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**PLUMBING AT THE HIGHLANDS,
FORT WASHINGTON, PENNSYLVANIA,
1845-1904**

Jennifer A. Haskell

A THESIS

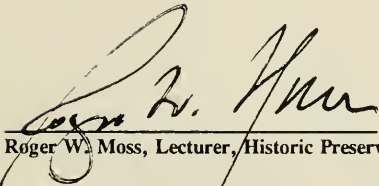
in


The Graduate Program in Historic Preservation

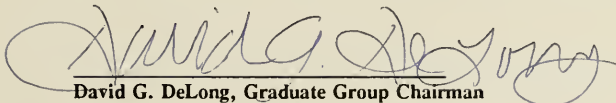
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Partial Fulfillment of the Requirements for the Degree of**

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CHAPTER ONE: INTRODUCTION

The interpretation of a historic site is a process by which the significant aspects of the site's past are explored and defined. Through interpretation, historic preservation teaches lessons of history to present and future generations.¹ Often, however, important components of a site's history are ignored in the interpretative process. With past emphasis on the exploration of the architectural, cultural, or genealogical associations with a particular site, the influence and importance of mechanical systems has been neglected. Alterations in the type of machinery employed in bathrooms or kitchens may far outnumber other types of changes that were made to a house, such as additions, aesthetic decisions, or changes in ownership. Not only did mechanical systems often change the function of rooms, but they also drastically affected the lives of the occupants at the site.

This is the study of one mechanical system, the plumbing system (the supply of water and the disposal of waste), at The Highlands, Fort Washington, Pennsylvania. It focuses on the period of the Sheaff family's occupation of the site during the second half of the nineteenth century (1845-1904). Archival materials will be examined and the technologies employed will be discussed.

Documentation

This study is possible because of the extensive documentation available for the site during the Sheaff residency. This documentation includes journals, bills, and site plans. The Sheaff family journals are the major documents of the day-to-day life at The Highlands. The journals begin in 1845 and end in 1904, with twenty-one years represented.² It is unclear who the main author was, but many family members appear to have made entries. Topics include weather; daily activities of the family; visitors; employee functions; planting and harvesting of crops; payment of bills; mail; special events (such as the Centennial Exhibition of 1876 or holidays); as well as a variety of other subjects. References to the plumbing system relate primarily to its

initial installation and its failure. Other types of primary documents have been used to supplement gaps in the journals.³ Trade catalogues, patent indices, contemporary discussions of sanitation and health, and recent secondary studies were also consulted.

A final note is necessary regarding the topographical map of the site and the floorplans and elevations of the mansion done in 1917 for Caroline Sinkler.⁴ It is probable that both represent conditions that existed during the Sheaff residency, as they were studies Sinkler had done prior to renovations that were carried out several years later.

Methodology

Following a brief history of the site, contemporary attitudes towards health and sanitation will be discussed. A general introduction and overview of the plumbing system at The Highlands will follow. Specific discussion will begin with the 1856 installation of a hydraulic water ram which pumped water into the house from a spring, and will include: a history of the ram, the company that manufactured it, and its use at The Highlands. Following chapters will look at other equipment used: the boiler, water closet, and bath tub. A brief history of each utility will be included, but it is not the purpose of this report to explore the background of these technologies and therefore secondary sources will be used for the history of some technologies. Finally, there will be a discussion of the importance and influence of the system in the history of The Highlands.

ENDNOTES: CHAPTER ONE

1. G. Ellis Burcaw, Introduction to Museum Work, (Nashville, TN: AASLH, 1983): 156.

2. Sheaff family, Daily Journals: 1845, 1850, 1860, 1868, 1870-4, 1876-8, 1881, 1886, 1888-91, 1893, 1896, 1901, 1904. St. Thomas Episcopal Church, Fort Washington, PA. (1850 and 1860 can be found at The Highlands Historical Society along with copies of all other years.) (Hereafter, all references to diaries found within the text will not be footnoted but specific diary entries found within the text can be found in Appendix A.)

3. It is assumed that all the work discussed in the following agreements was carried out at the approximate time they were made. Journal references support this hypothesis.

John Sheaff, "Agreement with John Gamble for Building a Shed and Bath House" (March 10, 1853). The Highlands Historical Society, Fort Washington, PA. (Hereafter this agreement will not be footnoted. Transcription of the agreement is found in Appendix B.)

John Sheaff, "Forsyth & Brother Plumbing Bill", (October, 1857), The Highlands Historical Society, Fort Washington, PA. (Hereafter, references to this bill will not be footnoted. Transcription is found in Appendix C.)

4. Franklin, "Topographical Map of Part of the Estate of Caroline S. Sinkler", (August, 1917). The Highlands Historical Society, Fort Washington, PA. (Hereafter, this map will not be footnoted but a copy is found at Figure 3.)

H.M. Hanson, "Floorplans and Illustrations of the Country Estate of Miss Caroline Sinkler", (c. 1917). Copies at The Highlands Historical Society, Fort Washington, PA. (Hereafter, these will not be footnoted but copies are in Figure 4.)

CHAPTER TWO: HISTORY

The Highlands, located approximately 12 miles north of Philadelphia in Montgomery County, Pennsylvania, is part of Whitemarsh Township.¹ It sits at the corner of Skippack Pike and Sheaff Lane.² (See Figure 1.)

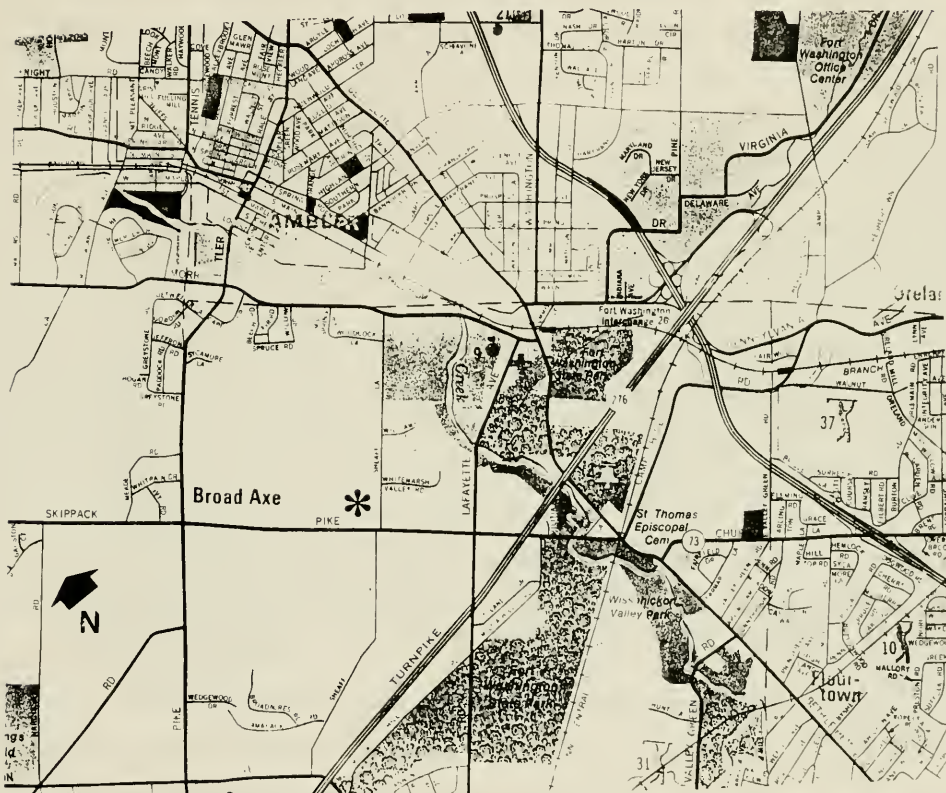


FIGURE 1. LOCATION OF THE HIGHLANDS is indicated by the asterisk. [SOURCE: Jean Barth Toll and Michael J. Schwager, eds, *Montgomery County: The Second Hundred Years*, vol. 1, first edition (Montgomery County Historical Society).]

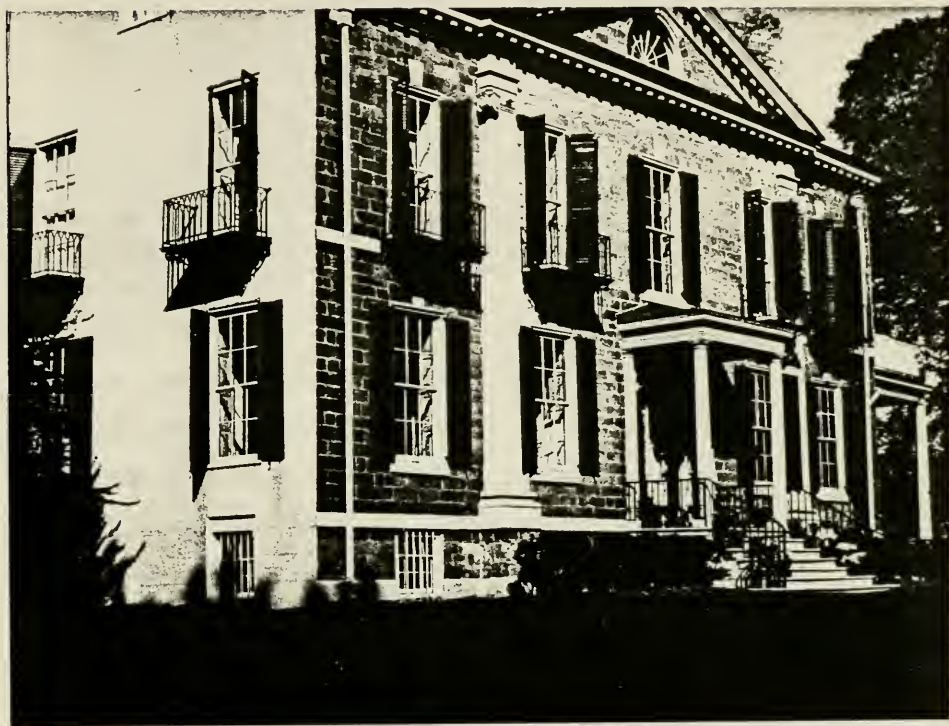
The owner of the property who commissioned the house was Anthony Morris (1766-1860), son of Samuel Morris. (See Figure 2.) Anthony Morris was involved in the politics of his time. He was a captain of the Philadelphia City First Troop during the Revolutionary War, a member of the State Legislature, as well as first Speaker of the House. Associations with men like Jefferson, Madison, and Monroe made Morris influential in his time and ultimately led him to become the United States Minister to the Court of Spain during the Madison administration.³ Morris attempted to sell the property in 1805 and the advertisement which appeared in the Political, Commercial Register provides an early description of the site.

The Mansion House and improvements attached to it, are not exceeded by any in Pennsylvania; its situation is elegant and healthy, and the surrounding scenery beautiful. The House is of stone, 60 feet in front, by 45 in depth, the entrance to the hall is by a flight of marble steps and the pediment in front is supported by marble Ionic pilasters. The hall is 14 feet wide, and in the centre of the house, with an elegant and spacious mahogany staircase, extending to the garrets, from whence there is also a private staircase descending into the kitchen. The stories are twelve and thirteen feet high; as to exclude the moisture caused by plastering on stone walls, and the chimneys in every room in both stories, finished with marble sides and hearths, iron backs and jams, with highly finished modern mantles; every window is guarded by shutters within and without, the latter venetian. The kitchen is provided with every modern improvement, has a pump of excellent water at the door, and adjoining it, is a very convenient room intended for a housekeeper, which commands the pantry, kitchen, and green house. A large and excellent ice house filled with ice is near the kitchen, and a large octagon stone spring house with a good room over it at a convenient distance in the garden, which is constantly supplied with water from an ever falling spring after furnishing a fish pond.

The barn, with a commodious carriage house, granaries, stables, and cellar under the same roof, is of stone, three stories high, and has every convenience; at the entrance of the barn is a pump, which supplies a poultry yard and house in front of it with water, and very convenient to the barn is a tenant's house and garden.⁴

Morris did not retain ownership of The Highlands for long, selling it in 1808 to Daniel Hitner (d. 1841) for \$30,000. Information on the Daniel Hitner family is limited, as was their occupancy at The Highlands. Selling the property after only five years, The Highlands passed to George Sheaff (1799-1851), a wine merchant, in 1813.⁵ Despite various attempts to sell, the Sheaff decedents were to be occupants of the mansion for most of the next century.⁶

FIGURE 2: THE MANSION HOUSE OF THE HIGHLANDS. [*Photograph taken by author, Spring, 1990.*]



The Sheaff family were farmers, utilizing all the latest methods of scientific agriculture. A.J. Downing included a discussion of the site in A Treatise on the Theory and Practice of Landscape Gardening noting, "this whole estate is a striking example of science, skill, and taste applied to a country seat, and there are few in the Union, taken as a whole, superior to it". He goes on to say:

The farm is 300 acres in extent and in the time of DeWitt Clinton was pronounced by him the model farm of the United States. At the present time we know of nothing superior to it and Captain Barclay, in his agricultural tour, says it was the only instance of regular, scientific system of husbandry in the English manner he saw in America. Indeed the large and regular fields, filled with luxuriant crops, everywhere of an exact evenness of growth and everywhere free from weeds of any sort, the perfect system of manuring and culture, the simple and complete fences, the fine stock, the very spacious barns, every season newly whitewashed internally and externally, paved with wood and as clean as a gentleman's stable (with stalls to fatten ninety head of cattle) these and the masterly way in which the whole is managed both as regards culture and profit, render this estate one of no common interest in an agricultural as well as ornamental point of view.⁷

The Sheaff family made many changes to the mansion. In approximately 1830 a two story addition on the north side of the mansion provided a large room for family gatherings and dining on the first floor and additional sleeping chambers above. Journals indicate more specific changes through the years---such as the first bathroom, painting, plastering, and other alterations.⁸ The site was sold in 1917 to Miss Caroline Sidney Sinkler, who would make more changes to the property during her twenty years of ownership.⁹

A new wing for servants was designed and constructed in 1917. This wing resulted in not only additional sleeping quarters for the help but also relocated the kitchen from the basement and into the first floor of the house. Caroline Sinkler had the back stairway, now no longer necessary with the relocation of the kitchen, removed and an elevator installed to run between the first and second floors. Several bathrooms were also added.¹⁰

Miss Sinkler did not stay at The Highlands for any extended periods. In 1940 she sold the property to her niece, Emily Sinkler, and her husband Nicolas Roosevelt, for one dollar.¹¹ The Roosevelts are not known to have made many changes to the property, keeping it as "Aunt

Carrie" had left it. In 1959 the Roosevelts gave the property to the Commonwealth of Pennsylvania, retaining residency rights until their deaths, the Commonwealth obtaining the property in 1970.¹² The house remained empty till 1975 when a group of neighbors and other persons concerned over the fate of the grounds and buildings, formed The Highlands Historical Society. Today, the Society maintains an administrative agreement with the state to be responsible for the daily operations and to help in the restoration and interpretation of the site. Open as a museum, The Highlands is used as a community center for art shows, meetings, lectures as well as a gathering place for weddings and other social events.¹³

ENDNOTES: CHAPTER TWO

1. Whitemarsh Township was found in 1704 and by 1880 it had 10 villages, one of them being the village of Fort Washington. The name Fort Washington comes from the Revolutionary War encampment that took place in the area. By the end of the nineteenth century many wealthy Philadelphia families had established summer homes in the area, some of which were later to become permanent residences.

Jean Varth Toll and Michael J. Schwager, eds, Montgomery County: The Second Hundred Years vol. 1 (Montgomery County, PA: Montgomery county Federation of Historical Societies, 1983): 792-3, 796. (Hereafter cited as Toll, MC.)

2. Skippack Pike was established in 1713. Sheaff Lane dates to 1796 and was originally a private roadway leading to the property. It was continued to Stenton Lane sometime prior to 1893. Toll, MC: 794.

3. Tomas Spiers and Associates, "Historic Structure Report: The Highlands, Whitemarsh Township, Montgomery County. Part I: The Mansion House", (Harrisburg, PA: Bureau of Historic Sites and Properties, The Pennsylvania Historical and Museum Commission, 1980): 2.3-5. (Hereafter cited as "HSR".)

