop | F . 2000 . 149 . | Pipe Cutter |  |
| WC-Workshop | F . 2000 . 151 . | 2 Rivett Set(s) |  |
| WC-Workshop | F . 2000 . 154 . | Wrench |  |
| WC-Workshop | F . 2000 . 155 . | Block Plane |  |
| WC-Workshop | F . 2000 . 159 . | Drill Bit Stand |  |
| WC-Workshop | F . 2000 . 160 . | Soldering Irons |  |
| WC-Workshop | F . 2000 . 161 . | Glue Brushes |  |
| WC-Workshop | F . 2000 . 162 . | Steel Tape Measure |  |
| WC-Workshop | F . 2000 . 163 . | Ruler |  |
| WC-Workshop | F . 2000 . 164 . | Hand Saw |  |

Carillon Historical Park - Wright Cycle Shop

| Sub location | Combined Object No. | Common Name | Picture |
|--------------|---------------------|-------------|---|
| WC-Workshop | F . 2000 . 166 . | Torch |  |
| WC-Workshop | F . 2000 . 167 . | Tool Box |  |
| WC-Workshop | F . 2000 . 182 . | 1899 Kite |  |
| WC-Workshop | F . 2000 . 183 . | 1902 Rudder |  |

Appendix A

"List of Tools for \$100," S.D.V. Burr, *Bicycle Repairing*, (New York: David Williams, 1896), pp. 10-11.

In the following list of tools we have assumed the money available to be \$100, \$300 and \$500, and have therefore divided the subject into three parts.

Equipment for \$100.

It is evident that with this amount only the small tools can be purchased, and the shop must be run solely by hand and foot power. And yet there are many repair shops which are now doing business successfully, and which are not provided with tools worth \$100. With only this amount at command, several important tools of undoubted value must be omitted. These are, in the order of their importance, the screw cutting lathe, upright drill, brazing table, air reservoir and its pump, enameling oven, and steam or gas engine, or electric motor or water motor, for driving the tools. While this amount will not include the screw cutting lathe it will permit of the introduction of an ordinary speed lathe, and with this much of the work can be done, although at a disadvantage. The upright drill may be replaced by the so-called blacksmiths' drill, which may be had for \$10 or \$15. The repairer can easily provide the table with suitable chucking devices for holding work of different kinds.

Unfortunately, since the Bicycle manufacturers have no standard of sizes, and no common or uniform method of doing work, it is necessary for the repairer to provide more tools than would be otherwise needed. This is particularly noticeable in the taps and dies required. The same size of spoke may call for three or four different threads, according to the whim of the maker. While this condition of things is being gradually brought to some degree of uniformity, the repairer is not aided at the present time.

LIST OF TOOLS FOR \$100.

| | | |
|--|-----------------------|--------|
| 1/16, 3/64, 5/32, 7/64, 3/8, 9/64, 1/16, 5/16, 7/16, 1/2, 3/4 inch | Drills for above..... | \$9.00 |
| Drills from 3/4 to 1/2 inch by 16ths..... | | 2.00 |
| 1 set Taper Reamers, 3/4, 3/8, 9/16, 3/16 inch..... | | 3.85 |
| 1 Hand Drill..... | | 1.70 |
| 1 Drill Gauge..... | | 1.50 |
| 1 Thread Gauge..... | | 1.00 |
| 1 Ball Pein Hammer..... | | 1.00 |
| 1 Riveting Hammer..... | | .50 |

THE EQUIPMENT OF THE SHOP.

| | |
|---|---------|
| 1 Hide Faced Hammer..... | 1.25 |
| 1 Lead Hammer..... | .40 |
| 1 Lignum vitae Mallet..... | .50 |
| 1 Bench Vise..... | 7.00 |
| 1 Pin Vise..... | 1.25 |
| 1 14-inch Pipe Wrench..... | 3.00 |
| 2 6-inch Monkey Wrenches..... | 1.00 |
| 1 15-inch Monkey Wrench..... | 1.20 |
| 1 pair Round Pliers..... | .45 |
| 1 pair Cutting Nippers..... | .60 |
| 1 pair side Cutting Pliers..... | .90 |
| 1 Oil Can..... | 1.00 |
| 1 50-pound Anvil..... | .35 |
| 1 Brazing Blow Pipe..... | 5.00 |
| 1 Foot Bellows..... | 3.00 |
| 1 Bit Punch for punching holes in tires for lacing..... | 5.00 |
| 1 Bit Brace..... | .60 |
| 1 pair Outside Calipers..... | 2.00 |
| 1 pair Inside Calipers..... | .40 |
| 1 pair Dividers..... | .40 |
| 1 Screw Clamp, opens 6 inches..... | .50 |
| 1 2-foot Rule..... | .45 |
| 1 Hack Saw Frame..... | .15 |
| 1 dozen Hack Saws..... | .90 |
| 2 Screw Drivers..... | .65 |
| 1 Foot Pump and Connections..... | .50 |
| 1 Brazing Solder..... | 2.00 |
| 1 Portable Forge..... | 1.00 |
| 1 Center Punch..... | 12.00 |
| 1 Grindstone..... | .20 |
| 1 Oil Stone..... | 4.50 |
| 1 1/2 and 1-inch Chisels..... | .50 |
| 1 Blacksmith's Drill..... | .70 |
| 1 Cold and 1 Cape Chisel, 1 1/2-inch..... | 12.00 |
| 1 Hand Drill..... | .60 |
| 1 Breast Drill..... | 1.50 |
| 2 12-inch Bastard Flat Files..... | 3.00 |
| 1 9-inch Bastard Half Round..... | |
| 1 9-inch Smooth Half Round..... | |
| 1 9-inch Smooth Round..... | 1.50 |
| Total..... | \$99.90 |

Some of the items in the above may be considered as superfluous by the repairer. We think the two most doubtful items are the forge and grindstone, which cost together \$16.50. While these would be of the utmost use if the outfit included a lathe, which would require the making of cutting tools, they can in this case be dispensed with. All brazing, soldering, etc., can be done with the brazing blow pipe. The sum represented by the forge and grindstone could be expended as follows:

A second Brazing Blow Pipe to be arranged so that the flames of the two would meet as in the Brazing Furnaces hereafter described.....\$3.00
Gas Pipe connections and table for same, with the necessary Fire Brick, etc., the work to be done by the repairer..... 7.00

This arrangement would be more convenient than the forge and would meet every requirement admirably. The balance of

BICYCLE REPAIRING.

12

the amount, \$6.50, can be profitably expended in increasing the line of taps, dies and drills, and in stocking up with brazing solder, rubber cement, patches for rubber tires, etc. It is presumed that the repairer will make all the work benches, racks, shelves, and similar articles.

Equipment for \$300.

The amount now to be expended for tools being \$300, the repairer can add the most essential machine tools to the list of small tools enumerated above. The first and most important is the lathe. This, of necessity, must be arranged for foot power, as the sum of money in hand will not provide power for the shop. A 12-inch swing over the ways will meet all ordinary requirements. The lathe should be screw cutting, and should be provided with face plate, drill chuck, inside and outside chuck, and the cutting tools. A lathe of this kind of good make can be bought for \$125, and the attachments needed for \$20.

Next an emery wheel grinder for \$15. An upright drill may be had for \$40, and will be found exceedingly useful for such work as drilling the holes in chain links, flanges of hubs and the like. The account now stands as follows:

| | |
|--------------------------------------|----------|
| Amount expended for small Tools..... | \$100.00 |
| Lathe..... | 125.00 |
| Lathe Attachments..... | 20.00 |
| Emery Wheel Grinder..... | 15.00 |
| Upright Drill and Attachments..... | 40.00 |
| Total..... | \$300.00 |

If deemed advisable by the work it is expected to do, the emery wheel grinder can be dispensed with and an enameling oven built for the amount it would cost, provided the repairer did the work himself.

Equipment for \$500.

With this amount it is possible to run the shop with power. In the vast majority of cases a steam engine would be out of the question, as power is only occasionally required. A gas engine or electric motor is preferable, as either may be started instantly, and there is no expense incurred except when some

work is being performed. Putting the cost of either of these at \$125, we have \$75 left. Of this, \$35 should supply the shafting, pulleys and belts. For the balance an air tank, to hold air under pressure for blowing up tires and running the forge, and the air pump may be purchased. The account now stands:

| | |
|-----------------------------------|----------|
| Small Tools and Machines..... | \$300.00 |
| Gas Engine or Electric Motor..... | 130.00 |
| Shafting, etc..... | 35.00 |
| Air Tank and Pump..... | 35.00 |
| Total..... | \$500.00 |

The above lists are only offered as suggestions. The desires and demands of each individual must largely influence the selection. Some repairers would do away with all of the last items and might expend the \$200 in a larger and better enameling oven, a brazing furnace, a larger lathe and in adding to the stock of small tools, and in the purchase of some of the most useful special appliances which have been designed for repair work.

Work Bench.

The work bench illustrated in Fig. 1 will be found very convenient in a small shop. It should be erected where daylight is abundantly supplied by one or more windows, and must be screwed to the floor, and, better still, also to the wall along the window side. Select for the top of the bench three lengths of 2 x 10 inch hardwood lumber, dressed on upper sides and all around on the 2-inch sides. Make a true joint where the timbers butt, and at every 30 inches bore 1/2-inch holes through the timbers, as indicated by the dotted lines A A. The joints are then to be glued and held together firmly by 1/2-inch bolts with large washers and nuts.

A very close fit of the top timbers is especially desirable, as small screws, oiler covers, flat springs, balls and similar parts of diminutive proportions, when placed upon a bench with fissures between the timbers, are liable to drop through the openings and disappear, sometimes never to be located again. A well-made top will also keep dust, filings and dirt out of the tool drawer, which may be located about as shown in cut. The legs L and cross timbers C should be pine posts 4 x 4 inches, and let

Appendix B

1909 Inventory, 1127 West Third Street, Wright Cycle Company, in Business Journals and Ledgers, 1902-1910, volume 4, microfilmed by Library of Congress. Copy at Dayton Aviation Heritage National Historic Park.

| | | | | | |
|-----|----------------------------|---|---|---|--|
| 177 | Reg Ribs | Size 1 | | | |
| 25 | " | " | " 2 | | |
| 25 | " | " | " 3 | | |
| 23 | " | " | " 4 | | |
| 24 | " | " | " 5 | | |
| 40 | Solid $\frac{1}{2}$ " Ribs | for Single Spar | | | |
| 11 | " | $\frac{1}{2}$ " | " double | | |
| 12 | " | 1" | " | | |
| 33 | Rib Tips | | | | |
| 11 | Seat Ribs | | | | |
| 13 | Engine Ribs | | | | |
| 11 | Repair Ribs | | | | |
| 33 | Reg Ribs | Size 1 | for Racer | | |
| 5 | " | " | " 2 " | " | |
| 6 | " | " | " 3 " | " | |
| 4 | " | " | " 4 " | " | |
| 5 | " | " | " 5 " | " | |
| 4 | Rib Tips | | | | |
| 73 | Uprights | for Loop Ends | | | |
| 51 | " | without Loops | | | |
| 10 | Ash Skids | (5 Pcs Each) | | | |
| 22 | " | Skid Blocks |  | | |
| 4 | Front Truck Cross Beam | | | | |
| 10 | Skid Runners | Short | | | |
| 10 | Front Skid Runners | | | | |
| 13 | Long Skid Beams |  | | | |
| 12 | heavy " | " |  | | |
| 11 | Short " | " | " | | |
| 10 | Front Rudder | " |  | | |
| 4 | Cross Struts | under Front Rudder | ed | | |
| 9 | Long Front Rudder Supports | Ash | | | |
| 5 | Short " | " | " | | |
| 9 | Act-Arms | for Rudder |  | | |
| 6 | half " | " | " | | |
| 52 | Act Struts | " | " | | |
| 13 | long " | " | " | | |
| 24 | Fair | " | | | |
| 16 | Front Pcs | for Fair | | | |
| 22 | Fair Bows |  | | | |
| 18 | Pcs | $\frac{3}{4}$ x $1\frac{1}{4}$ x 6-0 | ash | | |
| 30 | " | 1 x $1\frac{1}{2}$ x 8-0 | " @ 40¢ | | |
| 13 | Ash Hagon Bows | $2\frac{1}{2}$ " wood | | | |
| 13 | " | " | $1\frac{1}{4}$ " | | |
| 200 | Spruce Rib Strips | $9\frac{1}{2}$ x $\frac{1}{2}$ | Spruce | | |
| 40 | Pcs | $\frac{1}{2}$ x $\frac{3}{8}$ | Ash 6 ft @ 10¢ | | |

