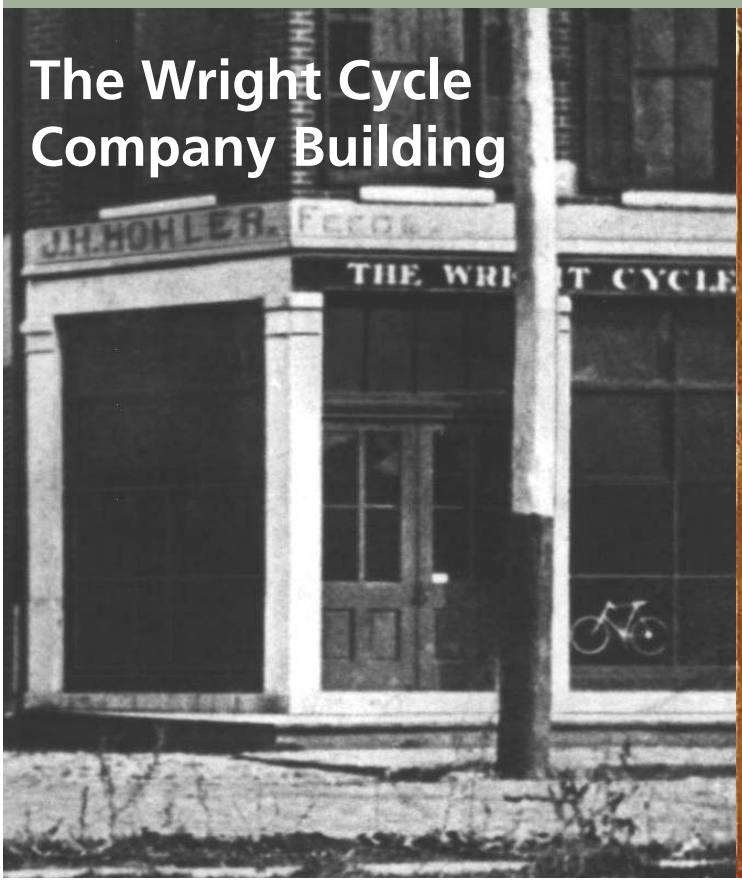
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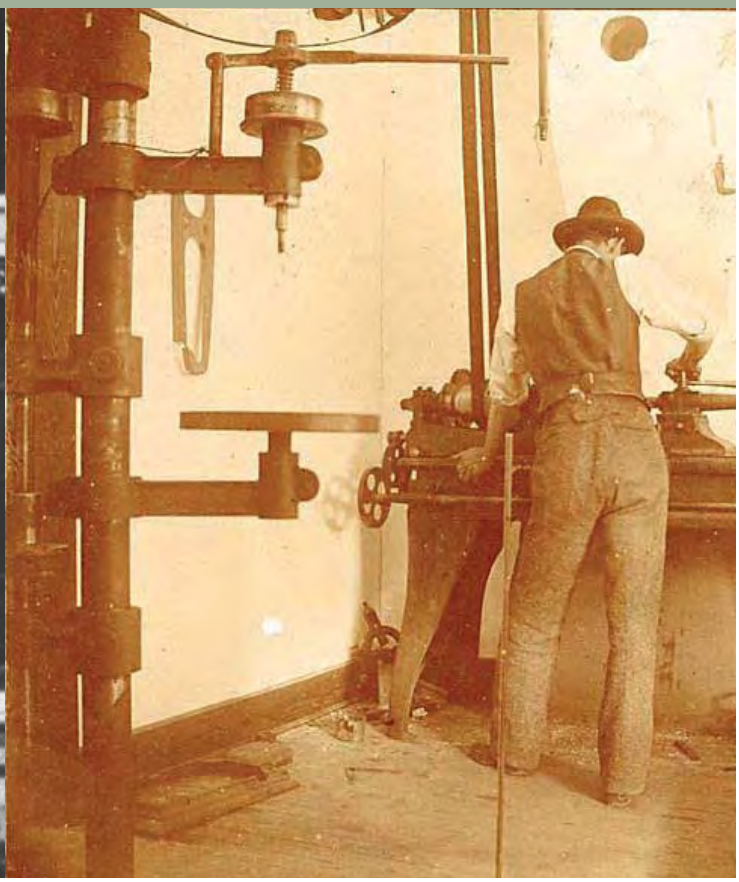
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Historic Furnishings Report

Dayton Aviation Heritage National Historical Park
Dayton, Ohio

The Wright Cycle Company Building





APPROVED:
Lawrence Blake
Superintendent, Dayton Aviation Heritage National Historical Park
February 18, 2006

Historic Furnishings Report

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Historical Park
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by Mary Grassick
Staff Curator

Media Services
Harpers Ferry Center
National Park Service, 2007

Cover: *Exterior of 22 South Williams Street, c. 1895, Wright State University, and Orville Wright at lathe, probably 22 South Williams Street, 1895–1897, Library of Congress.*

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Administrative Information

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Administrative Information

Management Background

Wilbur and Orville Wright opened their bicycle shop at 22 South Williams Street in Dayton, Ohio, in the spring of 1895. The building, down the street from their home at 7 Hawthorne Street, housed the brothers' bicycle sales and repair business as well as a limited printing operation until late spring of 1897. It was in this location that they began manufacturing their own brands of bicycles, the Van Cleve, the St. Clair, and the Wright Special.

The two-story brick building at 22 South Williams Street was constructed in 1886 and was used commercially before it was leased to the Wright brothers for their bicycle business in 1895. After the Wrights moved on to their final cycle shop location at 1127 West Third Street in 1897, the building continued to be rented by small businesses until it was converted into a two-family residence around 1911.[1] After many years of residential use the building fell into disrepair and was scheduled for demolition by the city of Dayton.

In 1980 Fred Fisk and Marlin Todd published a journal article on the Wright brothers' bicycle business, noting the location of the 22 South Williams Street building and including a previously unknown historic photograph of the site.[2] Around the same time, Mary Ann Johnson, co-founder of the non-profit Aviation Trail, Inc., identified the structure as a former Wright bicycle shop. The building was acquired on behalf of Aviation Trail in 1980, and sold to Aviation Trail in 1982. In 1985 Aviation Trail began restoration of the building to its 1895 appearance, and in June 1988 the restored building was opened to the public.

The Wright Cycle Company building at 22 South Williams Street was designated a National Historic Landmark in 1990. The building is a contributing structure to the West Third Street Historic District, which was listed in the National Register of Historic Places in 1989. The 2003 Committee, a group of Dayton community leaders and activists spearheading the city's celebration of the centennial of flight and instrumental in creating Dayton Aviation Heritage National Historical Park (NHP), purchased the building at 22 South Williams Street and donated it to the National Park Service in November 1995.[3]

Dayton Aviation Heritage National Historic Park was established by PL 102-419 as

1 "The Wright Brothers at 22 South Williams Street, 1895–1897: A Report to the Aviation Trail," Margaret (Lanny) Weaver, September 1983, Henry Ford Museum and The Henry Ford Research Center, EI 186, Wright Cycle Shop file.

2 Fred C. Fisk and Marlin Todd, "The Wright Brothers' Bicycles," in *The Wheelmen*, November 1980, cited in *Historic Structure Report: The Wright Cycle Company Building (HS-01), Dayton Aviation Heritage National Historical Park, Dayton, Ohio* (United States Department of the Interior, National Park Service, May 1999) (hereafter "HSR"), 9.

3 The 2003 Committee later changed its name to Inventing Flight.

amended in 1992. The park is comprised of four noncontiguous sites: The Wright Cycle Company complex; Huffman Prairie Flying Field on Wright-Patterson Air Force Base; Wright Brothers Aviation Center at Carillon Historical Park, and the Paul Laurence Dunbar State Memorial in West Dayton. The National Park Service, Wright-Patterson Air Force Base, Carillon Historical Park, the Ohio Historical Society and Aviation Trail, Inc. are federally mandated partners of Dayton Aviation Heritage NHP.

During the time Aviation Trail, Inc., was steward of the property, the organization installed exhibits and furnished settings on the first floor of the building to interpret the Wright brothers' bicycle sales, repair, and manufacturing activities at 22 South Williams Street. The National Park Service retained those exhibits on loan until 2005 and certain objects remain on loan. This report, in addition to addressing the historic use, occupancy and furnishing of 22 South Williams Street, includes recommendations for historic furnishings in selected sections of the ground floor of the building. Based on these recommendations, historic furnishings were installed in March 2005. Areas not interpreted with furnishings house exhibits designed by Christopher Chadbourne Associates, the firm selected to provide exhibit planning, design and production for Dayton Aviation Heritage NHP as a whole. Other exhibits are located in the nearby Hoover Block which, along with the adjacent building owned by Aviation Trail, Inc., makes up the Wright-Dunbar Interpretive Center for the park. Exhibits are also installed at the Huffman Prairie Flying Field Interpretive Center, located at Wright Brothers Hill at Wright-Patterson Air Force Base, overlooking Huffman Prairie Flying Field.

Documentation of the years the Wright brothers spent working at the 22 South Williams Street bicycle shop is limited; one of the best sources of information is the Library of Congress photograph of Orville Wright working at a lathe. This photograph provides important evidence as to the arrangement and modification of the machinery the brothers used in making and repairing bicycles. A second image of Orville working with friend and employee Ed Sines, probably taken at the 1127 West Third Street shop, contains important visual clues about the Wright brothers' work environment. Both photographs will be used to provide comparative evidence for furnishings recommendations.

The Wright brothers' business ledgers, held at the Library of Congress and available on microfilm through Dayton Aviation Heritage NHP, provide documentation specific to the brothers' activities at 22 South Williams Street. The earliest ledger, which covers the period from November 1890 through May 1898, documents sales by Wright and Wright, Printers. A second ledger begins just before the brothers moved their bicycle operation to 1127 West Third Street and so documents only a few months of sales and repair transactions at 22 South Williams Street.

Manuscripts held at the Library of Congress include Wright family correspondence which refers briefly to the brothers' business and provides some evidence about activities in the building. Period bicycle repair manuals, trade catalogs, and trade periodicals provide comparative evidence for furnishings recommendations.

Along with other media, historic furnishings are used at 22 South Williams Street to interpret the Wright brothers' combined efforts in bicycle making, sales and repair, as well as the continued operation of their printing business. The front window is furnished with bicycle displays in order to pique visitor interest and to accurately represent one type of advertising the Wright brothers would have employed to promote their bicycle busi-

ness. A furnishings vignette in the rear of the building illustrates how Orville and Wilbur Wright set up and used tools in their bicycle manufacture and repair business.

Interpretive Objectives

The 1997 *Interpretive Plan* for Dayton Aviation Heritage NHP identifies three interpretive themes for the site that can be addressed through historic furnishings at the 22 South Williams Street cycle shop building. These themes are:

- [The invention of the airplane] facilitated trade and communication and led to the creation of new industries.
- [The Wright brothers'] mastery of engineering, mechanics, mathematics, and writing qualified them to deal with every facet of aircraft development, design, and construction.
- The brothers' synergy created a whole that was greater than the sum of the parts.

In particular, historic furnishings vignettes in The Wright Cycle Company building illustrate the significance of the bicycle business to the Wright brothers' lives and careers, especially in providing them with both time and money to pursue their interest in aeronautics.

The furnished areas also emphasize the Wrights' method of solving technical problems, and their habit of modifying and adapting common tools to suit their own purposes. The lathe with its homemade attachment for bending tubing illustrates this point especially well, as does the overall emphasis on Orville and Wilbur's design and manufacture of their own brand of bicycle. Furnishing sections of the building in which the brothers combined both their printing and bicycle interests highlights the significance of the brothers' joint business operations, for it was ultimately their ongoing cooperative efforts – the synergy developed in solving technical problems – that "created a whole that was greater than the sum of its parts."[4]

Operating Plan

The park is open from 8:30 a.m. until 5:00 p.m. daily except for Thanksgiving, Christmas and New Year's Day. Visitors to 22 South Williams Street are greeted by a ranger who gives an orientation talk, and are then free to view traditional exhibits and historic furnishings vignettes at their leisure. Additional interpretation is provided by interpretive panels mounted on the barrier surrounding the work benches.

Prior Planning Documents

The following planning documents affect the use and management of 22 South Williams Street, Dayton Aviation Heritage NHS, Dayton, Ohio:

Draft Historic Resource Study, Dayton Aviation Heritage National Historical Park (2001)[5]

Historic Structure Report, The Wright Cycle Company Building (HS-01), Dayton Aviation Heritage National Historical Park, Dayton, Ohio (1999)

General Management Plan/Interpretive Plan, Dayton Aviation Heritage National Historical Park, Ohio (1997)

[4] *General Management Plan/Interpretive Plan, Dayton Aviation Heritage National Historical Park, Ohio*, (United States Department of the Interior, National Park Service, 1997), 53–54 and 63–64.

[5] Note that the draft Historic Resource Study was published as *What Dreams We Have: The Wright Brothers and Their Hometown of Dayton, Ohio* (Fort Washington, Pennsylvania: Eastern National, 2003).

Historical Information

History of the Structure

The Wright Cycle Company building at 22 South Williams Street was constructed in late 1886 or early 1887. The structural history of the building is detailed in Margaret Weaver's 1983 report "The Wright Brothers at 22 South Williams Street, 1895–1897" and in the 1999 *Historic Structure Report: The Wright Cycle Company Building (HS-01), Dayton Aviation Heritage National Historical Park, Dayton, Ohio*. The information in these two sources is summarized here.

The property was originally owned by brothers Abraham and Joseph Nicholas, who built the two-story brick building on the lot and operated a grocery there until they sold it to Joseph H. Hohler in October 1888. Hohler continued in the grocery business until around 1890 when he switched to feed sales, moving his business and residence a year later.

Hohler then rented the property to N. Thomas and Company, which operated a saloon and boarding house in the building. The saloon at 22 South Williams was run by a variety of proprietors who lived in the building with their spouses. The Wright brothers rented the building in the spring of 1895 and moved out in the spring of 1897. After the Wright company moved, the building was used commercially until around 1911, when it was converted to a residence. The Hohler family retained the property until 1947.[6]

The 1897 Sanborn map shows two additions to the rear of the building, as well as a small building labeled "Japanning Rm" at the rear of the lot. A one-story addition is visible in an 1896 photograph of 22 South Williams Street, which is the earliest known image of the building. (See figures 2 and 4.) The Japanning Room could have been constructed by the brothers or under their direction, or may have been an existing building converted to use for "japanning" or enameling bicycles. Enamel is very flammable, and so it was important that the operation be carried out away from the main building, if possible.[7]

According to the 1999 Historic Structures Report, most of the original interior fabric has been "replaced or repaired and refinished."[8] Finishes analysis included in the historic structures report indicates that period wallpaper is an appropriate finish for both the ceiling and the walls.[9] Late in the 2003–2004 renovation of the building, segments of plaster with wallpaper attached were uncovered on a segment of the south wall next to the stairwell. The wallpaper sample uncovered was too small to provide much information, but showed an indistinct white

6 "The Wright Brothers at 22 South Williams Street" (not paginated), and HSR, 59.
7 HSR, 10–12 and 15–16, and "The Wright Brothers at 22 South Williams Street."
8 HSR, 43.
9 HSR, Appendix C: Historic Paint Analysis, 81.

floral pattern on a dark blue-green ground. No research or analysis was performed on the samples. Historic finish layers were photographed by park staff and the photo documentation and wallpaper samples are in the park collection.

Original gas piping was also located in the ceiling during the renovation. Park staff documented the piping with a drawing which is located in park files.

The building continued to be used as a residence until late in the 20th century, when it was slated to be torn down by the city. Aviation Trail, Inc. acquired 22 South Williams Street in 1982 and began restoration of the building in mid-1985. The group rehabilitated the exterior of the building to its 1895 appearance and in June 1988 opened The Wright Cycle Company building to the public. In 1992 Dayton Aviation Heritage National Historical Park was created, and in 1995 the 2003 Committee purchased the cycle shop building and donated it to the National Park Service.[10] The National Park Service uses the first-floor shop area for exhibits, site orientation, and first-person interpretation, and maintains park office areas in the rear. Offices and meeting areas are located on the second floor.

[10] HSR, 9–10.

Analysis of Historical Occupancy

Wilbur and Orville Wright

The Wright brothers' early career is described in many sources, most notably in Tom Crouch's *The Bishop's Boys: A Life of Wilbur and Orville Wright* and in Fred C. Kelly's *The Wright Brothers*. This section will provide only a brief overview of their lives before they moved their business to 22 South Williams Street.

The Wright family lived in Dayton, Ohio, during most of the 1870s, and after moving to Iowa in 1878, returned to the city permanently in 1884. Orville Wright was born in the family home at 7 Hawthorne Street in 1871, the fourth son in a family that included older brothers Reuchlin, Lorin, and Wilbur, born in Indiana in 1867. A younger sister, Katharine, was born at Hawthorne Street in 1874. Their father, Milton Wright, was a leader in the Church of the United Brethren in Christ, serving as bishop and as editor of influential church publications.

Influenced in part by early exposure to the printing trade afforded by their father's position, both brothers — and Orville especially — became interested in printing. They began publishing a newspaper together in 1889 and opened a printing business in the Hoover Block at West Third and Williams Street in the autumn of 1890.

In the spring of 1893 Orville and Wilbur also opened a bicycle sales, repair and rental business on West Third Street, within blocks of their home and print shop in West Dayton. With business thriving, the brothers moved to a second and then a third West Third Street address, renaming their operation The Wright Cycle Company. They closed the West Third Street shop at the end of the cycling season in autumn 1894 and reopened two stores in the spring of 1895—a cycle business in downtown Dayton and a combination cycle shop and printing business at 22 South Williams Street.

The 22 South Williams Street shop, which the Wright brothers retained until the spring of 1897, was not only the first location to combine their printing and cycle businesses, but also the shop in which they first manufactured and sold their own brands of bicycles. The printing operation was probably located on the second floor, while bicycle sales, repair, and manufacture took place on the ground floor.

By 1897, Orville and Wilbur moved their cycle and printing businesses to 1127 West Third Street. In 1899 they discontinued their printing concern, selling their equipment, and in 1901 they added a room onto the rear of the building to house a basic machine shop. This shop was used to build and repair bicycles and eventually to build a flying machine.

After their successful flight at Kitty Hawk in December 1903, the Wright brothers returned to work on their flying machine at the shop in Dayton, though they assembled later airplanes in a hangar at Huffman Prairie, several miles outside of the city. In November 1909 Orville and Wilbur Wright incorporated their airplane manufacturing company and in 1910 constructed an airplane factory west of the 1127 West Third Street shop.

Wilbur Wright died of typhoid fever on May 30, 1912, and Orville carried on the business, retaining an office at 1127 West Third Street until November 1916 when he moved his office to the new laboratory he had built for himself nearby. Orville Wright died in Dayton on January 30, 1948 at age 77.

Employees and Family

Edwin Sines was a long-time friend and employee of Orville and Wilbur Wright. He worked for the brothers at Wright and Wright, Printers, in the Hoover Block and moved with them around the corner to the 22 South Williams Street location. According to the *Williams Dayton City Directories* for the years 1893 through 1898, he was employed as a bookkeeper and a printer.[11]

Orville and Wilbur's father, Bishop Milton Wright, also visited the store at 22 South Williams Street. He first mentions stopping at the store in his diary in April 1895 and in one instance calls it their "store and office." During the summer cycling season of 1895 the brothers opened two shops, the second at 23 West Second Street in downtown Dayton. Interestingly, on the late spring day in 1895 that Bishop Wright notes a visit to this shop in his diary, he refers to it as "Wilbur's bicycle store."[12]

Wilbur and Orville's brother, Lorin, and their sister, Katharine, are known to have been employed in various ways with the cycle business at 1127 West Third Street, and although it is not known whether they ever worked at 22 South Williams Street, it is likely that they visited the shop with some regularity.

11 Charlotte K. and August E. Brunsman, *Wright and Wright, Printers: The Other Career of Wilbur and Orville*, 15.

12 Bishop Milton Wright, *Diaries 1857–1917* (Dayton, Ohio: The Wright State University Libraries, 1999), 432–34 (entries for April 19, April 23 , May 11, and May 13, 1895) .

Evidence of Room Use and Furnishings

The Move to 22 South Williams Street

As mentioned above, the ground floor of the shop at 22 South Williams Street was used for bicycle sales, repair, rental, and manufacturing. Orville and Wilbur rented the property some time before mid-April 1895 and during the 1895 cycling season determined to manufacture their own brand of bicycles. In October, Orville wrote to their father that business was dropping off, "though we sell a wheel now and then" and they were still doing repairs. He continued: "We expect to build our wheels for next year. I think it will pay us, and give us employment during the winter."[13]

By the autumn of 1895, the Wright brothers had already been in the bicycle business for nearly three years and were conducting business at their fourth location. They rented their first store at 1005 West Third Street in December 1892, and prepared to open the Wright Cycle Exchange for business in the spring of 1893. In addition to repairing and renting bicycles, they intended to sell brands such as Coventry, Cross, and Envoy. Business was good, and later in the year they moved the operation to 1034 West Third Street, renaming it The Wright Cycle Company.

Near the end of the 1894 season, Orville and Wilbur continued to make a profit on their three rental bicycles – one of which brought in $8.00 a month, another $6.50, and the third rented hourly or daily – and on repairs. They gave up the shop at 1034 West Third Street in the middle of October, though, because as Wilbur pointed out: "There is hardly enough business to justify us in keeping so expensive a room any longer."[14] Operating out of their print shop in the Hoover Block at the corner of West Third and Williams Streets, the brothers planned to do repairs over the winter, in addition to running their printing business.[15]

In the spring of 1895, they determined to open two cycle shop locations, one at 23 West Second Street in downtown Dayton, and a second at 22 South Williams Street, around the corner from the print shop. They gave up their suite of rooms in the Hoover Block and moved the printing business to 22 South Williams Street. At the end of the 1895 season they closed their downtown store, probably due to competition in the form of several other cycle showrooms within blocks of their shop. They also decided to build their own brand of bicycle, preparing to market and sell the new cycle in the spring of 1896.[16]

13 Orville Wright to Milton Wright, October 8, 1895, Wright Papers, Library of Congress, Box 6.

14 Wilbur Wright to Milton Wright, September 12, 1894, and October 2, 1894, Wright Papers, Library of Congress, Box 6.

15 Wilbur Wright to Milton Wright, October 2, 1894, Wright Papers, Library of Congress, Box 6.

16 See Tom Crouch, *The Bishop's Boys*, 107–114, and Fred C. Fisk and Marlin W. Todd, *The Wright Brothers from Bicycle to Biplane: An Illustrated History of the Wright Brothers* (West Milton, OH: Privately printed, 1990).

The Wright brothers used their printing business to heavily promote their bicycle business and in April 1896 they announced in *Snap Shots*, their own publication, that: "After more delay than we expected, we are at last ready to announce that we will have several samples out in a week or ten days and will be ready to fill orders before the middle of the month."[17]

Wright Brand Bicycles

In a promotional pamphlet the brothers put out in early 1896 the Wrights noted that they were preparing to make two brands of bicycle, the Van Cleve, "a wheel of the highest grade" that would "embrace several novel features of our own invention" and a Wright Special, which was "a cheaper bicycle."[18] The new bicycle introduced at the end of April had "large tubing, high frame, tool steel bearings, needle wire spokes, narrow tread and every feature of an up-to-date bicycle. Its weight will be about 22 pounds." The "novel features" included a new coaster brake and a wheel hub with a reserve set of bearings.[19] This high-end model was called the "Wright Special" in the April 17, 1896, issue of *Snap-Shots*.[20] On May 16, 1896 Bishop Milton Wright noted in his diary that: "The boys got the first "Wright Special" bicycle ready for sale & a ladies' wheel about so – both their own manufacture."[21] Although there is some confusion as to the original name of the bicycle, the brothers eventually targeted the Van Cleve in their marketing. The name was a tribute to the Wright's Van Cleve ancestors who were early Dayton settlers, and one of their advertising slogans was: "Van Cleves get there First."[22]

The brothers also made a model called the St. Clair, which was less expensive than the Van Cleve. In early 1897 the Van Cleve sold for $65 and the St. Clair from $40 to $42.50.[23] According to a 1946 biography vetted by Orville Wright, Wilbur and Orville began making their own cycles in 1895: "The Wrights began assembling their own bicycles out of purchased parts, with a few improvements of their own …" They manufactured three models, "one unusually low priced," probably the St. Clair.[24]

Machinery

Before the brothers began manufacturing, however, they needed additional tools and machinery. The pamphlet advertising the introduction of the Van Cleve bicycle boasted that as The Wright Cycle Company moved into 1896: "Our salesroom at 22 South Williams Street is being nicely refitted ...[and] We are adding new machinery to our shop... ." The brothers also wanted customers to know that their repair shop was being "greatly improved" and that returning customers would be "carefully attended by competent mechanics" and in general "well cared for."[25]

In refitting their shop the brothers installed line shafting which was powered by a single-cylinder engine they designed and built together. This operated a lathe and a drill press. They

17 *Snap-Shots*, April 17, 1896, in Crouch, *Bishop's Boys*, 113.
18 Fisk and Todd, "Wright Cycle Co. Van Cleve Pamphlet," in *The Wright Brothers*, 28.
19 Anna Rothe, editor, *Current Biography* to Orville Wright, October 3, 1946; [Mabel Beck, secretary to Orville Wright] to Anna Rothe, December 21, 1946, and attachments, Wright Papers, Library of Congress, Box 60.
20 *Snap-Shots*, April 17, 1896, in Crouch, *Bishop's Boys*, 113.
21 Wright, *Diaries*, 453 (entry for May 16, 1896).
22 Fisk and Todd, "Wright Cycle Co. Van Cleve Pamphlet," in *The Wright Brothers*, 28.
23 Wright Brothers ledger, Book 2, Wright Papers, Library of Congress, microfilm edition, reel 1.
24 Anna Rothe, editor, *Current Biography* to Orville Wright, October 3, 1946; [Mabel Beck, secretary to Orville Wright] to Anna Rothe, December 21, 1946, and attachments, Wright Papers, Library of Congress, Box 60.
25 Van Cleve pamphlet, reprinted in Fisk and Todd, *The Wright Brothers*, 49.

also brought in tube cutting and bending equipment.[26] The lathe the Wrights used in the 22 South Williams Street shop was probably a Prentice Brothers model manufactured between 1880 and 1890. The drill press does not appear to be a commercially produced machine, and was probably of their own design and construction.[27] It is not known whether these were the first lathe and drill press the brothers owned – technically, they could have repaired, rented and sold bicycles without owning these relatively expensive machines. It would follow, however, that all three of their earlier shops would have been hand and foot powered, and as the 1896 manual *Bicycle Repairing* termed it, the lathe and drill press were "important tools of undoubted value."[28]

An article in a November 1896 edition of the periodical *Cycling Life* lists the lathe and the drill press as "required" tools, along with the forge, engine, brazing stand, and enameling outfit also encouraged by the author of *Bicycle Repairing*. The article, titled "Starting a Repair Shop," also warns against using "cheap, second-hand machinery" and admonishes readers to "get the very best."[29] It is doubtful that the Wright brothers, who built their own gas engine to use in this shop, followed this advice.

