GAS LIGHTING
AT THE
PRESIDENT LINCOLN AND SOLDIERS’ HOME NATIONAL MONUMENT

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Chapter 1: Introduction

In the late 1850s, the U.S. Government took the bold step of installing what was then the latest in lighting technology, a portable gas lighting system, on the campus of the Military Asylum (renamed the Soldiers’ Home in 1858, and now known as the Armed Forces Retirement Home [AFRH]). Located in northwest Washington, DC, the Soldiers’ Home campus contains the “Lincoln Cottage,” as it is now colloquially known. President Abraham Lincoln used the Soldiers’ Home as a seasonal retreat from June to November of 1862 to 1864. During that time the President and his immediate family stayed in the Lincoln Cottage, the former country home of Washington Banker George Riggs; it seems likely that the Lincoln’s also stayed in at least one other cottage on the Soldiers’ Home grounds at various times during the early 1860s. In 2000, President William J. Clinton designated Lincoln’s seasonal retreat as the President Lincoln and Soldiers’ Home National Monument (PLSHNM). The Lincoln Cottage, as it will be referred to throughout this document, is currently undergoing preservation directed by the National Trust for Historic Preservation. Exterior restoration was completed in the fall of 2005, and interior work is scheduled to begin in the summer of 2006.

The present volume focuses on research related to the gas lighting system utilized at the Lincoln Cottage from the late 1850s until the conversion to municipal gas in the mid-1870s; electric lighting was introduced in the late 1890s but gas lights were still in use in the early 1900s. The study explores the installation and use of gas lighting at the site as part of the planning process for the upcoming interior preservation project on the building. Preliminary research confirmed that the site was lighted using an early portable gas machine manufactured by the Maryland Portable Gas Company of Baltimore. The Maryland Portable Gas Company was one of many businesses of the time that manufactured devices capable of producing gas for lighting buildings, like those at the Soldiers’ Home, located outside the limits of a city’s municipal gas distribution system (Figure 1). As the company boasted in its 1855 pamphlet for the Portable Gas Apparatus,

gas lights have heretofore been considered a luxury which could only be enjoyed by those residing in the cities, and that too within reach of the Gas Companies’ pipes. This is now no longer true; for an apparatus is now offered to the public which brings this luxury home to every man, and adapts it to the wants and requirements of the private gentleman or the manufacturer.3

The plan of work for this study involved both primary and secondary documentary research along with field examination of selected buildings at the Soldiers’ Home site. The principal sections of the investigation entailed:

1) Contextual research on the history of gas lighting during this period, with particular reference to portable gas lighting systems used to light buildings located outside the service area of municipal gas plants;
2) Contextual research on the Maryland Portable Gas Company and the system that they manufactured including patent research on the system’s inventor Abram Longbottom. This work focused on understanding the technology of the system and how it was configured at the PLSHNM;
3) Historical and map research on the gas system at the PLSHNM, including records of PLSHNM (minutes and orders), all maps with outbuildings, and a search of insurance company maps and records;
4) Examination of the extant gas piping in the Lincoln Cottage in order to develop a suggested lighting plan for the building as it might have existed in the late 1850s and early 1860s;
5) Research on the importance of gas light during this period and its social uses and consequences; and
6) Recommendations for future archaeological and remote sensing studies related to the gas system at the site.

The researchers periodically met with the staff of the NTHP to provide updates on the research and will continue to work with the staff on particular preservation and interpretation issues that arise as the planning and construction work proceeds.

While the focus of this project is on the Lincoln Cottage, the Soldiers’ Home campus consists of numerous other historic buildings that were constructed between the mid-1850s and the early 20th century, many of which were also lighted with gas. The core of the campus during the period of operation of the Maryland Portable Gas Company’s Portable Gas Apparatus, approximately 1851 to 1872, was constructed around the extant “Riggs Mansion” or “Riggs Cottage,” built by Washington banker George Riggs in 1847. Riggs employed local builder/architect William H. Deggis to design and construct his country home in the Gothic Revival Style, made popular with the publication of Andrew Jackson Downing’s *Cottage Residences* in 1842 (Figures 2 and 3). Riggs apparently enjoyed the “simplicity of his country life” at the cottage until his daughter’s death in 1849 and some concurrent financial setbacks. Riggs and family returned to their Washington city home and sold the cottage to the U.S. Government in 1851.

In the mid-1850s, the government built the massive Scott Hall (now the Sherman Building) and three Italianate Revival cottages, Quarters 1 and 2 and the Corlisle Cottage.

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4 The structure is also later designated as the Anderson Cottage (1889-2002) and listed on period maps as such.
6 Pinsker. *Lincoln’s Sanctuary,* p. 128.
Figure 2. Rear façade of Lincoln Cottage, 2006. Note Sherman Building to right of photo.