A book of Morris' letters to his children while ambassador to Spain has been published: Letters From Spain: Anthony Morris' Letters to His Children, 1813-7. Philadelphia, PA: The Wyck Association, 1982.

4. Anthony Morris, "Offers for Sale His Farm...", Political, Commercial Register, November 12, 1805. As transcribed in "HSR": 2.69-70.

5. Anthony Morris to Daniel Hitner, Deed for the purchase of The Highlands, May 30, 1808. Deed Book 24, p. 376. And, Daniel Hitner to George Sheaff, Deed for the purchase of The Highlands, February 14, 1814, Deed Book 30, p. 7-13. Montgomery County Courthouse, Norristown, PA.

6. Advertisements appear in 1836 and 1849 offering the property for sale. Clippings of the advertisements are found at The Highlands Historical Society, Fort Washington, PA.

7. A.J. Downing, A Treatise on the Theory and Practice of Landscape Gardening, 4th edition. (New York: Orange, Judd, & Co., 1859): 57-8.

8. "HSR": 2.49-50. The changes to the mansion are evident upon examination of the two "For Sale" Advertisements of the Sheaff family, 1836 and 1849. See Sheaff family journals for reference to specific changes at the mansion.

9. Caroline S. Sinkler and Ellen C.W. Griffith et al. Deed for purchase of The Highlands. August 10, 1917. Deed Book 259, p. 567-79. Purchase price: \$37,500. Montgomery County Courthouse, Norristown, PA.

10. Drawings of the existing conditions and proposed changes were done for Caroline Sinkler soon after her purchase of the property and include: Franklin's "Topographical Map of the Part of the Estate of Caroline S. Sinkler", (August 1917), The Highlands Historical Society, Fort Washington, PA. Also, H.M. Hanson, "Floorplans and elevations of the Country Estate of Miss Caroline Sinkler", (c. 1917), Copies at The Highlands Historical Society, Fort Washington, PA.

11. Caroline Sidney Sinkler to Emily W. Roosevelt, Deed for the Sale of The Highlands, July 3, 1941. Book 1430, p. 380-3. Price: \$1.00. Montgomery County Courthouse, Norristown, PA.

12. Act of June 27, 1958, P.L. 425 which stated that the premises shall be held and used by the grantee for the benefit of the people of the Commonwealth of Pennsylvania. Will of Emily W. Roosevelt, dated August 3, 1965.

13. Charter of The Highlands Historical Society, incorporated 1975.

CHAPTER THREE: NINETEENTH CENTURY ATTITUDES TOWARDS SANITATION

Studies of historic hygiene practices have shown that "the ancient world practiced better hygiene than did most Americans and Europeans until the second half of the nineteenth century".¹ Advances in science and changes in attitudes of Americans towards sanitation and health in that era led to advances in technologies and improvements in personal hygiene. Scientific advances, such as Pasteur's germ theory for instance, led to the connection of impure water distribution in urban areas and the outbreak of epidemics, and helped to increase the awareness of the public regarding the importance of sanitation.²

The Civil War (1861-5) also influenced Americans' attitudes towards sanitation. Advances in the telegraph and photography allowed Americans to see more of the devastation than in earlier conflicts. People were dying not only from wounds, but from the spread of disease as well. The United States Sanitary Commission was established in 1861 and was staffed primarily by volunteers (mainly women) who were willing to look after Union soldiers. The Commission received permission from the War Department in mid 1861 to investigate the sanitary conditions of field and camp hospitals and troops.³ These investigations also encouraged changes in urban centers and in individual homes. According to one scholar:

after the war, the sanitary movement in the United States slowly gathered force, first as an effort to relieve the problem of cities congested with refuse and human waste, and later in the century as a broad-based plan of attack on American architecture and personal habits.⁴

The introduction of bathrooms into architectural designs of upper class homes in America began to occur by the middle of the century and by 1900 indoor plumbing was fairly standard in most urban centers in the United States.⁵

With the new technologies came new concerns.⁶ An article in The Household warned readers that the incorrect positioning of cesspools could contaminate the supply of fresh water.⁷

The gases and substances that threatened Americans ironically were products of the very technological and scientific successes by which they marked their progress from the unenlightened people of earlier centuries. Usually beyond the

boundaries of human perception, these new threats to health seemed menacing because they were generated inside the house, where one sought security, rather than in the outside world of strangers.⁸

Recommendations for the correct installation of plumbing were the result of such concerns. Sanitary engineers and reformers in England and America wrote suggestions for both plumbers and homeowners on the proper installation of plumbing in homes. According to one authority, sanitary experts recommended some basic installation principles in order to ensure that the most sanitary conditions possible were achieved. This included a drawing in the Sanitary Edition (1878) that seemed to imply three major drainage principles, including the proper ventilation and trapping of waste pipes; the use of durable materials in the construction of waste pipes; and the installation of all work with proper accessibility.⁹

In the later decades of the nineteenth century, the concentration turned away from the supply of water into dwellings (as this was now an area relatively free of health problems) and turned to the specific materials that were being utilized for the construction of plumbing systems. Health problems associated with materials such as lead were investigated. Early fixtures (such as pipes and cisterns) were usually hand-made of sheet lead because of the ease of forming it to the necessary shapes. It was not until after the middle of the century that there was an increasing variety and availability of manufactured plumbing goods, including cast-iron soil pipes and angled soil pipe fittings. These were not only cheaper than earlier types but were more durable as well.¹⁰

The technology and the machinery of the bathroom and water closet changed in answer to the new ideas that were generated during the late nineteenth century, making the introduction of water and the disposal of waste more efficient and more hygienic.

ENDNOTES: CHAPTER THREE

1.Gail Caskey Winkler, ed, The Well-Appointed Bath: Authentic Plans and Fixtures from the Early 1900s, (Washington, D.C.: The Preservation Press, 1989): 11-2. (Hereafter cited as Winkler.)

2.Barbara J. Howe et al., Houses and Homes: Exploring Their History, (Nashville, TN: AASLH, 1987): 127, 129. (Hereafter cited as Howe.)

3.Harvey Green, Fit for America: Health, Fitness, Sport, and American Society, (New York: Patheon Books, 1986): 106-7. (Hereafter cited as Green.)

4.Green: 107.

5.Winkler: 13. And Howe: 129.

6.The evolution of specific technologies such as the water closet and bath tub will be discussed in succeeding sections.

7.Green: 109.

8.Green: 122.

9.Despite the new evidence, the Sheaff water continued to be filtered through lead reservoirs and pipes. "Proper arrangement of waste pipes, traps, &c. in an ordinary three story and basement city dwelling", Plumber and Sanitary Engineer, no. 5 (April, 1878): 95. As quoted in May Stone, "The Plumbing Paradox: American Attitudes toward Late Nineteenth Century Domestic Sanitary Arrangements", Winterthur Portfolio (Autumn, 1979): 195-6. (Hereafter cited as Stone.)

10.Stone: 285-6, 197. Stone also notes that there was an early work on the toxicity of lead: Collections of Reports (Condensed) and Opinions of Chemists in Regard to the use of Lead Pipe for Service Pipe, in the Distribution of Water for the Supply of Cities. New York: Hosford & Co., 1859. This still would have been after the installation of the system at The Highlands.

CHAPTER FOUR: OVERVIEW OF THE SYSTEM AT THE HIGHLANDS

It is unknown what type of system of water supply or waste disposal was utilized at The Highlands when George Sheaff purchased the property from Daniel Hitner in 1813. The Morris advertisement of 1805 notes a pump near the kitchen door as well as near the barn. The later of these two pumps is indicated as supplying the poultry yard with water as well as being convenient to the tenant house and garden nearby. The spring house was also advertised as being convenient to a constant supply of water from the falling spring. No indication is given as to the location of a privy but it is likely that one was present near the mansion.¹ The earliest Sheaff advertisement (1836) contains no reference to a system.

The first documentation of the installation of plumbing at The Highlands is in the 1845 Sheaff family journal. In June of that year, a bath tub was installed in the house, the work completed on June 30. A forcing pump (a mechanism for getting water into the tub) was also mentioned. The locations of the pump and the tub were not indicated; however, it is probable that the small rooms for guests and servants that were added with the two story addition of 1830 would have been a logical location. Later documentary evidence, such as the plans done for Caroline Sinkler in 1917, support this hypothesis. (See Figure 4.)

According to an agreement dated March 10, 1853, John D. Sheaff hired John Gamble, carpenter, to construct a shed and a bathhouse on the property in Fort Washington. (See Appendix C.) No size or plan of the bathhouse have been found, but general specifications were contained in the agreement. A cedar bath was to be constructed, held together with copper spikes. Gamble was also responsible for the installation of any trunks (i.e. pipes) required to carry off water or waste. The total cost was \$400. No reason has been located for the installation of another tub when one had been installed in the house only eight years earlier. Along with the construction of the shed, the Sheaffs hired Gamble to install a privy. The specifications for it were as follows: "A privy is to be framed and inserted under the Arch [apeuring?] into Shed, having a well 8 ft deep & 5 feet wide walled up with brick". It is unknown where this privy was but it

seems to installed near the Hay house (and possibly near the barn). As it would have been inconvenient to the house in this location, it is possible it was installed for use by the farmhands, though the answer may never be known.



FIGURE 3A. TOPOGRAPHICAL MAP OF THE HIGHLANDS, 1917. ARROW NOTES LOCATION OF RAM PIT. ASTERISK SHOWS LOCATION OF MANSION. [SOURCE: Franklin, *Topographical Map of Part of the Estate of Caroline S. Sinkler, August, 1917*, (The Highlands Historical Society, Fort Washington, PA). Photograph by author, Spring, 1990.]



FIGURE 3B. TOPOGRAPHICAL MAP OF THE HIGHLANDS, 1917, ENLARGEMENT, NOTING LOCATION OF RAM PIT. [SOURCE: Franklin, *Topographical Map of Part of the Estate of Caroline S. Sinkler, August, 1917*, (*The Highlands Historical Society, Fort Washington, PA*). Photograph by author, Spring, 1990.]

The Forsyth and Brothers 1856 plumbing bill notes several important technologies that were utilized by the Sheaff family. (See Appendix B.) One was the installation of two Douglas water rams. These rams pumped water from the spring to the house where it was stored in two lead-lined reservoirs. (See Figure 3) From the reservoirs water was piped to the tub, water closet, and the kitchen sink. A boiler in the kitchen heated the water.

The 1856 bill notes charges for materials for two reservoirs, a "large Copper Bath tub" (which was enclosed in a wood case), a "double Shower back", and "one regular water closet". A complete listing of the materials and length of piping required for the job was also included, most pipes being composed of iron or lead. The bill also mentions specific labor and transportation costs for the job.

The bath installed in 1856 was located on the second floor of the mansion, in a room over the verandah.² It is assumed that the original room in which the water closet was installed was also on the second floor, between the two bed chambers on the eastern side of the house. (See Figure 4B)

The documentary evidence that exists fails to answer several of the problems found during a physical examination of The Highlands. The reservoirs, for instance, are not located directly above the bath tub, the water closet, or the kitchen. The distribution of water, therefore, would have required the installation of more complicated types of piping rather than merely the insertion of vertical connections between the source and the utilities.³ This could indicate that the reservoirs were installed at an earlier time and connected to gutters on the roof to collect rain water. However, the list of materials required for the reservoirs in the 1856 bill indicates they were added at that time. The fact that the system at The Highlands was retrofitted may have made the installation of vertical piping more difficult. Smaller existing spaces were desirable for the installation of fixtures such as bath tubs and would explain the placement of the 1856 tub into a room in the north of the house, where it is probable that the bath tub installed in 1845 had also been installed. Early water closets had various problems associated with them—one being the

smell that was bound to emanate from waste which was not fully disposed of. This feature would explain its placement in a smaller space, away from the sleeping chamber and the tub. It was also placed close to the servants stairs, making cleaning easier. A final period of change, this time only in the water closet, seems to have occurred sometime in 1888. The journal entry on February 12, 1890, notes that after 18 months the plumber's work was finally completed. The major portion of work seems to have involved the water closet, as the descriptions leading up to the February 12 entry discuss the water closet being "put in order". There is no other indication of exactly what type of work was done, however. Entries during the two years prior to the completion of the work discuss mostly problems with the rams and the subsequent work that was required, most done by John Sheaff. As will be discussed in Chapter Eight, it is likely that the water closet was replaced during this period, as improved models were now on the market and were far more efficient than models available in 1856.

When Caroline Sinkler purchased The Highlands from the Sheaff family in 1917, major renovations were undertaken. Several bathrooms were added and the whole estate seems to have been connected to the township water supply in 1926.⁴ With the exception of the two reservoirs on the third floor, little physical evidence survives of the Sheaff family's plumbing. (See Figure 5.) The location of the rams was destroyed in 1925 when Caroline Sinkler had a swimming pool installed in the area near the spring.⁵

FIGURE 4A. FLOORPLANS DONE PRIOR TO RENOVATIONS BY SINKLER. 1917.

[SOURCE: H.M. Hanson, Floorplans and elevations of the country estate of Miss Caroline Sinkler, ca. 1917. (Copies at The Highlands Historical Society, Fort Washington, PA). This is the source of ALL the drawings in Figure 4.] NOTE: THESE DRAWINGS ARE ASSUMED TO REPRESENT CONDITIONS DURING THE SHEAFF OCCUPANCY.

BASEMENT. Note locations of "pump", "sink", and "storage tank".

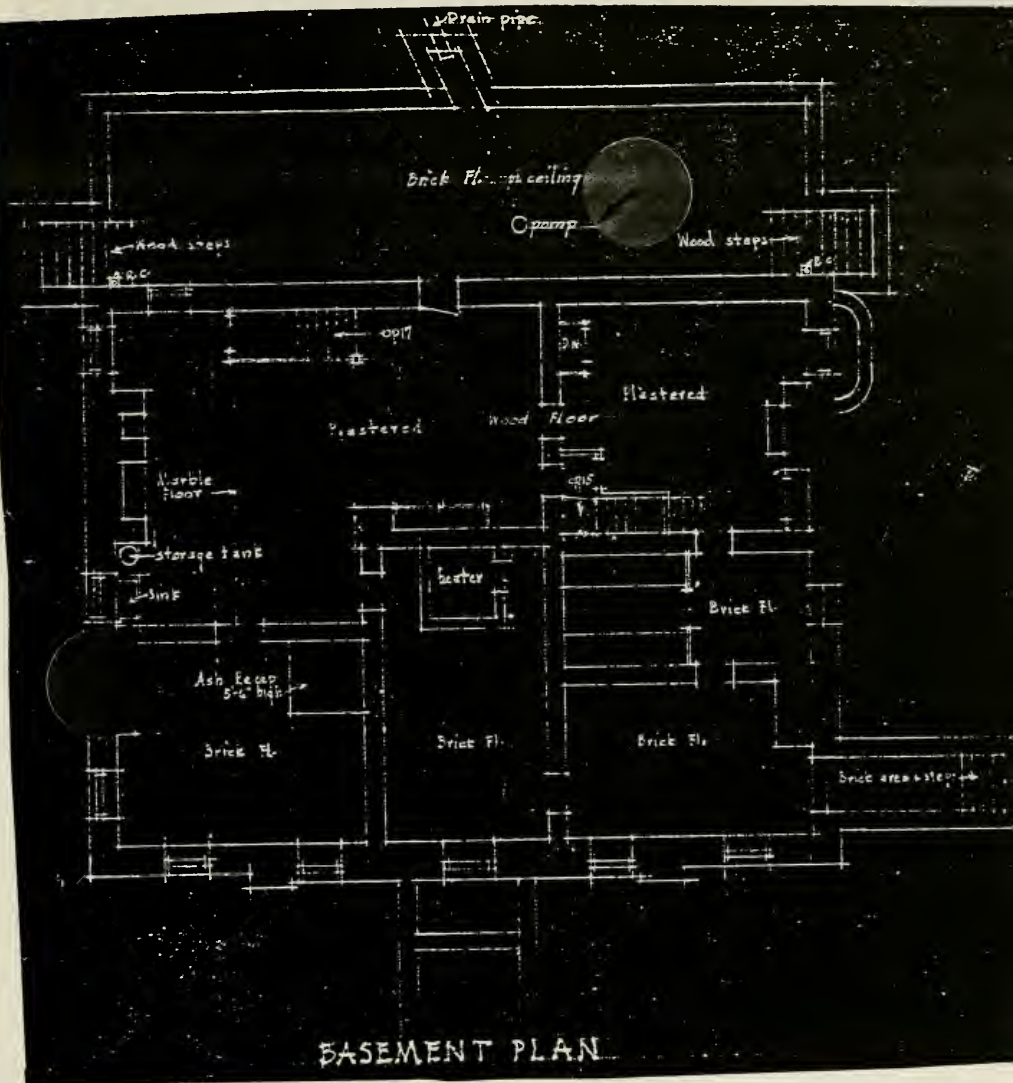


FIGURE 4B. SECOND FLOOR. Note location of water closet and bath tub.