Tools

A biography authorized by Orville Wright points out that when the brothers began building bicycles, they made their own tools "to save expense and to make sure the tools would be perfectly dependable."[30] Figure 1 shows a shop-made jig probably used for fitting frames together or for brazing frames. The vertical rod in the foreground of the photograph may have been used for aligning frames. Other small hand tools such as a hack saw, a bit brace, and files are shown in figure 3, while figure 1 shows 6" outside calipers, a lathe dog, and a lathe wrench.[31]

The 1896 publication *Bicycle Repairing* cautioned: "It is not good policy to lock up the money [buying tools] when it can be employed to far better advantage." The article goes on to suggest that a competent repairer, as both brothers surely were, could construct many tools "during his leisure moments."[32] Essential tools such as hammers, clamps, vises, wrenches, taps and dies, pliers, and drills appear on the list of basic recommended tools in *Bicycle Repairing* and on the 1909 inventory of the Wright brothers' last bicycle shop.[33]

The Wright brothers surely had some sort of brazing apparatus in the shop, although it is not known what kind they used. Brazing was "one of the most important operations connected with the making of a Bicycle" and if improperly done "the wheel is doomed to speedy destruction."[34] The Wrights' spring 1897 shop ledger shows payments for brazing frames.[35]

26 Tom Crouch, *The Bishop's Boys*, 112–13. The lathe and the drill press were replaced by 1901 with the Putnam lathe and Barnes drill press that were used to produce the first flying machine.

27 Appendix C by Bill Robertson in *Historic Furnishings Report: Wright Cycle Company Building at Carillon Historical Park* (Harpers Ferry, WV: National Park Service, 2001).

28 S. D. V. Burr, *Bicycle Repairing* (New York: David Williams, 1896), 10.

29 *Cycling Life*, November 19, 1896.

30 Anna Rothe, editor, *Current Biography* to Orville Wright, October 3, 1946; [Mabel Beck, secretary to Orville Wright] to Anna Rothe, December 21, 1946 and attachments, Wright Papers, Library of Congress, Box 60.

31 See Appendix 1, Bill Robertson's report.

32 Burr, *Bicycle Repairing*, 9.

33 Burr, *Bicycle Repairing*, 10–11 and 1909 inventory of 1127 W. Third Street Wright Cycle Co., Wright Brothers ledger, Book 4, Wright Papers, Library of Congress, microfilm edition, reel 2 (hereafter 1909 inventory).

34 Burr, *Bicycle Repairing*, 32.

35 Wright Brothers ledger, Book 2, Wright Papers, Library of Congress, microfilm edition, reel 1.

The essential elements of a brazier are two pipes with regulating valves, although these can be arranged in any number of configurations. One pipe contains air and one contains gas; the air and gas are combined and emitted through a single pipe. The flame resulting from their combustion is regulated by the valves. The flame is used to heat two pieces of metal which are joined by applying a flux and a solder.[36] As mentioned above, the jig illustrated in figure 1 may have been used for brazing frames.

Shop Arrangement

In several respects, the Wright brothers' shop at 22 South Williams Street was set up to conform with recommended cycle shop practice. A show window beckoned customers from the street and once inside the shop, visitors could view new wheels and other cycling merchandise in the front sales area. An office was partitioned off from the main room, and repairs and cycle construction took place in the rear of the shop. The manual *Bicycle Repairing* acknowledged that: "in the vast majority of cases the tools must be made to fit in a room which is, perhaps, not adapted to the work and in which the best arrangement cannot be obtained."[37] It illustrated two examples of floor plans which are similar to the arrangement of work space in both the 1127 West Third Street and the 22 South Williams Street shops. Partitioned offices are in the front of the building near the show windows, while displays of new bicycles and rentals fill the center of the room. The repair area is in the rear, arranged to take the best advantage of windows or skylights in the room. See figures 5 and 6.

Contemporary cycling publications recommended that bicycle repair shops be located on the ground floor, be "cleaned up and in good shape" and be well-lighted, with the bench and lathe positioned to take advantage of the most light. Walls should be whitewashed – the finish that appears in two images of the Wrights at work (see figures 1 and 3) – and the room should be "capable of being well heated."[38] An article in *Cycling Life* asserts: "bicycles will not do so well in the cold; the parts get stiff and gummy."[39] The 22 South Williams street shop was heated with a coal furnace, and while it is not known how warm the brothers kept the shop, the Wright's niece later recalled that their store at 1127 West Third Street was "always warm enough" and that even in winter her uncles did not wear sweaters.[40]

Show Windows

In May 1899, *The Cycle Age and Trade Review* began publishing a series of articles on "How to Display Goods." These articles offered suggestions such as keeping show windows clean, using the advertising potential of windows to the full, and offering interesting and varied displays, although admitting: "It's a mighty hard thing when you have only bicycles and sundries to create schemes of showing them which shall be novel and attractive."[41] The articles suggest that cycle salesrooms display advertisements for installment sales and place pricing information prominently "on a neat card."[42]

36 Burr, *Bicycle Repairing*, 32–35.
37 Ibid., 16.
38 *Cycling Life*, November 19, 1896.
39 *Cycling Life*, December 17, 1896.
40 Interview with Ivonette Wright Miller and Harold Miller, September 17, 1989, in The Henry Ford Research Center, EI 186, Wright Cycle Shop file.
41 *The Cycle Age and Trade Review*, May 11, 1899.
42 *The Cycle Age and Trade Review*, December 16, 1897.

According to one article, "[t]he prime requisites of a good show window are good glass, a commodious platform, and a tasty display of goods."[43] The platform covering was emphasized and finishes such as polished wood, carpeting, and linoleum were all suggested, with owners encouraged to let the style of the shop furnishings dictate the selection of the platform cover. Shop owners were also warned that the customer "must have changes, or he becomes disgusted with your lack of effort and soon forgets you."[44]

The Wright brothers gave a certain amount of consideration to their store window at 1127 West Third Street, for in the 1937 reinstallation of the West Third Street building at The Henry Ford (formerly the Henry Ford Museum and Greenfield Village), Orville Wright remembered clearly the iron and brass frame of their show window curtain, as well as the appearance of the yellow silk curtain which hung on the frame. (See Appendix 2.) The Wright Cycle Company building at 22 South Williams Street had two small show windows flanking the double wooden entrance doors which face northwest. Figure 4, the 1896 photograph of the exterior of The Wright Cycle Company, shows the outline of a small bicycle in the lower left corner of the west show window. This is probably a promotional placard or other advertising device.

Repair shop owners were also advised to advertise in show windows, in addition to placing newspaper ads and personally soliciting business. In general, shop owners were encouraged to "[use] your show window and newspaper in conjunction. They are good friends and will always pull well together."[45] Orville and Wilbur were certainly savvy to this piece of marketing advice, and went as far as to develop a periodical focused on cycling in general and on The Wright Cycle Company in particular. *Snap-Shots at Current Events* was introduced on October 20, 1894 and included light humor, essays and advertisements for the brothers' cycle shop, as well as for other local merchants. The final issue of *Snap-Shots*, dated April 17, 1896, announced the introduction of the Wright brothers' own brand of bicycle, samples of which were to be available within the next week.[46]

Office

Little is known about the office area in the 22 South Williams Street cycle shop. In the spring of 1895, Bishop Milton Wright writes that he visited "my boys at their store and office."[47] This could be a reference to their printing office, which the Wright brothers had just moved from the Hoover Block to the 22 South Williams Street building, or it could refer to the office area within the store.

The office furnishings the brothers used in their 1127 West Third Street building are well documented, and it is possible that they moved some of their furnishings from 22 South Williams Street to their new location on West Third Street. On the other hand, since the known furnishings are documented to the building in a 1909 inventory, it is possible they were acquired in the ensuing 12 years they spent at West Third Street. At West Third Street the brothers used a roll top desk, a swivel chair, a safe, and a typewriter on a small table. These objects were donated in 1938 to The Henry Ford, for use in the reconstructed Wright Cycle Company building.

43 Ibid.

44 *The Cycle Age and Trade Review*, May 11, 1899. *The Cycle Age and Trade Review* also covered "Effective Window Dressing" in the May 25, 1899 number.

45 *The Cycle Age and Trade Review*, May 11, 1899.

46 Brunsman and Brunsman, *Wright and Wright, Printers*, 13–14, and Crouch, *The Bishop's Boys*, 111–13.

47 Wright, *Diaries,* 433, entry for May 11, 1895.

Other office furnishings in the 1127 West Third Street building in 1909 included a jardinière stand, file cases, two rocking chairs and three other chairs. Matting covered the floors in one of the rooms.[48] The office area itself was separated from the sales area by a painted wood partition topped with glass panels. This partition had an interior shelf with a drawer that opened outwards; customers left money in the drawer and jotted down their payments in a notebook in the drawer.[49]

Printing

In the spring of 1895 Orville and Wilbur moved the printing business to their new quarters at 22 S. Williams Street. They continued to do job printing and to publish *Snap-Shots at Current Events*, but by this time their efforts were increasingly focused on bicycle work rather than printing. Profits from job printing eventually dwindled.[50]

The February 29, 1896 issue of *Snap-Shots* was printed in a smaller size than earlier issues and the quality of printing was improved. According to Charlotte and August Brunsmans' analysis of the Wright brothers as printers, this change may indicate that the brothers had acquired a new printing press.[51] The final number of *Snap-Shots* came out on April 17, 1896, announcing that the Wrights' own brand of bicycle was nearly ready for purchase.

Ed Sines continued to work for the brothers as a printer,[52] although he probably did bicycle repair as well. (See figure 3.) He was typically paid $7 per week.[53] The business consisted of such small printing jobs as letter heads, bills, statements, cards, tickets and folders. When the Wrights moved to 22 S. Williams Street in April 1895, they printed 5000 bills and 500 folders for The Wright Cycle Company. At the same time, Ed Sines purchased 100 invitations, in addition to new letter head and envelopes,[54] perhaps indicating that he was getting married.

In May or June of 1897 the Wrights moved the printing business and cycle shop for the final time to the 1127 West Third Street building. They operated the print shop and office on the second floor, with Ed Sines assuming much of the responsibility for the print business as the brothers' interest in flying grew. When Sines accepted another job in 1899, Orville and Wilbur sold their printing outfit to Stevens and Stevens, another Dayton printing company.[55]

48 Greenfield Village Guides Study Folder, 1938, in The Henry Ford Research Center, EI 186, Wright Cycle Shop file. See also 1909 inventory .

49 Report on Wright Cycle Shop, July 20, 1953, by Laura Merwin, in The Henry Ford Research Center, EI 186, Wright Cycle Shop file.

50 Crouch, *The Bishop's Boys*, 114. Crouch notes that from February through August 1897 profits from the print shop were $127.29 as compared to $2,000 or more from the bicycle shop.

51 Brunsman and Brunsman, *Wright and Wright, Printers*, 14.

52 Ibid.,15.

53 Wright Brothers ledger, Book 2, Wright Papers, Library of Congress, microfilm edition, reel 1.

54 Wright Brothers ledger, Book 1, Wright Papers, Library of Congress, microfilm edition, reel 1.

55 Brunsman and Brunsman, *Wright and Wright, Printers*, 15–16.

Furnishings Plan

List of Recommended Furnishings

Bicycle Repair Section

The furnishings vignette in the rear of the 22 South Williams building illustrates how Orville and Wilbur Wright set up and used tools in their bicycle manufacture and repair business. Furnishings are based on two photographs that document the interior of one of the Wright cycle shops, and on other photographs of period bicycle shop interiors. Additional furnishings evidence is provided by period bicycle repair manuals, trade periodicals, and trade catalogs.

OBJECT AND LOCATION	EVIDENCE	RECOMMENDATION
Drill press, shop-made (near doorway in north wall)	Figure 1	Reproduce. See Appendix 1 (Bill Robertson report) for full recommendation.
Engine (between drill press and north wall); **exhaust pipe** (venting exhaust to exterior)	To power drill press and lathe	Use engine in place. Acquire reproduction exhaust pipe. See Appendix 1 for full recommendation.
Lathe, Prentice Bros. (on east wall)	Figures 1 and 9	Use W. F. and John Barnes, Co.-brand lathe in place. See Appendix 1 for full recommendation.
Lathe accessories: **tail stock barrel locking lever,** **set screw wrench,** **lathe wrench,** **lathe dog** **tool holder,** **steady rest** (near or on lathe)	Figure 1	Acquire.
Pipe bending fixture, shop-made (attached to lathe)	Figure 1	Fabricate.
Oil can (on lathe)	Common practice	Acquire.
Line-shafting, **machine belting, leather,** **pulleys** (line-shafting on ceiling; belting and pulleys on line-shafting)	Figures 1 and 9	Replace ceiling blocks. Replace fiber belting with leather. Retain shafting and pulleys. Reconfigure line shafting.
Vise, for holding cycle frames,	Figure 3 See also figure 7.	Reproduce. See Appendix 1 for full recommendation.
Screw assembly, painted black (attached as part of vise, above)	Figure 3	Reproduce. See Appendix 1 for full recommendation.

OBJECT AND LOCATION	EVIDENCE	RECOMMENDATION
Frame, bicycle, black (in vise)	Figure 3 See also figure 7.	Fabricate.
Frame jig and false faces, for vise (leaning against east wall)	Figure 1	Reproduce. See Appendix 1 for full recommendation.
Bicycle pump (leaning against east wall)	Common practice	Acquire.
Work benches, 2 (across east end of room and against south wall)	Figures 3, 5, 7, and 9	Fabricate new benches using old wood. South bench measures 24″ x 84″ x 34″ h, and east bench measures 24″ x 72″ x 37″ h.
Tools: **bench vise** **bit brace** (hanging on wall) **ratchet brace** **taps, dies and screw plates** of bicycle sizes **assorted drills and reamers** under ¾″ **drill and thread gauges**, various sizes **boxing hammer** **ballpeen hammers**, 3 **tack hammer** **riveting hammer** **brass hammer** **lead hammer** **pin or hand vise** **assorted wrenches**, adjustable **assorted wrenches**, fixed **bicycle or pocket wrenches**, 10 **assorted pliers and nippers** **oil cans**, 2 **belt punch** **hack saws**, 2 (one hanging on wall) **files**, assorted, with and without handles, 5 **hand drills**, 2 **breast drill** **hide-faced hammer** **mallets**, wood, 2 **wire cutters** **calipers**, 4, inside and outside **dividers** **C-clamps**, large and small, 7 **screwdrivers**, assorted, 12 **punches** **cold chisels**, 5 **oil stones**, 3 **drill bits** **tubing cutters, or pipe cutters**, 2 **knife** **pocket level** **combination square** **steel rule** **gimlet** **scraper** **spreader** **glue brushes**, 2	Figures 1, 3, 7, and 9 See also *Bicycle Repairing*, by S. D. V. Burr (New York: David Williams, 1896) and 1903 E. H. Hall Co. catalog.	Acquire. See Appendix 1 for full recommendation.

OBJECT AND LOCATION	EVIDENCE	RECOMMENDATION
tool holders, 2 **spoke and nipple grips**, 2 (on or under work benches)		
Tape measure (on work bench)	See 1909 Wright inventory (Appendix 3).	Acquire.
***Wheel Talk* magazines**, 10 (on work bench)	Common practice	Acquire.
Boxes, rags, other shop clutter (on and below work bench)	Figures 3 and 9	Acquire.
Bicycle parts (hanging on wall and on work bench)	Figures 1, 3, and 9	Acquire or reproduce as necessary.
Calendar (east wall, over work bench)	Figures 3 and 9	Acquire or fabricate.
Window shade, green (on door on north wall)	Figure 4	Acquire.
Lighting fixture, gas, single-arm (on wall above lathe)	Figures 3 and 9	Acquire period fixture and wire for electricity.

Bicycle Shop Display Windows

OBJECT AND LOCATION	EVIDENCE	RECOMMENDATION
Bicycle, Wright brand (in north window)	The Wright brothers manufactured their own brand of bicycles while in this shop. See figure 8.	Acquire reproduction.
Bicycle stands, 2, cast metal (in window)	See figure 8 for one style of bicycle stand.	Acquire reproduction.
Platforms, 2 (in windows)	Figure 8	Fabricate free-standing platforms to height of window woodwork.
Curtains and hardware (in north window)	Orville Wright to Fred Black, November 4, 1937: "I am sending a sketch showing the general plan of construction of the frame for the screen. ..." " ... silk was of a deep yellow color ..." Letter includes sketch and description of hardware for screen and description of installation. The Henry Ford.	Reproduce.
Bicycle advertisement (in south window)	Figure 4	Reproduce.
Boxes and tins for parts and accessories: **Search Light gas lanterns** **Solar Cycle oil lamps** **Dress Guard Lacing** **Torrington bicycle spokes** **Standard cyclometer for bicycles** **Wald gun bicycle repair tools** **Diamond roller repair link** **Diamond bicycle chain** **bicycle lights**, 2 **front hub with box** (in display case)	Figure 8 These specific brands appear in the1903 Hall catalog. The Wrights ordered from the Hall catalog, see Orville Wright to Katharine Wright, October 14, 1900.	Acquire reproduction packaging and period parts and accessories.

OBJECT AND LOCATION	EVIDENCE	RECOMMENDATION
Bicycle parts and accessories: **tool kits** **grips, cork, with box** **chains** **saddles** **pedals, with boxes** **handle bars** (some or all displayed in windows)	Hall catalog	Acquire reproductions.
Bicycle cup, collapsible (displayed in north window)	Hall catalog	Acquire. Secure in north window.
Lighting fixtures, gas, 2 (ceiling-mounted in windows)	Period retail show window treatment. See Dan Mattausch lighting proposal in park file for further documentation.	Acquire.
Window shades, 4, green (in windows, door, and transom)	Figure 4	Acquire.

Illustrations

List of Illustrations

Figure 1. Orville Wright at lathe, probably 22 S. Williams Street, 1895–97, Library of Congress, LC-USZ62-56241.

Figure 2. Sanborn Insurance Map, 1897, The Sanborn Perris Map Co., in *Historic Structure Report: The Wright Cycle Company Building*, 16.

Figure 3. Orville Wright and unidentified man at work bench, 1127 West Third Street, September 1897, Library of Congress, 917574, W851-82.

Figure 4. Exterior of 22 South Williams Street, c. 1895, Wright State University.

Figure 5. "Repair Shop in Special Building" and "Repair Shop in Store," in *Bicycle Repairing*, p. 17 and 19.

Figure 6. Bicycle shop, possibly Detroit, Michigan, c. 1900–1920, Library of Congress, LC-D417.

Figure 7. Mrs. Jorgenson at Work in the Shop, 1895, from *Wheel Talk*, vol. #16, August 8, 1895, Dayton Aviation Heritage NHP collection.

Figure 8. G. W. Shroyer window display, Dayton, Ohio, c. 1910–20, Montgomery County Historical Society.

Figure 9. Interior, Dayton bicycle repair shop, c. 1900–1910, Dayton Aviation Heritage NHP, DAAV068A.

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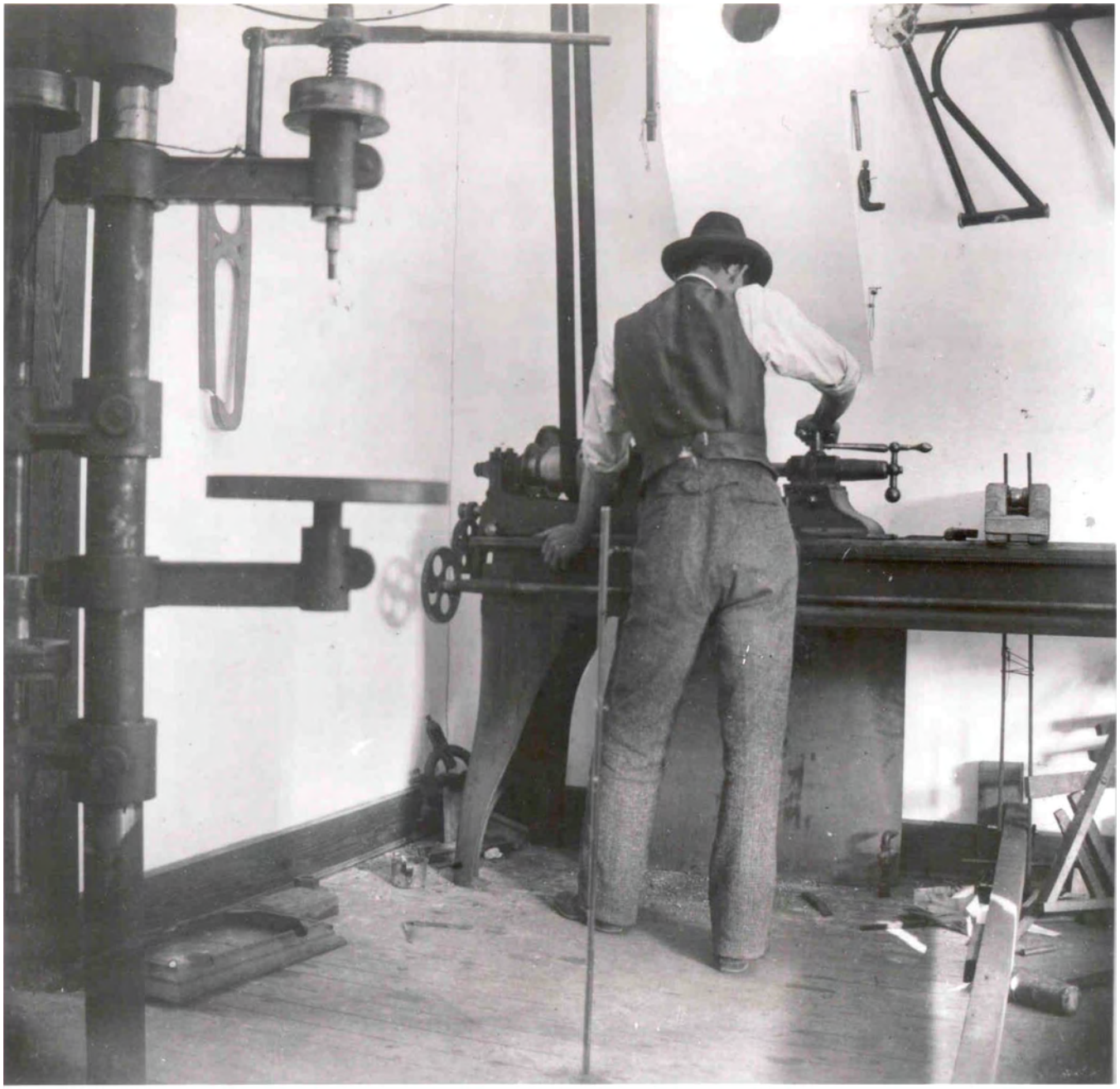


Figure 2. Sanborn Insurance Map, 1897, The Sanborn Perris Map Co., in *Historic Structure Report: The Wright Cycle Company Building*, 16.

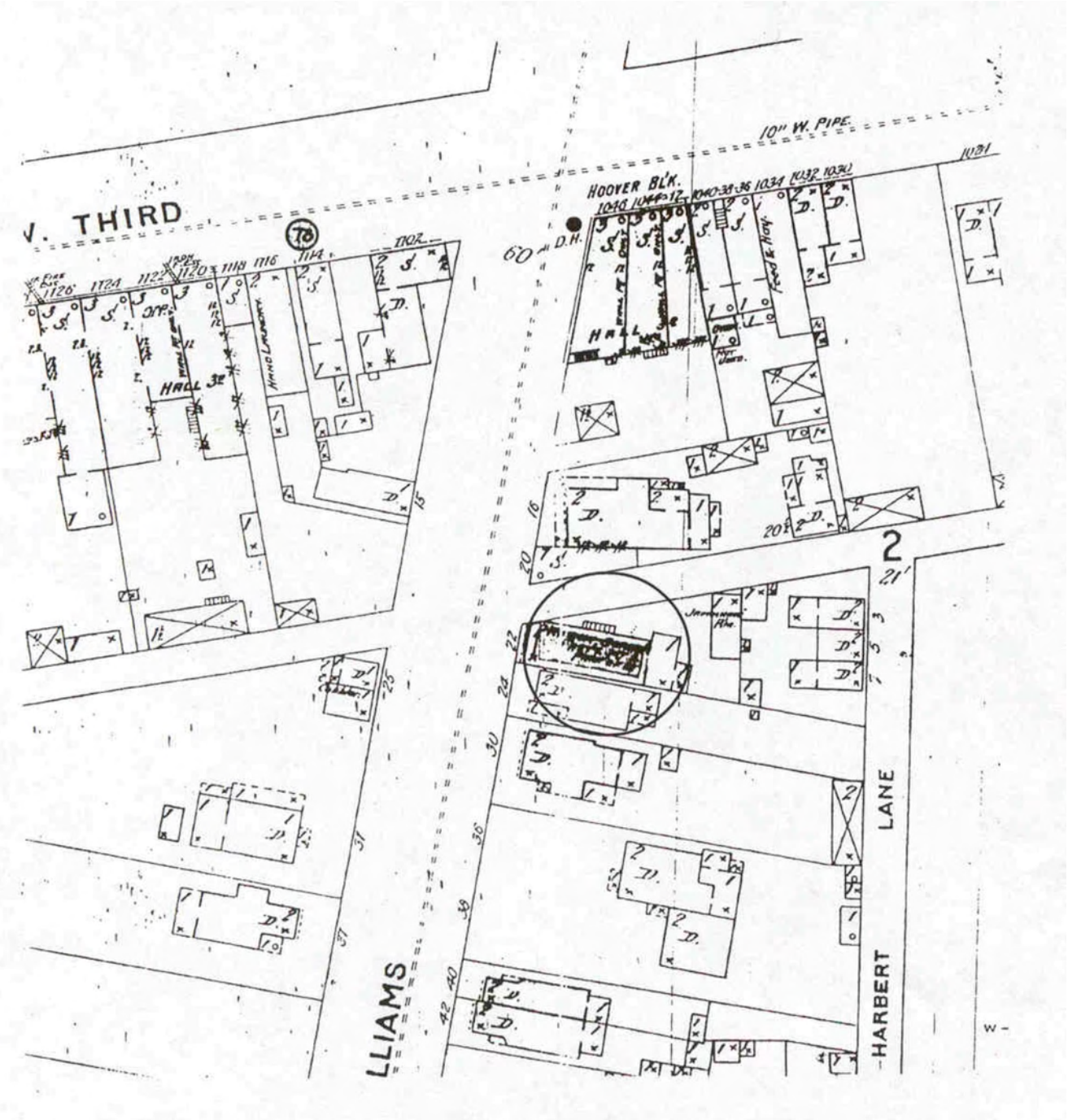

10" W. PIPE
HOOVER BL'K.
V. THIRD
HALL ST
HARBERT
LANE
LLIAMS

Figure 3. Orville Wright and unidentified man at work bench, 1127 West Third Street, September 1897, Library of Congress, 917574, W851-82.