| Quantity | Description | Notes | ✓ |
|----------|---|-----------------|---|
| | Starting Pullings | | / |
| 8 | From Rudder Hinges | | / |
| 4 | Act Rods for Rudder | | / |
| 26 | Act Arm ends A | | / |
| 27 | " " " B | | / |
| 68 | U ^s for Rudder Tail Uprights | | / |
| 13 | Act Rod Brackets Aluminum | | / |
| 20 | Hinges for Front Rudder ends | | / |
| 3 | Lower Ends " " Uprights | | / |
| 4 | Set's Front Rudder Hinges | 12" dia 3 arm B | / |
| 16 | U ^s for Long Front Rudder Uprights | 12" 3" B | / |
| 16 | Front Spar Double Hinges | | / |
| 16 | " " Single " | | / |
| 39 | Reel " " " | | / |
| 16 | Tail Support Fasteners | | / |
| 8 | Upper Skid Brace Hinges | | / |
| 3 | Lower " Runner " | | / |
| 74 | U ^s for Uprights 2 size | | / |
| 76 | Washers for " U ^s 2 " | | / |
| 5 | Lower Skid fittings | | / |
| 5 | " " " | | / |
| 5 | U ^s for " | | / |
| 5 | Skid Brace Fittings | | / |
| 24 | " " " " | | / |
| 6 | Straps | | / |
| 12 | " " | | / |
| 8 | Long " | | / |
| 6 | Short " | | / |
| 82 | Double Truss Hinges | | / |
| 54 | Single " " " | | / |
| 42 | " " " " | | / |
| 61 | Heavy Single | | / |
| 11 | " " " | | / |
| 14 | Long Loops | | / |
| 3 | Set's Shooting Stick Fittings | | / |
| 12 | Hanger Fasteners | | / |
| 24 | Pins for Hangers | | / |
| 6 | Hangers Complete | | / |
| 6 | Propeller Shafts | | / |
| 9 | Hanger Adjusters | | / |
| 5 | Short Chain Guides | | / |
| 5 | Long " " " | | / |
| 4 | Steel Friction Wheels | | / |
| 20 | Aluminum Wheel Pullings | | / |

| | | | | | |
|----|--------------------|-----------------------------------|--|-----|---|
| 9 | Jambuckles | | | | ✓ |
| 52 | Jambuckles | | | | ✓ |
| 10 | lbs Glue | | | 250 | ✓ |
| 10 | Radiators 5 sets | | | | ✓ |
| 20 | " | T ₅ | | | ✓ |
| 20 | F Rudder Bords | 4 Glue 20 spec 7/8 x 1 1/2 x 16-0 | | | ✓ |
| 10 | Pro Hickory Shes | 4 x 1 5/8 x 8-0 | | | ✓ |
| 16 | 1/2 x 1 3/4 x 11-6 | | | | ✓ |
| 32 | Front Spars | 12-3 | | | ✓ |
| 17 | " | " 14-4 | | | ✓ |
| 4 | 1/4 x 1 3/4 x 8-7 | | | | ✓ |
| 6 | " x " x 9-10 | | | | ✓ |
| 18 | Rear Spars | 12-3 | | | ✓ |
| 8 | " | " 14-6 | | | ✓ |
| 3 | 1/4 x 2 x 10-0 | | | | ✓ |
| 6 | F R Braces | | | | ✓ |
| 5 | Act-Rods | 1/8 x 1 1/2 | | | ✓ |
| 8 | Y Rod Connection | Brass Tubing | | | ✓ |

Feb 14

| | | | | | |
|-------|-------------------|----------------|-------------|---|---|
| 3 | Qty 3" x 1/4 F Jt | Stove Bolts | metal | | ✓ |
| 100 | - 2 1/2 x 1/4 " | " | " | " | ✓ |
| 20 | - " " " | " | " | " | ✓ |
| 50 | - 1 3/4 x 1/4 " | " | " | " | ✓ |
| 6 | - 1 1/2 x 1/4 " | " | " | " | ✓ |
| 80 | - 3/16 x 4 " | " | " | " | ✓ |
| 75 | - 3/16 x 3 1/2 " | " | " | " | ✓ |
| 225 | - 1" #6 | RT | " | " | ✓ |
| 36 | - 1 1/2 #6 | " | " | " | ✓ |
| 96 | - 3/16 x 3 | Carringe Bolts | " | " | ✓ |
| 84 | - | | | | ✓ |
| 72 | - 3/16 x 2 1/2 " | " | " | " | ✓ |
| 36 | - 3/16 x 2 " | " | " | " | ✓ |
| 12 | - 1/4 x 2 1/2 " | " | " | " | ✓ |
| 12 | - 3/16 x 2 3/4 " | " | " | " | ✓ |
| 50 | - 8-32 x 1/2 | Stove Bolts | " | " | ✓ |
| 9 1/2 | lbs | 1 1/4 No 10 | F Jt Screws | | ✓ |
| 1 | " | 1 1/4 No 11 | " | " | ✓ |
| 1 | " | 1 3/4 = 11 | " | " | ✓ |
| 1/4 | lb | 1 1/4 No 17 | F Jt Nails | | ✓ |
| 1/2 | " | 1" " 17 | " | " | ✓ |
| 1 | " | 1" " 17 | Brads | | ✓ |
| 1/2 | " | 7/8 = 18 | " | " | ✓ |
| 4 | lbs | 2 g | Lat | | ✓ |
| 2 | lbs | .050 | Wire | | ✓ |
| 5 | " | .080 | " | | ✓ |
| 1 | " | .100 | " | | ✓ |
| 1 | 1/8 | lbs | Solder | | ✓ |

| | | | | | |
|----|---|---|-------|--------|---------|
| 1 | 1 | Patina 14"x6' Eng Lath with Saper Attack | | 137.50 | 00 |
| 1 | 1 | American 25" Back Sided Crank Shear with S.H. Support | | 530.00 | |
| | | fr- | | 5.63 | |
| | | Drayage | | 6.00 | 541.53 |
| 1 | 1 | 26" Crescent Band Saw | | 40.00 | |
| 1 | 1 | Power Hack Saw | | 10.00 | |
| 1 | 1 | 20" Bands Drill Press | | 55.00 | |
| 1 | 1 | Emery Grinder Counter | | 10.00 | |
| 1 | 1 | Small Drill Press | | 10.00 | |
| 1 | 1 | Gas Engine | 10.11 | 50.00 | |
| 1 | 1 | Magneto Bosch on Engine | | 62.00 | |
| 1 | 1 | 6x6 Wood Pulley 2.75 | | | |
| 1 | 1 | 3x8 " " 2.60 | | | |
| 1 | 1 | 6x18 " " 5.70 | | | |
| 1 | 1 | 6x30 " " 10.60 | | | |
| 1 | 1 | 8x30 " " 13.00 | | | |
| 1 | 1 | 10x10 " " 46.50 | | | |
| 1 | 1 | 6x12 " " 39.00 | | | |
| 1 | 1 | 6x16 " " 50.00 | | | 173.50 |
| 1 | 1 | 1 1/2 x 22 ft Shaft #3 Stange | | | 12.00 |
| 1 | 1 | Brazing Tank | | | 5.00 |
| 1 | 1 | Air Tank | | | 6.25 |
| 1 | 1 | Annealing Oven | | | 1.50.00 |
| 1 | 1 | 3 1/2" Parker Vice | | | 3.50 |
| 1 | 1 | 5 1/2" Swivel Base & Jaw Vice | | | |
| 1 | 1 | 3 1/2" A.M. Co #70 Vice | | | |
| 18 | | 1/2" 3" Double Bell | 43 | | |
| 12 | | " 4" " " | 57 | | |
| 14 | | " 2" Single " | | | |
| 12 | | " 2" " " | | | |
| 18 | | " 2" " " | | | |
| 10 | | " 2" " " | | | |
| 18 | | " 2 1/2" " " | | | |
| 32 | | " 2 1/2" " " | | | |
| 19 | | " 3" " " | | | |
| 12 | | " 2" Double Lux ⁹⁶ | 28 | | 33.60 |
| 25 | | " 3" Single | | | |
| 4 | | 6" C Clamps | 35 | | 1.40 |
| 7 | | 4" " " | 23 | | 1.75 |
| 1 | | 2 1/2" " " | | | 2.00 |
| 1 | | Beass Blow Torch | | | 3.50 |
| 1 | | Surface Plate 24x36 | | | 5.00 |
| 2 | | Clue Pots | | | 86 |
| 1 | | Block Plane | | | |
| 1 | | Wood Jack Plane 24" W | | | |
| 1 | | 24x9 #4 Smooth Plan | | | |

| | | | |
|---|---|--|-------|
| 1 | Ratchet-Crane | | 1.60* |
| 1 | Pipe Cutter | | |
| 1 | Back Saw | | |
| 2 | Drawing Stamps | | 1.20 |
| 1 | Try Square 12" | | 35 |
| 1 | 4 Oil Stamps | | 2.00 |
| 1 | Spoke Shave | | 30 |
| 1 | 1 st Riveting Hammer | | |
| 2 | Ladles | | 50 |
| 5 | 6" Band Saw Files | | 35 |
| 1 | 100 ft Tape Line | | 65¢ |
| 2 | 5 Gal Gasoline Cans with Funnels 20 | | 1.20 |
| 1 | Nail Puller | | 1.25 |
| 1 | Pr Blacksmith Tongs | | 75 |
| 2 | Hand Saws | | 2.00¢ |
| 2 | Pr 9" Tin Shears | | 3.00 |
| 2 | 10" Monkey Wrenches | | 70¢ |
| 1 | 10" Joint Pipe Wrench | | 90¢ |
| 1 | 14" " " " | | 1.20¢ |
| 6 | Biycal Wrenches | | 90 |
| 2 | Marlet End Cutters #7 | | 37.6* |
| 1 | Stack Saw Frame | | 50¢ |
| 2 | Breast Drills | | 3.50 |
| 1 | Set Taps Dies 1/4-5/16-3/8-7/16-1/2-5/8-3/4 | | 1.00 |
| 1 | 1/8" Pipe Die | | 40 |
| 1 | 3/8" " Tapp | | 40 |
| 1 | 1/4" " " | | 40 |
| 2 | 5/16 Taps | | |
| 2 | 3/8 " " | | |
| 1 | 3/8 - 24 Taper Tap | | |
| 1 | 1/4 - 24 " " | | |
| 1 | 18 mm Tap | | |
| 1 | 1/2" - 20 Tap R | | |
| 1 | 1/2 - 20 " L | | |
| 1 | 5/8" Die Holder | | |
| 1 | 1 1/2 Auger Bit | | |
| 2 | 6" Pliers | | 1.00 |
| 1 | 9" Comb Pipe Pliers | | 75 |
| 1 | 10" Buller Pliers | | 75 |
| 1 | 7" Round Nose Pliers | | 80 |
| 1 | Set 3/16" Stamping Figures | | |
| 1 | 3/4" Pipe Tap | | |
| 1 | 4" Try Square | | |
| 4 | Com Oil Cans | | 1.50 |
| 5 | Gal Engine Oil | | |

| | | |
|---|---------------------------------------|-------|
| 1 | Starrett Drill Gauge | 150 |
| 2 | - 1" Drills | |
| 1 | - 1/8 " | |
| 1 | - 5/16 " | |
| 2 | - 7/8 " | |
| 1 | - 3/16 " | |
| 1 | - 1/16 " | |
| 1 | - 13/16 " | |
| 2 | - 17/32 " | |
| 1 | - 19/32 " | |
| 2 | - 5/8 " | |
| 1 | - 3/4 " | |
| 1 | - 2 1/32 " | |
| 1 | - 23/64 " | |
| 1 | Japan Drill Sleeve | |
| 2 | Speed Gauges | |
| 1 | - 3" Lathe Dog | |
| 1 | - 4 " " | |
| 1 | - 5 " " | |
| 1 | - 8 " " | |
| 2 | Knight-Monkey Wrenches | |
| 1 | - End Mill Cutter 1 5/16 | 210 |
| 1 | - 1 1/4 - 20 Japan Tap | 100 |
| 1 | - Gear Cutter #8 - 12 Pitch | |
| 1 | Champion Tool Holder | 285 |
| 1 | 1 lb Muscle Wire | |
| 1 | - 1 1/2 Mandrel | 147.5 |
| 1 | - 1 1/2 Reamer | |
| 1 | Set Gas & Gasoline Pump Tools | |
| 1 | Set Lathe Raising Blocks | |
| 1 | V Block | |
| 4 | Shaper Tools Forged | |
| 1 | Shaper Tool Holder | |
| 1 | Key Slot Tool | |
| 1 | Special Cylinder Chuck | |
| 1 | Custom Chuck | |
| 1 | Special Crank Steady Rest | |
| 1 | - 6" Universal Chuck 3 jaw | } 55 |
| 2 | - 9" 4 Jaw Independent Chucks, fitted | |
| 3 | Drill Chucks | |
| 2 | Extra Lathe Centers | |
| 1 | Still Boring Tool (2 Bars) | |
| 1 | Special Heavy Boring Bar | |
| 1 | Grinding Outfit & Pulley Shaper | |
| 1 | & Emery Wheel | 500 |
| 1 | Lathe Tool Holder as above | |
| 2 | Lathe Nuts | |