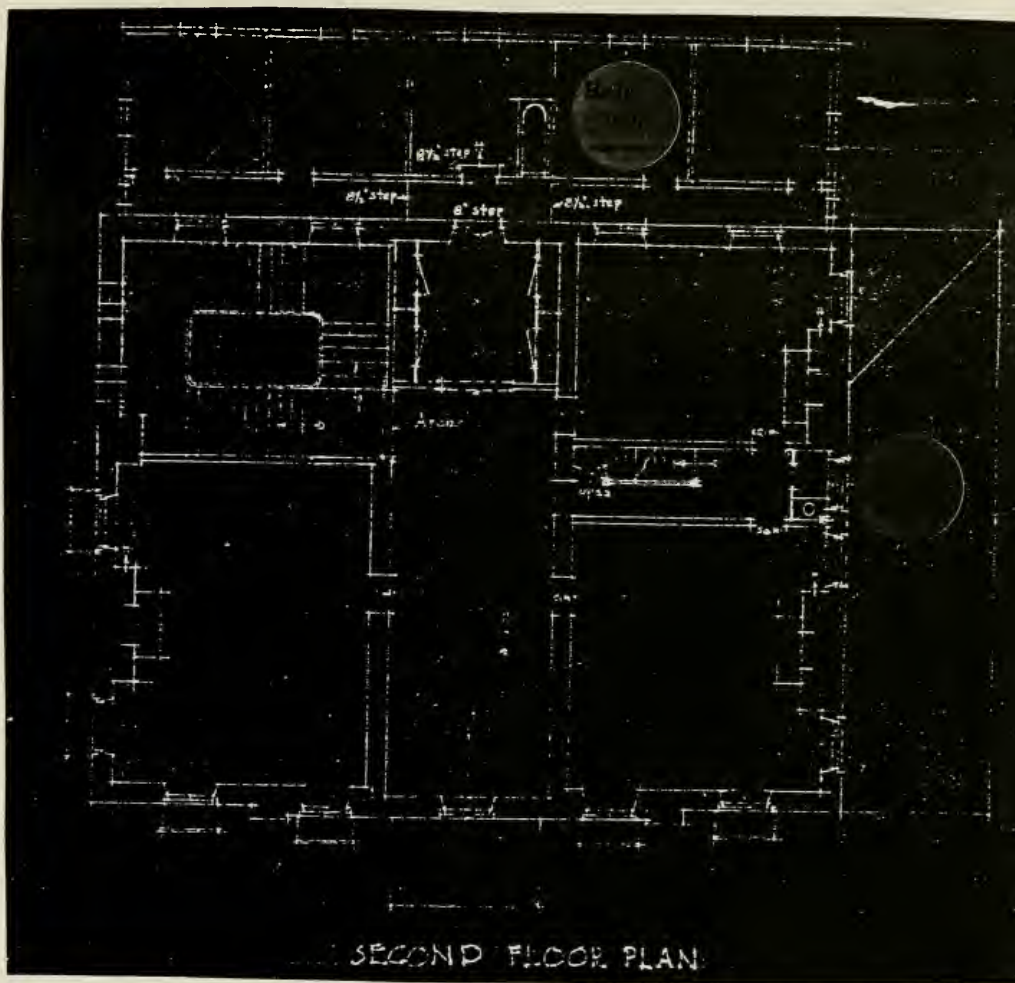


FIGURE 4C. THIRD FLOOR PLAN. Location of reservoirs is indicated.

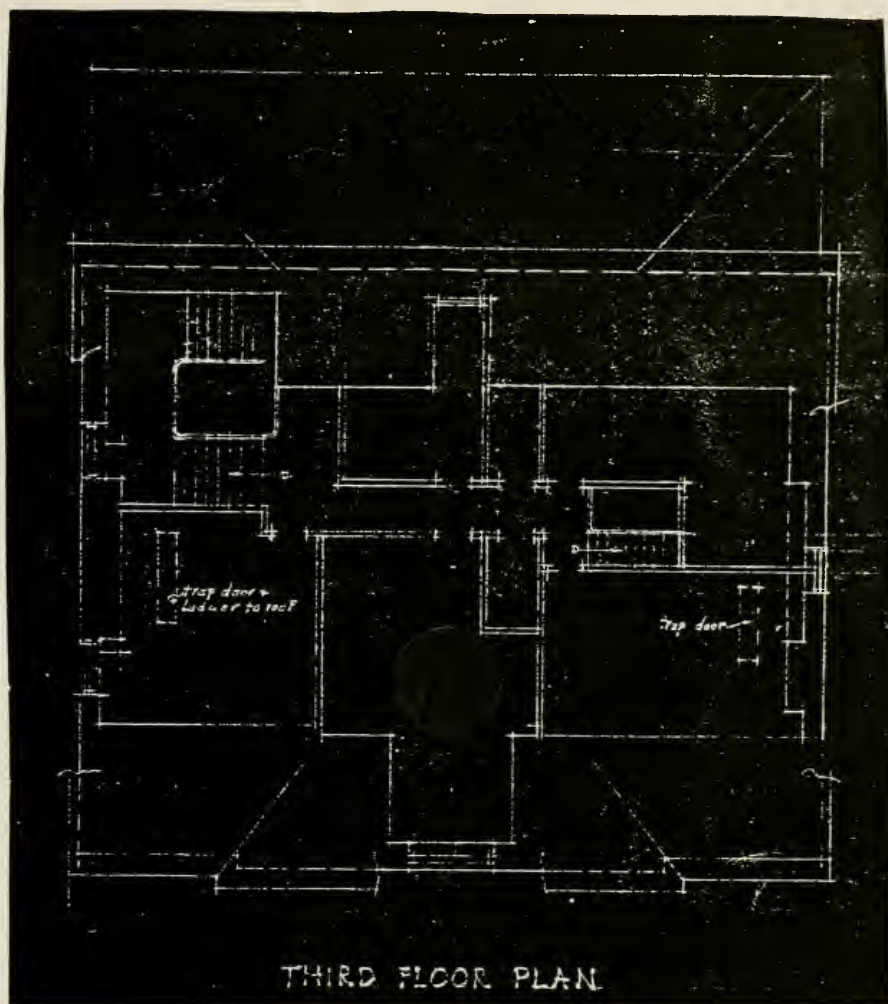


FIGURE 5. RESERVOIRS AS THEY EXIST TODAY. *[Photograph by author, Spring, 1990.]*



ENDNOTES: CHAPTER FOUR

1. Anthony Morris, "Offers for Sale His Farm...", Political, Commercial Register, November 12, 1805. As transcribed in Tomas Spiers and Associates, "Historic Structure Report: The Highlands, Whitmarsh Township, Montgomery County. Part I", (Harrisburg, PA: Bureau of Historic Sites and Properties, The Pennsylvania Historical and Museum Commission, 1980): 2.69-70.

2. December 26, 1870, Sheaff family journal entry notes: "Bath tub overflowed and poured through the verandah ceiling". The 1917 Hanson drawings (Figure 4B) also notes the location of a bathroom on the north side of the second floor.

3. Architect Theophilus P. Chandler Jr. included in his drawings of the "house for William Smythe, Esq. at Ridley Park", August 1872 (File #62 at The Athanaeum of Philadelphia) two water tanks and bathroom and kitchen connections to the water. Piping which had to be installed would have been completely vertical, with the tanks directly above the bathroom and kitchen.

4. Borough of Ambler, Water Department, Meter reading of Meter No. 2748, October 7, 1926. Copy at The Highlands Historical Society, Fort Washington, PA.

5. Drawing labeled "Swimming Pool for Miss Caroline Sinkler, Skippack Pike and Sheaff Lane", (June 10, 1925). The Highlands Historical Society, Fort Washington, PA.

CHAPTER FIVE: THE HYDRAULIC WATER RAM

In a set of articles published in APT Journal, Arthur Channing Downs, Jr., discussed the introduction and use of the water ram in America.¹ Those articles, research regarding the Douglas Company of Middletown, Connecticut, and information from the Sheaff family journals help to explain the machinery used at The Highlands.

The hydraulic ram is a device that raises water from one source (such as a spring) to a tank from which it is distributed for specific uses. Prior to the invention of ram, expensive and labor intensive methods of water supply included steam engines that pumped water. For those persons lucky enough to live in the right regions, rainfall could be collected into cisterns from the roof. A windmill might also provide power for a pump. A device which would cheaply and efficiently supply water for a variety of uses was needed. The introduction of the water ram in the nineteenth century was an innovative way of economically supplying water for a variety of uses, including indoor plumbing, irrigation of fields, or ornamental gardening.²

The history of the water ram begins in England about 1772 when John Whitehurst invented a non-self-acting ram.³ Various patents for hydraulic water rams began to appear in America as early as 1809 when J. Cerneau and S.S. Hallet of New York received a patent for one.⁴ Over the next several decades, numerous patents were issued for hydraulic rams. In 1845, the commissioner of patents of the United States noted in his report the new interest and technology of the water ram:

The ancient and too long neglected *water ram* has, during the past year been revived under new phases, and, it is believed, with good success. The syphon ram has long been known.... But, so far as know, it has been a philosophical toy, and unavailable for practical purposes. By the intervention of a rarified air chamber, as it is called, in conjunction with the momentum of the descending water in the long leg, the syphon ram has been made an attainment of much practical value, and possesses the advantage of being more simple, cheaper, and less liable to derangement than many of the devices employed to raise water above the level of its source.⁵

The 1856 plumbing bill for The Highlands mentions the installation of two 'Douglass' water rams, referring to rams manufactured by the W. & B. Douglas Company of Middletown, Connecticut.

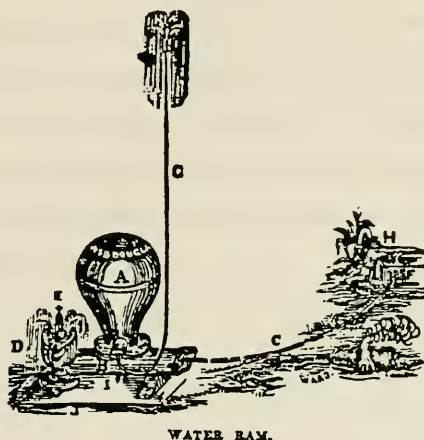
W. & B. DOUGLAS COMPANY

In the chronology which Downs included at the end of his first article, he noted several significant dates and events that involved the W. & B. Douglas Company. Between 1847 and 1850, the rams manufactured by the firm were exhibited several times at the Franklin Institute in Philadelphia as well as the American Institute in New York. In 1848 the company was awarded a silver medal at the annual fair of the American Institute for "an improvement in hydraulic rams, by which the ram may be used as a motive power." The next year they received a diploma from the Institute for rams displayed by their New York agent, Sexton & Webb. They received another diploma in 1850, this time for their "pumps, hydraulic rams, and bolts" from the American Institute.⁶ The W. & B. Douglas Company received other awards as well. The company was awarded the Highest Medal by the Universal Exposition of Paris in 1867, in Vienna in 1873, and in Philadelphia in 1876.⁷

Downs goes on to say that W. & B. Douglas seems to have been the only company producing rams in New England in the 1840s and that they were definitely in production by 1847. He alludes in the first article to the possibility that they were actually distributing the ram of E.W. Ellsworth of East Windsor, Connecticut, who received the only patent in the area in December of 1845.⁸ In his second article, Downs retracts this statement, stating the the two types were entirely different. He goes on to discuss an advertisement in The Cultivator (1848) and lists W. & B. Douglas distributors. (There is no mention of a Philadelphia distributor.) (See Figure 6.) The company described their products as follows:

This ram is constructed with an Adjuster, which renders it decidedly superior to anything of the kind yet invented, as by this improvement the same machine may be conveniently varied in capacity, and at once adapted to various sized streams.

FIGURE 6. THE W. & B. DOUGLAS WATER RAM [SOURCE: This illustration appeared in the *Albany Cultivator*, (April, 1848), p. 127 and in Lewis F. Allen's *Rural Architecture*, (1852), p. 338. As illustrated in Arthur Channing Downs, Jr. "The American Water Ram, Part II", *APT Journal* XI (1979): 92.]



They are composed of metal, and are very neat, compact and portable article---No. 4, the ordinary size, weighing but about 35 lbs., and occupying only about a cubic foot of space.'

The Douglas ram is not known to have been displayed prior to 1847, when it first appeared in the exhibitions of the Franklin Institute and the American Institute. According to Downs, "the examination committee of the latter organization stated the Douglass ram possessed 'the facility of regulating the quantity of discharge, to accommodate the same to different seasons of the year; and also the means of cleansing it from sediments, without taking the machine apart.'"¹⁰

A search of Connecticut directories from this period indicates that the company was in business prior to 1847. An 1856 entry in the Connecticut Business Directory under manufacturers of "Pumps, Hydraulic Rams, and Other Hydraulic Machines" states:

W. & B. Douglass, Middletown, Conn. manufacturers of the celebrated Patent Revolving Stand Premium Pump, Patent Yard Pumps, Patent Double and Single Acting Suction & Force Pumps of various Styles and Capacity, Patent Steam Pumps, Patent Premium Hydraulic Rams, Galvanized Pump Chain, Chain Wheels, 7 Fixtures...Works founded in 1832.¹¹

The W. & B. Douglas Company works began in 1832, under the firm name of Guild and Douglas. Its founders, William Douglas (1812-59) and W.H. Guild (dates unknown) manufactured steam engines and other types of machinery. On August 20, 1835, Douglas supposedly received the first patent for pumps.¹² In 1839, Douglas joined with his brother, Benjamin Douglas, and formed the W. & B. Douglas Company and continued the manufacture of machinery.¹³ (See Figure 7.)

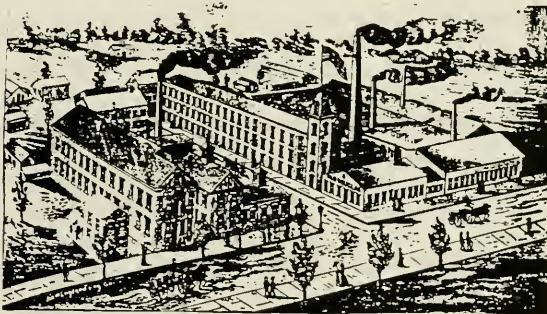


FIGURE 7. W. & B. DOUGLAS FACTORY [SOURCE: H.F. Donlan, *The Middletown Souvenir Edition: An Illustrated and Descriptive Exposition of Middletown, Portland, Cromwell, East Berlin, and Cromwell*, (Middletown, CT: E.F. Bigelow, 1896): 21. Middlesex County Historical Society, Middletown, CT]

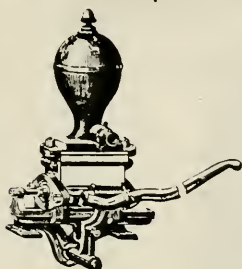
Two histories of Middlesex County give information on the size, revenues, and products associated with the W. & B. Douglas Company.¹⁴ In 1884, the company employed 80 workmen in the production of "their highly celebrated 'Patent Metallic Pumps, and Hydraulic Rams'---articles that have gained superiority over any kind of pumps, or water elevator, now in use".¹⁵ They also manufactured high-quality wrought iron butts and hinges (these used in connection with the pumps and rams), hardware, wrought iron washers, well wheels, friction rolls, and chain pumps. The manufacturing of their products required the use of six hundred tons of iron, twenty tons of brass, and in fuel for production, three hundred tons of anthracite coal annually. The engine that drove their machinery was of their own manufacture.