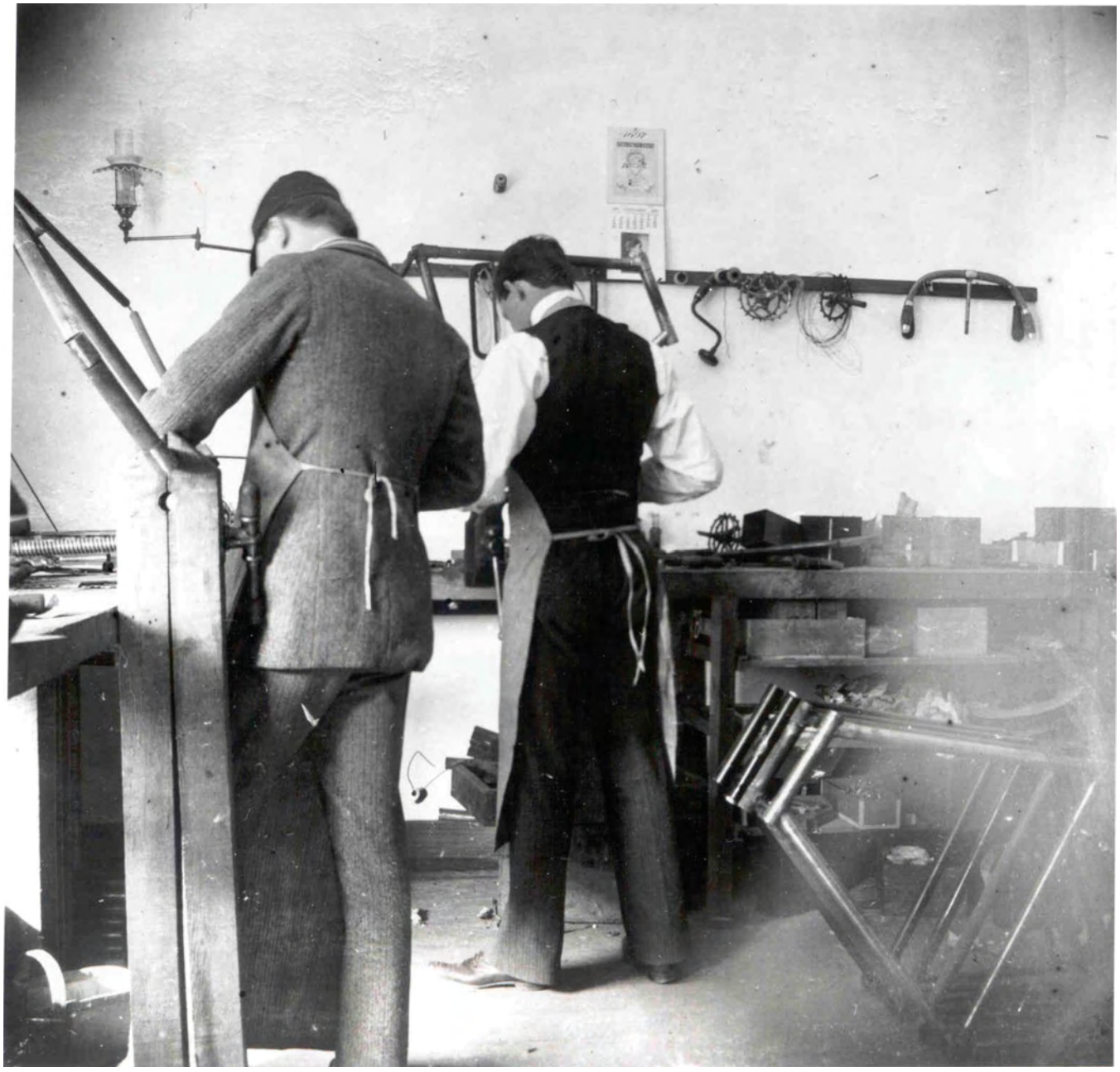


Figure 4. Exterior of 22 South Williams Street, c. 1895, Wright State University.


J.H.HOHLER.
T CYCLE CO.

Figure 5. "Repair Shop in Special Building" and "Repair Shop in Store," in *Bicycle Repairing*, p. 17 and 19.

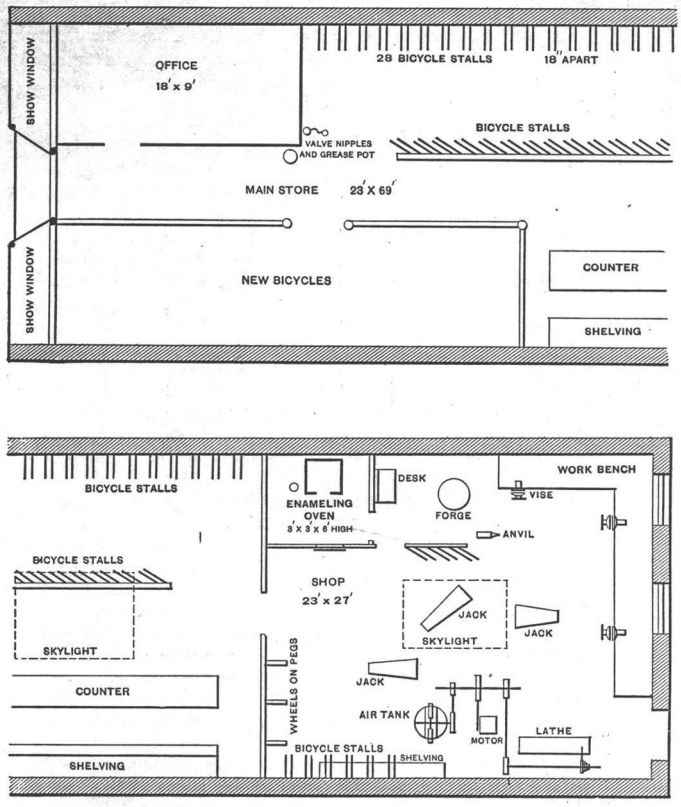


Fig. 2.—Repair Shop in Store.

top of it; then the lathe, grindstone, upright drill and forge. On the right is a bench carrying the vises and at one end an emery wheel and blower. To the left of the motor is a space

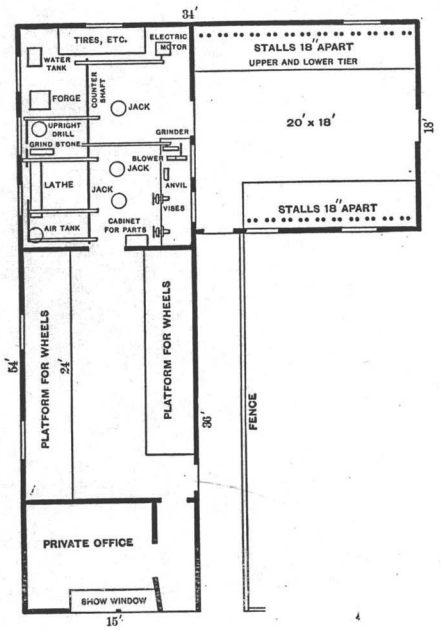


Fig. 3.—Repair Shop in Special Bu'lding.

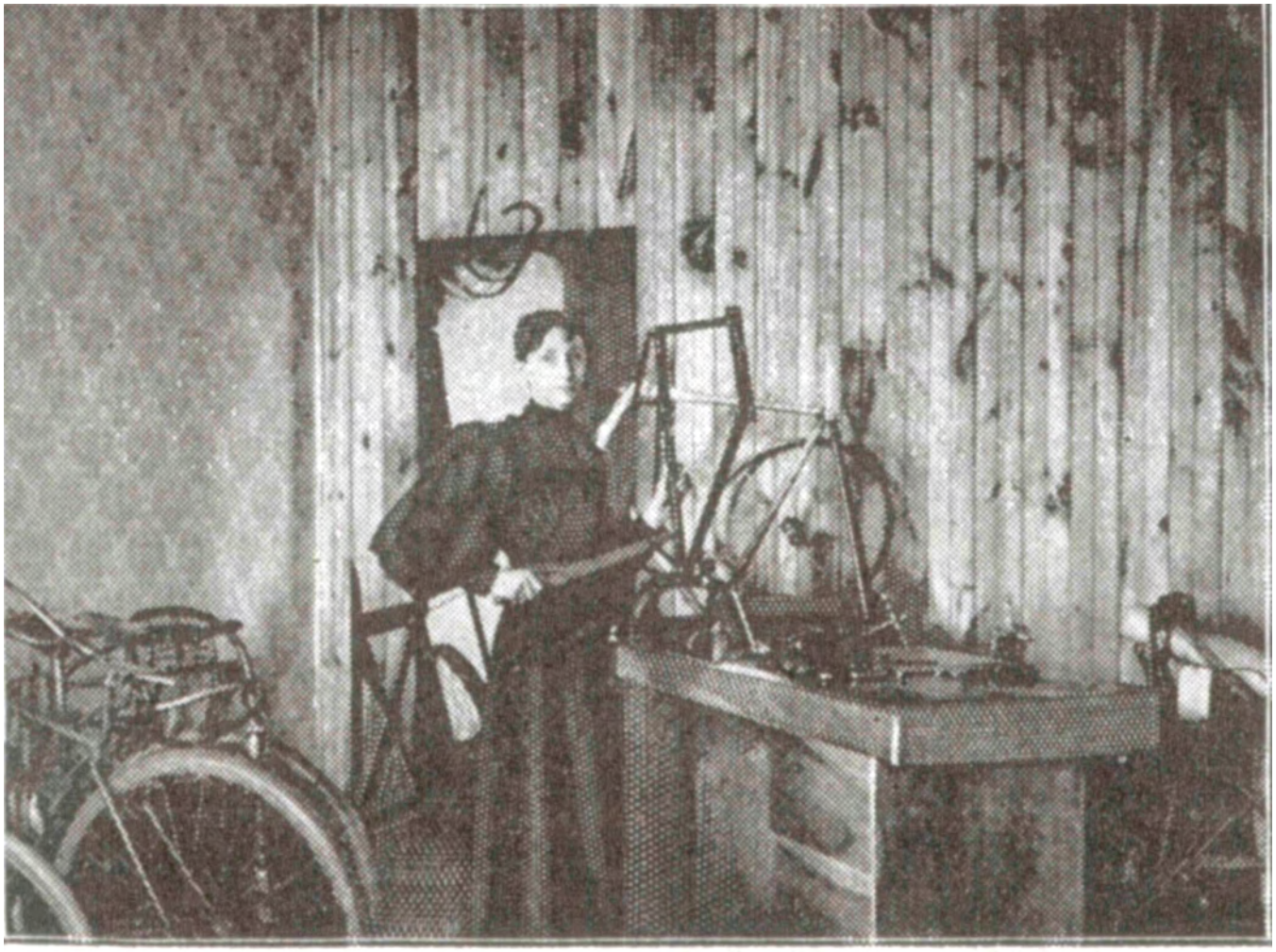
devoted to tires and still further to the left is the water tank. In the center of the room are jacks for holding Bicycles.

The spaces between the windows and under the bench are taken up with shelves and drawers for holding wheels and the

Figure 6. Bicycle shop, possibly Detroit, Michigan, c. 1900–1920, Library of Congress, LC-D417.



Figure 7. Mrs. Jorgenson at Work in the Shop, 1895, from *Wheel Talk*, vol. #16, August 8, 1895, Dayton Aviation Heritage NHP collection.



Mrs. Jorgenson at Work in the Shop.

Figure 8. G. W. Shroyer window display, Dayton, Ohio, c. 1910–20, Montgomery County Historical Society.


BICYCLES
AND ACCESSORIES
G. W. SHROYER & CO.
THE PAST
THE PRESENT
THE ROAD TO SUCCESS

Figure 9. Interior, Dayton bicycle repair shop, c. 1900–1910, Dayton Aviation Heritage NHP, DAAV068A.



Appendixes

Appendix 1: Report on the Lathe, Drill Press and Other Tools in the Wright Brothers' Workshop at 22 S. Williams St. from 1895 to 1897 by William R. Robertson

Note that the "Report on the Lathe, Drill Press and Other Tools" includes the following appendixes:

Appendix A: "Report of the Lathe and Drill Press in the Wright Brothers Workshop from 1897–1902" by William R. Robertson, 200l

Appendix B: W. F. & John Barnes Co. Foot Power Lathes catalog, August 1, 1903

Appendix C: Drawing of bending fixture for Wright Brothers' workshop, by William R. Robertson, 2001

Appendix D: W. F. & John Barnes Co. Metal Working Machinery catalog, March 1, 1896

Appendix E: Drawing of drill press from Wright Brothers' workshop, by William R. Robertson, 2001

Appendix F: Hammacher Schlemmer Co. trade catalog, bicycle screw-plates illustration

Appendix G: Drawing of planned Wright Cycle Company room arrangement, by William R. Robertson, 2001

REPORT ON THE LATHE, DRILL PRESS AND OTHER TOOLS IN THE WRIGHT BROTHERS WORKSHOP AT 22 S. WILLIAMS ST. FROM 1895-1897 BY WM. R. ROBERTSON

It is impossible, based on the research available, to determine with certainty the location, layout and the exact manufacture of the tools and machines used by the Wright bros. at their Williams st. workshop between 1895-1897. Therefore many of these suggestions are based on common shop practices of the period and
50 make use of objects available at the site.

To achieve the look of the 1897 shop photo the space behind the lathe should be filled in with a false wall and the distinctive chimney reproduced. It also appears there was a stove or heater where the lathe is located by the existence of a stove plate against the wall and gas cock on the floor. The cast iron object on the floor against the left wall could be a part of a stove.

ENGINE and LINE SHAFTS

No photo of the engine exists and the drawings done in 1937 by Charles Taylor shown in H. R. DuFour's book are of an engine the Wrights built in 1901. It is suggested to use the engine at the site with the following modifications.

1. Replace the fancy wood blocks under the engine and mounting the shaft hangers with blocks having a more utilitarian appearance.
2. Replace the fiber belts with leather ones.
3. Add an exhaust pipe from the engine to the outside either through the door or frame.
4. Check to see if this type of engine has an external fuel source and create accordingly.

LATHE

It is my opinion the lathe in the 1897 photo is a Prentice, see appendix A, and the W. F. & John Barnes Co. # 13 lathe, see appendix B, on site should be used with the following changes until a perfect match can be found.

1. Replace the tail stock barrel locking lever with on of a period appearance.
2. Mount a tool holder in the tool post and adjust to a working position.
3. Move the change gears from there current location on the wall to the left of the lathe to nails on the left side of the reproduction chimney. It is standard practice to keep these gears near the lathe as with the lathe dog and tool post wrench shown in the photo. From the 1897 photo one can see they are not on the wall, it is logical they could be on the left side of the chimney (blind to the camera) since the other lathe tools are on the

right side.

4. Acquire a steady rest and place in the left corner as shown.
5. The shop made fixture mounted on the right side of the lathe bed appears to be a fixture for bending tubing, reproduce this as shown in appendix C. This fixture does not use any features of the lathe other than the mass of the machine, from the information at hand, the lathe is the heaviest object in the shop.

DRILL PRESS

The drill press made by the Wrights is prominently shown in the 1897 photo and it demonstrates the their ability to make whatever was needed. Unfortunately only part is shown in the photo, which causes one to speculate on how the column is mounted to the floor and what kind of drive was used. The photo does give a clue as to the drive in that it does not have the typical right angle pulley or gear arrangement used in most drill presses and does show a friction pulley consistent with a Barnes type friction disk drive, see appendix D. It should be noted that the Wrights were most likely familiar with this as in 1901 they bought a Barnes drill press and may well have had a Barnes catalog at the time they made this machine. It was not uncommon for craftsman to make copies of commercially made tools however the reason usually is either economic, or need for a different size or an improvement. My personal collection contains a number of examples.

1. Reproduce the drill press as shown in appendix E, this will involve creating a set of working drawings, making patterns, casting and machining the parts and assembly at the site. Note the base, iron straps that would attach to the wall and belt shifting mechanism are of a simple and inexpensive design typical of the Wrights.

WORK BENCHES

The 1897 photo of O. Wright and E. Sines in the cycle shop will be the inspiration for the right side of the workshop. This photo shows two wood framed benches with vises. There are two later benches on the site with cast iron bases that have a Wright Bros. connection. These benches may be too large to fit in the space proposed, they are 32" high, 33" deep and 72" & 108" long and someone that would have a made a drill press would be unlikely to own work benches with expensive cast iron bases. One of them has a emmertt pattern maker's vise that is not appropriate for this shop.

1. Build new benches to the size required, about 24" deep, 66" long and 32" high, it would be best to use old tops or wide floor boards that have some character, since there will be very little on them, new tops will look too stark.

2. Reproduce the wooden cycle frame holding vise shown in the photo. A modern screw assembly such as Veritas's tail vise screw sold by Garrett Wade (#70G02.02) should look appropriate if painted black.
3. Acquire a 3 1/2" to 4" bench vise for the other bench.

OTHER SHOP MADE OBJECTS

To the right of the lathe is fixture that appears to have slots the same size as the tubing the Wright's used in their cycles and these meet at angle consistent with cycle frames. This could have been used as a jig to fit frames together or in brazing frame joints. Since it will be next to the door and due to lack of information and space, the interpretation may be that the brazing was done outside. On the floor to the left of the lathe are a number of false faces for vises as shown in Burr's book. There is a vertical rod in the center of the room, this may be for aligning frames.

1. Reproduce the frame jig and false faces for vise.

SMALL TOOLS

Very few hand tools appear in the two 1897 photos and the list in Burr is very basic. One tool that is quite unique to this class of work is a set of bicycle screw plates (tap & dies), these are long and slightly tapered to cut threads that fit very tight. They were used on bicycles where parts rattled loose before the invention of the lock washer. If this is of interest for interpretation it may be worth finding one of these fairly rare sets, see appendix F.

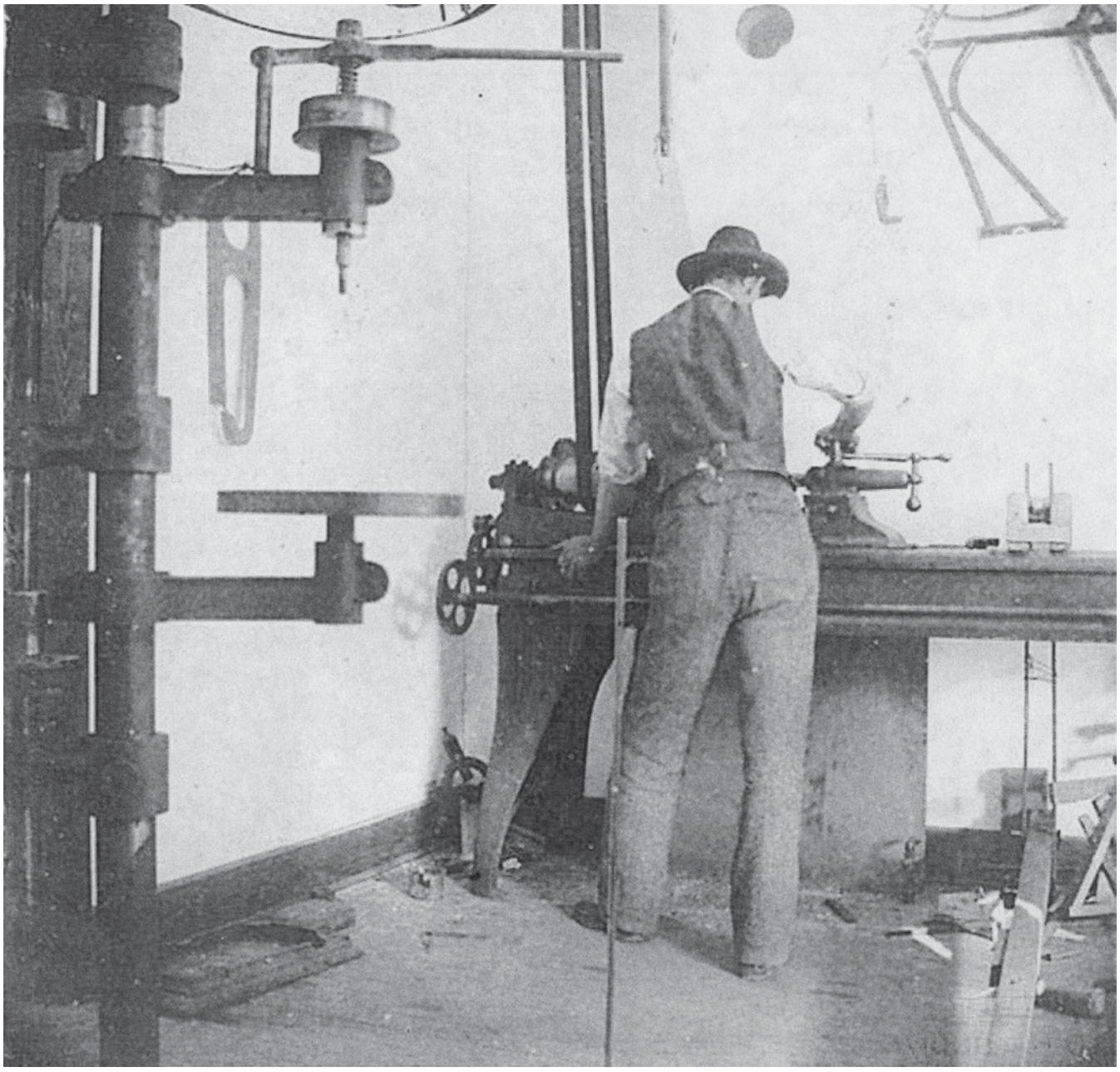
1. Acquire tools shown in photos
   - hack saw
   - bit brace
   - files
   - 6" outside calipers
   - lathe dog
   - lathe tool post wrench
2. Acquire tools described by Burr
   - assorted taps,dies and screw plates of bicycle sizes
   - assorted drills and reamers under 3/4"
   - hand and breast drill
   - drill and thread gauges
   - bullpen, riveting, hide faced and lead hammers
   - mallet
   - pin or hand vise
   - assorted wrenches, both fixed and adjustable
   - assorted pliers and wire cutters
   - oil cans

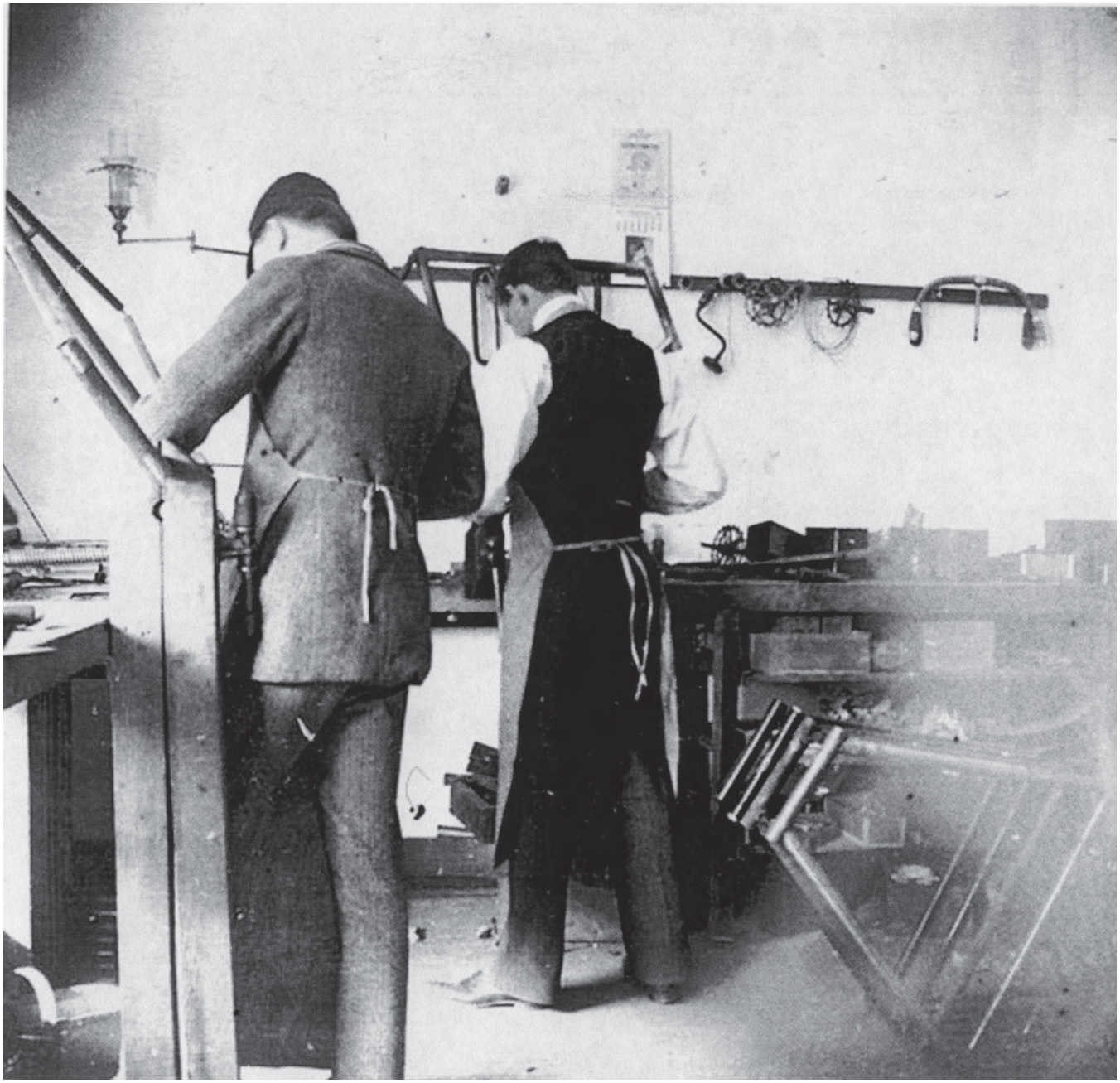
belt punch
inside calipers
dividers
C-clamps
2' rule
assorted screwdrivers
punch and chisels
oil stone
assorted files
brazing set up with air source

3. Acquire based on shop practice or other information
   tubing cutter
   tape measure (the Wrights used a number of these based on the 1909 inventory indicating it was their measuring tool of choice)

This report is limited to the tools and machinery and does not include shop clutter, boxes, ephemera and cycle parts.