| | | | |
|--------------|-------------------------------|--------|------|
| 1 | Babbitt Bar | | |
| 2 | Angle Plate | | |
| 1 | Emery Dresser | | |
| 2 | Apple Dynamometer | | |
| 1 | Hatchet | | |
| 1 | Ax | | |
| 1 | Special Angle Drill | | |
| 1 | Cylinder Body Boring Tool | | |
| 1 | Ball Punch | | |
| 1 | Hatchet | | |
| 1 | Brazing Compound | | |
| 5 | Solder | | |
| 5 | Speller | | |
| 24 | 1/2" x 1" Knipps Steel | 16 | 392x |
| 61 | " - 1 1/8" " | 14 1/2 | 885x |
| 24 | " - 3/4" " | 17 | 408x |
| 7 1/2 | " - 1/2" " | 21 | 158 |
| 30 | Starting Truck Iron Casting | | |
| 25 | lbs Bessemer Rod | 5 | 125 |
| 15 | lbs Tool Steel | 15 | 295 |
| 100 | 3/8 x 1 1/2 Hex Hd Cap Screws | 124 | 124 |
| 1 | Drill 3/16 | | |
| 2 | " 15/32 | | |
| 3 | " 7/16 | | |
| 2 | " 13/32 | | |
| 3 | " 3/8 | | |
| 2 | " 1/2 | | |
| 2 | " 5/16 | | |
| 3 | " 9/32 | | |
| 10 | " 1/4 | | |
| 4 | " #1 | | |
| 7 | " #2 | | |
| 3 | " #8 | | |
| 4 | " #10 | | |
| 2 | " #11 | | |
| 7 | " #12 | | |
| 5 | " 13 | | |
| 1 | " 14 | | |
| 2 | " 19 | | |
| 1 | " 20 | | |
| 1 | " 21 | | |
| 2 | " 22 | | |
| 6 | " 26 | | |
| 3 | " 28 | | |
| 4 | " 29 | | |
| 9 | " 30 | | |
| 2 | " 31 | | |
| 1 | " 33 | | |

| | | | |
|----|----------------------------------|------|------|
| 80 | Strap Iron | | 240x |
| 8 | 3/8 x 15 Ga Steel Strap (manila) | 8 | 64 |
| 4 | Wood Clamps | | |
| | + 100 ft Tarp | dup | |
| 2 | Re Tubing 1 1/2 - 29' 0" | 2042 | |
| 39 | ft 1 1/2 x 2 1/2 20 Ga Tubing | 58 | 2028 |
| 69 | " 3/4 22 Ga " | 38 | 2622 |
| 27 | 3' of 5/8 - #22 + 21 Ga " | 38 | 1035 |
| 6 | 10" 1 1/4 #16 " | 60 | 410 |
| 9 | 6" 1 1/2 #20 " | 43 | 408 |
| 9 | 0" 1 1/2 #20 " | 38 | 342 |
| 29 | 3" 1/2 20 " | 31 | 907 |
| 13 | 2" 1" #16 " | 40 | 527 |
| 22 | 6" 3/8 #22 r# " | 28 | 630 |

Less 80% 6910/1789

- 3 1/2 lbs Stubb Steel
- 1 1/2 lbs Tool Steel
- 8 1/2" Key Steel
- 2 Yds 48" Tinner
- 4 Hess Bright Bearings 30872
- 3 Axles & Cones for Starting Truck
- 5 3/8 Oil Tubes
- 5 Extra Magneto Connections
- 1 Starting Pulley Wheel Grooved
- 1 Casting for Flating Fan
- Bench in front West Room Uptown

- + Gas Motor
- X 1 Case Pigeon Holes " " " "
- X 1 Hand Bell
- + 2 Electric Bells Buttons
- X 1 Remington Smith Premier Typewriter #1
- X 1 Smith Premier Visible Write
- X 1 Gardenia Stand
- X 1 Typewriter Desk
- X 1 Roll Top Desk
- X 2 File Cases with 1 Top Drawer
- X 1 Case 3 Drawers + 1 Top
- X 1 Cupboard Uptown Office
- 1 Shelv Iron Box for Water Cup
- 1 Gas Engine (Old Upright)
- + 1 Case Shelv Box West Room
- X 1 Revolver Office Chair
- X 2 Rocking Chairs
- X 3 Chairs
- X 6 File Cases
- 1 Sewing Machine Table

~~1 Hand Tanned~~

~~1 Cement Heater~~

X 1 Safe

1 Oak Display Case Sold

1 Bench Rear Room (back shop)

1 Set Shelves " " " "

~~1 Horizontal Engine~~

1 Lot Lecter Filler

~~2 Air Pumps~~

1 qt. Crystal Finish ✓ 50

1/2 Pint Bry Liquid ✓ 25

1/4 lb. Aluminum Bronze ✓ 25

1 Varnish Brush

X 1 Lot Matting (Office)

X 1 Case for Bicycle Repair

2 Pr. Screws

repair
all a?

~~1 Pr. Nuts~~

X 2 Window Curtains

X 1 Set Drawing Instruments

X 1 Card Index Case Cards

X 1 Postal Sealer

7 ft. 1" Hose

1/2" Tow

1 Treadle with Roller

~~1 Brad Awl~~

~~1 1/2" Chisel~~

~~1 1/2" Gouge~~

1 Can Mark Ink & Brush 10 60

1 Saw Set

4 Emery Wheels

1 Felt Wheel

1 Chrome Wash Pan

{ 5 lbs Aluminum Castings partly machined
for steering device (used)

Apr 21

4 - 4 1/2 Pistons - complete with Rings & misc. pins

20 - Bicycle clamp Bolts for Hangers

2 Gasoline Tanks

2 Sets parts for 4's motors partly
assembled above

5 Complete Sets wood & metal

Appendix C

"Report on the Lathe and Drill Press in the Wright Brothers' Workshop from 1897-1902," by William R. Robertson. Written under contract for this historic furnishings report.

**REPORT ON THE LATHE AND DRILL PRESS IN THE WRIGHT BROTHERS WORKSHOP
FROM 1897-1902
BY WM. R. ROBERTSON**

The 1897 photograph

It is impossible, based on the research available, to determine the make of the lathe with certainty. However, it is not the Putnam lathe bought in 1901. Facts that can be determined from the photograph are the elimination of dozens of lathe makers and that the lathe dates from 1880 - 1890. In the photograph only part of the lathe is visible, some of the details are in shadow or not clear and the written document #1623, 209-0-3, box 6: scrapbooks, provides contradictory evidence. Are we to believe the man (Taylor) who used the lathe or the man (Wright) who owned and paid for the lathe? Below evidence is presented for three options. They are listed in order of preference, which may be biased toward the first two based on personal experience and use of similar machines.

Prentice Brothers of Worcester, Ma.

- A. "Taylor 5/18/37- Thinks old lathe of 90 ties was a "Prentiss"
- B. The gears have round holes cast into them instead of spokes and position of lead screw as both shown in 1880 Prentice Bros. ad.
- C. The leg, head and tail stock castings are similar.
- D. The extra space shown between the drive pulley and the back of head stock could be Prentice double back gear feature, see 1891 ad.

F. E. Reed of Worcester, Ma.

To add to the confusion F. E. Reed bought out A. F. Prentice in 1877 and Prentice Bros. in 1912. These two Prentices are related. All of these machines were very popular in the early 20th century and were commonly known as Reed-Prentice so Taylor could have easily mistook a Prentice for a Reed.

- A. The similar casting
- B. By 1890 most lathes had a threaded lead screw and a separate drive rod usually mounted below it. The photo is not clear whether the lathe shown has a threaded screw or rod. If it is a rod, the screw has been removed and it could be a Reed because all Reeds seem to have both screw and rod.

John Steptoe & Co. of Cincinnati, Oh.

- A. Based on Mr. Wright's statement "...he thinks this old lathe was made in Cincinnati."
- B. The Similar castings.

The drill press appears to be hand made by the Wrights.

- A. The drill press in the photo does not match or is even close to any illustration of a commercially produced drill press.
- B. "...a drill press, which, it is believed they built themselves,..." H. R. DuFour, Charles E. Taylor The Wright Brothers Mechanician, pg.25.

The correct machines for the Wright Bros. workshop in 1902

14" Putnam Tool Co., Fitchburg, Ma. lathe with 6' bed and factory installed taper attachment. This lathe also has a set of 4 riser blocks with it however it is not known if they came from Putnam or were made up by a shop in Dayton. The original lathe purchased 7/22/01, s/n # 1588 is at Greenfield Village. Catalog listing is 1899 Thos. Carey & Bros. Co. Baltimore, Md.

20" Barnes drill press with square base, combined lever, worm and self feed with automatic stop. The original drill press purchased possibly in Sept. 1901 and is at Greenfield Village. Catalog pages from #43 March 1 1896 W. F. & John Barnes Co. Rockford, Il.

The recommended machines to be used at Carillon Historical Park

The reconstruction of the 1127 W. Third Street. workshop will be interpreting 1902 time period. These machines should be replaced as the correct examples are acquired.

H. L. Shepard & Co. lathe currently in shop. This lathe is smaller than the Putnam and it has a distinctive gap bed feature making it not a ideal substitute. If the carriage is moved to the left and the mannequin of Mr. Wright is placed in the same position as shown in the 1897 photo this will hide the gap bed and look more authentic. The head and tail stock should also be painted black to match the rest of the machine and the motor removed.

Of the three drill presses owned by the park the one at the warehouse Howard DuFour took us to see most closely resembles a 20" Barnes. This machine should be lightly cleaned and painted black. The back gear and bevel gear guards should be removed for a more period appearance.

Machinery at Wright Cycle, before July 1901

(From Archives #1623, 209-0-3 Box 6: Scrapbooks)

Handwritten--

"Taylor 5/18/37 - Thinks old lathe of 90ties was a "Prentiss"

Drill Press - 21" Barnes Drill Press

Band Saw - Thinks Orville has in present laboratory

Vise - Thinks O.W. still has in laboratory

Emery grinder - nothing but a head --

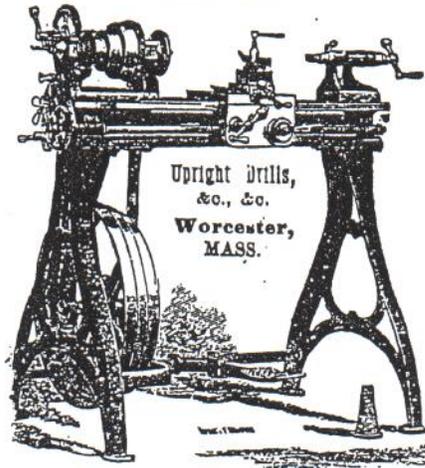
Wood Bench made out of some plank at one end of the room."

Typed--

"The spars for the first plane were cut by a neighbor who had a small planing mill. Mr. Wright states that back in the 90's, before they had the Putnam lathe, they had a very poor old lathe which they bought second hand but which they used very little. He thinks this old lathe was made in Cincinnati."

S. Bushouse
E.I. 5-17-84

PRENTICE BROTHERS,
Manufacturers of
Machinists' Tools, Engine Lathes,



1880

Improved "Prentice" Lathe.

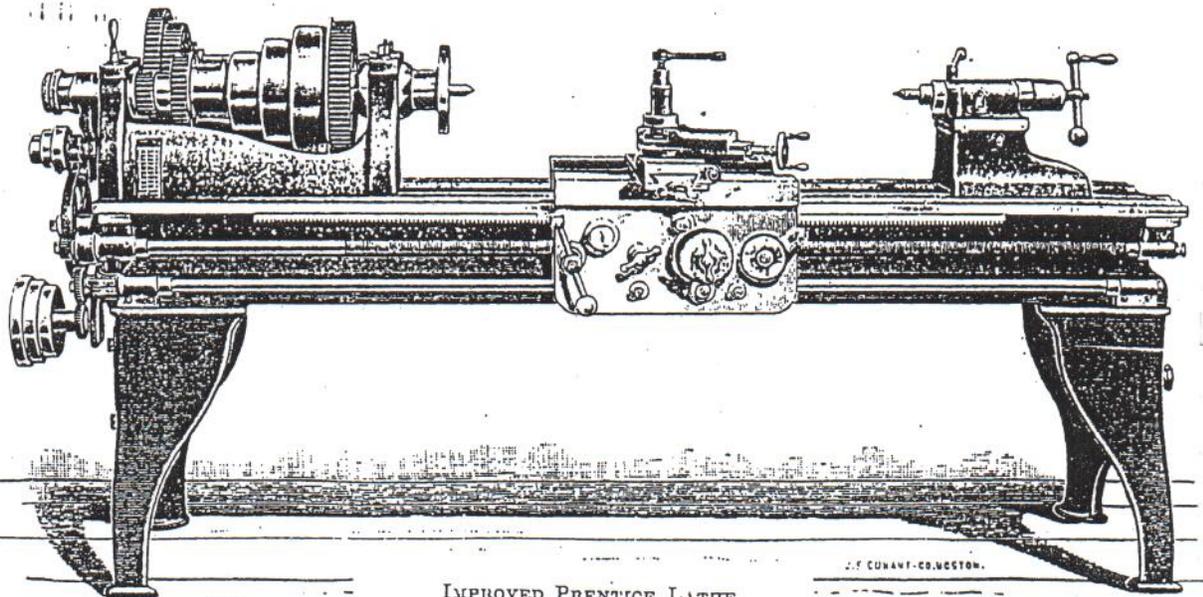
With this we give an illustration of a lathe which has recently been brought out by Prentice Brothers, of Worcester, Mass.