The Messrs. Douglas have raised themselves increasing year by year to their present business standing (now from \$80,000 to \$100,000 per year) entirely by their own inventive genius, artistical skill, and the aptness of their inventions to the wants of the public. And the demand for the labor of their heads and hands is the best evidence that their calculations were based upon no visionary and unsound theory as to what was really needed to supply the deficiency heretofore experienced in finding a successful, convenient, and cheap mode of forcing water for the various uses to which their pumps, rams, and other hydraulic machines are applied.¹⁶

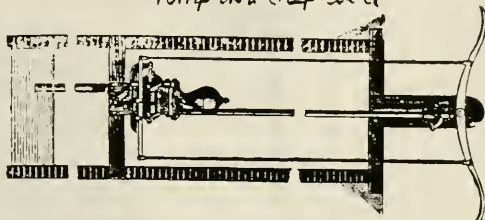
By 1896, the staff at the works had increased to almost 250, all skilled mechanics, with about 1500 styles and varieties of pumps and new ideas constantly being tested. The stock of the company was capitalized at \$600,000. The steam engines provided about 200-horse power. It was said that the company was "a most complete one in outfit and appointments, every part that enters into its products is worked up from the raw material on the premises and the operations are conducted at a large scale". The company manufactured a variety of house, domestic, and farm pumps, and belt power pumps for factory use.¹⁷ (See Figure 8.) The company had a reputation for producing quality goods and was known internationally.¹⁸

FIGURE 8. TYPES OF MACHINES AVAILABLE FROM DOUGLAS COMPANY, date unknown [SOURCE: "W. & B. Douglas Company", Papers at the Middlesex County Historical Society, Middletown, CT]

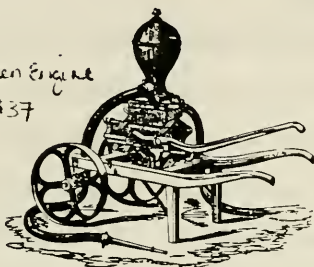
Household Pump



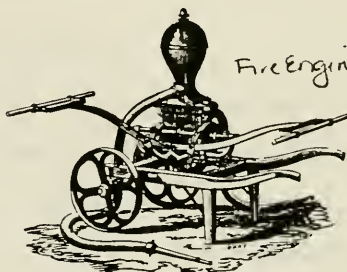
Pump in a deep well



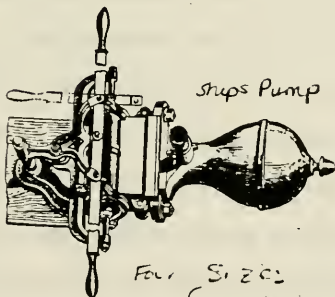
Garden Engine
3 in \$37



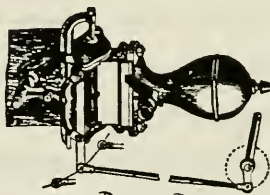
Fire Engine



Ships Pump

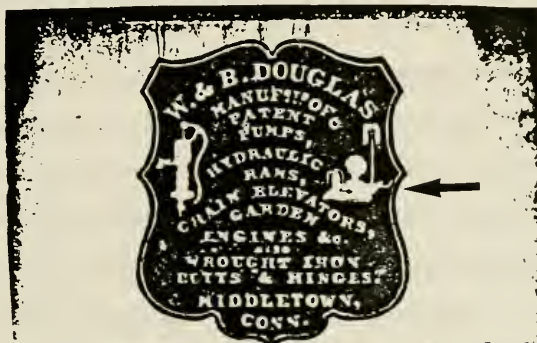


Power Pump



Four	Size		
House Pump	2 1/2 in	34	5 in of 35 (11 in) 112
	2 1/2 in	270	(-) 112
	3 in	450	25
	4 in	825	32 1/2
	5 in	1300	\$40
these prices will give you a price of - Engine			

FIGURE 9. BUSINESS CARD OF THE W. & B. DOUGLAS COMPANY, UNDATED. Note water ram indicated by arrow. [SOURCE: "W. & B. Douglas Company", *Papers at the Middlesex County Historical Society, Middletown, CT*]



THE W. & B. DOUGLAS COMPANY HYDRAULIC WATER RAM

It is not clear exactly when the W. & B. Douglas Company began to manufacture water rams. The 1847 diagram of the ram published in The Cultivator (See Figure 6) seems to be the earliest diagram of the company's product available and the earliest reference to their manufacture of a water ram. Though various patents received by the W. & B. Douglas Company have been located, no patent has been found for any rams the company manufactured, despite the company's advertisements that the ram was patented.¹⁹

Specific conditions were required for the ram to work properly. The ram was to be placed at a specific distance and height below the source of water. (See Figure 10.) The drive pipe carried water from the spring to the ram. The feedbox served as a reservoir for water from the spring prior to its entering the ram. The ram itself was composed of several different parts. The bulb-shaped machine was an air chamber with two valves, one connected to the drive pipe (the spring) and one leading to the two reservoirs in the house (discharge pipe). The force of the water falling from the spring (or the feed box), forced the impetus valve open, allowing a portion of the water to enter the chamber. The air that previously occupied the air chamber was compressed and when it reached its maximum point of compression, it expanded, filling the

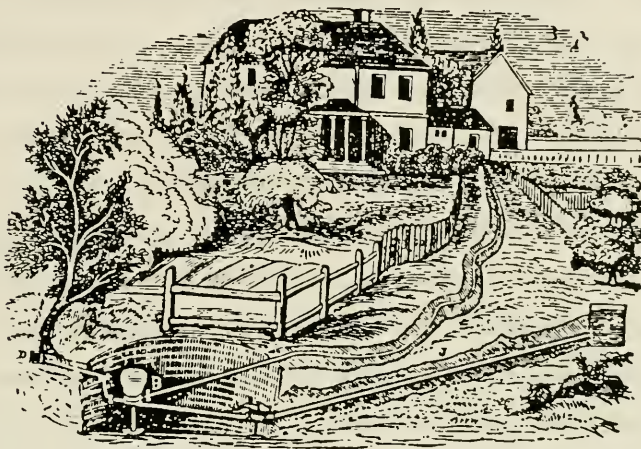
chamber and forcing the water out the drive-pipe and to the house. The volume of the discharge pipe had to be equal to the volume of the air chamber so there would not be too much water pumped into the system. The process was continuous, allowing a constant supply of water to the reservoirs for use in the house. The amount of water, the diameter of the various pipes, and the distance which the water had to travel were all factors in the amount of water pumped into the house, and most manufacturers gave specifications to the customer in order to determine the proper model needed to supply an adequate amount of water into the house.²⁰

The ca. 1912-4 trade catalogue of Hand Pumps, Spray Pumps, Power Pumps shows a hydraulic water ram and gives an explanation of the ram technology. General instructions specified correct installation of the water ram. The ram was to be placed in a pit, or "suitable housing" and out of the way of frost. In installing both the drive-pipe and the discharge-pipe (carried the water from the pump to point of discharge, or tank), angles were to be avoided. Also, "the length of the drive-pipe would be about three-fourths of the vertical height from ram to point of discharge, or five times the vertical height from supply to ram". The installation of a strainer was also recommended, to avoid getting foreign matter into the chamber.²¹

FIGURE 10. PROPER INSTALLATION OF THE RAM. [Illustration from *American Farmer*, I, No. 10, (April, 1846), p. 311, As found in Arthur Channing Downs, "The Introduction of the American Water Ram, ca. 1843-50", *APT Journal* XI (1979): 64.

BENSON'S PATENT WATER RAM.

No. 1.



HYDRAULIC WATER RAMS AT THE HIGHLANDS

It is probable that prior to installing a water ram at The Highlands, John Sheaff had seen literature on a Douglas ram or had seen the actual rams on display at the Franklin Institute. Either way, it would seem that the Sheaffs installed what may have been the best ram on the market, at least according to the 1852 endorsement, which described the W. & B. Douglas ram as "the most complete in its operation and perfect in its construction, of anything within our knowledge".²²

On October 6, 1856, Forsyth and Brothers Plumbing charged John Sheaff for two Douglas water rams for The Highlands, models numbers four and five, the former costing \$10.00 and the latter, \$15.00. The models which were installed are assumed to be similar to that published in *The Cultivator* (1848) and Lewis F. Allen's *Rural Architecture* (1852). (See Figure

6.) The Cultivator article stated that the number four model weighted only 35 pounds and occupied only a cubic foot of space.²³ The amount of water available at the spring was large enough for two models to be installed.

A "ram pit" appears on the 1917 topographical map Caroline Sinkler had drawn and is probably where the two Douglas Rams were installed in 1856. (See Figure 3.) Downs discusses "ram houses" as small buildings where the ram was placed, to protect it from the weather.²⁴ Whether such a building existed at The Highlands is unknown, but it is likely that the rams were placed in a box within a pit or ditch as the Forsyth bill notes a charge of \$4.50 for a box for the ram. Diary entries talk of cleaning out the ram pit on several occasions.

The first diary available after the installation of the rams is for the year 1860, and it mentions several problems that resulted in the lack of water in the house. On July 18, 1860, it was discovered that the rams had stopped and that the water supply in the reservoirs was reduced to only 7 or 8 inches. The following day, the gardener set the ram in motion again, but it did not work for very long. On July 21, he was able to fill the reservoir by supplying the "Feed Box" with waste water and letting "the ram go for only six hours at a time then allowing the feed box space for replenishing". In October of 1860, a pump maker had to be summoned to adjust the "three pumps"--indicating other sources of water on the site. The plumber returned again on November 9, to put the rams "in order" with a notation that the "supply of water [is] sufficient to work them both".

The next journal entry which may relate to the ram was ten years later, on September 10, 1871, with "seven men at work at ditch", and again on September 22, when nine men worked at the same task. The ram ditch had to be kept clear of any debris such as roots or excess water in order for the ram to function properly. In both 1874 and 1876, the only reference to water being pumped into the house is found in the discussion of a "heavy rain [which] fell during the night--good for the tanks" (July 29, 1874) and when a problem with the water was solved in June, 1876 when rain resulted in "water coming in".

After these problems, the rams were not mentioned for several years. In July of 1878, the ram stopped due to a blockage of the ram ditch with roots which had to be removed. On July 9, "Jerry" was able to remove enough of the blockage to get one of the rams to work. On August 1, 1878, John Sheaff adjusted an unspecified problem with the rams and started the small one (presumably the Douglas No. 4). Two days later--August 3, 1878--the reservoirs and boiler were washed out and the ram started again.

In 1881 the problem with the ram seems to have been the result of the water not being high enough for the ram to pump it into the house. If the spring was not high enough to fill the pipes to the rams, the velocity of the falling water could not produce the friction needed to open the air chamber. On February 24, 1881, the entry mentions that the family had had "incessant trouble with the water this winter". Other entries include the ram stopping during this year and the replacement of the ram head on November 25. This however did not completely solve the problem as there was still not enough water to work the ram properly.

In the Autumn of 1886 the Sheaffs had still more problems with the rams, resulting in a lack of water for the laundry. On October 25, 1886, the entry reads: "Had to carry water for washing again, as the ram only supplies the upstairs needs". This may once again indicate the low level of the spring, with the little water available being saved for the utilities on the upper floors, such as the water closet and bathtub. By November 26, with the ram once again started, there was sufficient water in the house.

The year 1888 brought constant problems with the rams. John Sheaff is noted on several occasions as having spent the entire day adjusting the ram. The nature of the problems is not entirely clear. On February 27, the entry notes that the ram has started again---for the first time since December 1. By March 2 the reservoirs were once again full and the water was turned on in the house. By the end of the month, however, (March 28) too much overflow had caused more problems with the rams.

Throughout the spring entries mention the ram stopping and starting. In August, John Sheaff installed a new head on the ram, "hoping it would do more work". Freed, a pumpmaker, was at work on September 20--and paid \$35 by the Sheaffs--but what exactly he did at that time is unclear. On September 25, after several problems with various pumpmakers and plumbers, John Sheaff put a wire in the ditch below the ram. "Will now be able to reduce the water over the pipes and save much trouble." On November 9, the entry reads: "John obliged to work at ram again. It has gone steadily for four weeks, but it is now entirely broken down, needing plumber."

In January of 1889, a series of entries mention visits by the plumber, who worked at an unspecified "difficult task". Some of the work done involved the water rams, and on January 17 and 18, they were restarted and the reservoirs were filled.

Problems with the rams did not seem to occur often after 1890. On January 29, 1896, John Sheaff spent a day at the ditch, surprised to find that the ground was dry, perhaps indicating that he thought the problem would be the result of water around the pipes, as in previous years. Several entries during October, 1896, mentioned plumbers and the water rams but for the most part the pages are illegible and therefore the nature of the problems are unclear. On March 18, 1901, men worked "trying to get water off ram which is flooded". A problem in June of 1901 is noted as being the first time in a long while that the ram had stopped and there was no water in the house. This is the last mention of the rams in the Sheaff family journals.

In 1978 Tomas Spiers and Associates conducted a conditions survey of the buildings on the property in Fort Washington as well as a preliminary evaluation of the water system.²⁵ Included in this study were observations regarding physical remnants of water system equipment and a description of the existing system. With the installation of the pool in 1925, Caroline Sinkler also had a pool house constructed for use as a changing room and a pump room. (It should also be noted that this installation destroyed all evidence of the ram ditch. The pump

room in this structure contains an old Aurora turbine pump which Spiers noted is probably a replacement for a reciprocal pump. Various controls indicate that it was a fully automatic system, with its power source probably electric. The pressure tank for this system was located in the ice house to the north of the mansion. Spiers concluded that the water from the spring would not have been sufficient to supply the utilities during the late summer months, so when public supply lines became available, Caroline Sinkler had the property connected via a main on Sheaff Lane.²⁴

The system which Spiers described appears to have been an interim system of supply between the rams and the township water lines and requires further investigation. However, it is likely that Sinkler did upgrade the Sheaff system as the renovations were undertaken. The rams may not have been able to supply the increasing needs of the mansion or the grounds but the new system proved that the spring may have been inadequate so when the borough water line became available in 1926, Sinkler installed yet a third system. This is currently the source of water for the property.

ENDNOTES: CHAPTER FIVE

1. For a complete history of the water ram see Arthur Channing Downs, Jr., "The Introduction of the American Water Ram, ca. 1843-50", APT Journal VII, no. 4 (1975): 56-103. (Hereafter cited as Downs, I.) And, Arthur Channing Downs, Jr., "The American Water Ram, Part II", APT Journal, XI (1979): 81-94. (Hereafter cited as Downs, II.)

2. Downs, I: 56-7.

3. Downs, I: 83.

4. Downs (I, 59) notes that this ram was not known to have attracted any attention. Subject-Matter Index of Patents for Inventions, 1790-1873. Vol 3 (Washington, D.C.: Government Printing Office, 1874): 769.

5. Report of the Commissioner of Patents Showing the Operations of the patent Office during 1845 (Washington, D.C.: Government Printing Office, 1846).

6. The Franklin Institute does not have copies of the Exhibition Catalogues that Downs cites in his article. Downs, I: 88.

7. W. & B. Douglas Company, Advertisement, (c. 1867). Middlesex County Historical Society, Middletown, CT. (Hereafter cited as Douglas, "Ad".)

8. Downs, I: 69.

9. Downs, II: 83-4.

10. Franklin Institute, Seventeenth Exhibition, (1847): 12. And American Institute, Annual Report for 1847: 134. As quoted in Downs, I: 69.