Appendix G is a proposed plan for the shop.





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.
56 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 intrepretering 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 an 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."

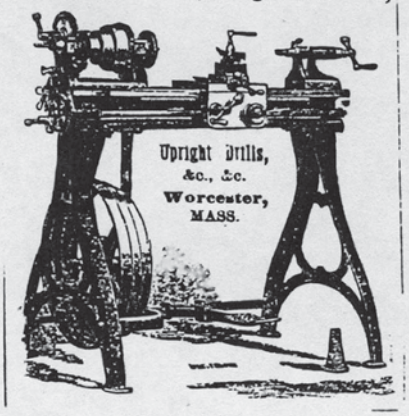
Typed--

"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

PHOTOCOPIED FROM ORIGINALS IN THE
RESEARCH CENTER, HENRY FORD MUSEUM
& GREENFIELD VILLAGE, DEARBORN, MI.

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



1880

Improved "Prentice" Lathe.

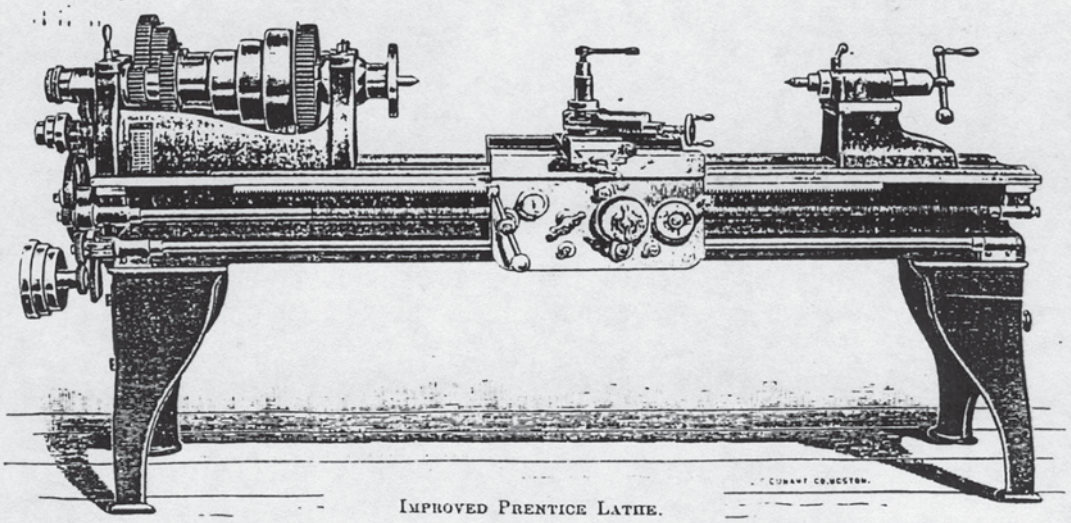
With this we give an illustration of a lathe which has recently been brought out by Prentice Brothers, of Worcester, Mass.

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.

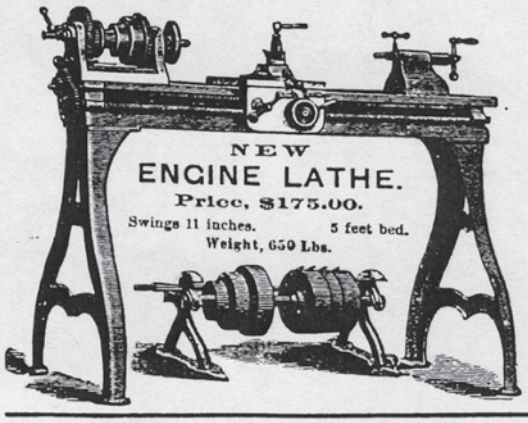
The apron contains an open and shut nut, used in screw cutting; friction connections for lateral and cross-feed; and a sliding pinion for the lateral feed. The sliding pinion is to throw the feed connections out of gear, when cutting screws, and there is no annoyance from revolving handles. A receptacle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



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.

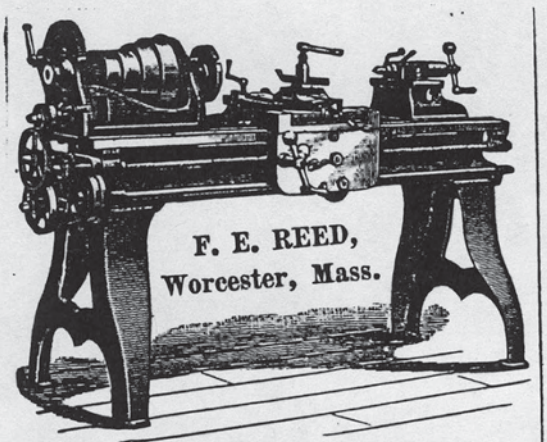
SLIDE RESTS.

Special Machinery and Machine Jobbing.

FOOT POWER LATHES A SPECIALTY.

54 Hermon Street
WORCESTER, MASS.

1880



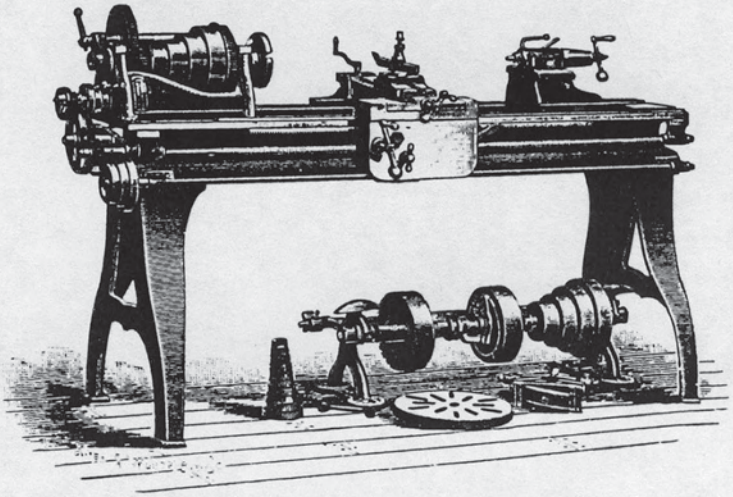
ENGINE Lathes, Hand Lathes, Foot Lathes, Upright Drills, and Milling Machines. Agents, MANNING, MAXWELL & MOORE, 111 LIBERTY STREET, NEW YORK.

1886

60

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 1¾ inches in diameter and 3½ 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



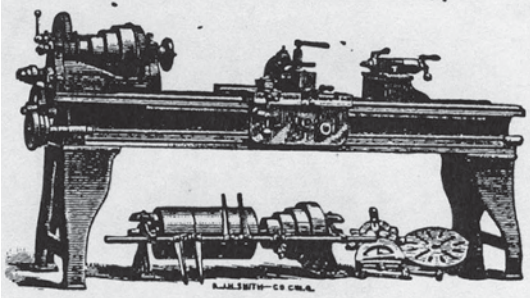
NEW FOURTEEN INCH LATHE.

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.

1888

Putnam Engine Lathes.

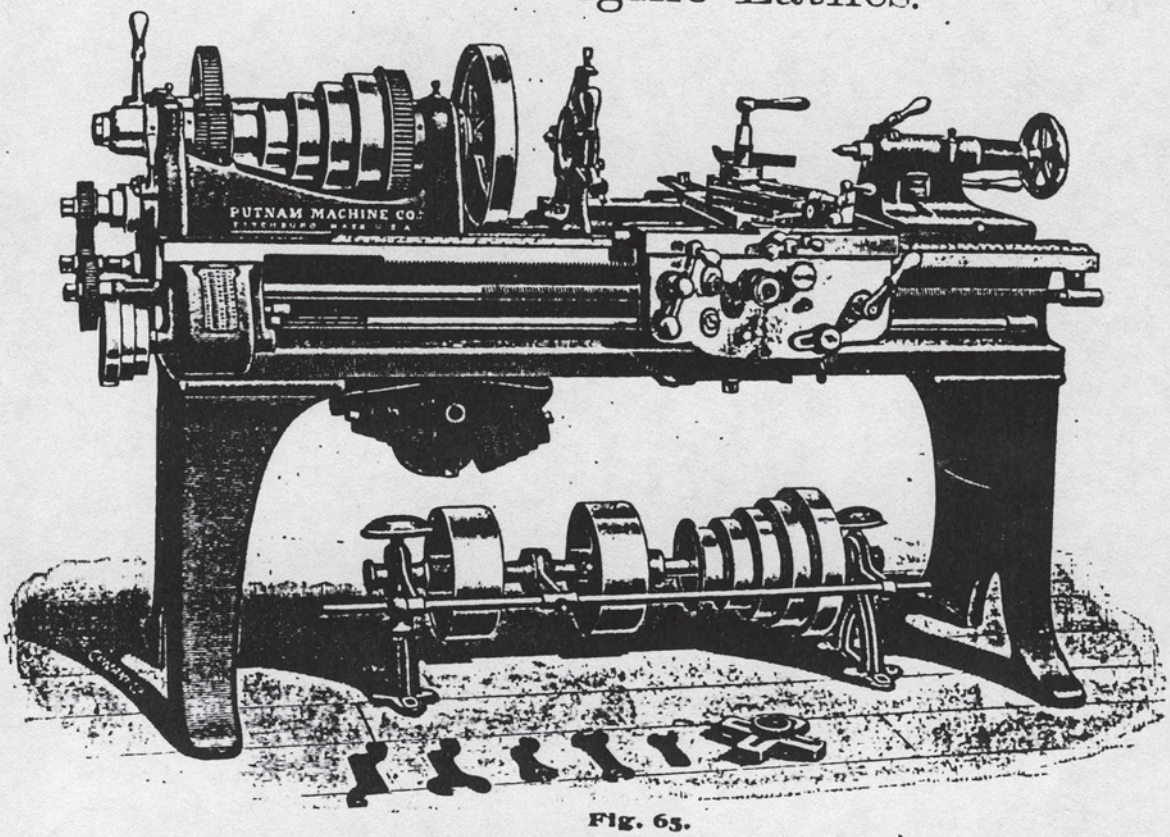


Fig. 65.

14-INCH SWING.

NEW PATTERN. PUTNAM ENGINE LATHES.

Hollow Spindle, Screw Cutting, Compound Gib 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

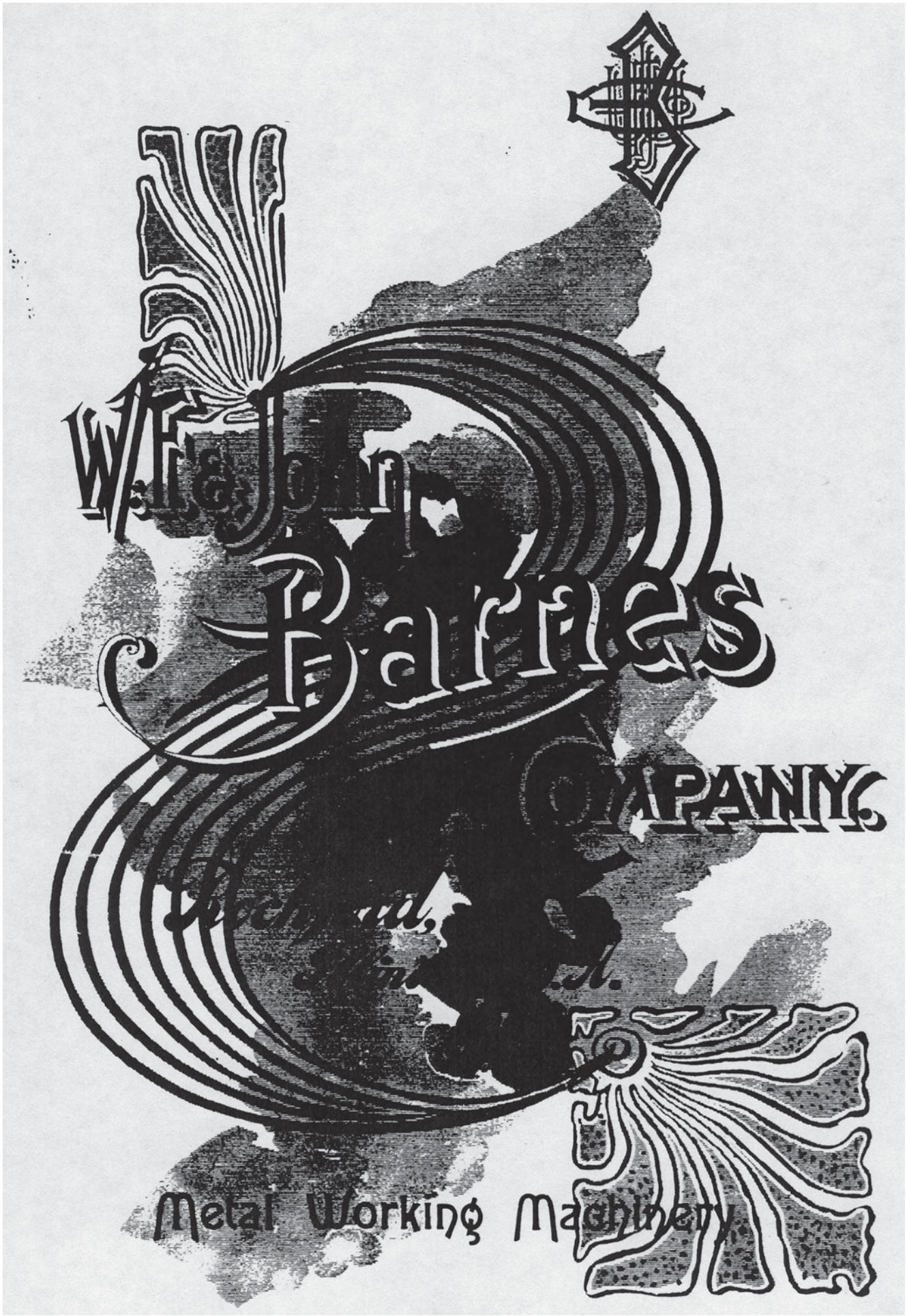
Description of 14-inch swing, same as 12-inch swing, with these exceptions: Swing diametrical over elevating rest, 6¼ inches; Compound rest, 8½ inches; Taper rest, 7¼ inches; Countershaft—friction pulleys, 95 revolutions per minute, reversing speed, 105 revolutions per minute.

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, 5¼ inches: compound rest, 7½ inches; taper rest, 6¼ inches. Important to state the kind of tool rest wanted. Compound rest, raise and fall rest (code Elevating), plain rest. Taper attachment, Universal, only when ordered, additional weight, 100 pounds. Price, $.... Countershaft—Friction pulleys, 8 inches diameter, 3⅛-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, ½ inch x⅞ inch stock, in sets. Price, $.... Hollow Spindle .... inch hole. Back rest, open three-jawed. Price, $.... Follower rest, price, $ ... Stop motion, price, $

1899


W. F. & John
Barnes
COMPANY
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 5¼ inches.
Diameter of spindle 1⅜ inches.
Vertical travel of spindle 9¾ inches.
Diameter of large pulley on cone 8 inches.
Diameter of small pulley on cone 3¾ 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.

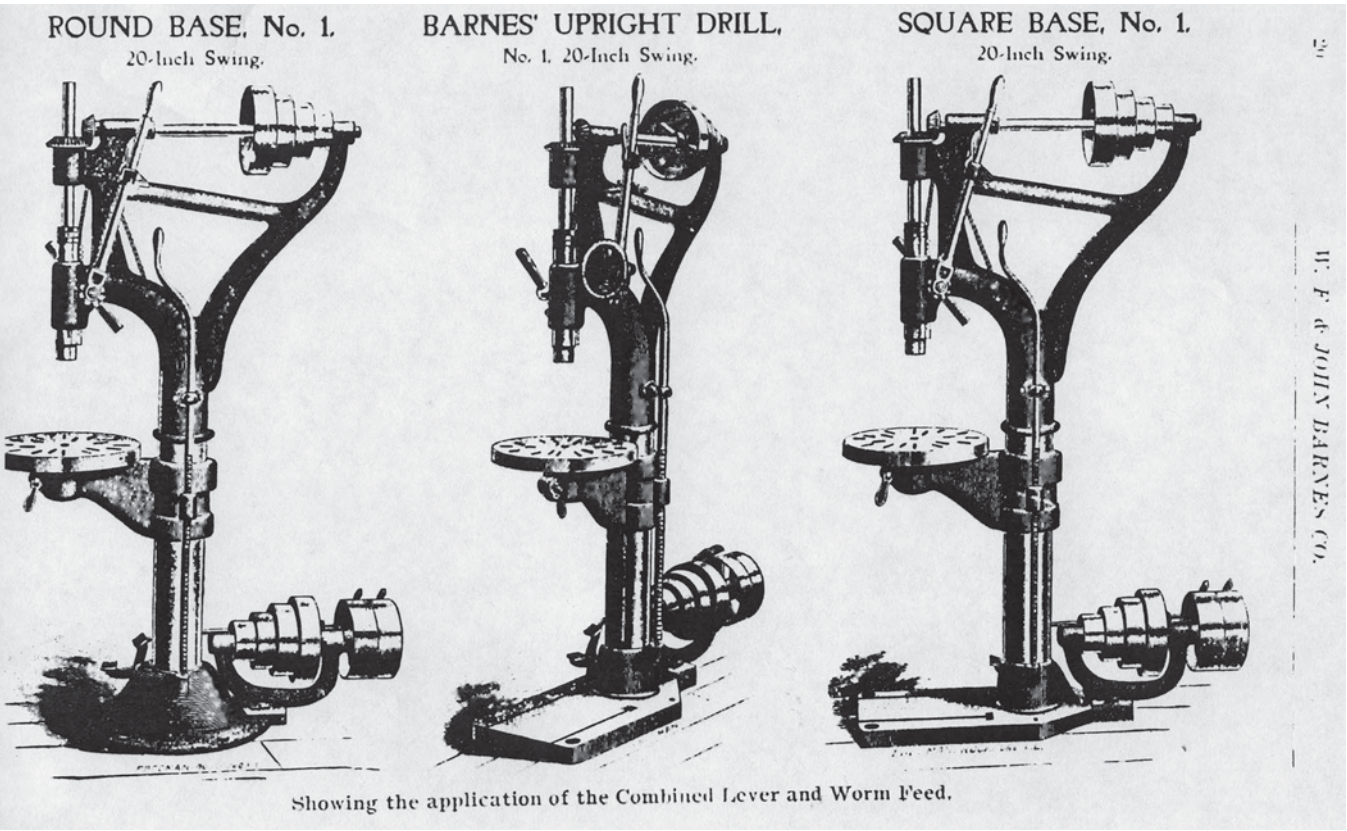
The tight and loose pulleys on countershaft should be speeded 200.

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.

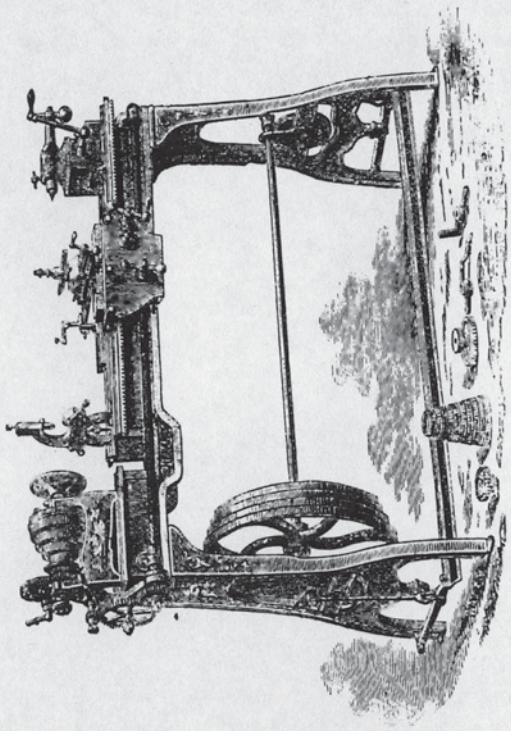
Weight, 500 pounds.

Prices quoted on application.



Showing the application of the Combined Lever and Worm Feed.


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 20x4.

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

SHEPARD'S BACK-GEARED SCREW CUTTING FOOT LATHE.

Price, $165.00, with Cap 20x4.

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.

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 gap 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 $1\frac{1}{2}$ 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 $\frac{5}{8}$ inch hole clean through, so that ram-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 hunt 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 complete 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.	Ind. Stud	Stud.	Screw.	No. Threads	Stud.	Ind. Stud.	Screw.
5	40	40	11	20	44	22	2 to 1	20	44	44	20	4 to 1	44
$5\frac{1}{2}$	40	44	12	20	48	24	2 to 1	20	48	48	20	4 to 1	48
6	40	48	13	20	52	26	2 to 1	20	52	52	20	4 to 1	52
$6\frac{1}{2}$	40	52	14	20	56	28	2 to 1	20	56	56	20	4 to 1	56
7	40	56	15	20	60	30	2 to 1	20	60	60	20	4 to 1	60
$7\frac{1}{2}$	40	60	16	20	64	32	2 to 1	20	64	64	20	4 to 1	64
8	40	64	17	20	68	34	2 to 1	20	68	68	20	4 to 1	68
$8\frac{1}{2}$	40	68	18	20	72	36	2 to 1	20	72	72	20	4 to 1	72
9	40	72	19	20	76	38	2 to 1	20	76	76	20	4 to 1	76
$9\frac{1}{2}$	40	76	20	20	80	40	2 to 1	20	80	80	20	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 Centre	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.

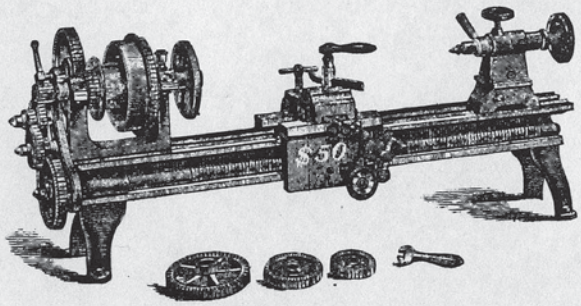
SELF-CROSS FEED LATHE.

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 10½ 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.

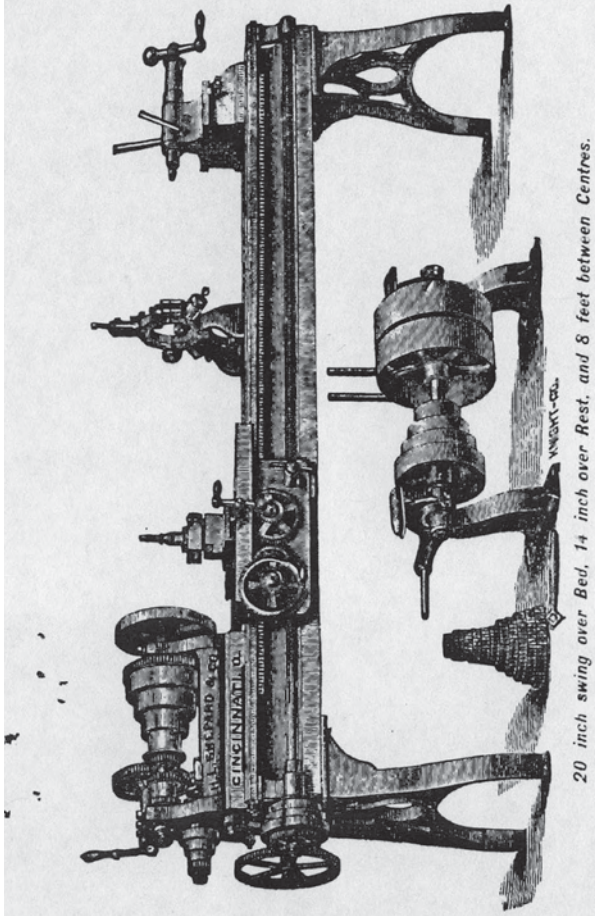
Hand Rest for wood turning, for $30.00, $60.00 or $80.00 Lathe, $1.50.

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.

SCREW-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 pullies for counter-shaft, so as to run Lathe backwarks 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

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.