The chief departure from the usual practice in lathes of this class is in the use of double back gears by the employment of which the lathe is given not only a wider range of speeds than is usual, but there is less variation between successive steps of the cone pulley, so that a speed more nearly approaching the exact correct one for any given job can be secured.

The spindle is of steel, running in hard bronze boxes, and the end thrust is taken by a device which is attached directly to the head and not to the rear spindle box. The lower feed cone runs on a stud which is placed in a swinging arm held by a clamp bolt to the feed-rod box, while gears, which can be changed, give any desired rate of feed. This also serves to keep the feed belt at the proper tension, without the necessity for re-lacing it.

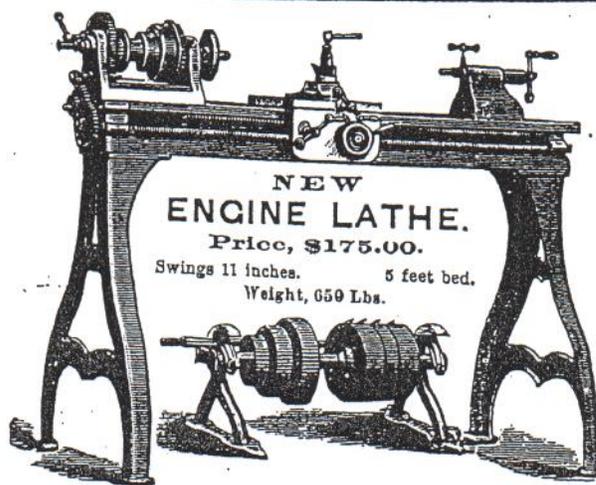
The apron contains an open and shut nut, used in screw cutting; friction connections for lateral and cross-feed; and a sliding pinion for the lateral feed. The sliding pinion is to throw the feed connections out of gear, when cutting screws, and there is no annoyance from revolving handles. A receptacle is provided in each leg, where change gears, tools and wrenches can be kept, free from dirt and oil. Counter-weights have improved hub friction wheels and noiseless clutch.

The lathes are built to swing 14", 16" 18", 21" and 24", with plain gibbed rest, raise and fall rest, or compound rest, also with taper attachment, and with any length



IMPROVED PRENTICE LATHE.

1891



A. F. Prentice & Co.
Manufacturers of
Light Machinists' Tools.

Improved Upright Drills, with
Lever Feed and Wheel Feed
with Quick Return Motion.

Hand and Foot Power Lathes.

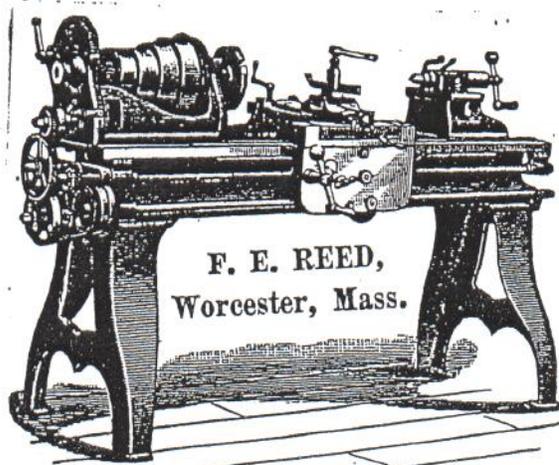
SLIDE RESTS.

Special Machinery and Ma-
chine Jobbing.

**FOOT POWER LATHES
A SPECIALTY.**

**54 Hermon Street
WORCESTER, MASS.**

1890

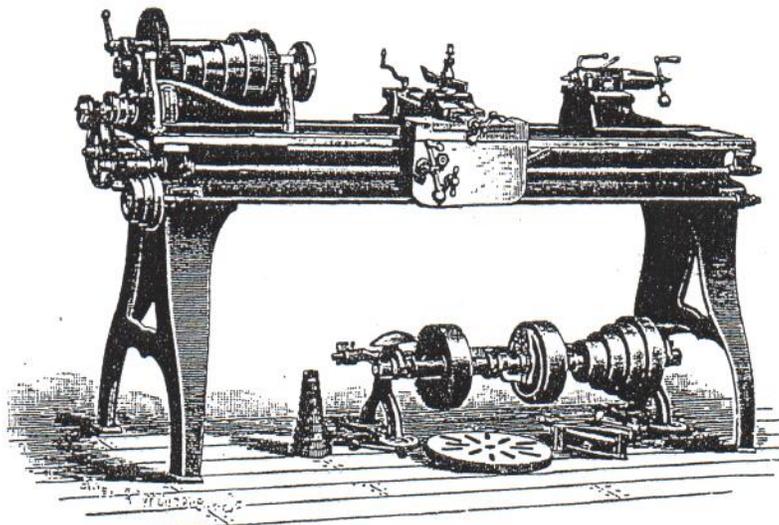


ENGINE Lathes, Hand Lathes, Foot Lathes, Upright Drills, and Milling Machines. Agents, MANNING, MAXWELL & MOORE, 111 LIBERTY STREET, NEW YORK.

1886

The engraving on this page represents a new engine lathe of fourteen inches swing, one of the standard line of lathes made by F. E. Reed, of Worcester, Mass.

The aim has been to construct a lathe that should possess the qualifications adapting it to light and fine work, in which case, ease and rapidity of manipulation are important features. At the same time it must possess the necessary strength for as large work as can be done on a lathe of this size. To attain these ends no reasonable pains or material seem to have been spared in this instance. The bed is deep, wide, and of extra strength, insuring a firm and solid support for all the working parts. The head has a cone pulley large in diameter, with four changes for a belt two inches wide. It is strongly geared. The spindle is hollow, and has a front bearing $1\frac{1}{2}$ inches in diameter and $3\frac{1}{2}$ inches long, with a back bearing correspondingly large and long. The tail stock is fitted with a spindle large in diameter, and is clamped to the bed with two bolts through a shoe on the underside of the bed. It has long bearing surfaces on the ways, is strongly and substantially made, and neat in appearance. The rest is



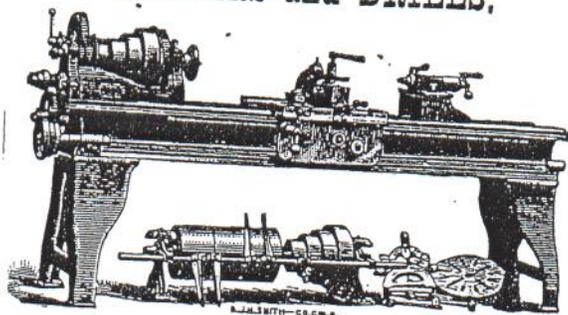
NEW FOURTEEN INCH LATHE.

1883

particularly strong in all its parts. It is provided with long bearings upon the bed, and all the sliding parts are scraped to as nearly perfect contact as possible. It is held to the bed by gibs on front and back side. The apron is strongly geared, and the feed is by a rod connected to a worm and worm-gear having an improved friction, simple in construction, and of proved strength and durability. The connection with the leading screw is by an open and shut nut, and the lathe is made to cut right or left hand threads, or feed right or left, by moving the small lever shown on end of head-stock.

A patent friction countershaft is furnished with these lathes, the construction of which is such that compensation for the wear can be evenly and readily adjusted by one screw, and all its working parts are exposed to view.

ENGINE LATHES, IRON PLANERS,
SHAPERS and DRILLS.



John Steptoe & Co.,
CINCINNATI, OHIO.

In Stock at our Agents':
FRASER & ARCHER, 121 Chambers St., N. Y. 1880

Putnam Engine Lathes.

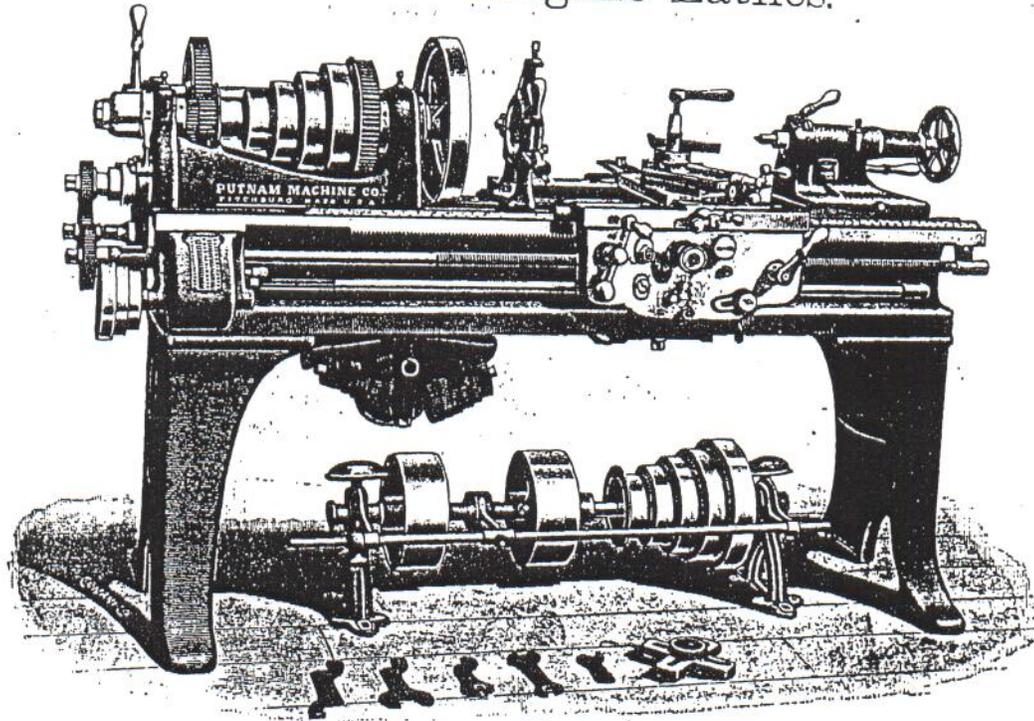


Fig. 65.

14-INCH SWING.

NEW PATTERN, PUTNAM ENGINE LATHES.

Hollow Spindle, Screw Cutting, Compound Gb Rest, and Power Cross Feed.

| Length of Bed. | Distance Between Centers. | Weight, Pounds. | Length of Bed. | Distance Between Centers. | Weight, Pounds. |
|----------------|---------------------------|-----------------|----------------|---------------------------|-----------------|
| 5 ft. | 2 ft. 3 in. | 1,356 | 8 ft. | 5 ft. 3 in. | 1,656 |
| 6 " | 3 " 3 " | 1,456 | 9 " | 6 " 3 " | 1,756 |
| 7 " | 4 " 3 " | 1,556 | 10 " | 7 " 3 " | 1,856 |