11. George Adams, Connecticut Business Directory, (Boston: George Adams, 1856), Microfiche, University of Pennsylvania Van Pelt Library: 76.

12. No record of such a patent was located in the government indices. E.M. Gorham, "Middletown As It Is", New York Journal of Commerce (1850). As quoted in History of Middlesex County Connecticut with Biographical Sketches of Its Prominent Men (New York: J.B. Beers & Company, 1884): 163. (Hereafter cited as Gorham.)

13. What happened to Guild is unknown.

William Douglas died intestate on April 21, 1858, leaving his wife, Catharine Douglas, and six children. An agreement was made whereby the business would continue with Benjamin Douglas and the heirs of William Douglas becoming the "W. & B. Douglas Company". The first meeting of the new firm was held on June 1, 1859. [*Agreement of heirs of William Douglas and Benjamin Douglas, c. 1859. Document 1989.13.26, Middlesex County Historical Society.*]

It was also in 1859 (and most likely as a result of the same agreement) that the company was incorporated by a special charter issued by the state of Connecticut, with Benjamin Douglas listed as president. [*Douglas, "Ad".*] The Company continued to be run by Benjamin Douglas till his death in 1894. The heirs received possession of the company and a new board of directors was appointed on January 15, 1896. John M. Douglas, son of Benjamin, who had served as secretary and treasurer of the company, was appointed president.

H.F. Donlan, The Middletown Tribune Souvenir Edition: An Illustrated and Descriptive Exposition of Middletown, Portland, Cromwell, East Berlin, and Higganum, (Middletown, CT: E.F. Bigelow, 1896): 20. (Hereafter cited as Donlan.)

Two years after the death of Benjamin Douglas, the company reported financial difficulties which apparently had started around 1884. Seth H. Butler, treasurer of the company, declared that there was a debt of \$180,000 in February of 1896 and that unless the company reorganized itself, they would be unable to continue manufacturing without raising at least \$140,000. The solution came with the decision to raise part of the money through the sale of bonds. It was also decided to replace John M. Douglas as president, most of the board members no longer being family members. ["*The Douglas Company: Board of Trade Takes a Hand in Reorganization...*". (c. 1896). Xerox of newspaper article at Middlesex County Historical Society. Paper unknown.]

[Donlan, 20.]

14.The two sources are Donlan (1896) and Gorham (1850).

15.Gorham: 98.

16.Gorham: 98.

17.Donlan: 20.

18.Donlan: 21.

19.United States Patent Indices were checked for the W. & B. Douglas Company from 1790 to 1915. NO PATENT WAS LOCATED FOR THE W. & B. DOUGLAS COMPANY RAM, even though they state in most of their advertisements that their ram is patented. Patents issued to the company of that time period are listed in the Chronology of the Company, Appendix D. The Union Catalogue lists the following W. & B. Douglas Trade Catalogues: AT Yale University Library, New Haven, CT: 1897-8 Pumping Machinery Catalogue. AT Franklin Institute, Philadelphia: Undated catalogue & Price list of "Pumps, Hydraulic rams, chain pumps, garden engines, & other hydraulic machines, hardware, etc..." (Other sources listed for this catalogue include the U.S. Library of Congress and the Boston Public Library.) At the Franklin Institute also: "1875-6 Catalogue & Price List: 1903 Hand & Power Pumps, Hydrants, etc." (Also at the New York Public Library); and the 1883-4 Catalogue. The trade catalogue collection is no longer owned by the Franklin Institute. It is recommended that the Smithsonian collection be checked. The Middlesex County Historical Society (Middletown, CT) has two catalogues: Booklet H: Power Pumps, Hand Pumps, Spray Pumps, c. 1897; and, Catalogue "M": Hand pumps, Spray Pumps, Power Pumps, c. 1912-14. The Connecticut Historical Society (Hartford, CT) has a ca. 1898 catalogue as well.

20.This description of the water ram technology is a combination of information from the Downs articles as well as the description of the hydraulic water ram in the Douglas Catalogue "M": Hand Pumps, Power Pumps (Middletown, CT: W. & B. Douglas, c. 1912-4): 85-6. (Hereafter cited as CAT.)

21.CAT: 85-6, 5.

22.Lewis F. Allen, Rural Architecture, (1852): 338. As quoted in Downs, II: 84.

23.Cultivator, (April, 1848): 133. As quoted in Downs, II: 83.

24.Downs, II: 83.

25. Tomas Spiers & Associates, "Preliminary Inventory and Condition Survey of Historic Buildings and Evaluation of Water System at The Highlands, Whitemarsh Township, Montgomery County, Pennsylvania", (Harrisburg, PA: Bureau of Historic Sites and Properties, Pennsylvania Historical and Museum Commission, 1978). (Hereafter cited as Spiers.)

26. Spiers, Section IV. It should be noted that much of the equipment that Spiers describes in this report is still present on the property and warrants further investigation and conservation. The pump in the pool house is rapidly deteriorating but is still intact as are the various electrical controls that Spiers mentions. Spiers also notes the presence of some pumps in the ice house. Whether these are still intact is unclear at this time as access to the ice house was not possible.

CHAPTER SIX: MISCELLANEOUS ITEMS: RESERVOIRS, PIPES, LABOR

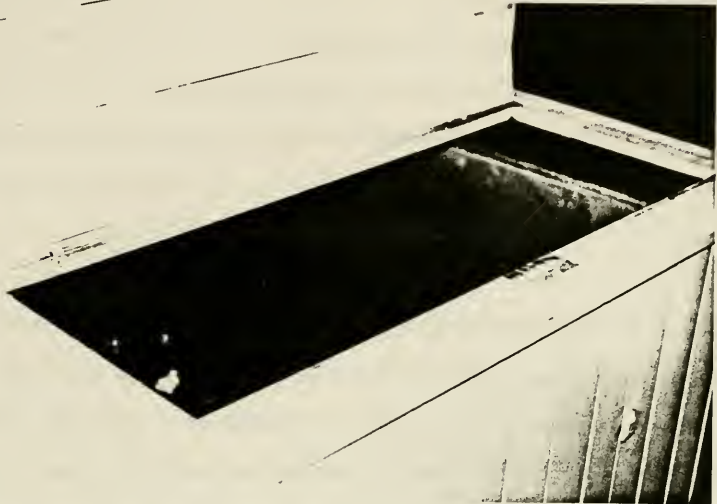
RESERVOIRS

The Forsyth and Brothers bill gives specifications for the construction of one reservoir with dimensions of 16 by 4 feet and 2 feet deep. An additional charge for materials for two reservoirs (each being "9ft 6in x 4 ft of 2 feet deep") was later added and it is these two that were constructed in the center room on the third floor of the mansion. (See Figures 5 and 11.) John Sheaff was charged \$5.50 for the construction of the boxes and lining them in lead. Why there was a need for changing the size of the reservoirs is unknown. It may be that they were able to fit two more easily into the space or they found they would be able to pump more water than originally planned into the house and needed the additional space, finding that two reservoirs would be easier to construct and clean than one large one. Also, the construction of two reservoirs would have allowed the weight of the water and the lead to be distributed, not causing as much stress on the structure itself.

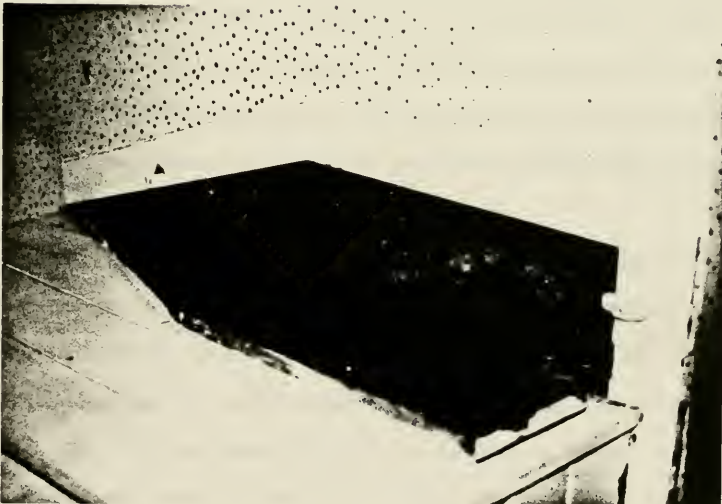
The reservoirs were directly connected with the ram and provided storage for all water in the house. A small pipe opening, located in the rear of each, connected the water to the fixtures in the house. The Forsyth bill also indicates an eight foot pipe which connected the two tanks, being 1/2 inch in diameter. An overflow pipe was run from the reservoir to the greenhouse.

FIGURE 11: THIRD FLOOR RESERVOIRS. These are the only physical evidence which remains of the Sheaff system. *[Photograph by author, Spring 1990.]*

A. Interior of reservoir



B. Pipe



According to the Sheaff journals, the reservoirs, along with the boiler, were periodically cleaned out, particularly when there had been problems with the rams and the water may have been muddy. The quality and purity of the water would not be acceptable by modern standards, partially because of the filtration of the water through the lead tanks. Foreign matter also entered into the water, as indicated by the entry on April 9, 1872: "Cleaned out reservoirs again, dead mouse in the water". The construction of lids on the Sheaff reservoirs may have been to guard against such intrusions.

PIPES

Along with all the other utilities listed in the Forsyth bill are the specific dimensions and lengths of all the piping required for the work. Most of the piping seemed to have been copper or lead, with some wrought or cast iron included as well. The bill indicates several charges for the bending and working of various pipes and joints. An overflow pipe was run from the reservoir to the green house of the stable, with the overflow going into the trough. There is also reference to the charge of \$41.60 for a change in the original dimensions, noting that 520 feet of larger overflow pipe was required in place of the original 3/4 inch pipe, at a difference of eight cents per foot. (No dimension for the new pipe was given.) The water closet was connected to a soil pipe which ran to the well, presumably meaning a cesspool of some type. The sink (in this case assumed to mean the kitchen sink) was fitted with a two inch wrought iron pipe for waste, the charge being \$8.50 for the 25 feet which was required.

The installation of the ram also required specific pipes, and the Forsyth bill indicates several different types which were installed. Sixty-five feet of 1/2 inch diameter pipe, as well as twelve feet of 5/8 inch diameter pipe is listed, the total for the two being \$39.95.

Other miscellaneous, unspecified pipes and parts are also listed along with the turning of some joints. John Sheaff was charged for \$1.25 for a copper strainer for a two inch pipe. Where the strainer was used is unclear but the bath tub or kitchen sink is a likely location.

LABOR

The installation as well as the maintenance of the system which the Sheaff family used required the skill of several different types of people, including plumbers, machinists, pumpmakers, and carpenters. The Forsyth and Brothers bill lists expenses for all the workmen, including labor charges, travel, and boarding expenses. Specific labor tasks included the bending of joints and making connections of specific pipes with utilities such as the ram. Carpenters were hired to construct the boxes for the ram and the bath tub and the seat for the water closet. The bill also indicates charges for the cutting out and refitting of the floors and other areas for the installation of the pipes, as well as for fixing the door in the reservoir room.

Journal entries indicate that after the installation of the system, John Sheaff assumed much of the responsibility for its maintenance, particularly in the case of the water rams. Occasionally there is mention of a pump maker or plumber on the site. On at least two occasions, plumbers came to the site and did not complete the work due to a disagreement with the boss, presumably John Sheaff.¹

ENDNOTES: CHAPTER SIX

1. See journal entries for August 13, 1888 and January 14, 1889.

CHAPTER SEVEN: BOILER/SHOWERBACK

Early nineteenth-century methods of heating water used a boiler attached to the kitchen range, heated by the range fire. As the century progressed, the methods of obtaining hot water became more and more sophisticated. A sturdier metal boiler replaced the hand-filled box that had once stood at the side or rear of a range fire in the early decades of the century. By the late 1840s, the boiler stood upright next to the hearth and received water from a water-back (heating chamber attached to the range). After 1850, the water-back became fairly standard equipment on the kitchen ranges. In some arrangements there was a hot water tank on the top floor to which the water was pumped from a heater on the range. From the tank it was distributed downward to the fixtures. Modern houses of the 1860s had range water-backs attached to a circulating boiler of galvanized iron or copper. The water passed through the boiler to the iron water-back and, when it was heated, it returned to the boiler. It was then distributed to fixtures in the house.¹

The Forsyth and Brothers plumbing bill includes a charge of \$7.25 for "1 double Shower back". It is unclear what a shower back was but it may be similar to the water-back which was attached to the kitchen range. Installed in the bathroom above the tub, the shower-back may have served as a cistern for hot water in the bathroom itself rather than being piped from the boiler when the faucet was turned on. No mention is made of the shower back in the Sheaff journals.

THE SHEAFF BOILER

The Sheaff family home was modernized with the installation of one "Copper Circulating Boiler" in 1856. John Sheaff was charged \$66.50 for the hot water heater, as well as \$2.25 for its iron stand. Presumably this device was attached to the range in the basement kitchen. Piping would have attached the boiler to the reservoirs on the third floor. When hot water was needed, the water from the reservoir that had been heated in the boiler would be piped

to the fixture. The bill indicates that the tub, shower back, and sink were all connected to the boiler.

Journal notations regarding hot water and the boiler begin in 1860. On January 6, 1860 a leak in one of the pipes required the extinguishing of the range fire. The following day, as a result of the problem in the kitchen as well as a problem with the ram, it was decided not to make a fire in the range for several days. With the installation of new washers in the water-back to prevent further leaks and new sides and grates in the range, a fire was made on January 10. On September 15, 1860, a pipe leading to the boiler burst, making it again necessary to put out the fire in the kitchen range. The problem was corrected several days later. On November 23, "some burning wood having fallen behind the range caused the water pipes to leak, obliged to turn the water off and move into the other room", presumably another room in the basement. The problem was remedied the next day and a fire made. The next entry which mentions the boiler is found on April 28, 1874, when a plumber came to stop leaks in the boiler and the water closet. In August of 1878, the reservoirs and boiler were washed out and the ram restarted. They were washed out again on August 11, 1881, and February 28, 1888.

ENDNOTES: CHAPTER SEVEN

1. May Stone, "The Plumbing Paradox: American Attitudes towards Late Nineteenth Century Domestic Sanitary Arrangements", Winterthur Portfolio (Autumn, 1979): 285, 297.

CHAPTER EIGHT: WATER CLOSET

The term water closet was used in the nineteenth century to denote the fixture that we today would call the toilet and not the small space in which the fixture was installed. The first patents for water closets in America were issued in 1833 and 1835, for portable devices or commodes. In the next few decades, fixed water closets came on the market.¹

The water closet was produced in two basic forms during the nineteenth century--the mechanical type and the water action variety. The first type were valve closet, and the plunger or plug closet where mechanical parts were closely connected to the bowl and controlled the flush. A water seal was achieved in these models by retaining some water in the bowl and the trap. The second type was the long and short shoppers, which depended for flushing on the supply pipe valves or high cisterns.²

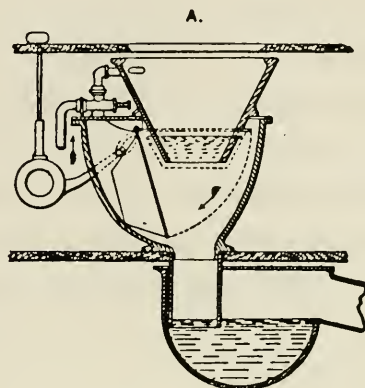
The most common type of water closet in use during the middle decades of the 19th century in America was the "pan" toilet.³ It was condemned by sanitarians in later years because "the lower waste receptacle retained hidden filth and the movable pan arrangement permitted escape of impure air". It was not until the introduction of the wash down, wash out, and siphon-jet toilets in the final decades of the century, that water closets finally became efficient in design.⁴

THE SHEAFF WATER CLOSET

In the 1853 agreement for the construction of a shed and bath house, John Gamble was instructed to insert a privy, five feet wide, walled with brick and with an eight foot well. It seems that this privy was installed near the barn, not easily accessible to the house and possibly not for use by residents but possibly by the farm hands. Where the privy for the mansion house was located is unclear.