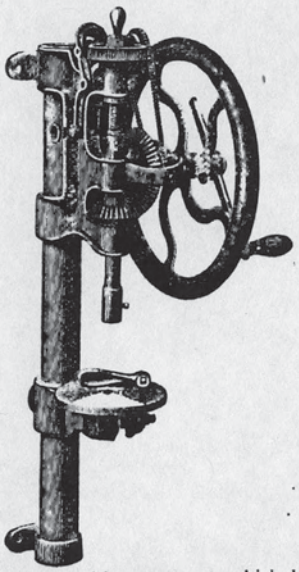
We have added to this Lathe an automatic stop that will chase a screw or turn up to wherever stop may be set.

Price	$500.00
Boxing and Shipping	5.00

Weight of Lathe, 2,500 Pounds.

UPRIGHT SELF-FEEDING DRILLING MACHINE.

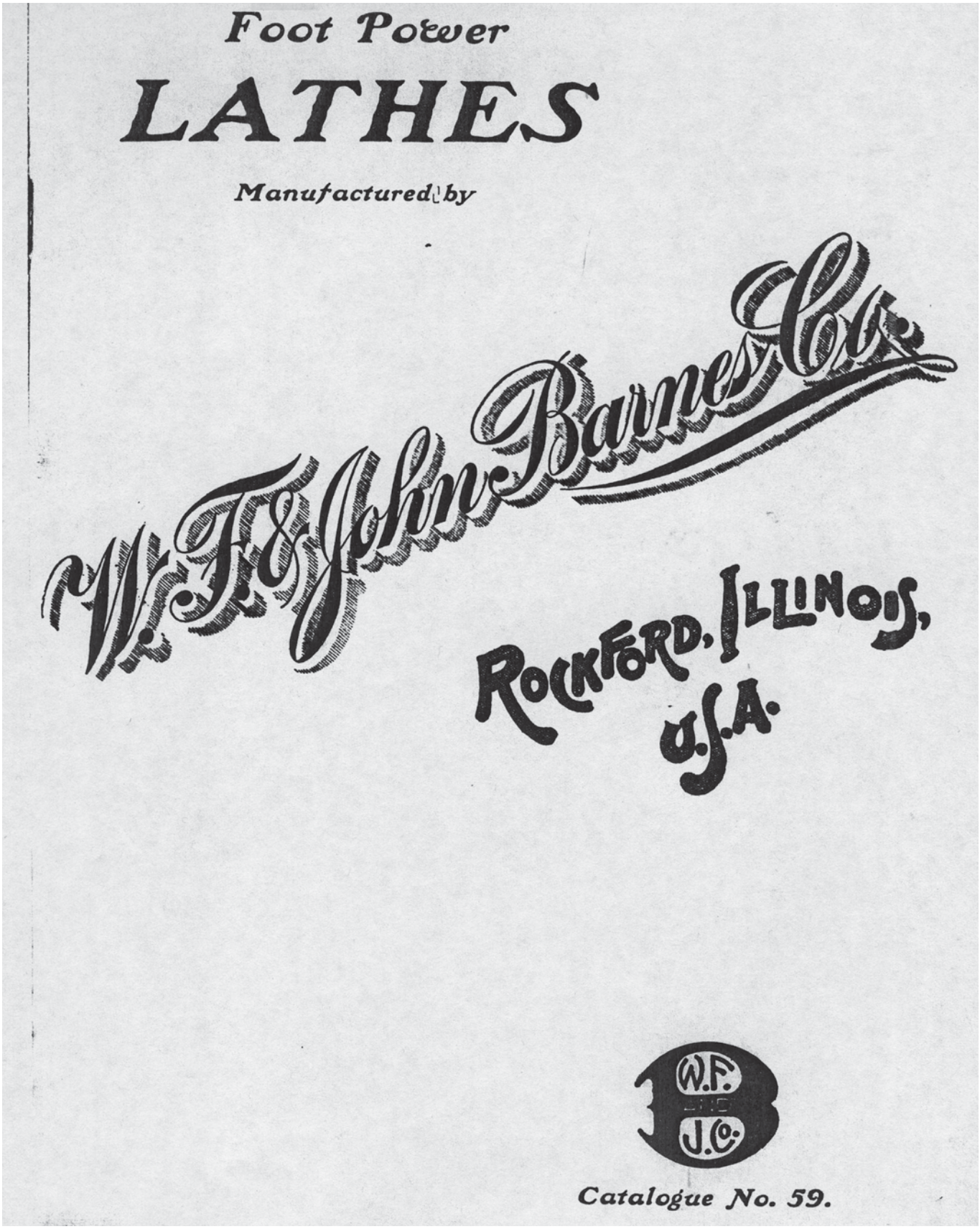
Drills From 1-8 to 3-4 Inch Hole.



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 ar usefulness.

Weight about 110 pounds.

Price $30.00. Arranged for power, $3.00 extra


Foot Power
LATHES
Manufactured by
W. F. & John Barnes Co.
Rockford, Illinois,
U.S.A.
W.F. AND J.C.
Catalogue No. 59.

Screw Cutting Engine Lathe No. 13.

Automatic Cross Feed and Compound Rest. 13-inch Swing.

THIS lathe corresponds in dimensions to the No. 5½ Lathe, but differs from it in having a splined screw, giving rod feed for turning, reserving the screw for thread cutting only; also it has AUTOMATIC CROSS FEED and COMPOUND REST.

72

With our patent velocipede foot power, motion can be started, stopped or reversed instantly, at the will of the operator, and greater power can be applied on the work than with any old style foot power and with greater ease.

The head-stock has a hollow steel spindle that will take a half-inch rod through its entire length. The boxes are accurately fitted to the spindle, with provision to keep them true and take up wear. The tail-stock can be readily set at any desired point, or taken altogether from the lathe bed, without removing nuts or bolts.

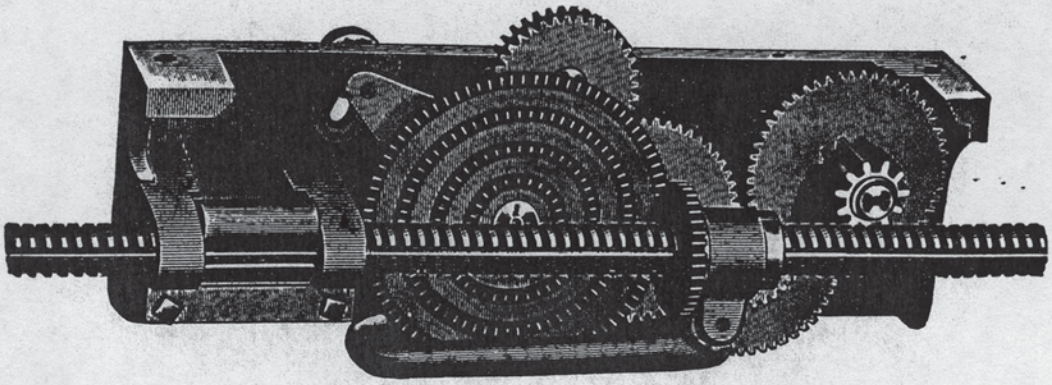
It can also be set over for turning tapers. The spindles for both head and tail stocks are of steel, with positively true taper holes for the reception of the centers, and the tail-stock center is self-discharging. The tool carriage is a model of convenience and accuracy and is gibbed to the bed.

All the works are securely protected from chips and dirt, thus insuring long wear and durability to the most costly and vital parts of the lathe. It is indexed for threads 4 to 32, and the change gears furnished can be combined for many other threads.

We call particular attention to the feed arrangements in this lathe. In the full view of lathe (see opposite page) at the lower right hand corner of the tool carriage apron is a slot; in this slot is a lever, which is also shown in the rear view of the apron (see illustration below). This lever moved to the right or left gives a great range of feed, graduating instantly from coarse to fine or vice versa. With this lever the feed can be instantly reversed. It also serves the cross feed of the tool carriage in the same manner.

If plain rest is wanted instead of compound rest, it can be furnished at a reduction of $12.00 from list price. Plain rest for No. 13 Lathe, however, does not swivel as on No. 4½, 5 and 5½ Lathes.

Extras, such as follower rest, hand rest, raising blocks and countershaft, are same price as those used on the No. 5½ Lathe.



This cut shows Feed Arrangement in Tool Carriage.

Lathe No. 13.

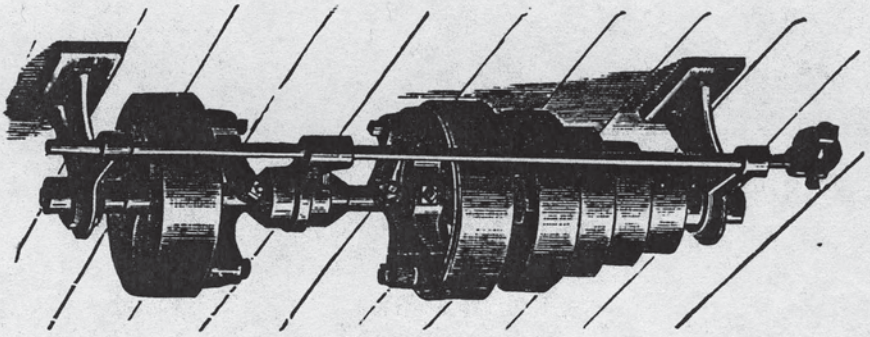
Automatic Cross Feed and Compound Rest.

Length of Bed.	Distance between Centers.	Swing on Face Plate.	Swing over Tool Carriage.	Hollow through Spindle.	Weight of Lathe	Weight Boxed.	Price.
5 ft.	33 in.	13 in.	8 in.	17-32 in.	640 lbs.	775 lbs.	$152 00
6 ft.	45 in.	13 in.	8 in.	17-32 in.	690 lbs.	850 lbs.	162 00
7 ft.	57 in.	13 in.	8 in.	17-32 in.	740 lbs.	890 lbs.	172 00
8 ft.	69 in.	13 in.	8 in.	17-32 in.	790 lbs.	950 lbs.	182 00
10 ft.	93 in.	13 in.	8 in.	17-32 in.	850 lbs.	1050 lbs;	202 00

Price advances $5.00 where Countershaft is taken in place of Foot Power.

We can furnish blocks for raising head and tail stocks and tool post to make swing of lathe 18 inches for turning and boring.

Price of Raising Blocks, $15.00.



The above cut represents a Friction Clutch Countershaft for No. 13 Lathe.

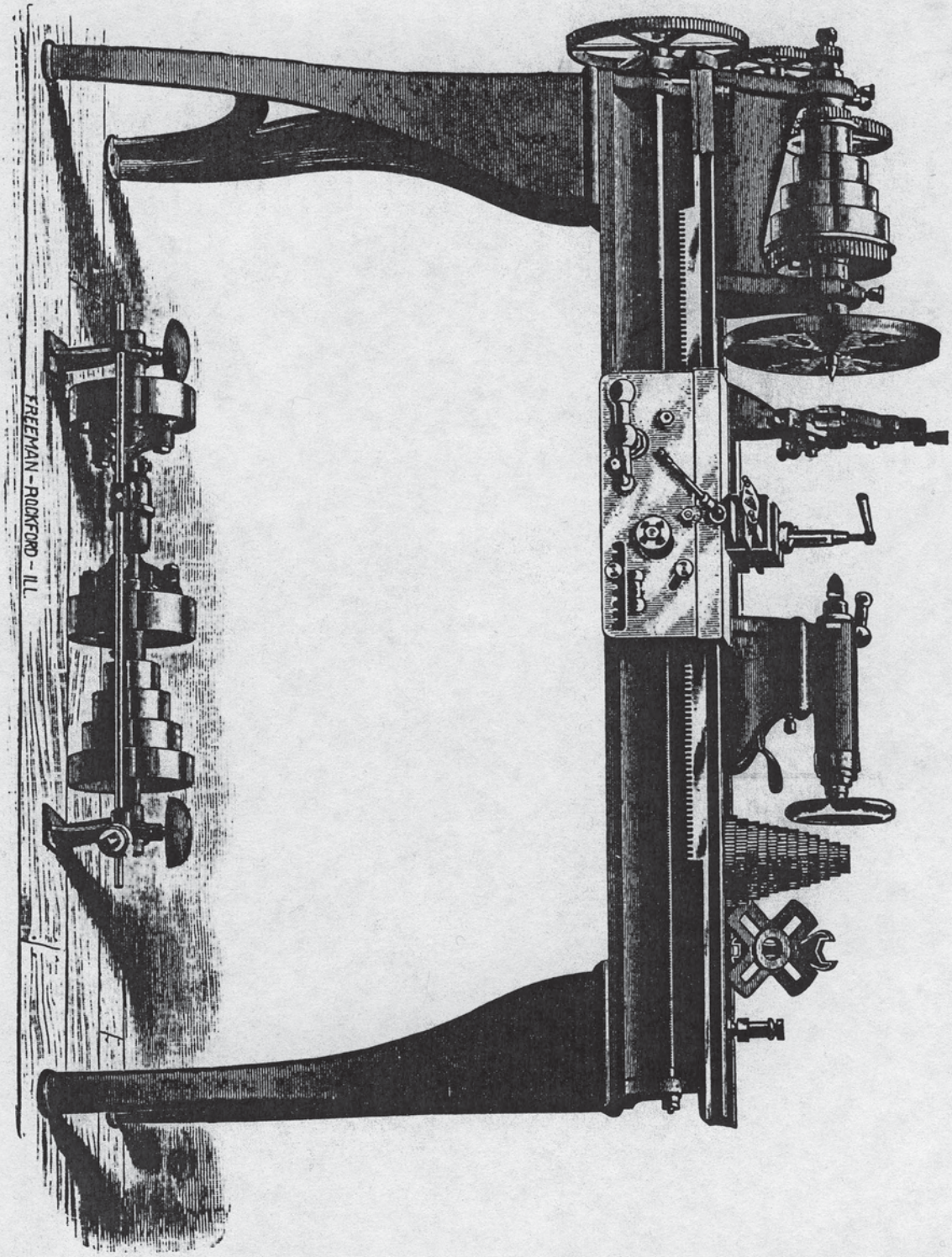
The pulleys on this countershaft are 7x2 inches, and should be speeded 225.

Price of Countershaft, $20 00.

Lathe No. 13.

Automatic Cross Feed and Compound Rest.

13-inch Swing.

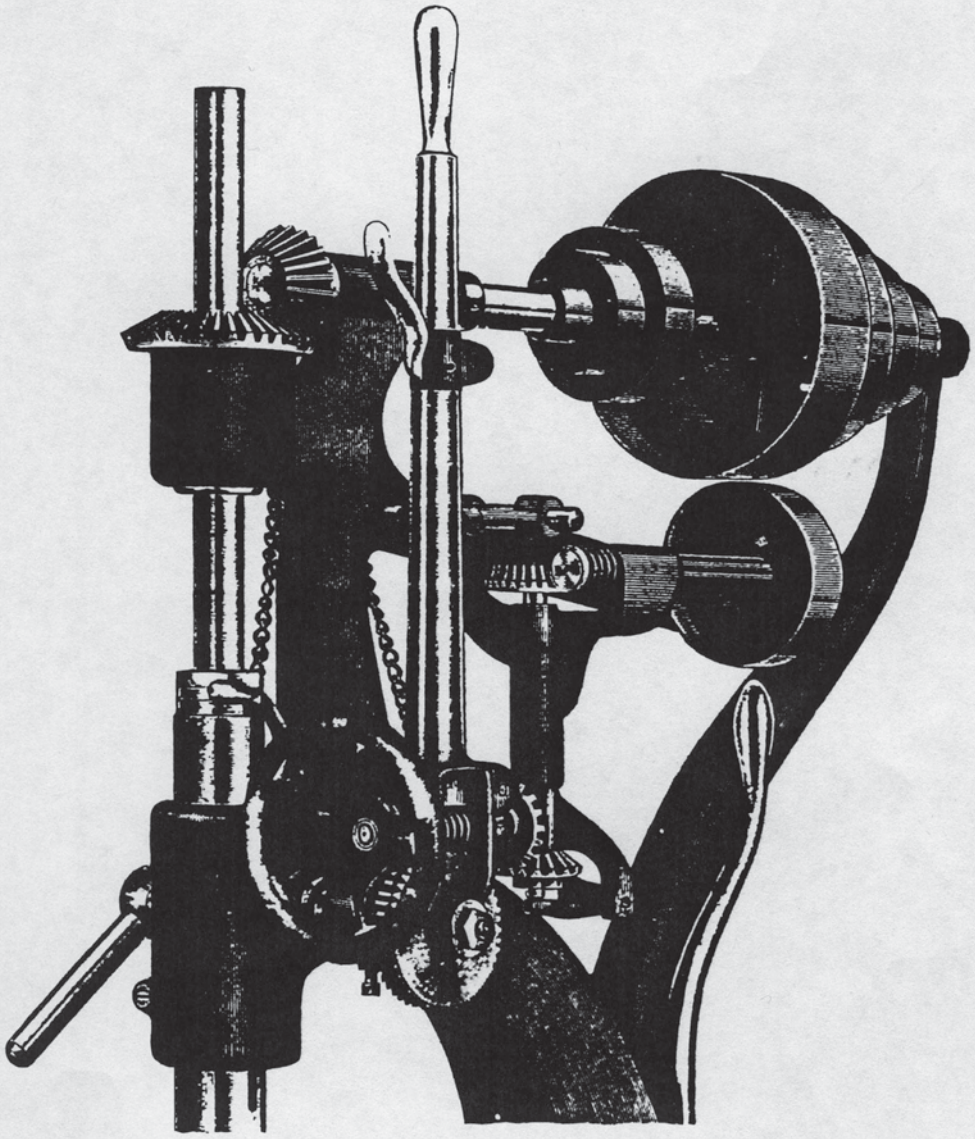


The cut on this page shows the No. 13 Lathe with Countershaft instead of Foot Power.

	With Foot Power.	With Counter-shaft.	With both Foot Pwr and Counter-shaft.	Extra cost Com-pound Rest.	Extra cost Raising Blocks.	Extra cost Follow Rest.	Extra cost Hand Rest	Extra cost Milling Gear At-tachm't.	Approx-imate Shipping Weight in lbs.
No. 4 Lathe	$ 40 00	$ 40 00	$ 55 00	.....	.....	.....	.....	.....	265
No. 4 Bench Lathe	30 00	40 00	.....	.....	.....	.....	.....	.....	100
No. 4½ Lathe	65 00	65 00	80 00	$ 8 00	$10 00	$2 50	$2 50	.....	350
No. 4½ Bench Lathe	55 00	65 00	.....	8 00	10 00	2 50	2 50	.....	175
No. 5 Lathe (regular bed)	90 00	90 00	105 00	10 00	10 00	3 00	3 00	.....	485
No. 5 Lathe (long bed)	95 00	95 00	110 00	10 00	10 00	3 00	3 00	.....	545
No. 5 Bench Lathe	80 00	90 00	.....	10 00	10 00	3 00	3 00	.....	340
No. 5 Bench Lathe (long bed)	85 00	95 00	.....	10 00	10 00	3 00	3 00	.....	360
No. 5½ Lathe (5-ft. bed)	125 00	130 00	145 00	12 00	15 00	4 00	3 50	$75 00	890
No. 5½ Lathe (6-ft. bed)	135 00	140 00	155 00	12 00	15 00	4 00	3 50	75 00	960
No. 5½ Lathe (7-ft. bed)	145 00	150 00	165 00	12 00	15 00	4 00	3 50	75 00	990
No. 5½ Lathe (8-ft. bed)	155 00	160 00	175 00	12 00	15 00	4 00	3 50	75 00	1080
No. 5½ Lathe (10-ft. bed)	175 00	180 00	195 00	12 00	15 00	4 00	3 50	75 00	1264
No. 13 Lathe (5 ft. bed)	*152 00	*157 00	172 00	*.....	15 00	4 00	3 50	75 00	890
No. 13 Lathe (6-ft. bed)	*162 00	*167 00	182 00	*.....	15 00	4 00	3 50	75 00	960
No. 13 Lathe (7-ft. bed)	*172 00	*177 00	192 00	*.....	15 00	4 00	3 50	75 00	990
No. 13 Lathe (8-ft. bed)	*182 00	*187 00	202 00	*.....	15 00	4 00	3 50	75 00	1080
No. 13 Lathe (10-ft. bed)	*202 00	*207 00	222 00	*.....	15 00	4 00	3 50	75 00	1264

*This price includes the Compound Rest and Automatic Cross Feed. If Lathe is wanted without the Compound Rest then deduct $12.00 from list price. (Remember the Plain Rest on No. 13 Lathe does not swivel like on the No. 5½, 5 and 4½ Lathes.)

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

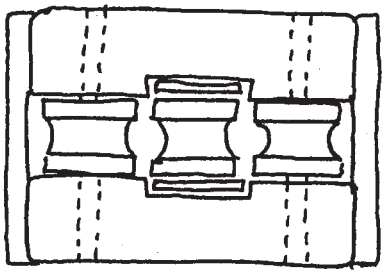


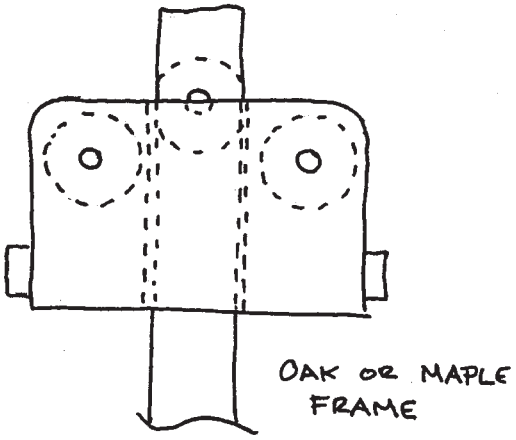
This cut shows the application of self feed and automatic stop to our 20-inch Drill, and we confidently claim that we are offering in this Drill the best tool of its size ever placed on the market.

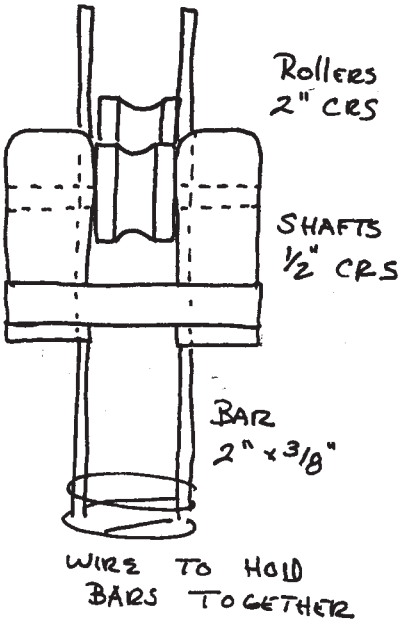
The arrangement of the parts as shown by the cut gives the following feeds: Lever Feed; Hand Worm Feed; Power Self Feed; Automatic Stop; Quick Return.