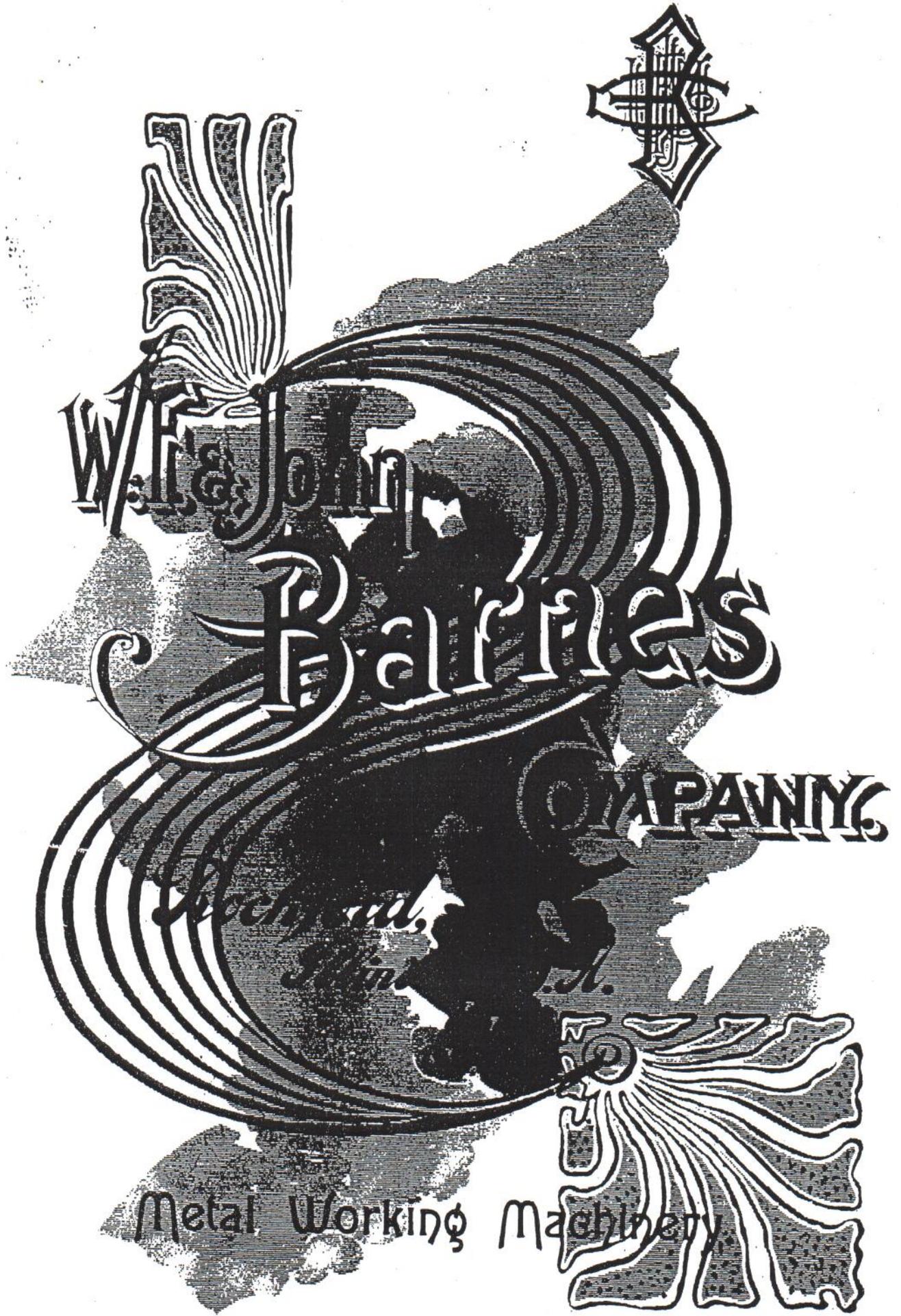
Description of 14-inch swing, same as 12-inch swing, with these exceptions: Swing diametrical over elevating rest, $6\frac{1}{4}$ inches; Compound rest, $8\frac{1}{4}$ inches; Taper rest, $7\frac{1}{4}$ inches; Countershaft-friction pulleys, 95 revolutions per minute, reversing speed, 105 revolutions per minute.

12-INCH SWING.

| Length of Bed. | Distance Between Centers. | Weight, Pounds. | Length of Bed. | Distance Between Centers. | Weight, Pounds. |
|----------------|---------------------------|-----------------|----------------|---------------------------|-----------------|
| 4 ft. | 1 ft. 3 in. | 1,200 | 8 ft. | 5 ft. 3 in. | 1,600 |
| 5 " | 2 " 3 " | 1,300 | 9 " | 6 " 3 " | 1,700 |
| 6 " | 3 " 3 " | 1,400 | 10 " | 7 " 3 " | 1,800 |
| 7 " | 4 " 3 " | 1,500 | | | |

Screw cutting, with one set of change gears, index to cut from 4 to 36 threads to the inch, including pipe thread. Swing diametrical over elevating rest, $5\frac{1}{4}$ inches; compound rest, $7\frac{1}{4}$ inches; taper rest, $6\frac{1}{4}$ inches. Important to state the kind of tool rest wanted. Compound rest, raise and full rest (code Elevating), plain rest. Taper attachment, Universal, only when ordered, additional weight, 100 pounds. Price, \$.... Countershaft—Friction pulleys, 8 inches diameter, $3\frac{1}{4}$ -inch face, 100 revolutions per minute; reversing speed, 110 revolutions per minute. Chuck of any make, as ordered, furnished and fitted to lathe at reasonable price. See Chucks. Turning tools, $\frac{1}{4}$ inch \times $\frac{1}{4}$ inch stock, in sets. Price, \$.... Hollow Spindle inch hole. Back rest, open three-jawed. Price, \$.... Follower rest, price, \$.... Stop motion, price, \$....

1899



W. L. & J. M.

Barnes

COMPANY

*Locust St.
St. Louis, Mo.*

Metal Working Machinery

Barnes' Drill,

No. 1. 20-Inch Swing.

This Drill has several desirable improvements on this class of machines, one of which is the very convenient and effective manner of adjusting the platen to any desired height on the column.

This is effected by a screw that is placed parallel with the column, the handle of which is within easy reach of the operator.

With this arrangement, the operator, standing upright and with but little effort, can raise or lower the platen with one hand—a feature that will be fully appreciated by all who are acquainted with this class of machines.

The spindle is made of the best steel, is fitted with the No. 2 Morse taper, and is counterbalanced by a weight in the hollow of the column.

The drill spindle has a long lever for feeding down the drill, and a short, or quick return lever for raising the spindle.

The rack and pinion for feeding the spindle are cut from solid Norway iron.

The bevel gearing is also cut from solid iron, and is as nearly noiseless as is possible for metal gearing to be made.

The bearings are long and well-fitted, thus insuring long wear.

The platen turns in the arm that supports it, and by swinging the arm on the column it can be thrown out from under the drill spindle.

Both the platen and its supporting arm can be clamped firmly in place by clamping screws that have levers attached, thus avoiding the use of wrenches or any detached tools to adjust the machine, for taking the various kinds of work that can be done on it.

The shipper is very conveniently located where the operator can start or stop the machine instantly with his foot, thus allowing free use of his hands for other purposes.

We can furnish this drill with self-feed and automatic stop as shown on following page.

Height of Drill is 67 inches.

Diameter of column $5\frac{1}{4}$ inches.

Diameter of spindle $1\frac{3}{8}$ inches.

Vertical travel of spindle $9\frac{3}{4}$ inches.

Diameter of large pulley on cone 8 inches.

Diameter of small pulley on cone $3\frac{3}{4}$ inches.

Diameter of fast and loose pulley 8 inches.

Diameter of bevel wheel 5 inches.

Diameter of bevel pinion 3 inches.

Distance from spindle to floor (Round Base Drill), 43 inches.

Distance from spindle to floor (Square Base Drill), 41 inches.

The cones carry 2-inch belt and have four speeds.

The tight and loose pulleys on countershaft should be speeded 200.

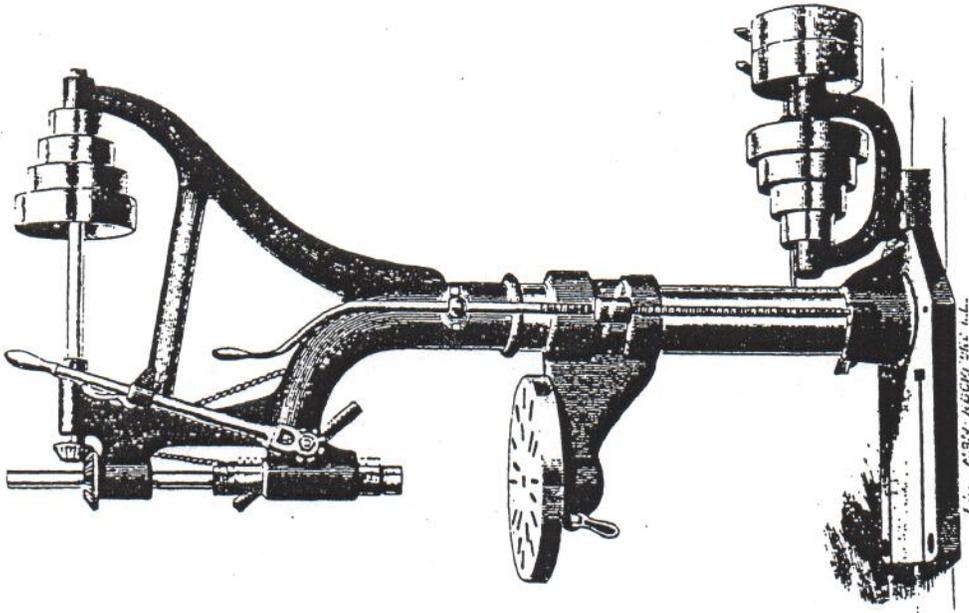
The machine will drill to the center of a 20-inch circle.

It is thoroughly and accurately constructed, and the best material for the purpose used in every part.

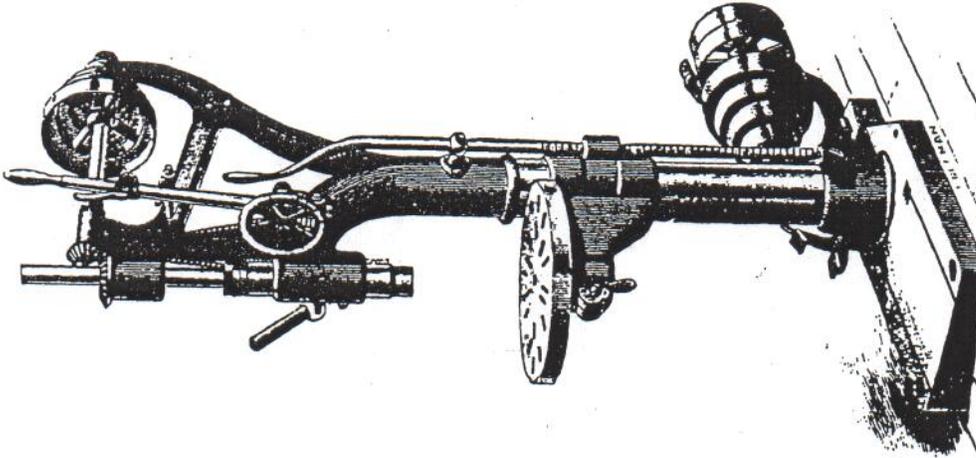
Weight, 500 pounds.

Prices quoted on application.

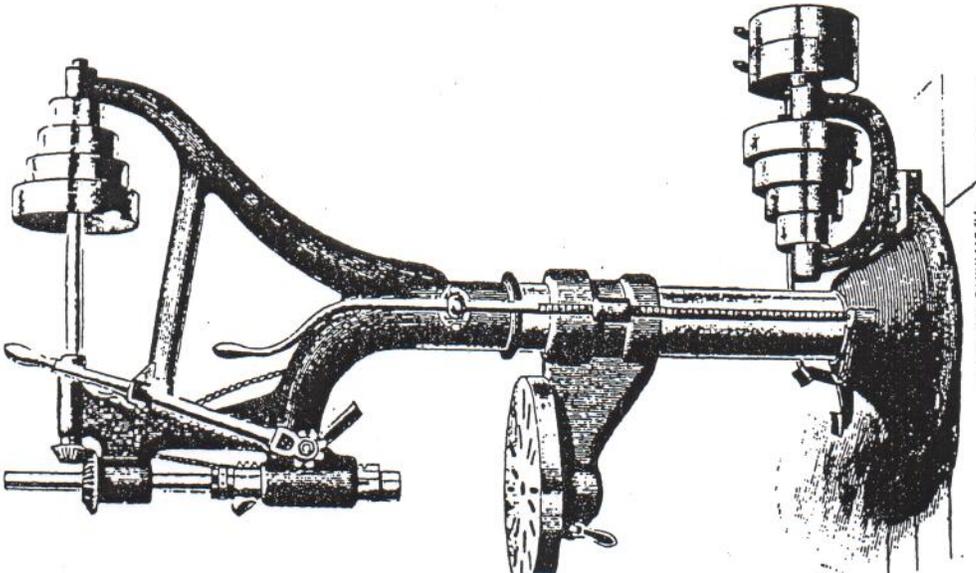
SQUARE BASE, No. 1,
20-Inch Swing.



BARNES' UPRIGHT DRILL,
No. 1, 20-Inch Swing.