The type of water closet installed by Forsyth Brothers Plumbing in 1856 is unknown, but the popularity of the pan type water closet during this time period suggests that this type of mechanical toilet may have been installed. (See Figure 12.) Listed among numerous other work

FIGURE 12. PAN TOILET. [SOURCE: William Paul Gerhard, *House Drainage and Sanitary Plumbing* (New York: D. Van Nostrand, 1882), fig. 4. As found in May Stone, "The Plumbing Paradox: American Attitudes towards Late Nineteenth Century Domestic Sanitary Arrangements", *Winterthur Portfolio* (Autumn, 1979): 306.]



and parts, is the notation "one regular water closet, resoveoir [sic] to with Soil pipe connecting with Well,...". There was also an unspecified charge for carpenter's work for fitting up the water closet seat.

The soil pipe would have carried waste out of the house to a cesspool. The only indication of location of the fixture is the 1917 drawings which H.M. Hanson did for Caroline Sinkler prior to her renovations. (See Figure 4.)

The journals supply little information on the water closet, with most references to technologies in the house being limited to talk of the bath tub or boiler. The first entry regarding the water closet (described as the "w.c") appeared in 1889. As previously noted, a period of changes seems to have occurred between 1888 and 1890 in relation to the water closet, with it "being put in order" during this time. What specific change occurred is unclear. On January 29, 1889, the plumber was unable to complete the task because a "piece" was lost. On February 4,

1889, the plumber finished his task in the kitchen and the water was turned on, but he was unsuccessful with the water closet. A year later the problems continued. On February 3, 1890, James Lisle, a plumber, "came up to make another attempt at putting the water closet in order". It is doubtful that he was successful because only on February 15, 1890, does an entry note that the plumber came and finally remedied the problem, completing almost eighteen months of work. The changes in the technology and efficiency of the water closet may mean that a new type of fixture was installed at this time, such as a valve or plunger closet. (See Figure 13.) It may, however, also indicate that it took this long to find someone skilled enough to fix the problem and that no changes were made in fixtures. But as no bill has been located and no listing of what was done is found in the journals, the answer may never be known.

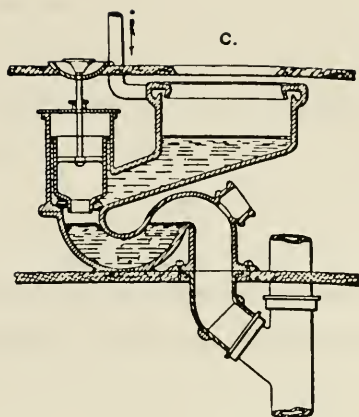


FIGURE 13A. PLUNGER WATER CLOSET

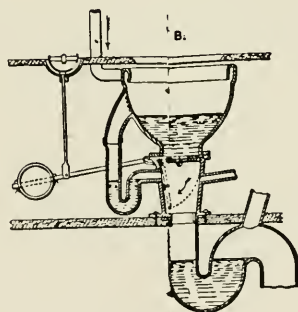


FIGURE 13B. VALVE WATER CLOSET. [SOURCE OF FIGURE 13A & B: William Paul Gerhard, *House Drainage and Sanitary Plumbing* (New York: D. Van Nostrand, 1882), fig. 4. As illustrated in May Stone, "The Plumbing Paradox: American Attitudes towards Late Nineteenth Century Domestic Sanitary Arrangements", *Winterthur Portfolio* (Autumn 1979): 306.]

On March, 1890, the furnace man arrived to "put pipe in water closet in order". The reference to "water closet" in this case may indicate the change in usage of the term to denote the space itself rather than just the fixture. The final reference to the water closet was January 14, 1901, when George Collins was paid \$20 for cleaning out wells on the site, including the water closet well.

As already mentioned, Caroline Sinkler added several new bathrooms which included new water closets and other fixtures. These are the same facilities that are being used today.

ENDNOTES: CHAPTER EIGHT

1. May Stone, "The Plumbing Paradox: American Attitudes Towards Late Nineteenth Century Domestic Sanitary Arrangements", Winterthur Portfolio (Autumn 1979): 285, 297. (Hereafter cited as Stone.)

2. Stone: 304-5.

3. Harvey Green, Fit for America: Health, Fitness, Sport, and American Society, (New York: Patheon Books, 1986): 112-3.

4. Stone: 304-5.

CHAPTER NINE: BATHTUB

Bathtubs in the 18th and early 19th centuries were mostly formed of sheet metal, including copper or sheet iron coated with tin or zinc and then painted. They were usually quite small, owing to the fact that they had to be filled and emptied by hand. When they became stationary (i.e. when they were connected to running water) the large lounge or plunge-type baths became more common. Tubs continued to be made of sheet metal and were encased in wood wainscoting that matched the surrounds to hide ugly machinery, plainness, and poorly joined parts. Sheet metal proved difficult to clean as well as requiring frequent repainting and was not a good material for either water closets or tubs. Later experimentation with the production of fixtures from cast iron corrected such problems.¹

THE SHEAFF BATHTUB

The earliest reference to a bathtub at The Highlands is found in the Sheaff journal dated June 18, 1845, noting a wagon arrived, bringing a "bath tub, force pump, and all the parts for arranging the bathroom". By June 30, the job had been completed, although the journal says little about the specific tasks involved or the cost of the whole installation. An entry on July 8, reported: "The bathroom gives great satisfaction and all are delighted with the improvement". Even visitors apparently enjoyed the luxury for an entry on July 23, 1845, noted: "Dr. Smith came up and took tea with us, tried the bath before leaving, and took with him the old shower bath".

Eight years after the bathtub was installed in the house, John Sheaff hired John Gamble to construct a bath house at The Highlands. Specific plans of the structure are not given but several important features can be discovered through an examination of the agreement. (See Appendix C.) The building itself was to contain a bathing room as well as a dressing room, both with floors of yellow pine. It was to be constructed of hemlock framing and weather boarded on the outside, lined on the inside and given three coats of paint. (No indication is given as to

whether the painting was of the interior or exterior.) Gamble was responsible for constructing a tub of Cedar plank with copper spikes, to be enclosed in a frame. Gamble was also to install "trunks" (presumed to be pipes) to carry the water and waste, though it is noted that "John D. Sheaff is to do the Mason work digging etc, also to find the Gates to let off the water". The notation suggests the tub was connected to some type of discharge pipe but whether it was connected to a force pump is not indicated.

No other reference to a bathroom appear until after the 1856 changes, but the Forsyth and Brothers bill does mention the "old bath tub". Whether this "old tub" was the one installed in the mansion in 1845 or in the bath house in 1853 is unknown. The 1856 bill noted the old bath tub was put in and connected with the waste pipe as well as hot and cold water. However, on the same day, John Sheaff was charged for a large copper bath tub. It may be that the older tub was connected for use by servants, but later journal entries do not indicate the existence of two tubs in the house. The 1917 Hanson drawings also indicate only one bath tub in the house.

The documentary information regarding the 1856 bath tub which was installed by Forsyth is limited. John Sheaff was charged \$43.50 for "1 large Copper Bath tub with over flow" as well as an additional \$3.00 for a plug, washer, and chain for the tub. The whole was enclosed in a wood case, at a cost of \$7.50, including the lining of the wall over the tub. (See Figure 14.) Seven feet of two inch lead pipe was connected to a plunge bath, indicating this style tub was installed. Its location was probably in the same space which had been previously occupied by the earlier bath, that is in a small room on the north side of the second floor. Journal entries and the 1917 Hanson drawings confirm this.

FIGURE 14. TUB, SINK, AND WATER CLOSET ENCLOSED IN WOOD WAINSCOTING. THE SHEAFF TUB AND WATER CLOSET MAY HAVE LOOKED SIMILAR TO THIS, THOUGH THEY WERE NOT INSTALLED IN THE SAME ROOM. [SOURCE: William Paul Gerhard, *The Water Supply, Sewerage and Plumbing of Modern City Buildings*, (New York: John Wiley & sons, 1910), fig. 207. As illustrated in May Stone, "The Plumbing Paradox: American Attitudes Towards Late Nineteenth Century Domestic Sanitary Arrangements", *Winterthur Portfolio*, (Autumn 1979): 308.]

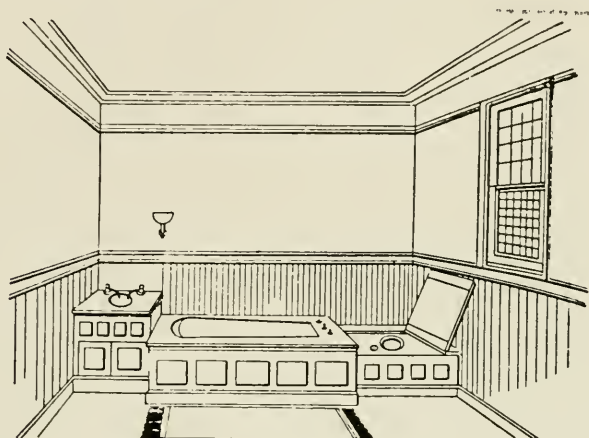


FIG. 207. View of Old-Fashioned Bath Room.

ENDNOTES: CHAPTER NINE

1. Gail Caskey Winkler, ed, The Well-Appointed Bath: Authentic Plans and Fixtures from the Early 1900s, (Washington, D.C.: The Preservation Press, 1989): 16. And, Harvey Green, Fit for America: Health, Fitness, Sport, and American Society, (New York: Patheon Books, 1986): 122.

CHAPTER TEN: CONCLUSION/RECOMMENDATIONS

The system of plumbing installed in The Highlands in 1856 appears to be an early example of indoor plumbing in a rural area. Documentary evidence indicates that the specific machinery installed by the Sheaff family, such as the ram and the boiler, were fairly new technologies and allowed the Sheaff's to enjoy a "modern" home.

The importance of mechanical systems at The Highlands, such as the plumbing, should not be ignored. Study of the system may further our understanding of other areas. As a significant component of the site's history, the plumbing drastically affected the mansion and the occupants. The 1856 installation led to changes in the functions of two spaces in the house. Sanitary conditions on the site improved and the whole system probably provided a more convenient method of water supply and waste disposal than unidentified earlier systems could have, despite the frequent problems and subsequent repairs by the Sheaff family. Also, by understanding the effects of the toxicity of lead on health it may be possible to initiate a study of the effects this material on the Sheaff family.

With little physical evidence surviving of the Morris or Sheaff plumbing systems, all projects on the site should consider the fact that the equipment used in these early systems is irreplaceable and all precautions should be taken to preserve what remains of them. This includes the identification of areas on the property which may still contain important physical evidence of earlier systems that have been relandscaped or buried. For instance, any work done in the area of the ram pit should be prefaced with archeological work to determine if any evidence of the Douglas rams remains. This also applies to work done in the house itself, which should always be well documented and should never be undertaken without a full understanding of the history of the space.

The extensive amount of archival information on the plumbing systems at The Highlands presents a unique opportunity for interpretation. All safeguards should be taken to protect the documents---any reconstruction of the early plumbing systems would be impossible without them.

APPENDIX A:
SHEAFF JOURNAL ENTRIES TO PLUMBING

The following transcriptions were taken from:

Sheaff Family Daily Journals: 1845, 1860, 1868, 1870-4, 1876-8, 1881, 1886, 1888-91, 1893, 1896, 1901, 1904. St. Thomas Episcopal Church, Fort Washington, PA. (The journals from 1850 and 1860 are in the collection of The Highlands Historical Society, Fort Washington, PA along with copies of all other years.)

SHEAFF JOURNAL REFERENCES TO PLUMBING

1845

JUNE 2: Mr. (illegible) came up to see about bathroom--it was decided to undertake the job and he will be up again shortly.

JUNE 18: Wagon brought up bath tub, forcing pump and all the parts for arranging the bathroom.

JUNE 20: This morning Mr. Wright came up with four workmen, and they are now busily engaged putting up the bath, hoping to conclude the job by tomorrow evening.

JUNE 21: This evening the Bath room was completed, much to John's satisfaction, who has had the superintendence of the business. It promises to answer well, and if so, is doubtless a most useful and necessary addition to the place.

JUNE 27: John continues to be very busy with the bathroom, which is not yet in Complete Order.

JUNE 30: ...John having put the finishing stroke to the bathroom.

JULY 8: The bathroom gives great satisfaction and all are delighted with the improvement.

JULY 23: Dr. Smith came up and took tea with us, tried the bath before leaving, and took with him the old shower bath.

1860

JANUARY 6: Put out fire in kitchen, as there is a leak in one of the pipes.

JANUARY 7: As John could not remedy the difficulty in the kitchen and the ram has stopped, it was decided not to make fire in the range for a day or two.

JANUARY 10: John put washers in water back to prevent leak, and new sides and grate in the range, made fire again this evening.

JANUARY 11: Two plumbers here, put the ram in order again.

JULY 18: Discovered that ram had stopped and water in reservoir reduced to 7 or 8 inches in depth.

JULY 19: Gardener set ram in motion again, continued to go for only a little while.

JULY 21: Gardener has succeeded in filling up the Reservoirs, by supplying the Feed Box with waste water and letting the ram go for only six hours at a time then allowing feed box a space for replenishing.

SEPTEMBER 15: Put out fire in kitchen range, as one of the pipes leading to the boiler has burst.

SEPTEMBER 19: Plumber came up from Chestnut Hill, stopped the leak so that the water could be turned on and fire made again.

1860 (cont'd)

OCTOBER 8: John and Fanny went up to Centre Square for pump-maker, promised to put all the pumps in order next week.

OCTOBER 15: ...Pump maker here today, put three pumps in order.

OCTOBER 25: Conrad, pump maker, here today.

NOVEMBER 9: Plumber here putting both rams in order. Supply of water sufficient to work them both.

NOVEMBER 23: Some burning wood having fallen behind the range caused the water pipes to leak, obliged to turn the water off and move into the other room.

NOVEMBER 27: John discovered cause of leak in the kitchen, remedied it at once, so that fire can be made.

1868

NO REFERENCES

1870

FEBRUARY 26: Took down stove pipe from Bath room.

DECEMBER 26: Bath tub overflowed and poured through the veranda ceiling.

1871

SEPTEMBER 20: Plumber here and pipes put in order, water on in the house. Seven men at work at ditch.

SEPTEMBER 22: Nine men at ditch.

1872

APRIL 9: Cleaned out reservoirs again, dead mouse in the water.

1873

NO REFERENCES

1874

APRIL 28: Plumber came up to stop leaks in boiler and water closet.

JULY 29: Heavy rain fell during the night—good for the tanks.

1876

JANUARY 7: Finished cleaning out the water tanks commenced yesterday.

JUNE 16: Plumber here at last, but not successful.

JUNE 17: Rain all night at last, water coming in.

1877

NO REFERENCES

1878

JANUARY 4: Much commotion caused by water from overflow pipe coming through Fanny's room.

MARCH 17: Tried ditch below ram again, no success.

JULY 9: The drain below the ram is perfectly filled with roots, but Jerry has taken enough out to force one ram which we hope soon to have at work.

AUGUST 1: John had long wet day putting rams in order. Started the small one.

AUGUST 3: Reservoirs and boiler washed out and ram started again.

1881

JANUARY 1: Pipes in bathroom frozen.

JANUARY 4: John started ram again, water does not increase. Pipes thawed without bursting.

JANUARY 17: At last the water has risen and the ram is on full stroke, joyful news!!!

FEBRUARY 8: John started ram once more, water not so high as last time.

FEBRUARY 24: John set the big ram going. We have had incessant trouble with the water this winter.

APRIL 1: John at ram, not very good for a cold which he is developing.

JUNE 24: Ram started this afternoon to the great joy of the household.

AUGUST 11: Washed out reservoirs and boiler.

NOVEMBER 25: John put new head on the ram, but no water yet, so it could not work.

1886

JANUARY 13: Bathroom waste pipe had to be thawed.

JANUARY 19: Started ram a fresh.

1886 (cont'd)

FEBRUARY 12: Ram stopped, too much water.

FEBRUARY 16: John tried the ram but with no success, too much overflow. No water in the house.