The combination of parts by which these are effected allows each feed to be used independently of the others and without requiring any

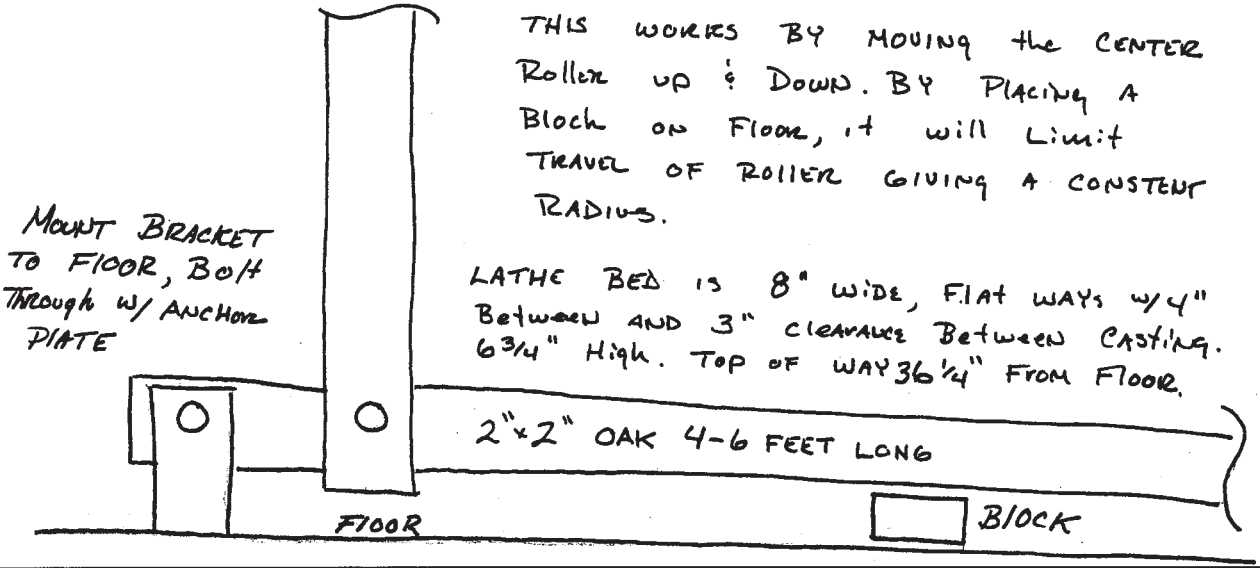
1/4" = 1"

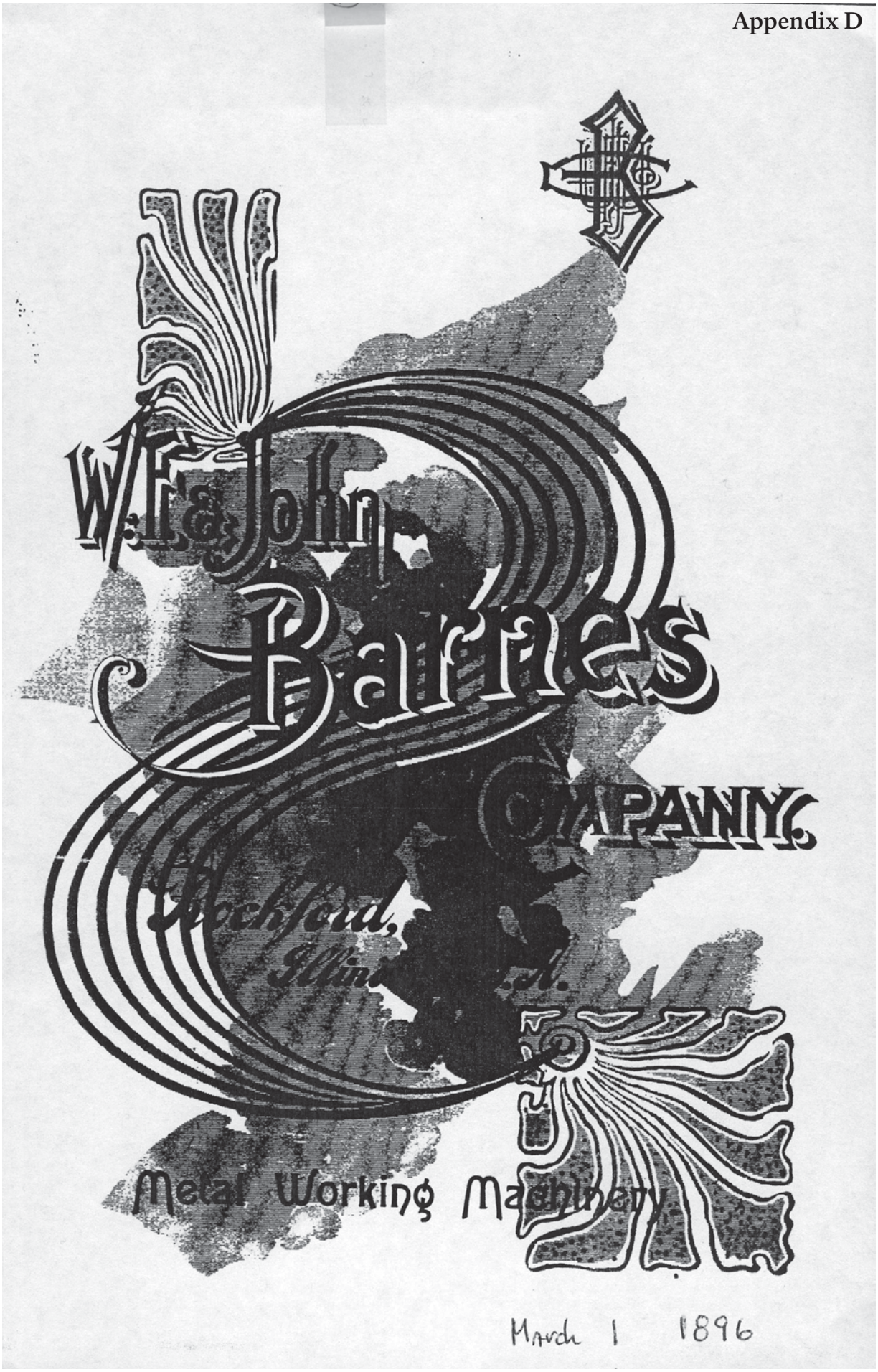




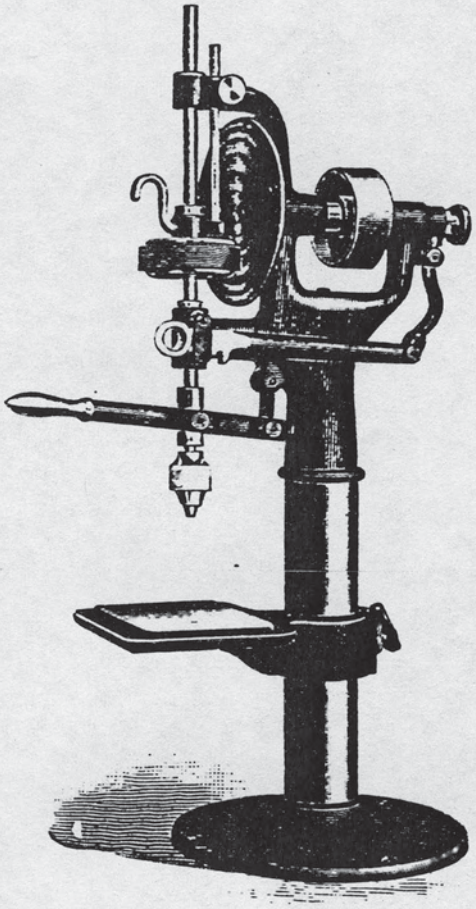


BENDING FIXTURE TO MOUNT ON LATHE
IN THE WRIGHT BROS. WORKSHOP




W. F. & John
Barnes
COMPANY.
Rockford,
Illinois, U.S.A.
Metal Working Machinery
March 1 1896

Bench Friction Disk Drill.



This drill we have recently brought out to meet the demand for a smaller drill embodying the same driving principle and other features of our column Friction Disk Drill, and the points of superiority we claim for that drill will be found in this—it is built on the same lines but of smaller size and capacity and for use on the bench instead of on the floor.

CAPACITY AND DIMENSIONS.

It will drill from 0 to ¼ inch, and to the center of an 8 inch circle.

Greatest height from base of drill to spindle, 16 inches.

Greatest height from platen to spindle, 12 inches.

Distance from column to spindle, 4 inches.

Diameter of column, 3 inches.

Diameter of spindle, $\frac{13}{32}$ inch.

Vertical travel of spindle, 2 inches.

Size of table, 5x7½ inches.

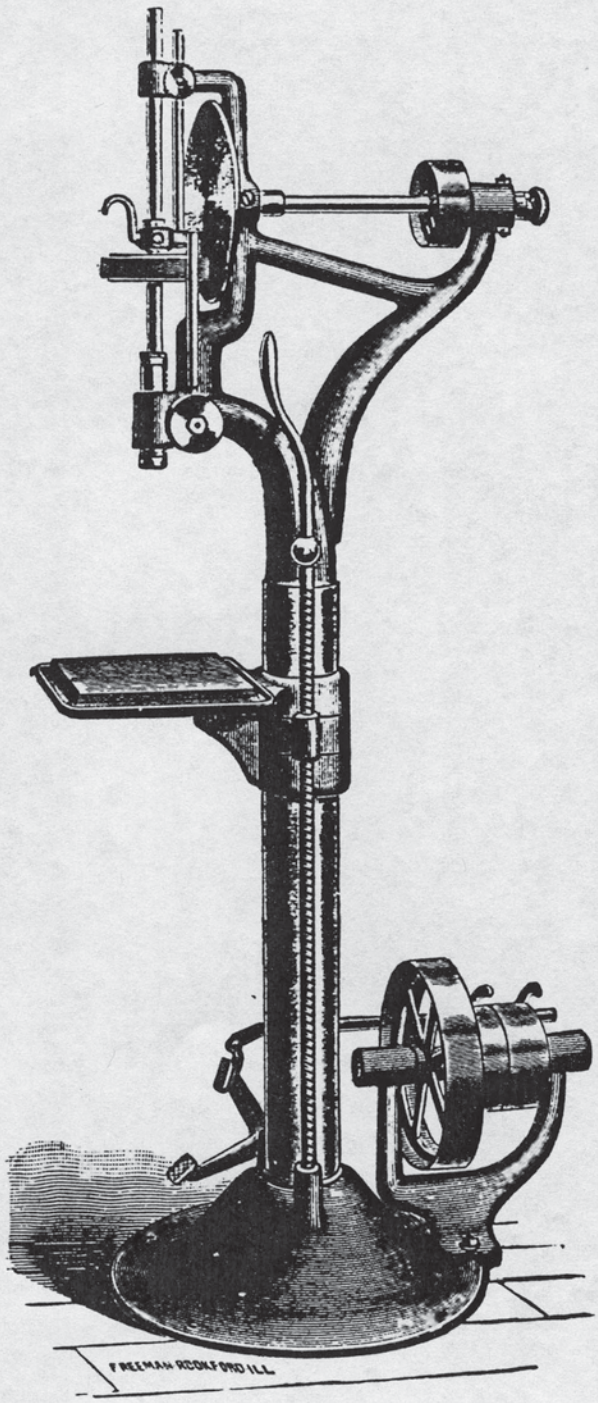
Size of driving pulley on upper horizontal shaft, 4x1½ inches.

Speed, 0 to 1,600 revolutions.

Weight, 70 lbs.

The cut shows drill chuck fitted to spindle, but it will of course be understood that the chuck is not included with the drill. We advise for use with the drill the $\frac{5}{16}$ Almond Chuck. Prices quoted on application.

Barnes' Friction Disk Drill.



This new drill embodies principles not found in other tools of its class, and is simpler in construction, and more effective in operation than any drill for light work on the market.

The speed of the drill spindle can be increased or diminished instantly, or the motion reversed, without stopping machine or shifting belts.

More or less driving power can be applied to the drill spindle, as the size of the drills or the nature of the work may demand.

The feed lever is provided with a very sensitive adjustment, which with the perfect control of the operator over the speed and power, makes it possible to use the smallest drills with the least possible danger of breakage.

By a hand screw within convenient reach, the platen or table can be moved rapidly on the column, and can be clamped firmly at any desired height.

The workmanship throughout is first-class, and the material used the best for the purpose. All bearings and wearing surfaces are especially fitted for durability, and ample provision is made for taking up wear.

We claim, therefore, for this drill, superiority both is simplicity of construction, which renders it less liable to derangement, and in effectiveness of operation on account of the variations of speed and power being so completely under the control of the operator, whereby all the adjustments are made with the least possible loss of time. It is smooth and almost noiseless in operation, and entirely free from the viabratory motion commonly found in drills of this class, where the spindle is driven by belt.

For all the uses for which such a drill is required, we believe ours to be unequalled.

Capacity and Diamensions.

It will drill from 0 to 5-16 inches.

And to center of 10 inch circle.

Greatest height from base of drill to spindle 46 inches.

Greatest height from platen to spin dle, 36 inches.

Distance from column to spindle, 5 inches.

Diameter of column, 3½ inches.

Diameter of spindle, ¾ inch.

Size of table, 10x14 inches.

Vertical travel of spindle, 3½ inches.

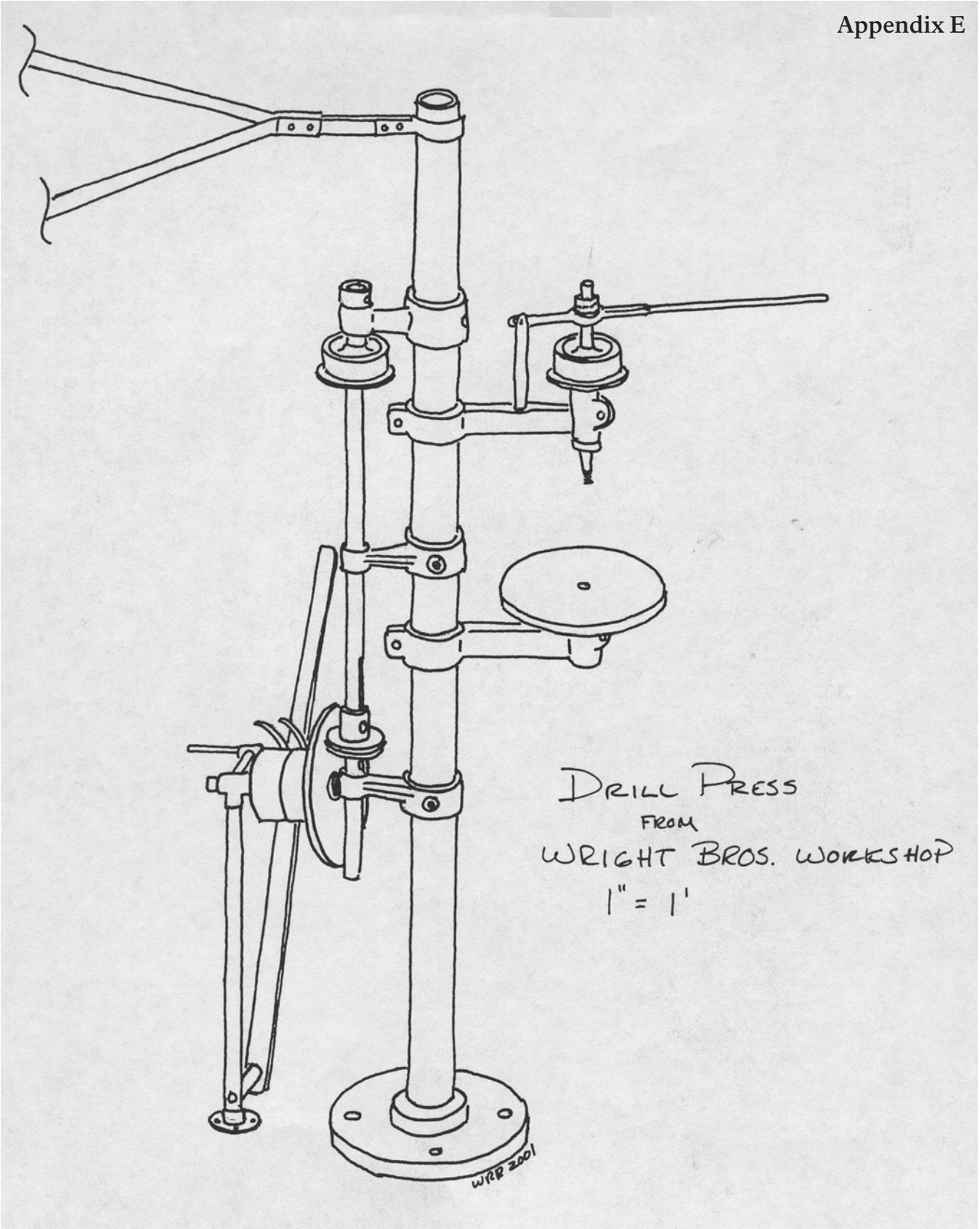
Tight and loose pulleys, 5x2 inches.

The tight and loose pulleys should be speeded 350.

Speed, 0 to 1,600 revolutions.

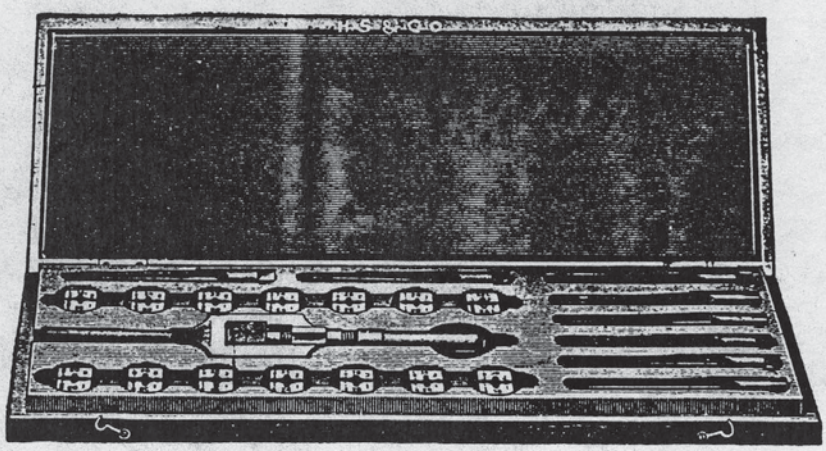
Weight, 170 pounds.

Prices quoted on application.


DRILL PRESS
FROM
WRIGHT BROS. WORKSHOP
1" = 1'
WRB 2001

HAMMACHER SCHLEMMER & CO
NEW YORK. 247

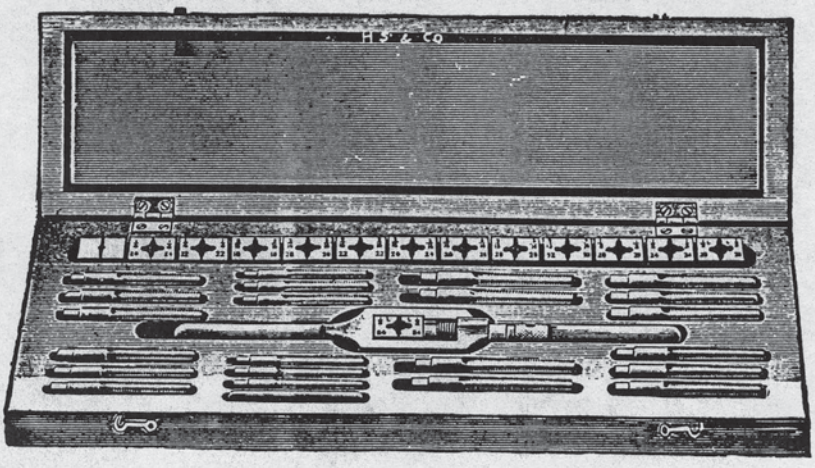
BICYCLE SCREW-PLATES



No. 2½P. Stock 11½ in. long, 10 pairs dies, 1 tap-wrench die and 8 bicycle taper-taps, cutting ¼, $\frac{5}{16}$ and ⅜ x 20, 22, 24, 26, 28, 30, ½ x 20, 24 R. H. and ½ x 20, 24 L. H.....Per set, $18.00

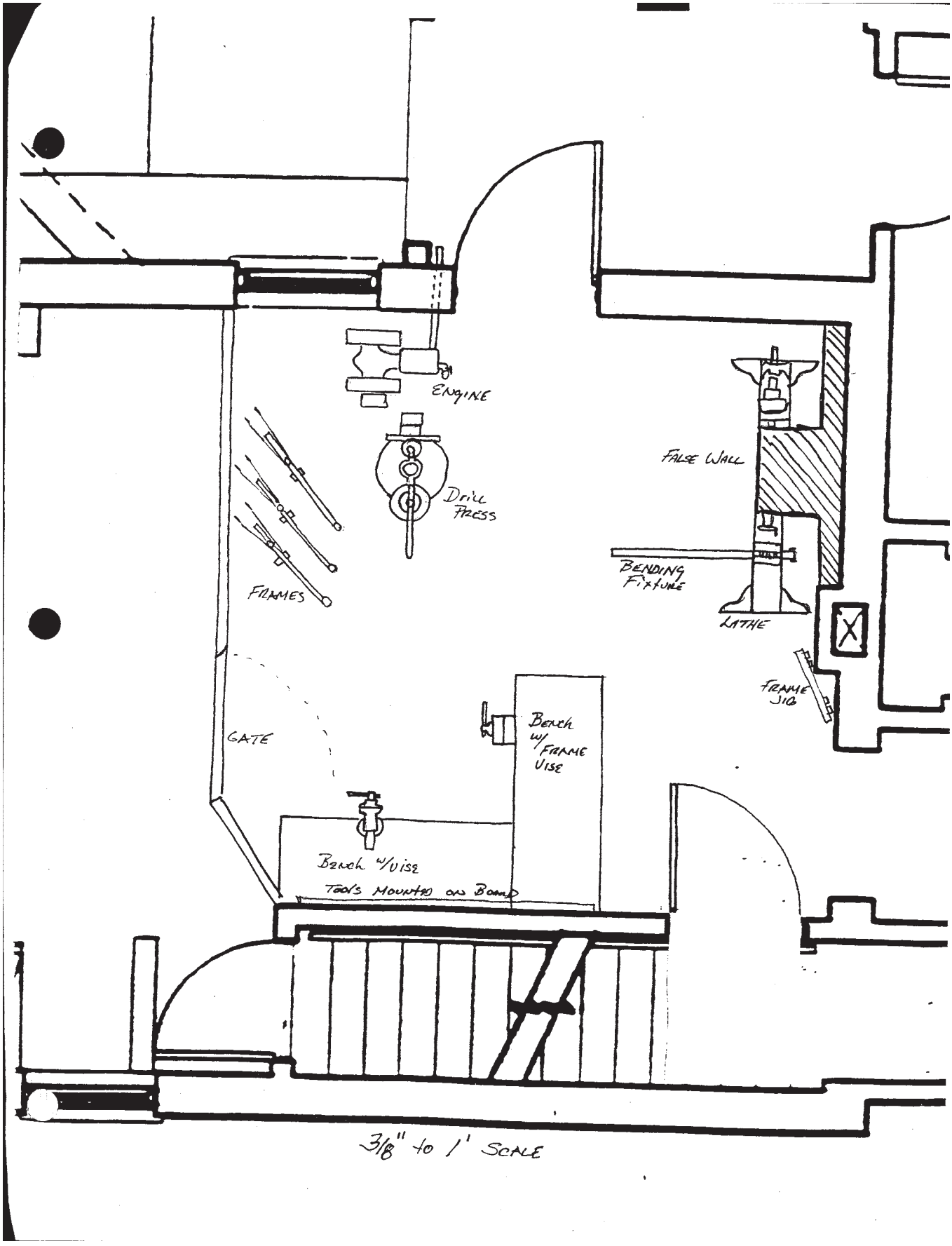
No. 2½Q. Stock 11½ in. long, 14 pairs dies, 1 tap-wrench die and 8 bicycle taper-taps, cutting ¼, $\frac{5}{16}$, ⅜, $\frac{7}{16}$ and ½ x 20, 22, 24, 26, 28, 30 R. H., ½ x 20, 24 L. H..... " 20.75

No. 2½R. Stock 11½ in. long, 8 pairs dies, 1 tap-wrench die and 8 bicycle taper-taps, cutting ⅜, $\frac{7}{16}$ and ½ x 20, 22, 24, 26, 28, 30 R. H., ½ x 20, 24 L. H..... " 16.25



No. 99. Stock 12 in. long, 14 pairs dies, cutting ¼ x 24, 32; $\frac{5}{16}$ x 18, 20, 22, 24, 26, 28, 32; ½ x 20, 24 R. H.; ½ x 20, 24 L. H.; 1 pair tap-wrench dies, 22 bicycle taper-taps, cutting ¼ and $\frac{5}{16}$ x 20, 22, 24, 26, 28, 32; ⅜ x 18, 20, 22, 24, 26, 28; ½ x 20, 24 R. H.; ½ x 20, 24 L. H. The dies can be adjusted to cut $\frac{1}{16}$ in. larger or smaller.....Per set, $20.00

See Discount Sheet


ENGINE
DRILL PRESS
FRAMES
FALSE WALL
BENDING FIXTURE
LATHE
FRAME JIG
GATE
BENCH W/ FRAME VISE
BENCH W/VISE
TOOLS MOUNTED ON BOARD
3/8" to 1' SCALE

Appendix 2: Orville Wright to Mr. Fred L. Black, The Edison Institute, November 4, 1937, The Henry Ford Research Center

8-10-73

ORVILLE WRIGHT
DAYTON, OHIO

November 4, 1937.

Mr. Fred L. Black,
The Edison Institute,
Dearborn, Michigan.

Dear Mr. Black:

When I was at Greenfield Village last week I made a list of several things on which information was desired. I am giving the best information I have on these points:

MONEY DRAWER SHELF. 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.

SHOW WINDOW SCREEN. I am sending a sketch showing the general plan of construction of the frame for the screen. If I remember correctly it was made of 1/4 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 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.

PHOTOCOPIED FROM ORIGINALS IN
RESEARCH CENTER, HENRY FORD M
& GREENFIELD VILLAGE, DEARBOR

COLORS IN STORE ROOM. I do not remember whether you have paper on the walls of the store room. 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.

After seeing the results of trying to copy what was on the walls thirty-five years ago, in the decorating of the house, I hesitate to suggest following that plan further. As the exact papers and paints can not now be found I believe the best plan is simply to use paints and papers that harmonize.

COLOR OF OFFICE PARTITION. The walls of the partition were of the same color as the other woodwork in the room. I believe the color you now have on the woodwork is about as it was. The frame of the partition was of a light maroon or mahogany color.

12" wide room

UPSTAIRS FRONT ROOM SHOP. I believe I gave Mr. Ryan a photograph of this room last June. Mr. Taylor and Mr. Cutler 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.

WIND-TUNNEL. I think the plans for the wind-tunnel had better be held up until I can have time to furnish sketches of the instruments used in it.

On my return to Dayton I found that the horses used for supporting the drawing board were taken away from here with the drawing board and other pieces of furniture, etc., last July 16th.

The drawings of the engine have just come in since I started this letter. I will look them over and report within a day or two, if I find important errors.

Thank you for the copies of the "Herald".