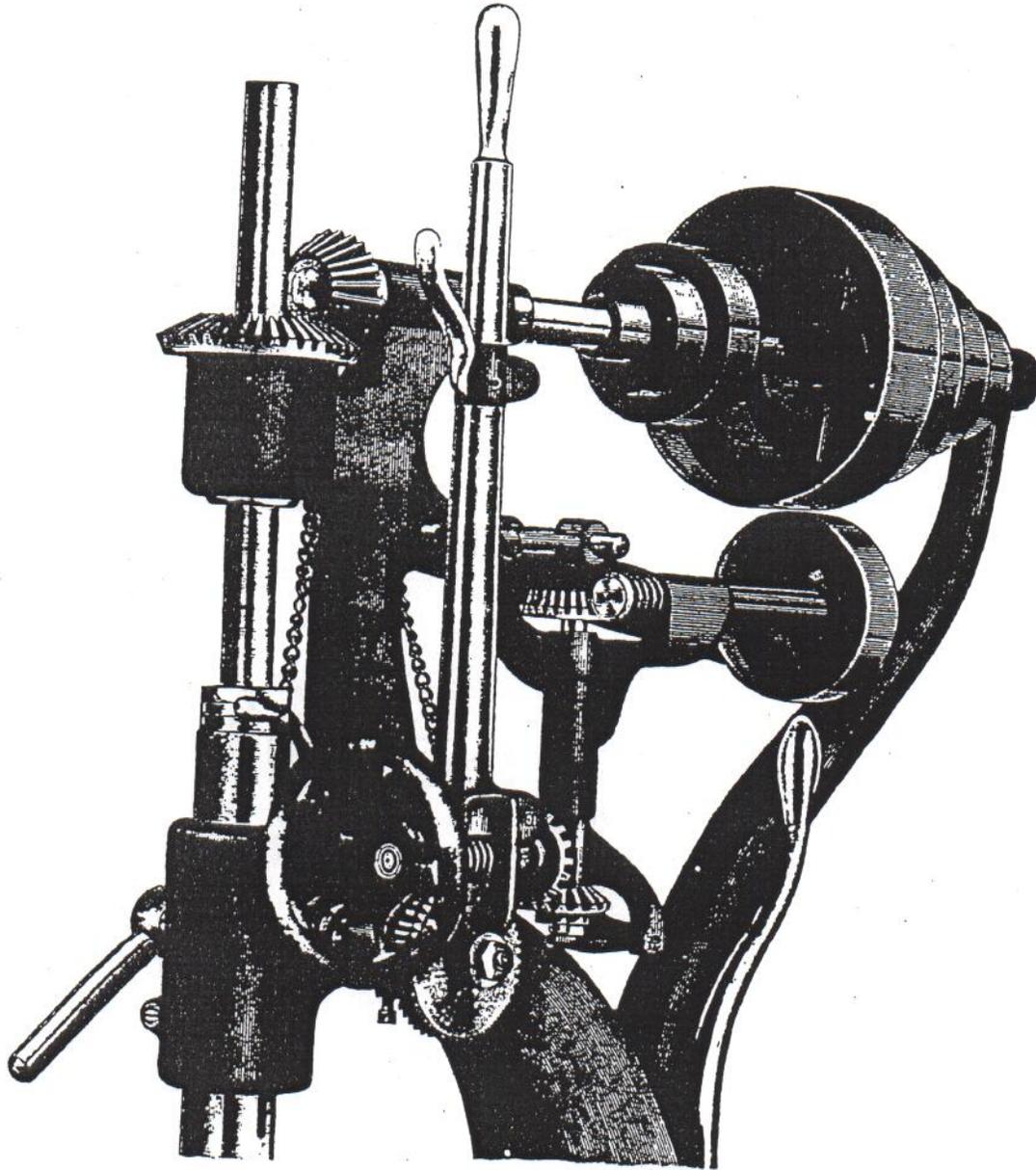


ROUND BASE, No. 1,
20-Inch Swing.



Showing the application of the Combined Lever and Worm Feed.

Barnes' 20-Inch Drill with Self Feed and Automatic Stop.



This cut shows the application of self feed and automatic stop to our 20-inch Drill, and we confidently claim that we are offering in this Drill the best tool of its size ever placed on the market.

The arrangement of the parts as shown by the cut gives the following feeds: Lever Feed; Hand Worm Feed; Power Self Feed; Automatic Stop; Quick Return.

The combination of parts by which these are effected allows each feed to be used independently of the others and without requiring any extra motion on the part of the operator.



H. L. SHEPARD & CO.

—MANUFACTURERS OF—

SHEPARD'S

Foot & Power Lathes

DRILL PRESSES,

Scroll Saws, Circular Saws, Etc.,

Nos. 341, 343 & 345 WEST FRONT STREET,

CINCINNATI,

OHIO.



SHEPARD'S BACK-GEARED SCREW CUTTING FOOT LATHE.

Price, \$165.00, with Cap 20x14.

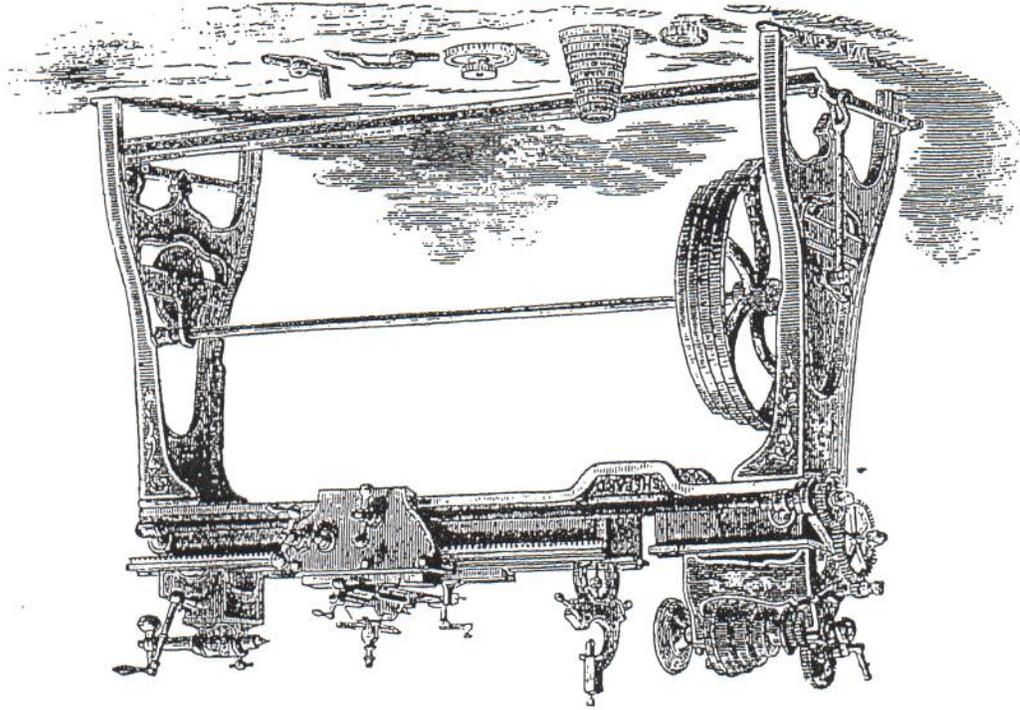
Swings 14 Inches over Bed, 40 Inches between Centers. Weight 600 Lbs.

This Lathe we have taken particular pains to make symmetrical; to put the iron in the right place. We may be pardoned in saying that it has proved itself far ahead of those sold at twice the money.

The particular feature of our Lathes we wish to call your attention to. A foot lathe takes hard work to run it. Now our Lathes run as easy as a sewing machine. They have large crank power with small foot motion. Where a lathe has large foot motion and small crank power, the muscles of the legs soon get tired, and it is hard work, and most lathes have been so constructed. Before you buy a foot lathe, inquire around to see just how they are built, and if you are a mechanic, you will at once see the immense advantage we have over any lathe now built. This feature of ours is patentable, and is secured to us, and none others will be allowed to use it.

The foot motion of this Lathe is made wholly of wrought iron. The bar on which the foot rests is angle iron, being at once light and stiff. The pitmans slip through a hole in the connecting strip, so that if your foot gets under the treadle the bar slips up on the pitmans, thus not injuring the foot and not unhooking. The tops of the pitmans are gun-metal. The crank shaft is of wrought iron, and is turned and polished, as well as the cranks. The fly wheel weighs ninety pounds, and is also turned and polished. The crank shaft runs on large seven-inch friction rollers, let through a core in the legs, and has a bearing on each side. This makes the easiest, lightest, and stiffest foot motion known. The thrust of crank is on the leg, and is not felt on the body of the Lathe—a great improvement. The length of stroke is also adjustable.

The lathe bed is five feet long, and will turn fourteen inches over shears, and takes in lengths of forty between centers. Then there is the gap right down from the face plate, which will swing twenty inches in diameter, and four inches in space. This gap is a great feature. We have had great experience in tools, and we never found any thing so handy. How often you want to turn a pattern or crank, or bore a wheel over 14 inches in diameter. Then you have to go to work and raise the head, lengthen the belt, throw the whole feed rigging out of joint, as well as the screw cutting gear.



SHEPARD'S BACK-GEARED SCREW CUTTING FOOT LATHE.

PRICE, \$165.00, WITH CAP 20x14.

Swings 14 Inches over Bed, 40 Inches between Centers. Weight 600 Lbs.

We often thought of this, and resolved in our minds to attempt to build a lathe that would swing the largest wheel in a sewing machine; one that would be light, just as strong as any lathe, and not need any pieces bolted in to cause loss of time and annoyance. The construction of this grip is in this way: It is a box core across the lathe, and is carried way beyond the weak point; and we will guarantee it as stiff here as at any point of the lathe. The bed is braced every eleven inches, has four V's, and is planed up and polished. The rack is of wrought-iron, and is cut out of the solid. The head stock is of beautiful design. The ends are planed up. The back gear is thrown in and out by cam motion. The stud, for screw-cutting or self-feed, has two bearings, making it at once stiff and light running. The reverse gear in head stock is thrown either for right or left-hand screw-cutting or self-feed, by handle coming through side of head-stock, or thrown entirely out of gear. This is a very simple as well as nice arrangement.

The spindle is made out of 1 1/2 inch solid piece of steel, and all wear is taken up by a set-screw and jam-nut at the end of lathe, which can be adjusted very nicely. The spindle has 5/8 inch hole clean through, so that run-rods, as well as other light rods, can be turned or a thread cut on them. The tapered hole for the center is bored out after the lathe is finished, while the spindle is in its place, thus insuring a true hole. The center will run true if put in "hap-hazzard"—a blessing, to be sure. The tail stock sets over for tapers, and is fastened by a cam coming through the side; no wrenches to hurt up, no stooping to get under your lathe. Tail spindle is of steel. The slide rest has raising screw at back, and is said to be the most complete rest ever put on a lathe. This raising screw can be tightened by screwing up the screws a little tighter should it be too loose. The slide rest is gibbed down both front and back by our new improved spring gib, that will hold the rest steady, no matter how much worn, and can be tightened as it wears. The top part of the rest can be turned to any angle, so as to bore or turn any angle of the circle, a trick that will be appreciated. The rest is moved along by geared down handle, for power and ease of movement. The nut for screw is in two halves, which is open and very durable. The screw is made of steel, has five threads to the inch, thus making the most accurate screw, as well as the most durable. Five threads to the inch make the easiest figured table for gears, and a glance at the table will insure no mistakes; it tells no lies. All the gears are turned and cut out of the solid, for cast gears are not accurate. The yoke at end of lathe for adjusting of gears will be found the most com-

plete ever put on a lathe, and we do not see how it can be improved. All screws are of steel, with square thread, and the nuts are gun-metal, for steel and gun-metal prove the best to run together.

We have made some changes, which we find to be great improvements. The \$165.00 Lathes, and all of that class, have our new reverse movement, which will catch any thread you may be chasing, without running the Lathe backward. This movement is accomplished by Spur Gearing, thus doing away with Bevel Gearing. Said to be the simplest, most ingenious reverse movement ever put on any Lathe, and well worth \$25.00, but at present we give this on our large Lathe at no advanced cost. We have adopted five threads to the inch for our index, and our screws are all made to that pitch.

We will furnish a counter shaft for power, instead of the foot motion, at the same price, or where both are wanted, for \$12.00 extra. In ordering, be sure to say whether you want the Lathe with foot motion or with counter shaft.

A steady rest, as in cut, as well as a 6-inch face-plate, two pointed centers, and the necessary wrenches go with Lathe at no further cost.

INDEX TO SHEPARD'S \$165.00 SCREW-CUTTING LATHE.

Screw is Five (5) Threads to the Inch.

Reverse No. 20 Gear, and use 2 to 1 Gear on Independent Stud.

| No. Threads | Stud. | Screw. | No. Threads | Stud. | Screw. | No. Threads | Stud. | Screw. | No. Threads | Stud. | Screw. | No. Threads | Stud. | Screw. |
|-------------|-------|--------|-------------|-------|--------|-------------|--------|--------|-------------|-------|--------|-------------|--------|--------|
| 5 1/2 | 40 | 40 | 11 | 20 | 44 | 22 | 2 to 1 | 20 | 44 | 20 | 44 | 44 | 4 to 1 | 44 |
| 6 1/4 | 40 | 44 | 12 | 20 | 48 | 24 | 2 to 1 | 20 | 48 | 20 | 48 | 48 | 4 to 1 | 48 |
| 6 | 40 | 48 | 13 | 20 | 52 | 26 | 2 to 1 | 20 | 52 | 20 | 52 | 52 | 4 to 1 | 52 |
| 6 3/4 | 40 | 52 | 14 | 20 | 56 | 28 | 2 to 1 | 20 | 56 | 20 | 56 | 56 | 4 to 1 | 56 |
| 7 | 40 | 56 | 15 | 20 | 60 | 30 | 2 to 1 | 20 | 60 | 20 | 60 | 60 | 4 to 1 | 60 |
| 7 1/2 | 40 | 60 | 16 | 20 | 64 | 32 | 2 to 1 | 20 | 64 | 20 | 64 | 64 | 4 to 1 | 64 |
| 8 | 40 | 64 | 17 | 20 | 68 | 34 | 2 to 1 | 20 | 68 | 20 | 68 | 68 | 4 to 1 | 68 |
| 8 1/2 | 40 | 68 | 18 | 20 | 72 | 36 | 2 to 1 | 20 | 72 | 20 | 72 | 72 | 4 to 1 | 72 |
| 9 | 40 | 72 | 19 | 20 | 76 | 38 | 2 to 1 | 20 | 76 | 20 | 76 | 76 | 4 to 1 | 76 |
| 9 1/2 | 40 | 76 | 20 | 20 | 80 | 40 | 2 to 1 | 20 | 80 | 20 | 80 | 80 | 4 to 1 | 80 |
| 10 | 40 | 80 | | | | | | | | | | | | |

Extra Gears, each \$1.00.