FEBRUARY 19: John tried the ram again, without success.

MARCH 13: John started the ram again.

MARCH 17: John had very wet day in ram hole, putting in new washers everywhere. Did not succeed to entire satisfaction.

MARCH 20: John spent another day at the ram and returned wet through as usual, but this time with good results.

MAY 24: John started ram, which had stopped on Saturday. (5/22)

SEPTEMBER 27: No wash today, no water.

OCTOBER 25: Had to carry water for washing again, as the ram only supplies the upstairs needs.

NOVEMBER 9: The ram cannot be crayed (?) any longer, water very low.

NOVEMBER 26: Good news! Ram once more at work and water in bathroom.

1888

FEBRUARY 23: Ram box cleaned out.

FEBRUARY 24: John busy all day with ram, etc.

FEBRUARY 25: Muddy water undid some of John's work of the last few days. Reservoirs cleaned today.

FEBRUARY 27: Ram started for the first time since December 1.

FEBRUARY 28: Boiler cleaned out and all things ready for the fresh water.

MARCH 2: Reservoirs full, water turned on at last.

MARCH 28: John at work at ram again, much overflow.

APRIL 9: John busy again with ram which is very troublesome of late.

APRIL 19: Ram had to be attended to again.

APRIL 24: Ram stopped again.

MAY 7: Ram set going again.

1888 (cont'd)

JULY 28: Water very scarce in the house.

AUGUST 13: Plumber came and went off in a tiff, work half done. John went out to pumpmakers.

AUGUST 23: Plumber here fixed taps, but had to go back to town at 2:05 for pipe.

AUGUST 24: Plumber here again and again had to leave the work unfinished.

AUGUST 28: John put new head on ram, hoping it would do more work.

SEPTEMBER 12: John went in town, no success with plumber.

SEPTEMBER 20: Freed, pumpmaker, here and paid \$35.

SEPTEMBER 21: Water increased sufficiently to work the ram on the whole stroke.

SEPTEMBER 25: John successful in getting wire through the ditch below the ram. Will now be able to reduce the water over the pipes, and save much trouble.

OCTOBER 8: John spent 2 or 3 hours at ram successfully.

OCTOBER 13: Reservoir full, once more.

NOVEMBER 9: John obliged to work at ram again. It has gone steadily for four weeks, but it is now entirely broken down, needing plumber.

NOVEMBER 12: John built wall around wash house pump.

1889

JANUARY 7: John had hard day's work at rams.

JANUARY 9: John went in town...ordered to plumber.

JANUARY 10: Plumber came up, but did not make much headway in the difficult task.

JANUARY 11: Plumber at work with more success.

JANUARY 14: Plumber came up for his tools, owing to some difficulty with the "boss"...but the matter was smoothed over.

JANUARY 15: Plumber came and work progressed so satisfactorily...

JANUARY 17: Plumber's work satisfactorily accomplished, and big ram started this afternoon, throwing a fine stream of water.

JANUARY 18: Reservoirs filled by 3pm.

JANUARY 19: Plumber left with tools w.c. not quite done, a piece lost.

1889 (cont'd)

JANUARY 21: Luxury to have water in such abundance.

FEBRUARY 4: Plumber here finished in kitchen and water turned on, but not successfully with water closet.

FEBRUARY 7: Plumber came up but the casting he brought did not fit, so went back at 11...

JULY 25: John over at blacksmith's most of the day, having pump spout fixed.

1890

FEBRUARY 3: James Lisle, plumber, came up to make another attempt at putting water closet in order.

FEBRUARY 4: Plumber up for a few hours, had to go back for want of screws.

FEBRUARY 10: Plumber here.

FEBRUARY 11: Plumber here.

FEBRUARY 12: Plumber's work done at last, after 18 months of prevation. John had almost all to do himself.

FEBRUARY 15: Plumber came again to remedy a still existing trouble and this time the success is perfect. Paid him in full.

MARCH 13: Furnace man here to put pipe in water closet in order.

MAY 8: Ram stopped, smallest one started.

1891

NO REFERENCES

1893

NO REFERENCES

1896

JANUARY 9: Plumber came but was sent home, no time to attend to him.

JANUARY 14: Plumber here again.

JANUARY 15: Plumber here.

JANUARY 16: Plumber here, not much progress.

JANUARY 17: Plumber again, began to clean out wells.

JANUARY 18: Plumber here, wells cleaned.

1896 (cont'd)

JANUARY 20: John at Ambler, getting things made for ram. No plumber.

JANUARY 29: John busy at ditch, ground all dry, contrary to his expectations.

JANUARY 30: Plumber here.

JANUARY 31: Plumber again.

FEBRUARY 1: No plumber today.

FEBRUARY 3: No plumber, of course.

OCTOBER 22-24: References to plumber, illegible.

OCTOBER 26: Ram going.

OCTOBER 28: Reservoirs washed out, ram started again.

OCTOBER 29: John busy at ram, not (illegible) successful.

OCTOBER 30: John busy at ram this (illegible) hopes all is right.

OCTOBER 31: Middle sized ram merrily (illegible), cart and barrel taken (illegible) at last.

1901

JANUARY 9: George Collins here at last [Note: He was hired April 26, 1893 to clean outhouses.]

JANUARY 14: George Collins finished cleaning out water closet well \$20.

MARCH 18: Men at work trying to get water off ram which is flooded.

JUNE 8: Ram stopped and water out, first time for a long while.

JUNE 10: John started little ram.

JUNE 12: Ram stopped and water out.

JUNE 13: Started large ram.

JULY 10: John started ram.

JULY 26: John started small ram.

OCTOBER 2: John worked at ram all the afternoon, unsuccessfully, has very bad cold.

OCTOBER 3: Ram going again.

1901 (cont'd)

NOVEMBER 1: Water scarce, ram not started.

DECEMBER 27: John succeeded in starting big ram.

1904

FEBRUARY 18: ...Two of the water pipes had burst

FEBRUARY 19: John went to Ambler to see about plumber.

FEBRUARY 20: Plumber here this morning but did nothing and went in town.

FEBRUARY 22: Plumber from Ambler this morning mended the two broken pipes and set all in order by afternoon, very satisfactory.

APPENDIX B:
FORSYTH AND BROTHER PLUMBING BILL, 1856

Sheaff, John. Forsyth & Brother Plumbing bill, October 13, 1856. The Highlands Historical Society, Fort Washington, PA.

FIGURE 15. COPY OF FORSYTH & BROTHERS PLUMBING BILL TO JOHN SHEAFF, OCTOBER 1856. [ORIGINAL AT THE HIGHLANDS HISTORICAL SOCIETY, FORT WASHINGTON, PA.]

Plumbers & Manufacturers.
 HYDRANTS, BATHS,
 Water Closets, Steam Pumps, Cold
 Water Fountains, Cast Iron Sinks,
 Dumb-Bells, Lead Cisterns, and Lead
 work of every description.
 ORNAMENTAL FOUNTAINS,
 For Parks, Gardens, Saloons, &c.
 Bill/

Philadelphia, Pa.
Mr. Geo. D. Sheaff
To FORSYTH & BRO
Sheaff & Co



1890 To cont. Friends
Sept 27 " 1/2 feet 2 in lead pipe for
" " plumbing bath
" " 1 in 2 in Stop Rock joints
" " 1 in 2 in Brass Fittings etc
" " 2 joints on piece 2 in iron
" " 1/2 char grade Water Wrist
" " running 500 feet in over loc
" " to Green House at Watg in 1/2
" " difference 8 ft 6 in Foot
" " making Sept or Oct 1 hour
" " 1 Brass Rock Joints
" " making joints on pipe &
" " place
" " 5 feet 1/4 in pipe
" " board & saw for 2 Stances
" " 1 day of Machinist although
" " Expenses
" " 65 feet 1/2 in pipe for Run
" " 12 " 1/2 in do.
" " 2 days time plumber helped
" " Expenses
" " Lumber & extra help on

1856 To Cont. Last Year.
 Jan. 3 " 68 Ft. 2 mi of pipe.
 " " 6 " 1 " pipe 40 " 24.
 " " " 2 mi traps End.
 " " " 3/4 trap block.
 " " " 1 Small Fence, etc.
 " " " Lumber & Ma. Per.
 " " " 2 days time of G.
 " " " 2 do " " 1.
 " " " Fare on Rail Road.

**TRANSCRIPTION OF BILL FROM FORSYTH & BROTHERS PLUMBING
TO JOHN SHEAFF, OCTOBER 1856**

Philadelphia October 13th 1856
Mr. Jno. D. Sheaff White Marsh
To FORSYTH & BROTHER, Dr.
No. 17 South Seventh Street

1856

June 28	To repairing Yankee Force Pump	2.25
July 10	1/2 days time removing paper from under valve of the c.	
July 26	Expenses of machinist plumber at place	2.30
Sep 27	putting in maker wheel & pump with connecting pipes from Spring to do & pipe from pump to resevir at House & wood, work for on resoveor 16 x 4 & 2 feet deep, lining do putting in old bath tub, connecting waste pipe to do with hot & cold shower & hot and draw cooks over the same, one regular water closet, resoveoir to with Soil pipe connecting with Well, from Sink in Kitch. on with hot & cold water over same of pipes attached to boiler, running overflow pipe from resoveior from Green House of Stable with overflow in trough including carpenter work lining around the wall over bath fitting up water closet rooms seat, cutting out & refitting floors etc for pipes through House and fixing door in Resoveoir Room	975.00
""	To 1 large Copper Bath tube with over flow	43.50
""	"plug, washer & chain for do	3.00
""	"plating 2-1 in Bath Biibs for do. at 6.25	12.50
""	" do. 1 double Shower back	7.25
""	" making wood case for Bath	7.50
""	" 1 Copper Circulating Boiler 133 (illegible) 50 cents	66.50
""	" 1 iron stand for do.	2.25
""	" 25 feet 2 inc wrought iron pipe for waste to Sink	12.50
""	" 1 2 in fitting	.45
""	" work bending fitting of do.	2.75
""	"1 pen dulum Stop Back joints in cellar	3.25
""	"1 draw back joint " do.	2.
""	" Extra charge for lining 2 resoveoirs 9ft 6in x 4ft/of 2 feet deep in place of one 16 ft x 4 of 2 deep	20.88
""	8 feet 1/2 in pipe to connect do. at 50 cents	4.00
""	" 2 flanges on do. and soldering to resoiveoir " 1.12 ²	2.25
""	"27 feet 4 in iron pipe from well to connect 4 in pipe from Spring at 45 cents	12.15

forw^d 1,182.58

end of page one of original

1856	To amt forward	\$1,182.58
Sept. 27	"7 feet 2 in lead pipe from 4 in iron pipe to plunge bath at 75 cents	
		5.25
""	" 1 2in Stop back joint	8.25
""	" 1 2in brass fenule joints	2.12
""	2 joints on piece 2 in iron pipe	.87
""	" Exchanging Water Wheel	12.50
""	" running 520 feet in overflow pipe from dwelling to Green House & Stable in place of 3/4 in pipe the difference 8 cents per foot	41.60
""	"making box to order & lining with lead	5.50
""	1 Draw back joints	2.00
""	" making joints on pipe & time going to and from place	3.50
""	" 5 feet 3/4 in pipe at 30 cents	1.50
""	"board & fare for 2 Hands	1.80
""	"1 day of Machinist altering valves	2.50
""	"Expenses	.70
""	" 65 feet 1/2 in pipe for ram	35.75
""	12 5/8in do. at 30 cents	3.60
""	" 2 days time plumber helper fixing pipe to Ram at 2.50	5.00
""	"Expenses	1.75
""	" Lumber Extra Carpenter work	56.12
""	"board for time at Extra Work	6.50
""	"carpenters bill making box for Ram	4.50
Oct. 6	" 30 feet 1 in pipe at 35 cents	10.50
""	" 10 5/8in do. at 28 cents	2.80
""	"time making joints, fixing pipe going to & returning from place	5.25
""	" 2 1/2 ft folder at 30 cents	.75
""	(illegible) board	2.90
""	" 1 day plumber helper fixing in Ram	3.00
""	" fare for 2 on Rail Road	1.40
""	" 1 No. 4 Douglass Ram	10.00
""	"1 No. 5 do. do.	15.00
Dec. 9	" 1 day plumber helper ^{3.75} 1 ft folder ³⁰	4.05
""	fare on Rail Road for 2	1.40
		5.45
"23	" Ball valve Ball	2.50
"24	" 1 do. do	2.00

forw @ \$ 1,445.44

1857 To amt. brot forw^d

\$ 1,445.44

Jan. 3	" 68 ft. 2 in Stg pipe 85 ^{57.90}	
	4 ft 3/4 pipe 35 ^{1.40}	59.20
""	" 6 1 pipe 40 ^{2.40} 1 2in Iron Check Valve ^{3.75}	6.15
""	" 1 2in brass End fewle joint	2.12
""	1 3/4 Stopback ^{1.50} Copper Strainer for 2in pipe 1.25	2.75
""	" 1 small Screw Wrench	1.00
""	Lumber & making plan to box	9.75
""	" 2 days time of 2 plumbers at 2.75	11.00
""	" 2 do. 1 helper at 1.00	2.00
""	" fare on Rail Road & Expenses of hands	4.25
		98.22
		\$ 1,543.66

end of original

APPENDIX C:
AGREEMENT BETWEEN JOHN SHEAFF AND
JOHN GAMBLE FOR THE CONSTRUCTION OF A
SHED AND BATH HOUSE,
MARCH 10, 1853

Sheaff, John. Agreement with John Gamble for building a Shed and Bath House, March 10, 1853. The Highlands Historical Society, Fort Washington, PA.

FIGURE 16. COPY OF AGREEMENT BETWEEN JOHN GAMBLE AND JOHN D. SHEAFF
FOR THE CONSTRUCTION OF A SHED AND BATH HOUSE, MARCH 10, 1853. [ORIGINAL
AT THE HIGHLANDS HISTORICAL SOCIETY, FORT WASHINGTON, PA.]

Memorandum of An Agreement. on
John Gamble Carpenter, of the one part
has as follows.