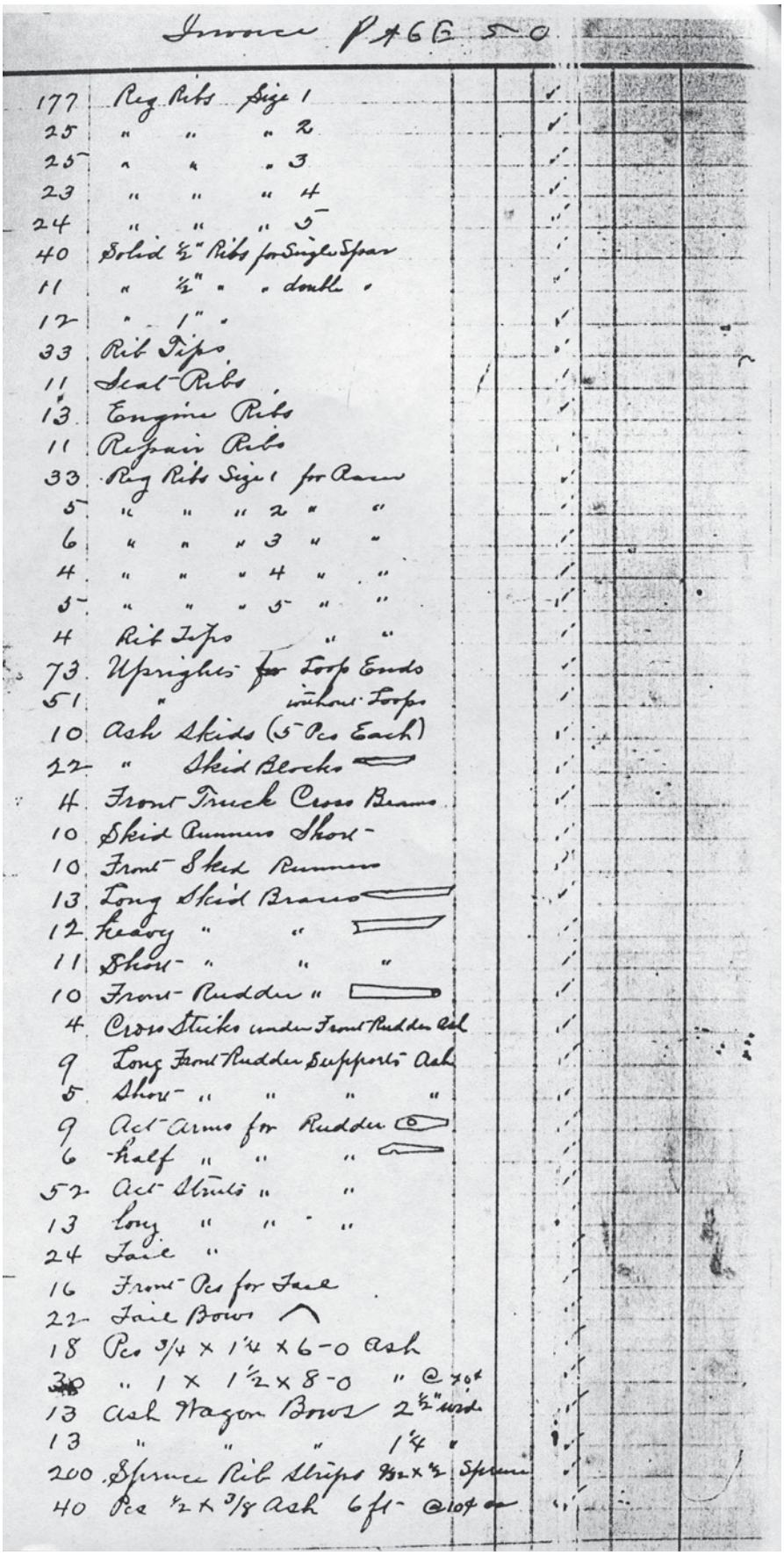
Sincerely yours,

Orville Wright

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RESEARCH CENTER, HENRY FORD M
& GREENFIELD VILLAGE, DEARBOR

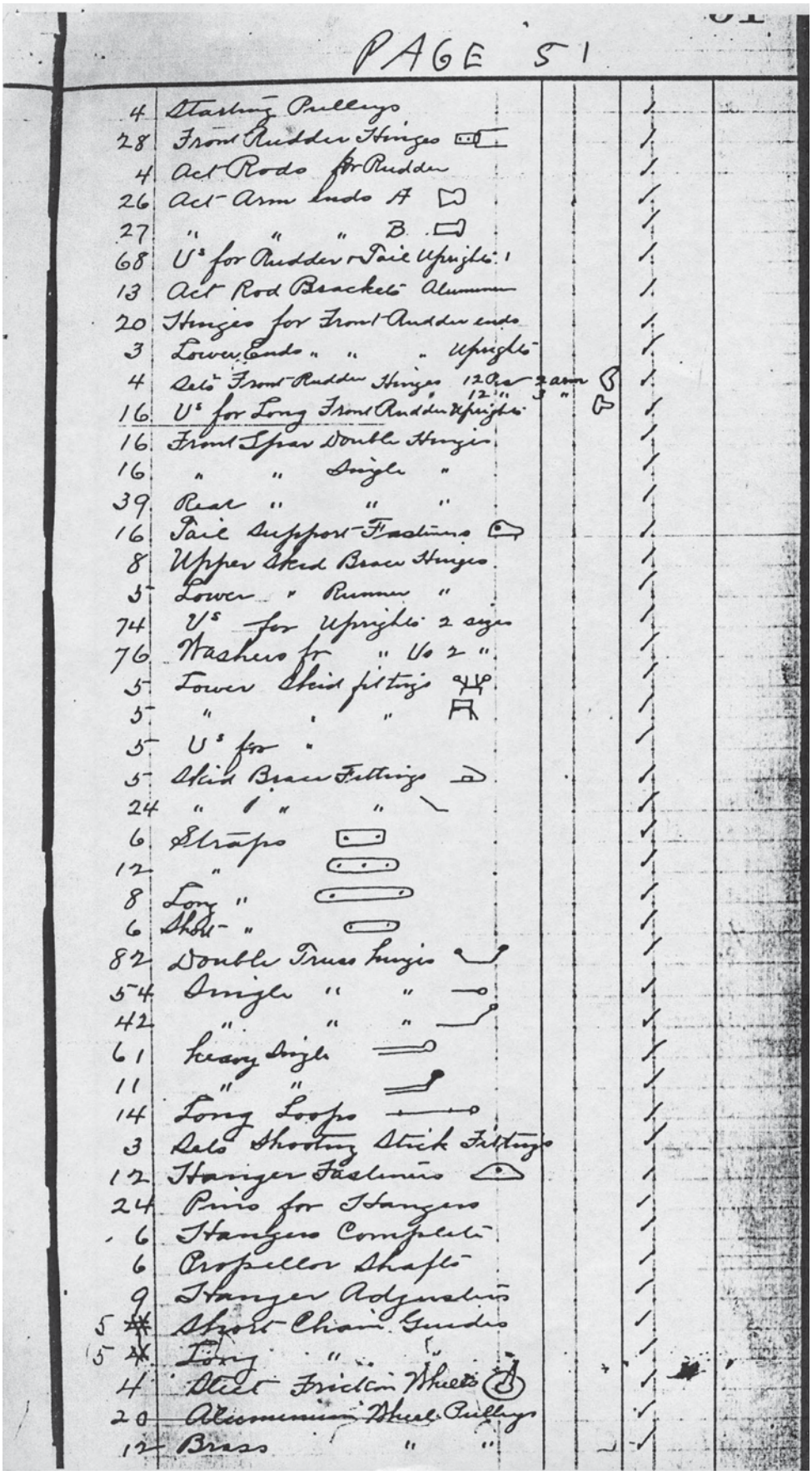
(Floor)
Sunroom
Show window seen sketch
Nov 4, 1937
REPRODUCED FROM THE COLLECTIONS OF THE
PHOTOCOPIED FROM ORIGINALS IN THE
RESEARCH CENTER, HENRY FORD MUSEUM
& GREENFIELD VILLAGE, DEARBORN, MI.

Appendix 3: 1909 Inventory, Wright Cycle Co., 1127 W. Third Street, Wright Papers, Library of Congress



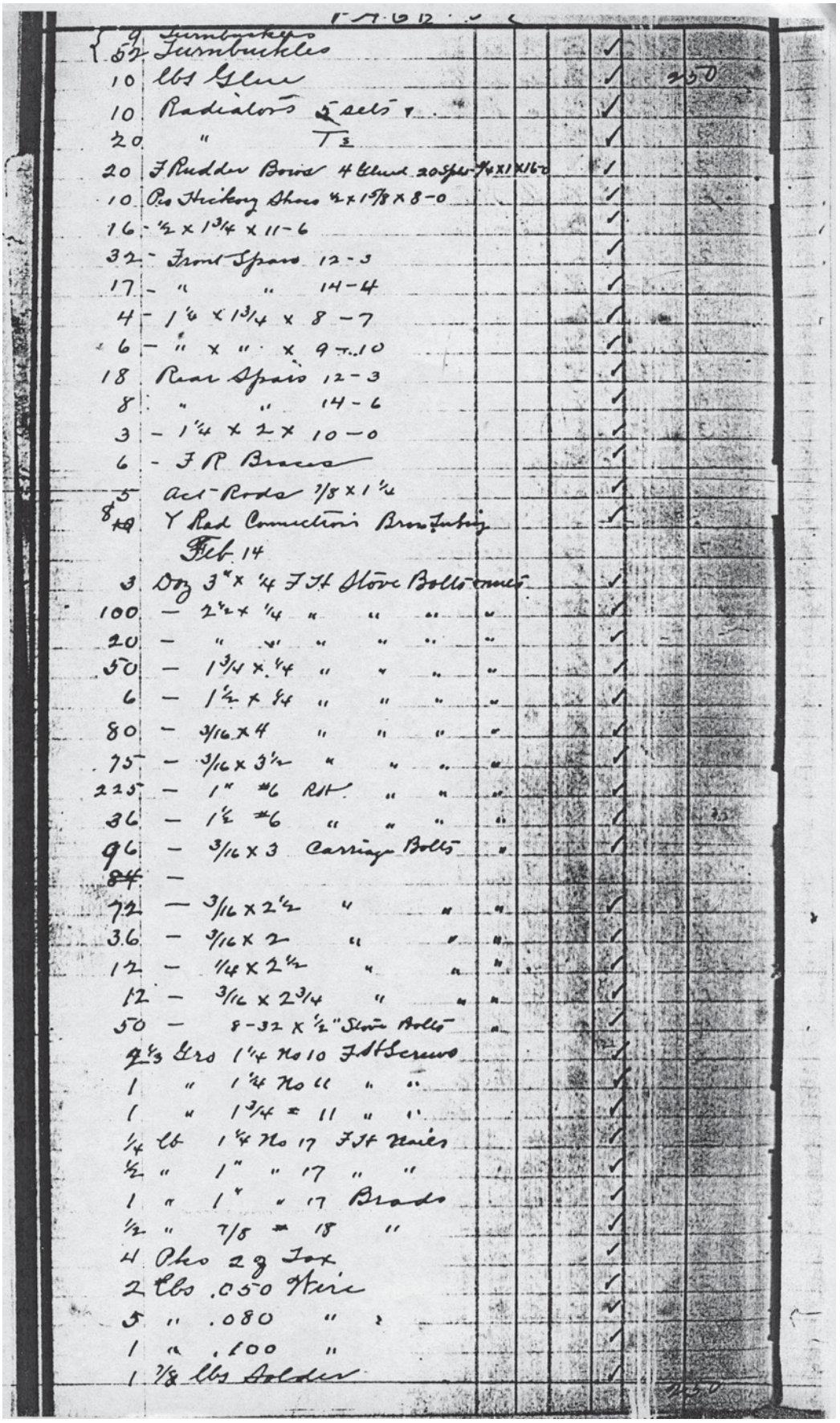
Invoice P#66 5-0

177 Reg Ribs Size 1
25 " " " 2
25 " " " 3
23 " " " 4
24 " " " 5
40 Solid ½" Ribs for Single Spar
11 " ½" " " double "
12 " 1" "
33 Rib Tips
11 Seat-Ribs
13 Engine Ribs
11 Repair Ribs
33 Reg Ribs Size 1 for Rear
5 " " " 2 " "
6 " " " 3 " "
4 " " " 4 " "
3 " " " 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 Beams
10 Skid Runners Short
10 Front Skid Runners
13 Long Skid Braces
12 Heavy " "
11 Short " "
10 Front Rudder "
4 Cross Sticks under Front Rudder Rail
9 Long Front Rudder Supports Ash
5 Short " " " "
9 Rud Arms for Rudder
6 Half " " "
52 Rud Struts " "
13 Long " " "
24 Tail "
16 Front Pcs for Tail
22 Tail Bows
18 Pcs ¾ × 1½ × 6-0 Ash
30 " 1 × 1½ × 8-0 " @ 70¢
13 Ash Wagon Bows 2½" wide
13 " " " 1¼ "
200 Spruce Rib Strips 3/32 × ½ Spruce
40 Pcs ½ × ⅜ Ash 6 ft @ 10¢

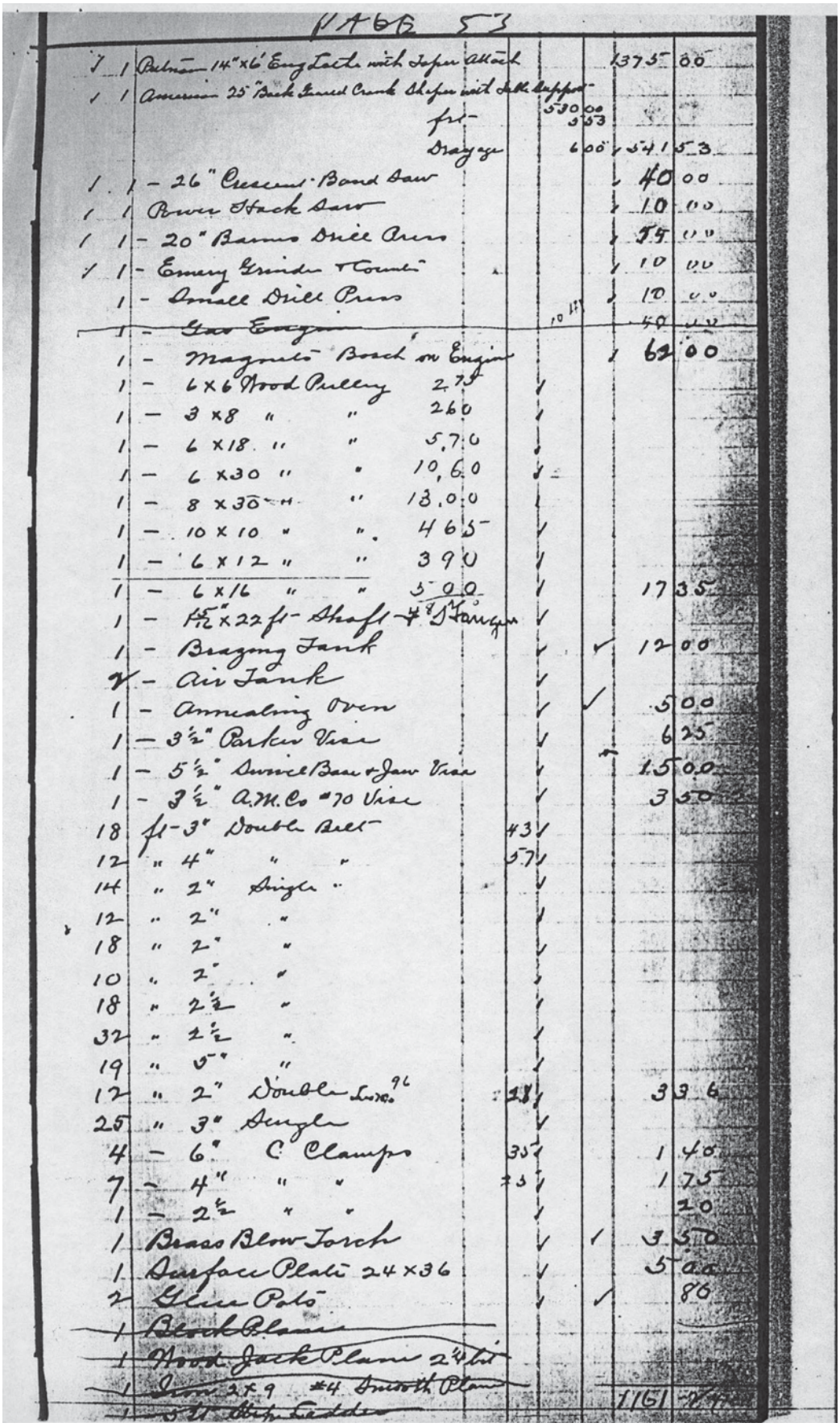


PAGE 51

4	Starting Pulleys
28	Front Rudder Hinges
4	Act Rods for Rudder
26	Act Arm ends A
27	" " " B
68	Us for Rudder & Pair Uprights
13	Act Rod Brackets Aluminum
20	Hinges for Front Rudder ends
3	Lower Ends " " " Uprights
4	Sets Front Rudder Hinges 12 Rs 2 arm
16	Us for Long Front Rudder Uprights 12 " 3 "
16	Front Spar Double Hinges
16	" " Single "
39	Rear " " "
16	Pair Support Fastenings
8	Upper Steel Brace Hinges
3	Lower " Runner "
74	Us for Uprights 2 sizes
76	Washers for " Us 2 "
5	Lower Skid fittings
5	" " "
5	Us 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	Sets Shooting Stick Fittings
12	Hanger Fastenings
24	Pins for Hangers
6	Hangers Complete
6	Propeller Shafts
9	Hanger Adjusters
5 *	Short Chain Guards
5 *	Long " "
4	Steel Friction Wheels
20	Aluminum Wheel Pulleys
12	Brass " "

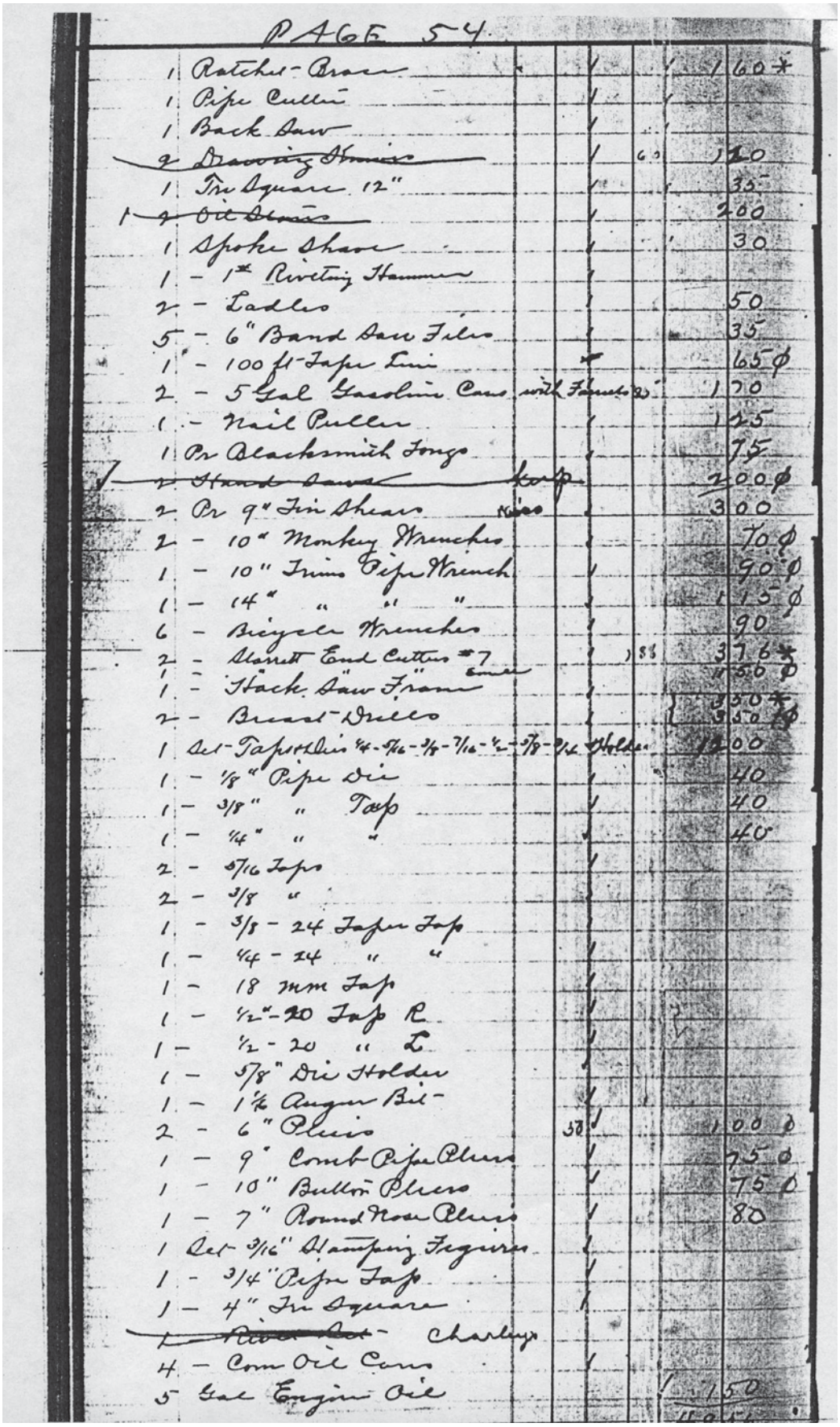


1 Turnbuckles
10 lbs Glue
10 Radials 2 sets
20 " T2
20 F Rudder Bows 4 Glued 20 Spls 3/4 x 1 x 16-0
10 Pcs Hickory Stock 1/2 x 1 5/8 x 8-0
16 - 1/2 x 1 3/4 x 11-6
32 - Front Spars 12-3
17 - " " 14-4
4 - 1 1/4 x 1 3/4 x 8-7
6 - " x " x 9-10
18 Rear Spars 12-3
8 " " 14-6
3 - 1 1/4 x 2 x 10-0
6 - F R Braces
5 Act-Rods 7/8 x 1 1/2
8 Y Rod Connections Bronz Tubing
Feb 14
3 Doz 3" x 1/4 F H Stove Bolts
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 R H " " "
36 - 1/2 #6 " " " "
96 - 3/16 x 3 Carriage 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
2 1/3 Grs 1 1/4 No 10 F H Screws
1 " 1 1/4 No " " "
1 " 1 3/4 " 11 " "
1/4 lb 1 1/4 No 17 F H Nails
1/2 " 1" " 17 " "
1 " 1" " 17 Brads
1/2 " 7/8 " 18 "
4 Ohs 2 g Tax
2 lbs .050 Wire
5 " .080 " "
1 " .100 "
1 7/8 lbs Solder



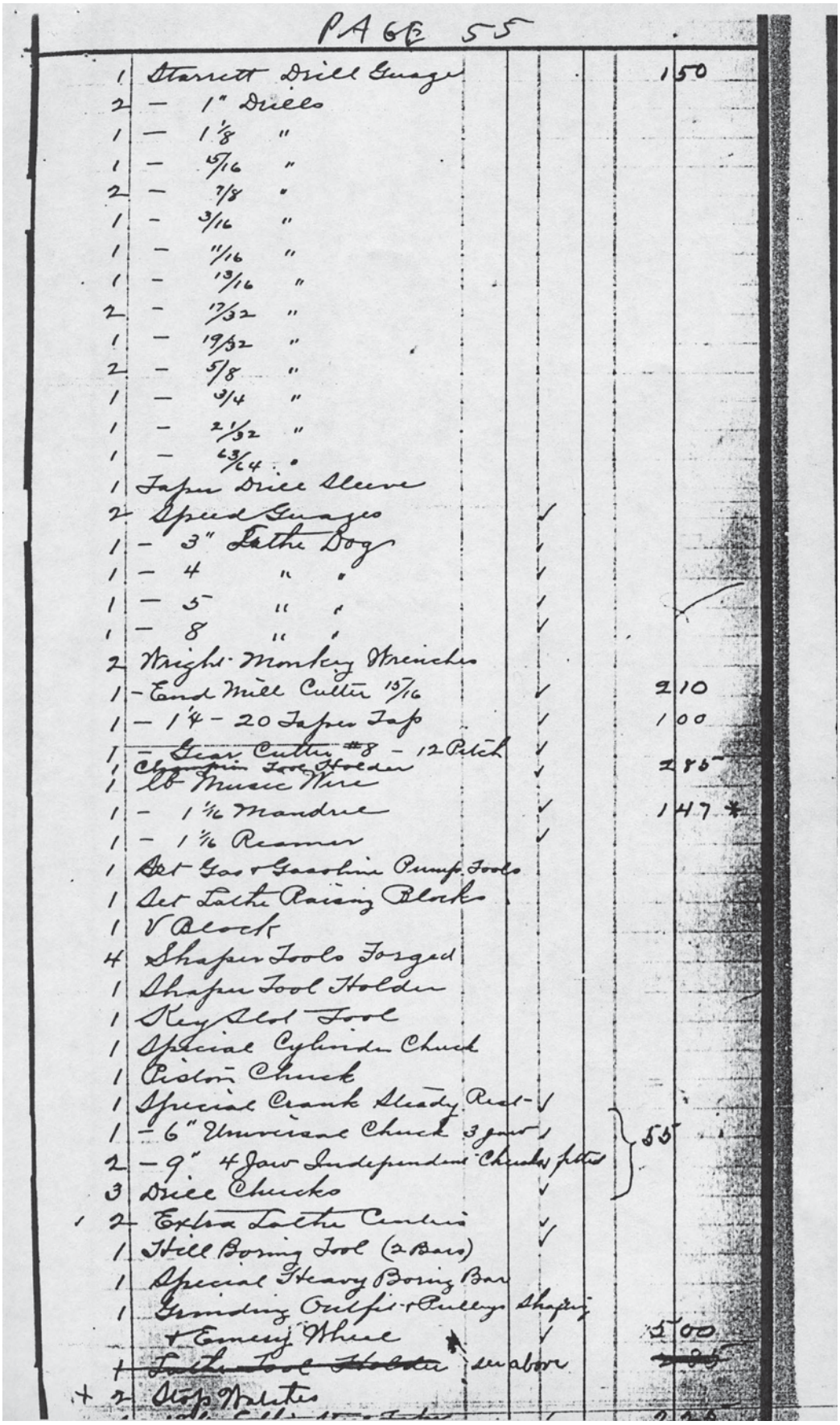
NAB 53

✓	1	Pelton 14" x 6' Eng Lathe with Taper Attach			375	00
✓	1	American 25" Back Geared Crank Shaper with Table Stepped				
		for	300			
		Drayage	6	00	541	53
✓	1	- 26" Crescent Band Saw			40	00
✓	1	Power Hack Saw			10	00
✓	1	- 20" Barnes Drill Press			35	00
✓	1	- Emery Grinder & Counter			10	00
	1	- Small Drill Press			10	00
	1	- Gas Engine			40	00
	1	- Magneto Bosch on Engine			62	00
	1	- 6 x 6 Wood Pulley	2.70	✓		
	1	- 3 x 8 " "	2.60	✓		
	1	- 6 x 18 " "	5.70	✓		
	1	- 6 x 30 " "	10.60	✓		
	1	- 8 x 30 " "	18.00	✓		
	1	- 10 x 10 " "	4.65	✓		
	1	- 6 x 12 " "	3.90	✓		
	1	- 6 x 16 " "	5.00	✓	17	35
	1	- 1 5/16 x 22 ft - Shaft & Hangers		✓		
	1	- Bragony Tank		✓	12	00
✓		- Air Tank		✓		
	1	- Annealing Oven		✓	5	00
	1	- 3 1/2" Parker Vise		✓	6	25
	1	- 5 1/2" Sunnel Bar & Jaw Vise		✓	15	00
	1	- 3 1/2" A.M.Co #70 Vise		✓	3	50
	18	ft - 3" Double Belt	43	✓		
	12	" 4" " "	57	✓		
	14	" 2" Single "		✓		
	12	" 2" "		✓		
	18	" 2" "		✓		
	10	" 2" "		✓		
	18	" 2 1/2 "		✓		
	32	" 2 1/2 "		✓		
	19	" 5" "		✓		
	12	" 2" Double Lace	28	✓	3	36
	25	" 3" Single		✓		
	4	- 6" C Clamps	35	✓	1	40
	7	- 4" " "	25	✓	1	75
	1	- 2 1/2 " "		✓		20
	1	Brass Blow Torch		✓	3	50
	1	Surface Plate 24 x 36		✓	5	00
	2	Glue Pots		✓		80
	1	Block Plane				
	1	Wood Jack Plane 24 in				
	1	Iron 2 x 9 #4 Smooth Plane				
	1	- 5 ft Step Ladder			1161	29