We also make this Lathe in four sizes, as follows:

| | | |
|---------------------------------|-------|----------|
| 14 x 40 inches between Centres. | Price | \$165.00 |
| 14 x 52 " | " | 185.00 |
| 14 x 64 " | " | 210.00 |
| 14 x 76 " | " | 235.00 |

These Lathes are produced with steady Rest, and all gears to cut from 5 to 80 threads, and are made with or without the gap, as may be desired.

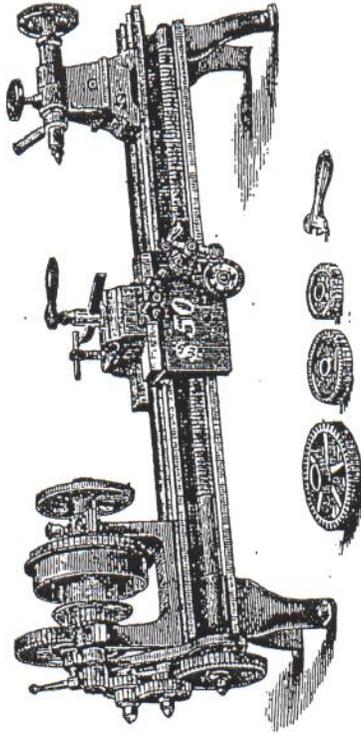
SELF-CROSS FEED LATHE.

We make the above Lathe with self-cross feed, but with plain rest. No raising rest or swivel rest. This makes the stiffest rest known, and will do hard work.

The cross-feed is so arranged that it will cut scrolls same number to inch as screws to inch; or, in other words, the same index will answer for either scroll or screw.

Swings over carriage 10 1/2 inches.

| | | |
|---------------------------------|-------|----------|
| 14 x 40 inches between Centres. | Price | \$200.00 |
| 14 x 52 " | " | 220.00 |
| 14 x 64 " | " | 240.00 |
| 14 x 76 " | " | 260.00 |



SHEPARD'S \$60 BENCH ENGINE LATHE.

WEIGHT 75 POUNDS.

So many wish our (\$60.00) Lathe for a Power Lathe, or a Bench Lathe, that we have put it on short legs, as per cut, with counter-shaft. The price is \$60.00. The Lathe just as it stands, no counter-shaft, is \$55.00. Boxing and Drayage, \$1.00.

We make a Compound Rest that will go on any of our small Lathes. It can be raised or lowered or swiveled to any angle. Price, with 3 tools, \$7.50.

Small tools for Rest per dozen, \$1.50.

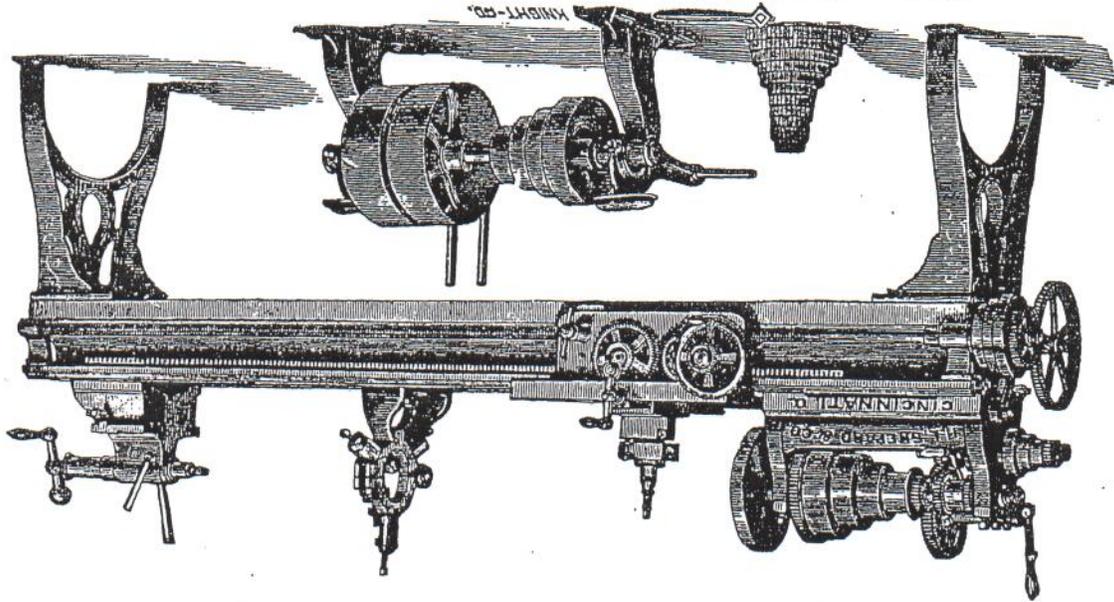
Hand Rest for wood turning, for \$30.00, \$60.00 or \$80.00 Lathe, \$1.50.

Hand Rest for \$165.00 Lathes and that class, \$3.00.

Steady Rest for small Lathes, \$1.50.

Steady Rest for large Lathes, \$3.00.

Follower Rest for any large Lathe, \$1.50.



20 inch swing over Bed, 14 inch over Rest, and 8 feet between Centres.

SREW-CUTTING ENGINE LATHE

The opposite cut represents our new 20 inch Back geared Screw-cutting Engine Lathe.

In consequence of having met with such marked success in the manufacture of small Lathes, by placing a tool superior to any in the market at a much less price, as our customers are willing to certify, we feel sure that when the above Lathe is brought before the mechanics who are in want of a Lathe possessing qualities that cannot be surpassed for design, quality and workmanship, that make it excelsior to any other manufactured, they will favor us with their order.

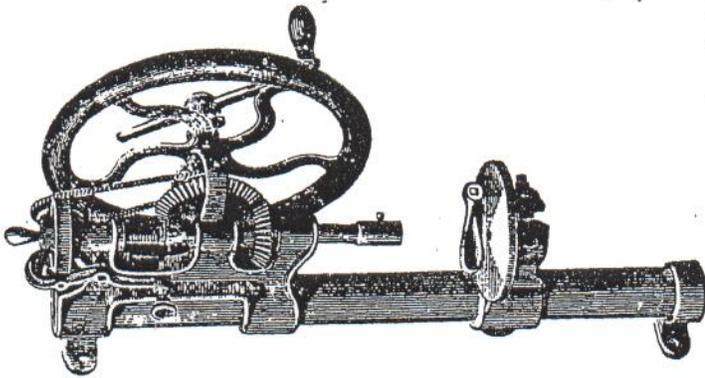
We are willing to do with this Lathe as with all others we manufacture—guarantee it to be as represented.

This is a new Lathe with all the latest improvements; has new reverse motion in head-stock, self-cross feed, incline raising rest for chasing or milling work. It is thoroughly braced, cuts all the standard threads from 1 to 20, and all standard pipe threads. The spindle is made of $2\frac{1}{4}$ steel; the front bearing is 2 3-16; length of spindle, 25 inches. This is much longer than is usually put on Lathes of this size, and adds greatly to steadiness of work. Means are provided for taking up lost motion and wear. Length of head-stock, 22 inches. Cone is made for 4 speeds, and takes $2\frac{1}{2}$ inch belt. Cone, largest speed, 14 inches, gearing, 14 inches. Back-gear is thrown in and out by usual eccentric. The boxes are of best gun-metal instead of cast-iron, as is usually used by other makers. Our experience is that cast-iron boxes will cut on heavy work, hence we substitute the most expensive box for the cheapest.

The reverse motion in head-stock will catch any thread while chasing, and prevents all mistakes while cutting screws. We believe this to be the only perfect reverse motion for the purpose intended. Will chase either right or left by pulling handle in head-stock to correspond. It is not necessary to use cross belt for chasing; but we furnish three pulleys for counter-shaft, so as to run Lathe backwards for milling or chasing if so preferred. Two speeds of cone for change of feed. The feed screw is $1\frac{1}{2}$ inch diameter, 5 threads to the inch, has slot through it and acts as a feed rod. The apron has two worms, one for cross and one for regular feed. Whole nut is used for chasing, and is closed by cam in

UPRIGHT SELF-FEEDING DRILLING MACHINE.

Drills From 1-8 to 3-4 Inch Hole.



This machine has several improvements which deserve notice. The feed, which is an important feature in this class of drills, is continuous, and avoids the jerk motion common to all self-feeding hand-drilling machines heretofore made. It is obvious that this is the true way, and that the saving in drills would, in time, amount to the price of the machine. The main standard is iron; the table is clamped to it in any position or height required, and therefore it is held firmly in place. The whole machine is thoroughly made, and nothing has been neglected which would add to its durability or usefulness.

Weight about 110 pounds.

Price \$30.00. Arranged for power, \$8.00 extra.

apron, thus all adjustments are in front, and all the necessity for reaching over or going behind the Lathe is obviated. The gearing is outside of apron and makes a much stiffer and more durable mode of the inner working of the apron. It has wrought-iron rack. The rest is gibbed down front and back, and has means of adjustment by simply tightening screws, a mode that we believe is only used by us; it is rigid at all times. The adjustment of other Lathes is by refitting. The rest is raised by an inclined wedge.

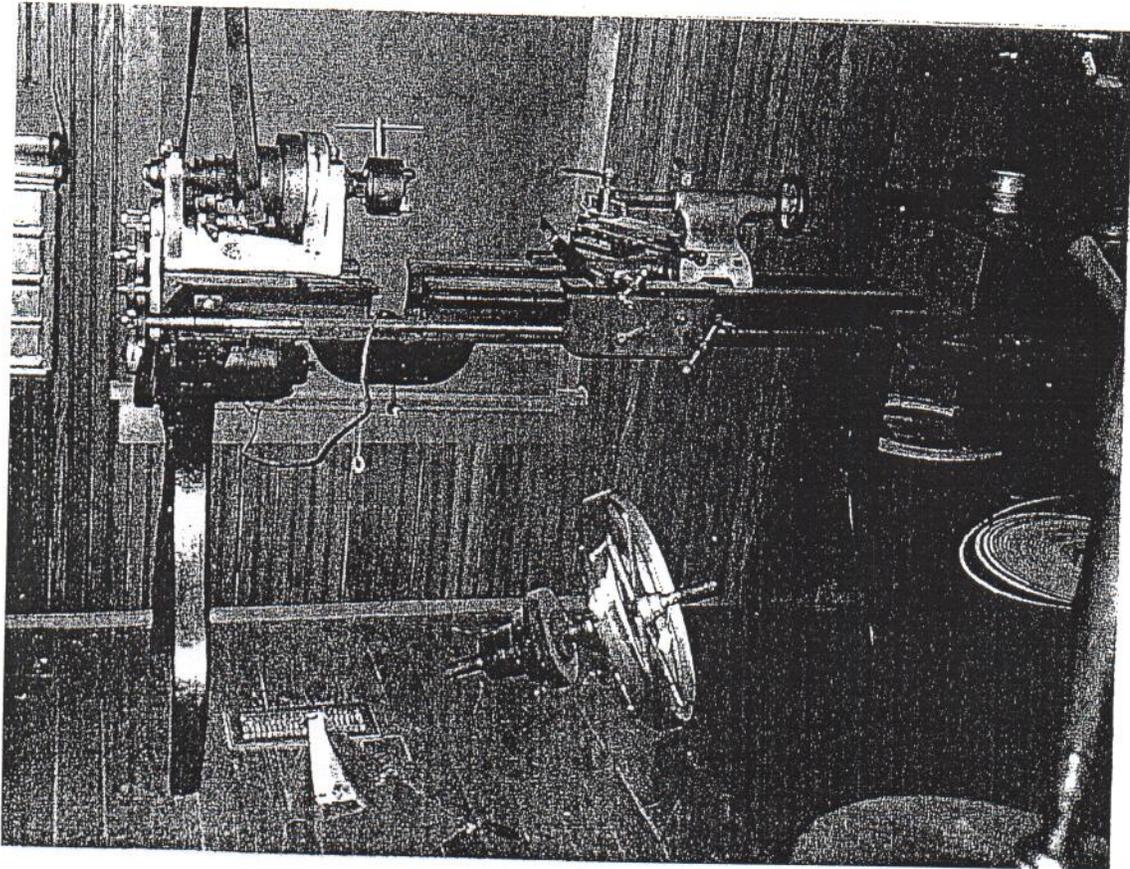
The tail stock sets over for taper work and is bound down by a cam, the handle of which is out of the way and always ready for use. The steady rest is included in price, and the cut is a truthful guide to what you get with the Lathe.