John Gamble has this day agree
Shed, 37 feet long by 20 ft wide and
over it 18 ft. Elevation on the front. and
Shed to be of Stone 18 inches in thick
of the foundation, Cashed on the outside
to be of Frame, the boards of the shed
being Planked, ploughed and beaded.
ploughed & Grooved. The Lumber used
of the substance and to be framed &
sustaining any amount of Hay the
having a furlin in the middle to sup-
by two Iron Columns not less than
foundation of Stone 2 ft square.

by the 15 of June 1853. John Gamble is to do all the Digging
sinking and labour that may be required about said building -
In consideration of which John & Greaff is to pay the said
John Gamble the sum of Five hundred Dollars. One hundred
Dollars to be paid when the Mason work is completed, Five
hundred & no pay on raising the roof, and the balance when said
building is completed

John Gamble
Pro: & Greaff

John Gamble has this day also, Agreed to put up for John &
Greaff a Bath House, of the size and plan given him by John &
Greaff. The Lumber used is to be of the best quality, weather boarded
on the outside and lined up and down on the inside, the Framing
to be of Hemlock. The Bath tub is to be made of 2 in Cedar plank
fastened with Copper or Composition Spikes, having a frame outside
to keep it tight. The floor in Bath & Dressing Rooms to be of
Yellow pine. The Dressing Room is to be covered with a tin roof, the
ceiling boarded. The whole building inside and out, is to receive three
Coats of Paint of any Colour that John & Greaff may decide upon -
It is understood by John Gamble that he is to do all the Carpenter
work about said bath house, such as laying trusses to carry off
the water &c. that may be required, in a workmanlike manner
and according to the Apperception of John & Greaff. And that
John & Greaff is to do the Mason work Digging &c, also to find
water to let off the water - The whole is to be completed by the 1st
day of July, in consideration of which, John & Greaff is to
pay the said John Gamble the sum of Three hundred
Dollars, - One hundred Dollars to be paid on raising

**TRANSCRIPTION OF AGREEMENT BETWEEN JOHN GAMBLE
AND JOHN D. SHEAFF FOR THE CONSTRUCTION OF A
SHED AND BATH HOUSE, MARCH 10, 1853**

Memorandum of an agreement made this 10th day of March John Gamble, carpenter, of the one part and John D. Sheaff of the other part as follows

John Gamble has this day agreed to put up for John D. Sheaff a Shed, 37 feet long by 20 ft wide and 8 1/2 feet high, having a Hay house over it 18ft. Elevation on the front and 8 ft on the back. The wall of said Shed to be of Stone 18 inches in thickness above ground and 2 ft wide at the foundation, dashed (?) on the outside and plastered inside. The Hayhouse is to be of Frame, the boards of the best quality used for weather boarding being planed, ploughed and beaded on the outside, the floor to be ploughed and grooved. The lumber used is to be of the best quality Hamlock of such substance and to be framed in such a manner as to be capable of sustaining any amount of Hay that said Hayhouse will contain, having a purlin (?) in the middle to support the roof, The Front to be supported by two Iron columns not less than 6 inches in thickness, resting on a foundation of stone 2 ft square. The roof is to be of the best Cedar Shingle, having a tin gutter and conductor to carry off the water. There is to be a large double door in the front and a small one in the side, also a trap door with steps leading from under said Shed to Hay house---

[A] tunnel is to be boarded up in Barn so as to throw Hay from said Hayhouse into the Stable Adjoining Shed. A privy is to be framed and inserted under the Arch [apeuring?] into Shed, having a well 8 ft deep and 5 ft wide walled up with brick. The whole (with the exception of roof) is to have three coats of paint of any colour that John D. Sheaff may decide upon---It is understood by John Gamble that the work is to be done in a workmanlike manner, according to the approbation of John D. Sheaff and that the whole is to be completed by the 15 of June 1853--- John Gamble is to do all the digging, hauling, and labour that may be required about said building---In consideration of which John D. Sheaff is to pay the Said John Gamble the sum of Five Hundred Dollars, One Hundred to be paid when the mason work is completed, Two Hundred on raising the roof, and the balance when said building is completed.

Signed

John Gamble
John D. Sheaff

John Gamble has this day also agreed to put up for John D. Sheaff, a Bath House of the size and plan given him by John D. Sheaff, the Lumber used is to be of the best quality, weather boarded on the outside and lined up and down on the inside, the Framing to be of Hemlock---The Bath tub is to be made of 2 in Cedar plank fastened with copper or composition Spikes, having a frame outside to keep it tight. The floor in Bath & Dressing room to be of Yellow Pine. The Dressing room is to be covered with a tin roof, the ceiling boarded. The whole building inside and out, is to receive three coats of paint of any colour that John D. Sheaff may decide upon. It is understood by John Gamble that he is to do all the carpenter work about said bath house, such as laying trunks to carry off the water etc. that may be required, in a workmanlike manner and according to the approbation of Jno. D. Sheaff and that John D. Sheaff is to do the Mason work digging ect, also to find the Gates to let off the water---The whole is to be completed by the 1st day of July in consideration of which John D. Sheaff is to pay the said John Gamble the sum of Three hundred Dollars, One Hundred Dollars to be paid on raising of the roof and the balance when the building is completed.

Signed

John Gamble
Jno. D. Sheaff

APPENDIX D:
CHRONOLOGY OF THE W. & B. DOUGLAS COMPANY
MIDDLETOWN, CONNECTICUT
1832- c. 1915

**CHRONOLOGY OF W. & B. DOUGLAS COMPANY,
MIDDLETOWN, CONNECTICUT
1832-c. 1915**

1832	Middletown, CT	Firm of Guild and Douglas began to manufacture steam engines and other types of machinery. ¹
1839	Middletown, CT	William Douglas joined with his brother, Benjamin Douglas, to form the W. & B. Douglas Company. ²
December 31, 1842	Middletown, CT	W. & B. Douglas received Patent 2895 for a pump. ³
June 1843	Middletown, CT	Agreement with Doctor Jarvis to manufacture the "George Jarvis Patent Adjuster or Bone Setting Machine". ⁴
October 1847	New York City	Exhibited rams at the American Institute. ⁵
1848		Advertisement appeared in <u>The Cultivator</u> . ⁶
October 1848	New York City	Exhibited rams at the American Institute. Received a silver medal for "an improvement in hydraulic rams, by which the ram may be used as a motive power". ⁷
October 1849	Philadelphia	Exhibited rams at Franklin Institute.
	New York City	Awarded a diploma for force pumps and hydraulic rams by the American Institute. They were displayed by their agents Sexton & Webb, 112 South Street, New York City.
October 1850	Philadelphia	Displayed rams at Franklin Institute.
	New York City	American Institute Fair awarded company for rams, pumps, and bolts. ⁸

July 11, 1854	Middletown, CT	William & Benjamin Douglas received Patent 661 for "well-curbs" design. ⁹
1856		<u>Connecticut Business Directory</u> listing. ¹⁰
April 6, 1858	Middletown, CT	W. & B. Douglas received Patent 19834 for a portable pump. ¹¹
April 21, 1858	Middletown, CT	William Douglas died intestate. The heirs joined with Benjamin Douglas to continue W. & B. Douglas Company. ¹²
1859	Middletown, CT	The W. & B. Douglas Company was incorporated by a special charter issued by the state of Connecticut, listing Benjamin Douglas as president. ¹³
April 12, 1859	Middletown, CT	"Benjamin Douglas and Benjamin Douglas, admin'r of Wm. Douglas" received Patent 23649 for Pumps. ¹⁴
June 1, 1859	Middletown, CT	First meeting of the W. & B. Douglas Company under the direction of the new owners, with Benjamin Douglas acting as president. ¹⁵
November 6, 1860	Middletown, CT	Benjamin Douglas, assignor to W & B. Douglas received Patent 30603 for Pumps. ¹⁶
September 17, 1861	Middletown, CT	Benjamin Douglas received Patent 33299 for pumps. ¹⁷
November 19, 1861	Newton, NJ	John W. Lane, assignor to W. & B. Douglas received Patent 33765 for Pumps. ¹⁸
April 22, 1862	Middletown, CT	Joseph W. Douglas, assignor to W. & B. Douglas, received Patent 35059 for Pumps. ¹⁹

July 1, 1862	Middletown, CT	Benjamin Douglas, assignor to W. & B. Douglas, received Patent 35802 for Pumps. ²⁰
May 5, 1863	Middletown, CT	John W. Douglas, assignor to W. & B. Douglas, received Patent 38444 for Pumps. ²¹
July 24, 1866	Middletown, CT	Johseph W. Douglas, assignor for W. & B. Douglas, received Patent 56671 for Pumps. ²²
1867	Paris	Received Highest Medal from Universal Exposition. ²³
February 11, 1868	Middletown, CT	J.W. Douglas received Patent 2574321 for Pumps. ²⁴
December 14, 1869	Middletown, CT	J.W. Douglas received Patent 97767 for a pump. ²⁵
January 11, 1870	Middletown, CT	Joseph W. Douglas, assignor for W. & B. Douglas, received Patent 98674 for "adjustable attachment of pump barrels to their bases". ²⁶
May 3, 1870	Middletown, CT	Joseph W. Douglas, assignor for W. & B. Douglas, received Patent 102664 for a "pump-valve". ²⁷
May 2, 1871	New York, NY	Addison P. Brown, assignor for W. & B. Douglas, received Patent 114403 for Pump. ²⁸
December 24, 1872	Middletown, CT	James C. Lamb and Erwin Lavens, assignors to W. & B. Douglas, received Patent 134294 for rotary pump. ²⁹
1873	Vienna	Received Highest Medal from Universal Exposition. ³⁰
November 25, 1873	Middletown, CT	J.W. Douglas, assignor to W. & B. Douglas, received Patent 144965 for Pump. ³¹

May 26, 1874	Middletown, CT	Joseph W. Douglas, assignor for W. & B. Douglas, received Patent 151364 for "construction of pump-gearing". ³²
January 19, 1875	Middletown, CT	Joseph W. Douglas, assignor for W. & B. Douglas, received patent 158786 for "Lining Pump Cylinders". ³³
August 3, 1875	Middletown, CT	Joseph W. Douglas, "assignor of one-half interest to Benjamin Douglas" received Patent 167195 for hydrant. ³⁴
1876	Philadelphia	Received Highest Medal from Universal Exposition. ³⁵
February 15, 1876	Middletown, CT	Joseph W. Douglas received Patent 173601 for vehicle wheel.
July 4, 1876	Middletown, CT	Joseph W. Douglas, assignor to W. & B. Douglas, was reissued Patent 7199 for "construction of pump-gearing". ³⁶
July 3, 1877	Middletown, CT	Joseph W. Douglas, assignor to W. & B. Douglas, was reissued Patent 7774 for "knapsack fire engine".
July 10, 1877	Middletown, CT	Joseph W. Douglas, assignor for W. & B. Douglas, received Patent 192979 for "portable pump". ³⁷
April 17, 1877	Middletown, CT	James C. Lamb, "assignor to self, W. Rackliff, B. Douglas, & L.B. Deming: received Patent 189752 for "lubricator". ³⁸
July 19. 1881	Middletown, CT	Joseph W. Douglas, assignor to W. & B. Douglas, received Patent 244384 for Pump. ³⁹

June 12, 1883	Middletown, CT	Joseph W. Douglas received Patent 279360 for "combined drill on reamer, tap, & socket.
June 26, 1883	Middletown, CT	Joseph W. Douglas received Patent 280146 for cutter and holder for lathes as well as Patents 280147 and 280148 for "cutter and holder for lathes &c". ⁴⁰
1884	Middletown, CT	Company is reported to have employed 80 workmen for the production of their patent pumps and rams. The manufacture of their products required the use of six hundred tons of iron, twenty tons of brass, and in fuel for production, three hundred tons of anthracite coal. Their income averaged \$80,000-100,000 per year. ⁴¹
February 26, 1884	Middletown, CT	Joseph W. Douglas, "assignor to himself and W. & B. Douglas" was issued Patent 294210 for pump.
October 14, 1884	Middletown, CT	Joseph W. Douglas, "assignor to himself and W. & B. Douglas" was issued Patent 306679. ⁴²
July 7, 1885	Middletown, CT	Joseph W. Douglas was issued Patent 321804 for "lever shears". ⁴³
July 17, 1888	Middletown, CT	Edward Douglas, assignor to W. & B. Douglas, received Patent 386115 for "Telescopic stopcock for water service". ⁴⁴
1894	Middletown, CT	Benjamin Douglas died. His son, John M. Douglas, who had served as Secretary and Treasurer, took over as President. ⁴⁵

1896	Middletown, CT	Staff of almost 250 skilled mechanics. As many as 1500 styles and varieties of pumps. Steam engines provided about 200-horse power. Company stock was capitalized at \$600,000. Branch warehouses were listed in New York and Chicago as well as representatives in Boston, Chicago, Paris, and London. ⁴⁶
January 15, 1896	Middletown, CT	The new board of directors was appointed with John M. Douglas as President.
February 1896	Middletown, CT	Seth H. Butler, treasurer of the company, reported that the company had a debt of \$180,000. Board decided to sell bonds in order to raise the needed money to continue the business. ⁴⁷
July 21, 1914	Middletown, CT	Henry P. Bliss, assignor to W. & B. Douglas, received Patent 1,104,098 for "hand-portable pump apparatus". ⁴⁸

ADDITIONAL INFORMATION REGARDING THE W. & B. DOUGLAS COMPANY CAN BE FOUND AT THE MIDDLESEX COUNTY HISTORICAL SOCIETY, MIDDLETOWN, CONNECTICUT.

ENDNOTES: APPENDIX D

1. History of Middlesex County Connecticut with Biographical Sketches of Its Prominent Men, (New York: J.B. Beers and Company, 1884): 163. (Hereafter cited as HMC.)

2. HMC: 163.

3. Subject Matter Index of Patents for Invention, 1790-1873. Vol. 3 (Washington, D.C. Government Printing Office, 1874): 1146.

4. W. & B. Douglas, "Agreement with Doctor Jarvis", (June 1843). Middlesex County Historical Society, Middletown, CT.

5. Arthur Channing Downs, "The Introduction of the American Water Ram, ca. 1843-50", APT Journal VII, no. 4 (1975): 87. (Hereafter cited as Downs, I.)

6. Arthur Channing Downs, "The American Water Ram, Part II", APT Journal, XI (1979): 92. (Hereafter cited as Downs, II.) The information regarding the W. & B. Douglas Company found in the two Downs' sources comes from a variety of primary documents unavailable for this study. Check both Downs' articles for specific sources.

7. Downs, I: 87.

8. Downs, I: 88.

9. General Index of The Official Gazette and Monthly volumes of Patents of the United States Patent Office for the year 1854. (Washington, D.C.: Government Printing Office, 1855): 125. (Hereafter patents will be cited as Patent, Year: Page number. This refers to the year of the General Index represented.)

10. George Adams, Connecticut Business Directory, (Boston: George Adams, 1856): 76. Microfiche, University of Pennsylvania Van Pelt Library.

11. Patent, 1858: 87.

12. Agreement of heirs of William Douglas and Benjamin Douglas, c. 1859. Document 1989.13.26, Middlesex County Historical Society, Middletown, CT. (Hereafter cited as Douglas, "Agreement".)

13. W. & B. Douglas Company, Advertisement, (c. 1867). Middlesex County Historical Society, Middletown, CT. (Hereafter cited as Douglas, "Ad".)

14. Patent, 1859: 48.

15. Douglas, "Agreement".

16. Patent, 1860: 52.

17. Patent, 1861: 45.

18. Patent, 1861: 70.

19. Patent, 1862: 43.
20. Patent, 1862: 43.
21. Patent, 1863: 103.
22. Patent, 1866: 93.
23. Douglas, "Ad".
24. Patent, 1868.
25. Patent, 1869.
26. Patent, 1870: 73.
27. Patent, 1870: 73.
28. Patent, 1871: 48.
29. Patent, 1872: 106.
30. Douglas, "Ad".
31. Patent, 1873: 50.
32. Patent, 1874: 58.
33. Patent, 1875: 61.
34. Patent, 1875: 61.
35. Douglas, "Ad".
36. Patent, 1876: 54.
37. Patent, 1877: 55.
38. Patent, 1877: 118.
39. Patent, 1881: 70.
40. Patent, 1883: 90.

41. E.M. Gorham, "Middletown As It Is", New York Journal of Commerce (1850). As quoted in History of Middlesex County Connecticut with Biographical Sketches of Its Prominent Men (New York: J.B. Beers & Company, 1884): 98.

42. Patent, 1884: 80.
43. Patent, 1885: 99.

44. Patent, 1888.

45. H.F. Donlan, The Middletown Tribune Souvenir Edition: An Illustrated and Descriptive Exposition of Middletown, Portland, Cromwell, East Berlin, and Higganum, (Middletown, CT: E.F. Bigelow, 1896): 20. (Hereafter cited as Donlan.)

46. Donlan, 20-1.

47. "The Douglas Company: Board of Trade takes a Hand in Reorganization..." (c. 1896). Xerox of newspaper article at Middlesex County Historical Society, Middletown, CT. Paper unknown.

48. Patent, 1914: 58.

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- A. M'Elroy's Philadelphia Directory for 1839. Philadelphia: A. M'Elroy, 1839. Microfiche, University of Pennsylvania Van Pelt Library.
- A. M'Elroy's Philadelphia Directory for 1840. Philadelphia: A. M'Elroy, 1840. Microfiche, University of Pennsylvania Van Pelt Library.
- Annual Report of the Commissioner of Patents for the Years 1844-1915. Washington, D.C.: Government Printing Office, 1845-1916. (Each year is a separate volume.)
- Bourough of Ambler Water Department. Meter Reading of Meter No. 2748. October 7, 1926. Copy at The Highlands Historical Society, Fort Washington, PA.
- Chandler, Theophilus P. Jr. "House for William Smythe, Esq. at Ridley Park". August, 1872. File #62 at the Athanaeum of Philadelphia.
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