Figure 3. Front façade of Lincoln Cottage, 2006.
Thus, by the late 1850s the core of the Soldiers’ Home consisted of five principal buildings and smaller support structures located east of Scott Hall; additionally, several small outbuildings were scattered across the grounds including a privy or privy located between the Lincoln Cottage and Scott Hall (Figure 4). By the mid-1860s, the campus included these original buildings and additional support buildings in the service complex located east of Scott Hall (Figure 5). At the time that the original gas works were abandoned and replaced by municipal gas, ca. 1872, the campus contained several other new buildings, including the Rose Chapel (1870), the Secretary to the Treasurer’s Quarters (1870), and the Park Rd. Gate Lodge (1869-1873) (Figure 6).

As will be clear from the historical documentation on the gas system, the gas works were housed in a discrete building(s) and the gas then piped to the principal buildings, outbuildings, and even lamp posts on the campus. The location of this gas house, as it would have been known, has been tentatively identified and appears to have been located in the vicinity of later utility buildings in the complex of service-related structures east of Scott Hall.

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7 Pinsker. *Lincoln’s Sanctuary*, pp. 2-3.
Figure 4. Detail of *Topographical Map of the District of Columbia* showing the Soldiers’ Home. 1861. A. Boschke. Source: Historical Society of Washington, DC (G3850.1861, B6 vault). Note the possible privy(s) between the Lincoln Cottage and the larger Scott Hall.
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Chapter 2:
Brief Historical Background

During the Civil War, President Lincoln and his family resided seasonally (June-November 1862-64) at the Soldiers’ Home in northwest Washington, DC. Founded in 1851 as a home for retired and disabled veterans of American wars, the Soldiers’ Home contained 250 acres situated on Washington’s third highest area. Like President Buchanan before him, Lincoln enjoyed the cool breezes and refreshing peace of the Soldiers’ Home as a seasonal retreat just over three miles north of downtown (see Figure 1). But unlike his predecessor, Lincoln could not escape the Civil War and his burden of leadership even at this country locale.

For Lincoln, the Soldiers’ Home was a kind of sanctuary under siege – a refuge where he could think deeply about the purpose and direction of the Civil War. During his 14 months of residency at the Soldiers’ Home, Lincoln rendered some of his most important presidential decisions about the direction of our republic, including the revolutionary Emancipation Proclamation. At the Soldiers’ Home, the Lincolns resided in a Gothic Revival style cottage, the centerpiece of the present-day President Lincoln and Soldiers Home National Monument now undergoing restoration and preservation. New research leads the National Trust to believe that the Lincolns also may have resided in one of two Italianate Revival cottages (Quarters 1 or Quarters 2) on the Home’s grounds.

First hand accounts from soldiers, visiting dignitaries and politicians, family and household members, and Lincoln’s personal secretaries vividly depict how Lincoln both worked and relaxed at the Soldiers’ Home. These primary sources portray Lincoln commuting daily by horseback or carriage from the Soldiers’ Home to the White House, finding relief from the pressures of war in intimate moments with his son Tad and wife Mary, seeking camaraderie with active duty soldiers stationed there to protect him from kidnap and assassination, meeting with political allies and adversaries, and reflecting upon his and the nation’s predicament during lonely midnight walks.

In the pastoral landscape of the Soldiers’ Home, Lincoln typically ignored the dangers that lurked around him. He dismissed an assassination attempt, eluded his armed escort, and directly observed the nearby Battle of Ft. Stevens. In fact, the Soldiers’ Home setting likely dramatized to Lincoln the unstinting sacrifice of Americans engaged in a war for union by freedom. For instance, on his daily commute, Lincoln passed near a contraband camp for free blacks and escaped slaves in downtown Washington. One of Lincoln’s house staff at the Soldiers’ Home recorded in a memoir her impressions of Lincoln’s personal visit to the contraband camp where she resided. Wartime hospitals abounded, and Mrs. Lincoln and her son regularly visited wounded soldiers; surely wife and son shared their impressions with their husband and father. Lincoln received visits at all hours at the Home from citizens and soldiers afflicted by the war. And, perhaps most poignant, the bodies of Union and some Confederate soldiers arrived daily for burial in

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9 This section is reproduced from National Trust for Historic Preservation, “President Lincoln and Soldiers’ Home National Monument, Strategic Plan for 2004-2007,” December, 2004, Pp. 4-5. (Used with permission from the National Trust for Historic Preservation).
the Soldiers’ Home National Cemetery where ultimately 5,000 Civil War dead were interred. The cemetery was only a few hundred yards from the President’s cottage.