We have added to this Lathe an automatic stop that will chase a screw or turn up to wherever stop may be set.

Price \$500.00

Boxing and Shipping 5.00

Weight of Lathe, 2,500 Pounds.



Appendix D

“Tools to be Replaced for C E Taylor,” September 1940, in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.

Req. WC Shop B.F
9/40

TOOLS TO BE REPLACED FOR C E TAYLOR

- 1 Gerster Tool Chest #.052
- 1 pr Outside Calipers, Starrett #36, 12"
- 1 pr Calipers, B&S #801, 6"
- 1 pr Dividers, B&S #800, 6"
- 1 pr Thread Calipers, Starrett #76, 4"
- 1 pr Dividers, B&S #800, 4"
- 1 pr Dividers, B&S #800, 3"
- 1 pr Lock Joint Outside Calipers, Starrett #38, 4"
- 1 pr Lock Joint Inside Calipers, Starrett #39, 4"
- 1 2" Micrometers, B&S #48RS (in case)
- 1 1" Micrometers, B&S #12B (in case)
- 1 Surface Guage, Starrett #257A
- 1 Combination Square, Bevel Protractor and Center Guage, 12",
B&S #438, #4 graduate
- 1 Double Steel Square, complete, Starrett #14
- 1 Machinists' square, 6" blade, B&S #544
- 1 Scale, B&S #300, 12"
- 1 Scale, B&S #300, 4"
- 1 Steel Tape, Lufkin #143, 3'
- 1 Drill Guage, 1-60 drill, Starrett #185
- 1 pr Vee Blocks, B&S #750A
- 1 parallel clamp, B&S #754E, 4"
- 1 Williams Tool Holder #1-3, for 5/16 tool bit

- 1 Spacing Center Punch, Starrett #118
- 1 Norton Crystolon Oilstone, #MJB24
- 1 Metal Punch, Hyro #0X
- 1 pr Kraeuter #2601 Side cutters, 5½"
- 1 pr Kraeuter #1671 Taper nose pliers, 6"
- 1 pr Kraeuter #1831 flat nose pliers, 5"
- 1 pr Kraeuter #1721 Taper nose pliers, 6"
- 1 pr Kraeuter #1593 Flat nose pliers,
- 1 pr Kraeuter #1611 Round nose pliers, 6"
- 1 pr Kraeuter #1850 End cutters, 8"
- 1 pr Kraeuter #102 Pliers with side cutters, 5½"
- 1 Music wire cutter, Starrett Type "B", 5½"
- 1 pr Snips, Bluebird #212, 12", 3" cut
- 1 Hammer, Maydole #78
- 1 Hammer, Maydole #267
- 1 Hammer, Maydole #42½

RC suggests that letter to Mr Henry Ford

To Mr Frank Campsall Dept. Dearborn Date September 27, 1940

Mr Ford stopped at the Wright Shop some time ago to talk to Mr Taylor. In the course of the conversation, Mr Ford suggested to Mr Taylor that he leave his tools in the reconstructed shop in the Village and that he go up and see someone in the Engineering Laboratory about buying new ones in exchange for them. Attached is a list of the tools, including chest, which are necessary to replace those which Mr Taylor used during the time he worked for Wilbur and Orville Wright and which he now uses in the shop in the Village. Mr Taylor assisted in making up the list.

Mr Taylor has three other chests in the shop containing miscellaneous tools which he bought at different times after leaving the Wright Company. Does Mr Ford want these tools and chests also left in the Wright Shop and replaced by new ones or is he interested in having only those which Mr Taylor used when he worked in the Wright Cycle Company shop and built the engine which powered the first successful flight?

Signed EWR *E W Reimer*
Dept. _____

Appendix E

Excerpt from "Machinists' Tools and Tool Chests," by Duncan Hay, in Andre Millard, Duncan Hay and Mary Grassick, *Historic Furnishings Report: Edison Laboratory, Edison National Historic Site, West Orange, New Jersey*, volume 2 (Harpers Ferry, WV: Division of Historic Furnishings, Harpers Ferry Center, National Park Service, 1995), pp. 757-61.

Excerpt from “Machinists’ Tools and Tool Chests”

Every machinist owned his own measuring and layout devices, along with a complement of hand tools [and his tool chest]. Machinists’ chests feature several shallow drawers that protect and provide ready access to delicate instruments. A single removable panel usually covers the bank of drawers and can be locked to secure their contents. Most machinists’ chests have a top till with a hinged lid for large tools. The inside of the lid is often fitted with a small mirror, not for vanity’s sake, but to help the owner locate and remove metal chips from his eyes. The remaining surfaces inside the lid may, or may not, be covered with pin-ups.

Nineteenth-century machinists’ chests appear broad and squat, compared to their 20th-century counterparts.¹ Early examples that survive in museum collections have single drawers under deep tills fitted with lift-out trays. Tool chests manufactured by H. Gerstner & Sons, Union Tool Chest company, and others, beginning in the early years of the 20th century, were taller and shallower front-to-back, presumably to conserve bench space. Their fronts were divided by a larger number of smaller drawers.²

The contents of a machinists’ tool chest varied enormously from one owner to another. Machinists completed apprenticeship with a basic set of tools, then added to that kit throughout the course of their careers, picking up specialized devices for a particular job and getting better versions of instruments they already owned (but almost never getting rid of the old ones). Any machinist would have several sizes of inside and outside calipers, both spring joint and firm joint, some dividers, a selection of steel rules and straight edges, machinist’s squares, a combination square with centering and protractor heads, files, scrapers, a hacksaw frame, an assortment of wrenches, some screw drivers, a tap wrench or two, prick punches, cold chisels, and a few ball-peen hammers.

[By the early 20th century] many machinists probably owned micrometers, but these tools were still comparatively new and had not yet come into universal use. The forerunner of the portable micrometer caliper was first patented in France by Jean Laurent Palmer, in 1848. Joseph R. Brown and Lucian Sharpe brought the first Palmer micrometer to this country in 1867 and produced an adaptation the following year for use as a sheet metal gauge. Brown & Sharpe introduced their first production model of the one-inch standard micrometer to the American market in 1877. An improved model, which had the features and looked very much like modern instruments, came out in 1885.³

The Danow tool chest [in the collections of the Smithsonian Institution’s National Museum of American History] serves as a reminder that tools are routinely handed down and that there has always been a lively market for good second-hand equipment. [Danow

¹ See catalog illustrations for “Acme” tools chests and “Jewelers’ or Machinists’ Chests” in Montgomery & Co., *Illustrated Catalog and Price List of Supplies, Tools, Machinery...* (New York: n.d. [c. 1889]), p. 626; Frasse & Company, *Fine Tools, Machinery, and Supplies* (New York: 1889), p. 484. Both catalogs can be found in the Edison National Historic Site collection.

² H. Gerstner & Sons, Inc., P.O. Box 517, 20 Cincinnati Street, Dayton, Ohio, has been in business since 1906 and continues to manufacture the archetypal machinist’s tool box.

³ Joseph Wickham Roe, *English and American Tool Builders: The Men Who Created Machine Tools* (New Haven: Yale University Press, 1916), pp. 212-13.

worked for R. Hoe and Company, a New York manufacturer of printing presses and other machinery, from 1904 until he left the trade during a protracted strike in the 1920s. His tool chest, made by Union Tool (cat. 84.0625), contained 128 tools when it came to the National Museum of American History.]

Danow (Danowski before Ellis Island) emigrated from Berlin, Germany, in 1895. He began his apprenticeship in 1903, yet his three-drawer mahogany tool chest has a much earlier form and is strikingly similar to tool chests featured in catalogs of the late 1880s. Its handles have the date 1871 in their castings. It is not known whether this was his father's tool chest or a used one that he purchased during or after his apprenticeship.

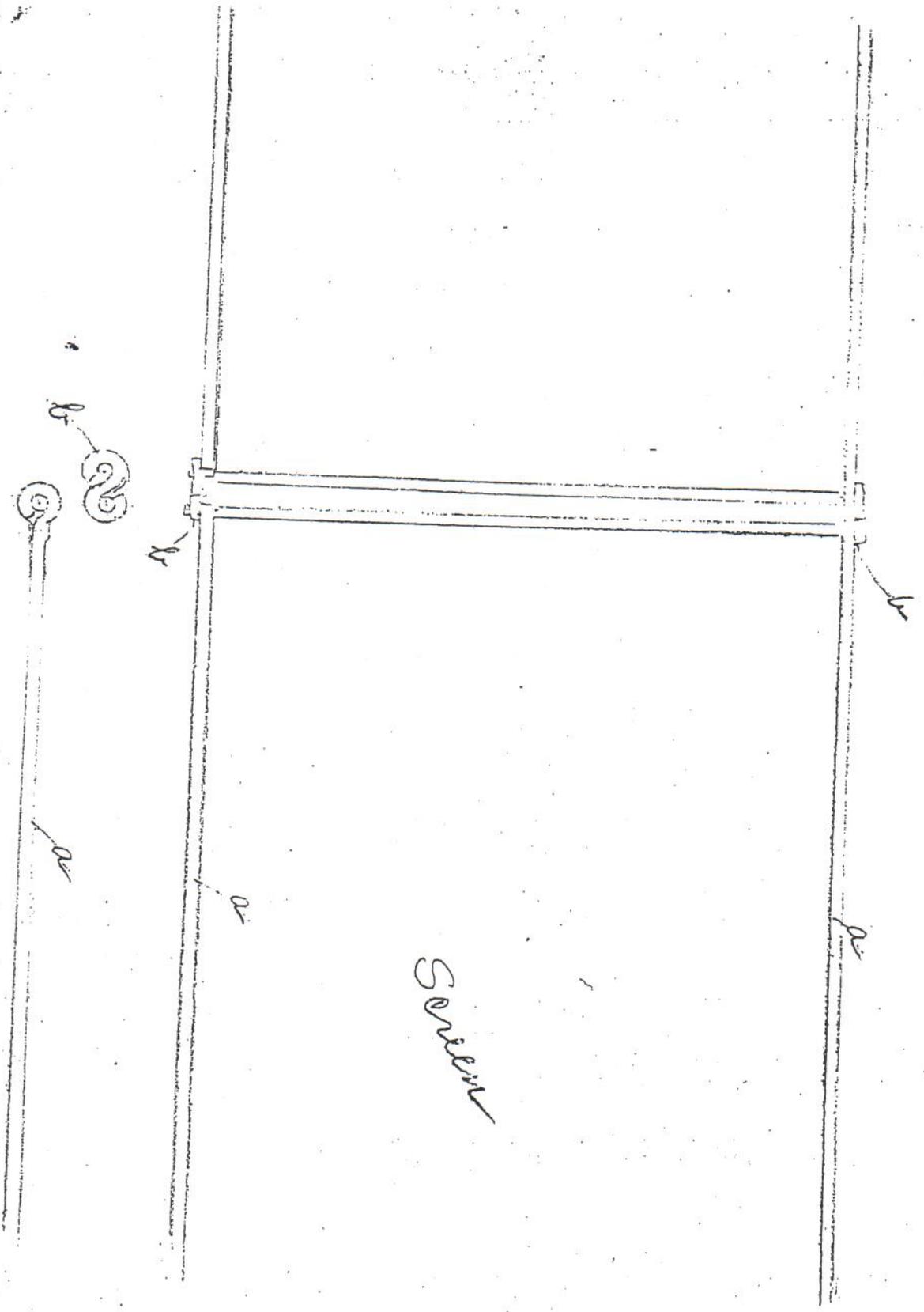
Datable collections of a single machinist's tools are rare. Either they are added to throughout the individual's career and those of his successors or, in the words of the National Museum of American History's David Shayt, "they are handed from machinist-father to non-machinist son and end up disemboweled, their contents scattered through several home workshops."⁴

— Excerpt from "Machinists' Tools and Tool Chests," by Duncan Hay, in Andre Millard, Duncan Hay and Mary Grassick, *Historic Furnishings Report: Edison Laboratory, Edison National Historic Site, West Orange, New Jersey*, volume 2 (Harpers Ferry, WV: Division of Historic Furnishings, Harpers Ferry Center, National Park Service, 1995), pp. 757-61.

⁴ David Shayt to Collections Committee, July 20, 1984, accession file 1984.0025, National Museum of American History. This sentiment was reinforced in conversations with John Bowditch, Curator of Machinery, Henry Ford Museum; Rob Howard, Curator, Hagley Museum; Peter Liebhold, Division of Engineering and Industry, NMAH [National Museum of American History]; Matt Roth, Curator, The Peterson Museum, and Robert Vogel, retired Curator of Civil and Mechanical Engineering (now Division of Engineering and Industry), NMAH.

Appendix F

“Show window screen sketch, Nov. 4, 1937,” attached to Orville Wright to Fred Black, November 4, 1937 in Henry Ford Museum and Greenfield Village Research Center, EI 186, Wright Cycle Shop file.



Screen

Fig

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