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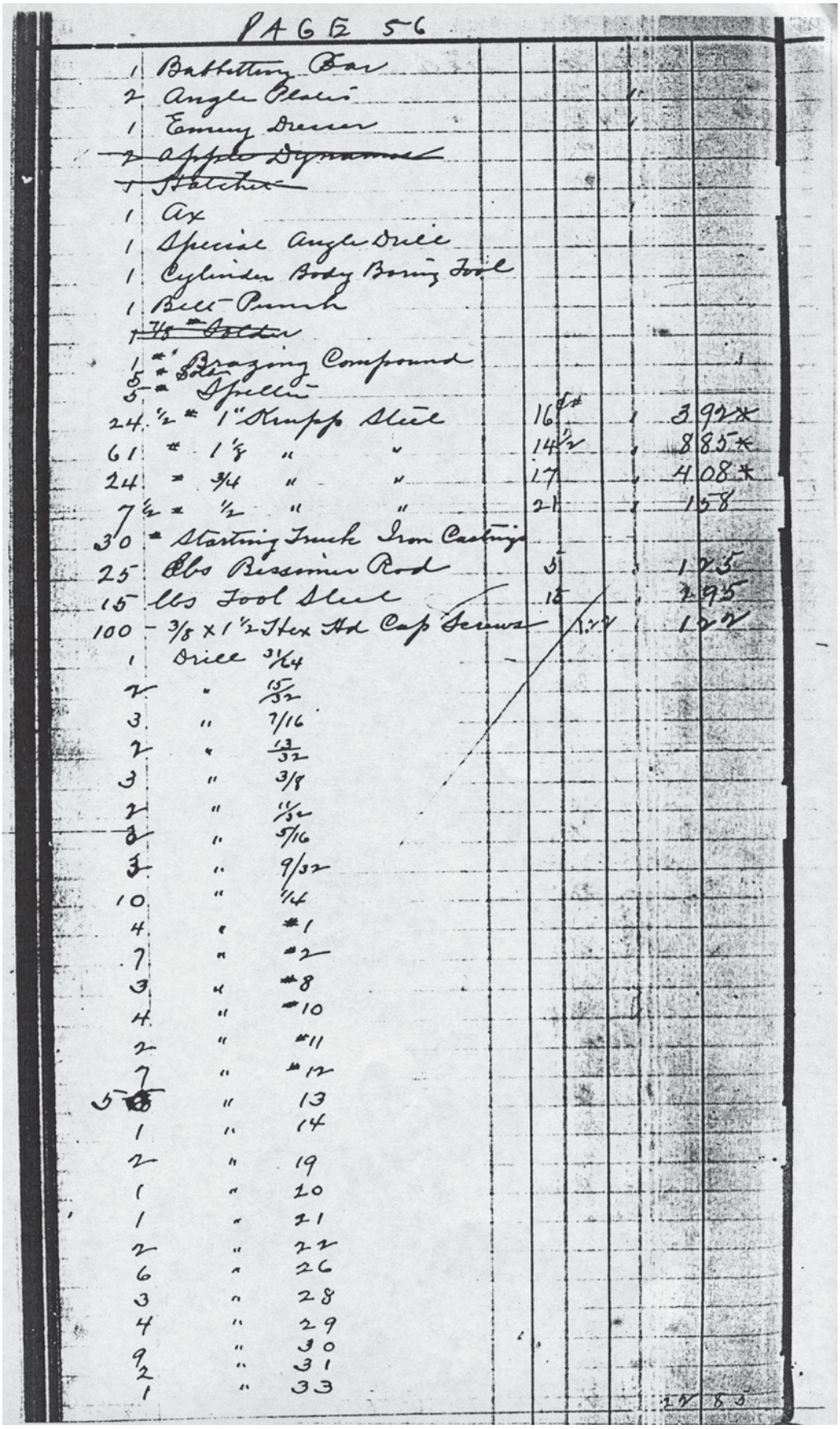
1	Ratchet - Brace		1		1	60
1	Pipe Cutter		1			
1	Back Saw		1			
~~2~~	~~Drawing Knives~~		1	60	1	20
1	Tri Square 12"		1			35
~~1~~ 2	~~Oil Stones~~		1			200
1	Spoke Shave		1			30
1	- 1st Riveting Hammer		1			
2	- Ladles		1			50
5	- 6" Band Saw Files		1			35
1	- 100 ft Tape Line		1			65 ¢
2	- 5 Gal Gasoline Cans	with Faucets			1	70
1	- Nail Puller		1			25
1	Pr Blacksmith Tongs		1			75
~~1~~ 2	~~Hand Saws~~	Keen Kutter	1			200 ¢
2	Pr 9" Tin Shears		1			300
2	- 10" Monkey Wrenches		1			70 ¢
1	- 10" Trimo Pipe Wrench		1			90 ¢
1	- 14" " " "		1		1	15 ¢
6	- Bicycle Wrenches		1			90
2	- Starrett End Cutters #7		1	88		376
1	-					50 ¢
1	- Hack Saw Frame		1			30
2	- Breast Drills		1		3	50
1	Set Taps & Dies 1/4 - 5/16 - 3/8 - 7/16 - 1/2 - 5/8 - 3/4 Holder				12	00
1	- 1/8" Pipe die		1			40
1	- 3/8" " Tap		1			40
1	- 1/4" " "		1			40
2	- 5/16 Taps		1			
2	- 3/8 "		1			
1	- 3/8 - 24 Taper Tap		1			
1	- 1/4 - 24 " "		1			
1	- 18 mm Tap		1			
1	- 1/2" - 20 Tap R		1			
1	- 1/2 - 20 " L		1			
1	- 5/8" Die Holder		1			
1	- 1 1/4 Auger Bit -		1			
2	- 6" Pliers	38	1			100 ¢
1	- 9" Comb Pipe Pliers		1			75 ¢
1	- 10" Bullon Pliers		1			75 ¢
1	- 7" Round Nose Pliers		1			80
1	Set 3/16" Stamping Figures		1			
1	- 3/4" Pipe Tap		1			
1	- 4" Tri Square		1			
~~1~~	~~Rivet Set~~ - Charley					
4	- Com Oil Cans		1			
5	Gal Engine Oil				1	50



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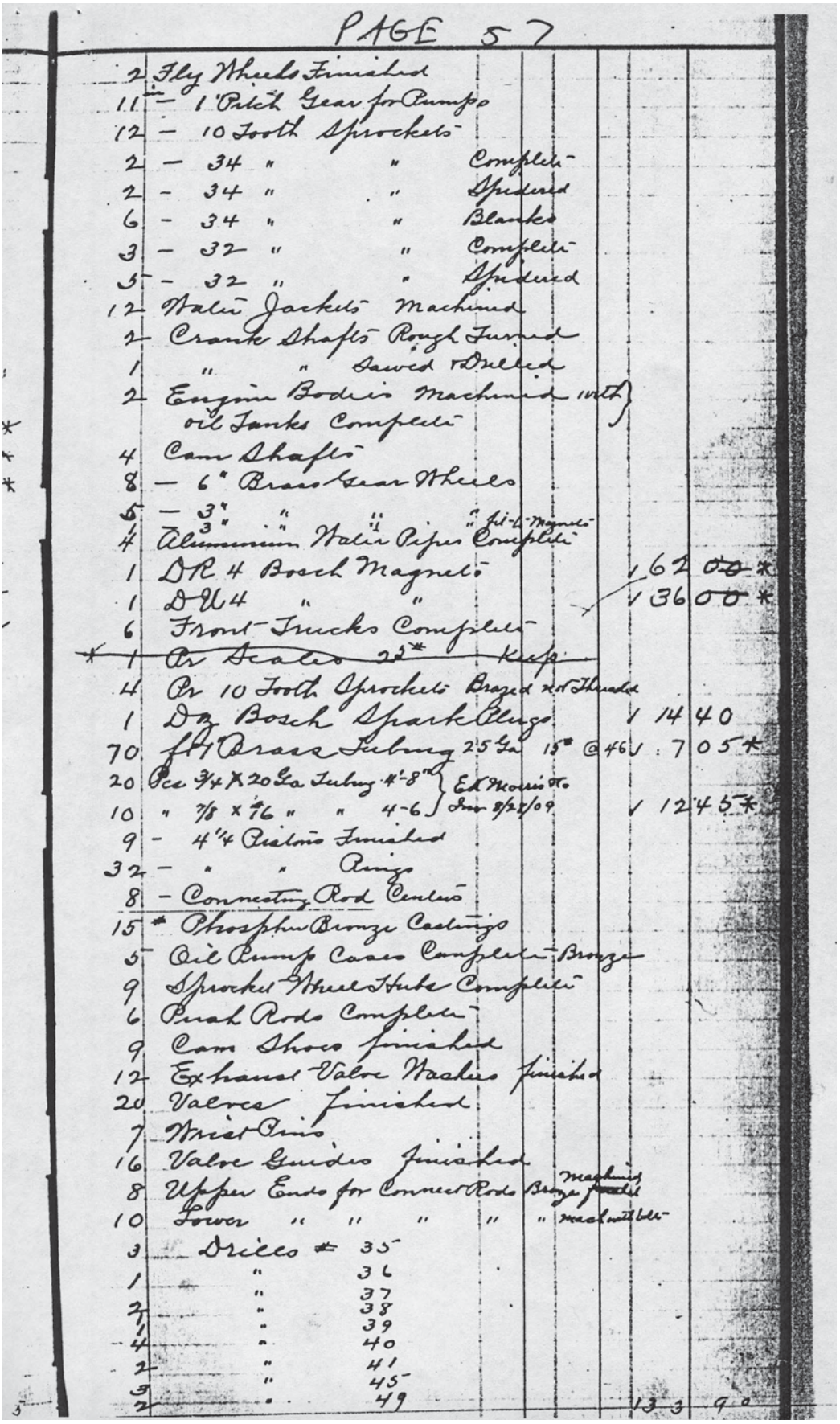
1	Starrett Drill Gauge			150
2	— 1" Drills			
1	— 1⅛ "			
1	— 5/16 "			
2	— 7/8 "			
1	— 3/16 "			
1	— 11/16 "			
1	— 13/16 "			
2	— 17/32 "			
1	— 19/32 "			
2	— 5/8 "			
1	— 3/4 "			
1	— 21/32 "			
1	— 43/64 "			
1	Taper Drill Sleeve			
2	Speed Gauges	✓		
1	— 3" Lathe Dogs	✓		
1	— 4 " "	✓		
1	— 5 " "	✓		
1	— 8 " "	✓		
2	Wright Monkey Wrenches			
1	End Mill Cutter 13/16	✓		210
1	— 1/4 - 20 Taper Tap	✓		100
1	~~— Gear Cutter #8 - 12 Pitch~~	✓		
1	~~Cleveland Tool Holder~~	✓		285
1	Lb Music Wire			
1	— 1⅛ Mandrel	✓		147 *
1	— 1⅛ 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	Piston Chuck			
1	Special Crank Steady Rest	✓		
1	— 6" Universal Chuck 3 jaw	✓		85
2	— 9" 4 Jaw Independent Chucks pair	✓		
3	Drill Chucks	✓		
2	Extra Lathe Centers	✓		
1	Hill Boring Tool (2 Bars)			
1	Special Heavy Boring Bar			
1	Grinding Outfit & Pulley shaft & Emery Wheel	✓		500
1	~~Lathe Tool Holder~~			~~285~~
2	Stop Nuts			

* labor



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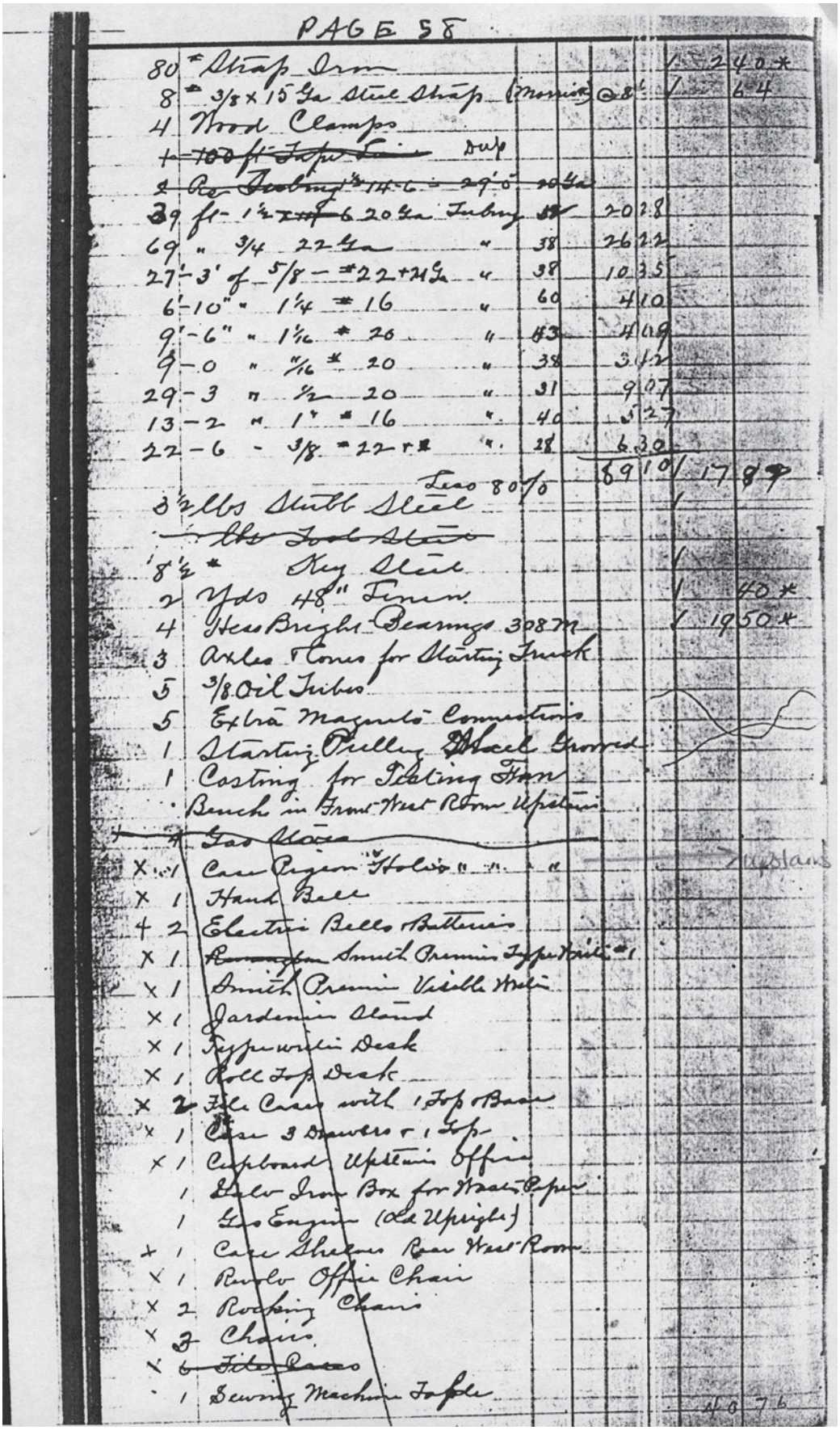
1	Babbitting Bar				
2	Angle Plates				
1	Emery Dresser				
~~2~~	~~Apple Dynamos~~				
~~1~~	~~Hatchet~~				
1	Ax				
1	Special Angle Drill				
1	Cylinder Body Boring Tool				
1	Bell-Punch				
~~1~~	~~½ " Solder~~				
1	" Brazing Compound				
5	" Solder				
5	" Spelter				
24	½ " 1" Krupp Steel	16	5#	1	3.92 ✕
61	" 1⅛ " "	14	½	1	8.85 ✕
24	" ¾ " "	17		1	4.08 ✕
7	½ " ½ " "	21		1	1.58
30	" Starting Truck Iron Castings				
25	lbs Brass Reamer Rod	5		1	1.25
15	lbs Tool Steel	16		1	2.95
100	- ⅜ x 1½ Hex Hd Cap Screws	1.7		1	1.92
1	Drill 31/64				
2	" 15/32				
3	" 7/16				
2	" 13/32				
3	" ⅜				
2	" 11/32				
~~2~~	" 5/16				
~~3~~	" 9/32				
10	" ¼				
4	" #1				
7	" #2				
3	" #8				
4	" #10				
2	" #11				
7	" #12				
~~5~~ 6	" 13				
1	" 14				
2	" 19				
1	" 20				
1	" 21				
2	" 22				
6	" 26				
3	" 28				
4	" 29				
9	" 30				
2	" 31				
1	" 33				
					27 83



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2 Fly Wheels Finished
11 — 1 Pitch Gear for Pumps
12 — 10 Tooth Sprockets
2 — 34 " " Completed
2 — 34 " " Spudded
6 — 34 " " Blanks
3 — 32 " " Completed
3 — 32 " " Spudded
12 Valve Jackets Machined
2 Crank Shafts Rough Turned
1 " " Sawed & Drilled
2 Engine Bodies Machined with oil Tanks Completed
4 Cam Shafts
8 — 6" Brass Gear Wheels
6 — 3" " " " for Hi-L-Magneto
4 Aluminum 3" Water Pipes Completed
1 DR 4 Bosch Magneto ✓ 62 00 *
1 DW 4 " " ✓ 36 00 *
6 Front Trucks Completed
~~1 Pr Scales 22* Kept~~
4 Pr 10 Tooth Sprockets Brazed & Threaded
1 Dz Bosch Spark Plugs ✓ 14 40
70 ft Brass Tubing 25 Ga 15* @ 46 ✓ 7 05 *
20 Pcs 3/4 X 20 Ga Tubing 4'-8" } Ed Morris Co.
10 " 7/8 X 16 " " 4-6 } Inv 8/24/09 ✓ 12 45 *
9 — 4 1/4 Pistons Finished
32 — " " Rings
8 — Connecting Rod Centers
15 * Phosphor Bronze Castings
5 — Oil Pump Cases Completed — Bronze
9 Sprocket Wheel Hubs Completed
6 Push Rods Completed
9 Cam Shoes finished
12 Exhaust Valve Washers finished
20 Valves Finished
7 Wrist Pins
16 Valve Guides Finished
8 Upper Ends for Connect Rods Bronze Finished machined
10 Lower " " " " " " machined
3 Drills # 35
1 " 36
1 " 37
2 " 38
1 " 39
4 " 40
2 " 41
3 " 45
2 " 49

13 3 90

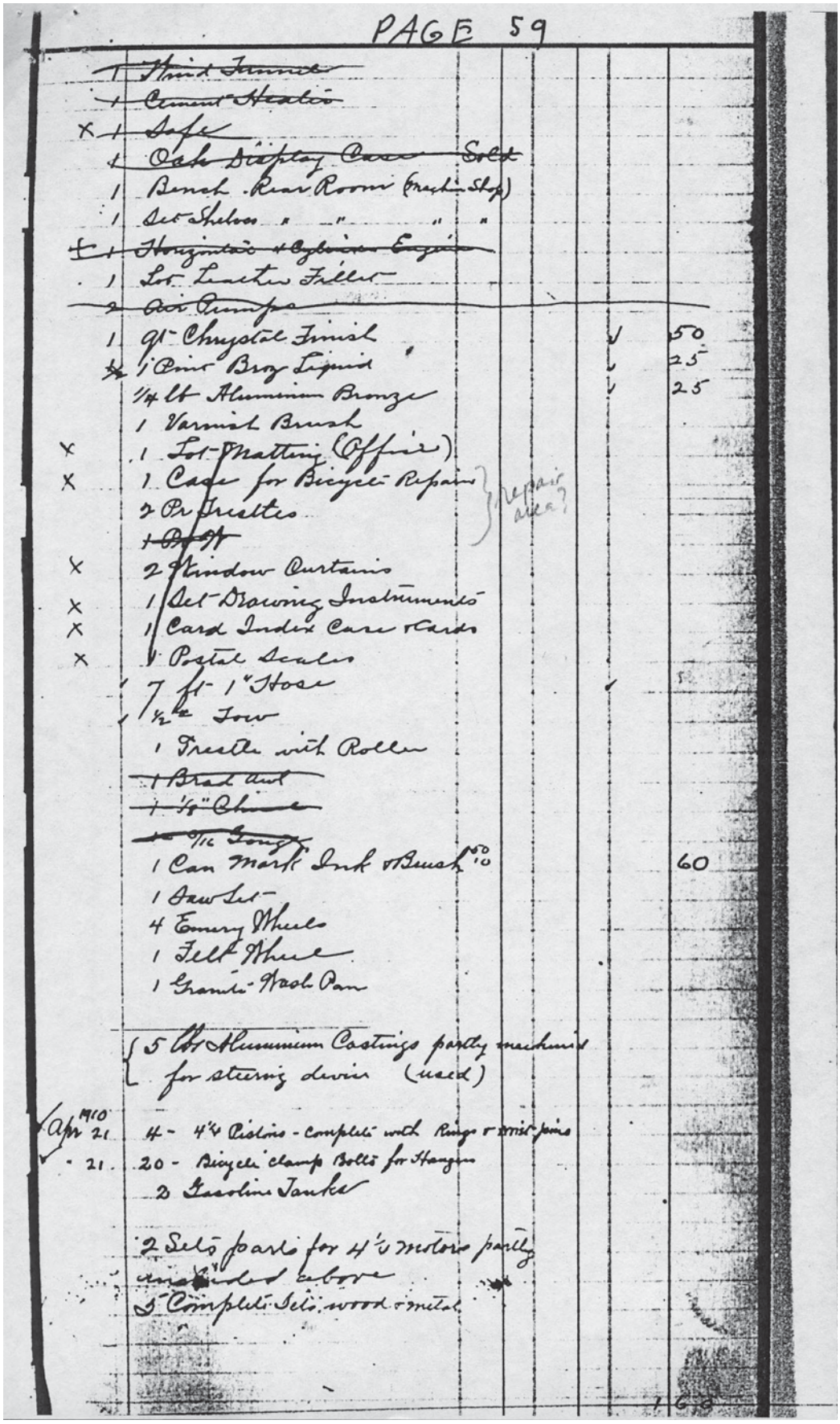


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80 ft Strap Iron 1 2 40 *
8 " 3/8 x 15 Ga Steel Strap (Morris) @ 8¢ 1 64
4 Wood Clamps
~~1 100 ft Tape Line~~ Dup
~~2 Rd Tubing 1/2 14-6 = 29'0" 20 Ga~~
39 ft 1 1/2 " 6 20 Ga Tubing 38 20 28
69 " 3/4 22 Ga " 38 26 22
27'-3' of 5/8 - #22 + 24 Ga " 38 10 35
6'-10" " 1/4 #16 " 60 4 10
9'-6" " 1/16 # 20 " 43 4 09
9-0 " 1/16 # 20 " 38 3 42
29-3 " 1/2 20 " 31 9 07
13-2 " 1" # 16 " 40 5 27
22-6 - 3/8 #22 + # " 28 6 30
Less 80/0 89 10 1 78 9

3 1/2 lbs Stub Steel 1
~~1 lbs Tool Steel~~
8 1/2 " Key Steel 1
2 Yds 48" Linen 1 40 *
4 Hess Bright Bearings 308 M 1 1950 *
3 Axles + Cones for Starting Truck
5 3/8 Oil Tubes
5 Extra Magneto Connections
1 Starting Pulley 2 Wheel Grooved
1 Casting for Plating Tank
1 Bench in Front Mat Room Upstairs
~~1 Gas Stove~~
X 1 Case Pigeon Holes " " " Upstairs
X 1 Hand Bell
4 2 Electric Bells + Batteries
X 1 ~~Remington~~ Smith Premier Typewriter #1
X 1 Smith Premier Visible Writer
X 1 Jardenier Stand
X 1 Typewriter Desk
X 1 Roll Top Desk
X 2 File Cases with 1 Top + Base
X 1 Case 3 Drawers + 1 Top
X 1 Cupboard Upstairs Office
1 Steel Iron Box for Wall Paper
1 Gas Engine (4 H Upright)
X 1 Case Shelves Rear Wall Room
X 1 Revolv Office Chair
X 2 Rocking Chairs
X 3 Chairs
X 6 ~~Tables~~
1 Sewing Machine Table

40 76



PAGE 59

~~1 Hand Hammer~~
~~1 Cement Trowel~~
X ~~1 Safe~~
~~1 Oak Display Case Sold~~
1 Bench Rear Room (machine Shop)
1 Set Shelves " " " "
~~1 Hoisting & Cylinder Engine~~
1 Lot Leather Fillet
~~2 Air Pumps~~
1 qt Chrystal Finish ✓ 50
~~1~~ Pint Brg Liquid ✓ 25
1/4 lt Aluminum Bronze ✓ 25
1 Varnish Brush
X 1 Lot Matting (Office)
X 1 Cage for Bicycle Repairs } Repair area?
2 Pr Trestles
~~1 Bench~~
X 2 Window Curtains
X 1 Set Drawing Instruments
X 1 Card Index Case & Cards
X 1 Postal Scales
7 ft 1" Hose
1/2 Ton
1 Trestle with Roller
~~1 Brad Awl~~
~~1 1/2" Chisel~~
~~1 9/16 Gouge~~
1 Can Marking Ink & Brush 50/10 60
1 Saw Set
4 Emery Wheels
1 Felt Wheel
1 Granite Wash Pan

5 Lbs Aluminum Castings partly machined for steering device (used)

1910
Apr 21 4 - 4'4 Risers - complete with Rings & wrist pins
" 21 20 - Bicycle clamp Bolts for Hangers
2 Gasoline Tanks

2 Sets parts for 4 1/2 Motors partly ~~manufactured~~ finished above
5 Complete Sets wood & metal

1 68

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