The mounting specter of the Civil War’s cost in human life and Lincoln’s unwavering will to preserve the Union around a principle of freedom inspired Lincoln to articulate new ideas of American nationhood that endure today. The Soldiers’ Home – rich in primary source material and steeped in an authentic atmosphere little changed over time – is perfectly suited to explore President Lincoln’s extraordinary leadership in creating this new national unity based on an ideal of freedom. Educational programs and the interpretative experience at the National Monument will do precisely this by examining stories based upon people’s direct encounters with Lincoln at the Soldiers’ Home and Lincoln’s own words as expressed in such diverse documents as the Emancipation Proclamation or the pathos-filled Gettysburg Address.

The National Monument represents a kind of missing link in the chain of historic sites that relate Lincoln. The American and international public will benefit enormously from the “re-discovery” of this missing link in Lincoln’s story. The fact that the site’s close connection to President Lincoln remains largely intact is attributable to the Home’s continuing purpose and pride in its role in American history.
Chapter 3: 
Gas Lighting in the 19th Century

Gas Lighting Systems

Gas lighting systems evolved during the late 18th and 19th century, and used several main types of fuel: coal gas, rosin oil, gasoline, and later, calcium carbonate. Municipal gas lighting became available in the early 1800s, and was provided by city gas works. These gas works produced the gas, and acted as the central location for distribution. In contrast to municipal gas works, self-contained gas generating units, like the Maryland Portable Gas Machine, became popular in the late 1850s and 1860s in areas beyond the reach of city gas works, and also were advertised for city dwellers as a less expensive alternative to municipal gas.

Coal gas was the first gas type to be used for lighting on a large scale and, beginning in the early 19th century, the first type of gas to be employed in the United States. Interest in gas or “inflammable air” developed in the 17th century and by mid-century various scientists were conducting experiments to better understand the nature and uses of gas. By the mid-18th century, numerous scientists were working on coal gas processing.

In the first years of the 19th century, William Murdoch, a Scottish inventor and engineer from Cornwall, and others began to expand their experimentation with and applications for gas lighting. In 1802, he staged a public exhibition of gas lighting in London; it was reported that: “the illumination of the Soho works on this occasion was of the most extraordinary splendor; the whole front of that extensive building was ornamented with a great variety of devices that admirably displayed many of the varied forms of which gas-light is susceptible.”

While Murdoch was busy touting his gas system in England, a French engineer named Phillipe Lebon had obtained a patent in France for a similar approach and had lit his own house in Paris. In 1805, still without a patent for his process, Murdoch erected a large gas works to supply the premises of Messrs. Boulton and Watt, and another to serve several cotton mills in Manchester.

Working during much of the same period as Murdoch, a Moravian engineer named Frederic Albert Winsor (Winzer) performed numerous experiments and obtained the first patent for gas lighting. Winsor claimed that he was the “discoverer, inventor, and patentee of gas lighting.” Hughes and O’Connor reported that Winsor was a tireless proponent of gas lighting and had defended it from critics who felt gas unsafe and prone


11 Hughes and O’Connor, Gas Works, p. 15.
12 Hughes and O’Connor, Gas Works, p. 16.
13 Hughes and O’Connor, Gas Works, pp. 16-17.
14 Hughes and O’Connor, Gas Works, pp. 16-20.
to explosion.\textsuperscript{15} In 1810, Winsor and his subscribers incorporated “The Gas-light and Coke Company,” obtaining a royal charter in 1812.\textsuperscript{16}

The gas produced by The Gas-Light and Coke Company was distilled from coal and then condensed and run through purifiers and scrubbers to remove harmful impurities such as tar and water, carbonic acid, ammonia, and sulphur. The final result of the process was purified coal gas suitable for lighting. The typical gas works of the period included a “retort-house, coal-store, purifying house, engine and exhauster, station-meter and governor houses, valve and regulator room, workshops, dwellings, and offices, with the ordinary appliances for testing the quality of the gas, the yard and chimney, together with the necessary plant for the manufacture of the sulphate of ammonia....”\textsuperscript{17}

The retort house contained the ovens or “retorts” used for the distillation or carbonization of coal, the initial process in making coal gas.\textsuperscript{18} Attached to the retort house was a coal-store; the engine, boiler, and exhauster house contained engines to run pumps for pumping water (particularly during the period of wet-lime purifying), and the exhauster which was a pump to quickly remove the gas from the retort.\textsuperscript{19} The purifying-house contained several types of equipment to clean the gas of impurities, including a condenser to remove heavy impurities, a washer and/or scrubber to remove ammonia from gas, and either wet-lime (earlier) or dry-lime purification systems which were used to removed sulphuretted hydrogen, carbonic acid, and other sulphur compounds.\textsuperscript{20} The finished gas was then piped through the station meter, a device to measure the output or quantity of gas produced, to a gas holder or gasometer to store the gas.\textsuperscript{21}

Gas lighting caught on quickly in England, particularly for municipal lighting; by 1807, the Pall Mall area of London had installed coal gas streetlights.\textsuperscript{22} By 1823 there were four gas companies supplying gas to the north side of London, and by 1829, there were no less than 200 gas light companies in various towns across the United Kingdom.\textsuperscript{23} Within ten years of its introduction in London, coal gas systems were being installed in the United States for street and domestic lighting.

With the success of gas lighting and the desire to use it more widely for lighting homes and businesses, portable gas machines were developed to allow the luxury of gas lighting in areas outside the reach of municipal gas distribution systems. The early systems were essentially small versions of municipal coal gas plants, and required regular maintenance and attention by knowledgeable operators. As the 19th century progressed, several other types of fuel were used for the portable machines, particularly rosin oil.

\textsuperscript{15} Hughes and O’Connor, \textit{Gas Works}, p. 20.
\textsuperscript{16} Hughes and O’Connor, \textit{Gas Works}, p. 22.
\textsuperscript{17} Hughes and O’Connor, \textit{Gas Works}, p. 94.
\textsuperscript{18} Hughes and O’Connor, \textit{Gas Works}, pp. 94-97.
\textsuperscript{19} Hughes and O’Connor, \textit{Gas Works}, p. 100.
\textsuperscript{20} Hughes and O’Connor, \textit{Gas Works}, pp. 101, 155, 166.
\textsuperscript{21} Hughes and O’Connor, \textit{Gas Works}, pp. 101, 216, 235.
\textsuperscript{23} Hughes and O’Connor, \textit{Gas Works}, pp. 26-27.
gasoline or naptha, and later, calcium carbonate. Rosin oil was converted to gas much like coal, using retorts to heat the fuel and produce gas, while gasoline and calcium carbonate were typically converted into air gas using a system of air pumps and gas generators (evaporators). Gasoline, a colorless, volatile, flammable, and explosive liquid, was a byproduct of the refining of crude petroleum into kerosene, then the most popular lamp fuel. Toward the end of the 19th century, gasoline was challenged by another gas known as acetylene. Acetylene gas, a hydrocarbon-based fuel that gives off a brilliant light, is created by mixing calcium carbide with water.

Early gas lighting, whether supplied from a gas works or gas machine, was generally rather inefficient, mainly due to fluctuating pressure in the gas lines and the unreliability of early gas burners. Early burners, little more than pierced holes in iron pipes, could easily become corroded or clogged, affecting the quality and efficiency of the light. A variety of burners, including the single jet, batwing, fish tail, cockspur, Argand, and incandescent, were eventually developed that greatly improved gas lighting.

Even with a slight drop in popularity due to the cheapness of kerosene, gas was one of the best sources of lighting available, and by the mid-1800s had become a principal source of urban and industrial lighting. Gas provided a bright, steady light that enabled people to go about their work at night as they had by day. This aspect of gas lighting was welcomed on the domestic front as well as in industry, where good lighting was desperately needed. Brighter gas light also reduced that eyestrain that was a common complaint among those who had read by oil lamp, candlelight, or rushlamp. As time went on, the delivery systems for gaslight were greatly improved, and new uses, such as stoves, water heaters, and other appliances, were found for the fuel. Like earlier lighting sources, gas posed certain dangers when handled incorrectly, but was deemed safer than most oil type lamps with liquid fuels that could explode or easily be knocked over and cause a tragic fire. Likewise, establishing a city’s gas works and then running pipes to individual houses was an expensive and time-consuming operation. It was also expensive for individual households to hook into the system and refit their houses for gas lighting. Thus, gas lighting, like many new innovations appeared first in the homes of the wealthy, and on the domestic front was confined mostly to the upper social and class levels. The general populace, who at the time were almost universally lighting their houses with kerosene, was more likely to encounter gas lighting in stores or factories, and in urban areas with gas street lighting. It was the advent of electric light in the 1880s that eventually really revolutionized and democratized lighting, eventually bringing cheap, reliable, quality lighting into most homes. While electric lighting eventually won the battle as the principal source of lighting, gas remained a major light source in both industrial and domestic settings well into the 1920s.

26 Hughes and O’Connor, *Gas Works*, p. 337.
**Gas Lighting in America**

By the time of the Civil War, gas had grown to become the dominant light source in the United States, particularly in urban settings. The introduction of municipal gas lighting to the public was a very important event, both technologically and socially. This process was slow at first, as a host of technical problems had to be resolved and individual houses and businesses had to be connected to a particular gas works company by a system of underground pipes; infrastructure costs were high and distribution systems were quite primitive. Municipal gas works initially provided lighting for public places, such as lights for streets, parks, and commercial establishments, and gradually expanded to serve private residences.

Historian and Smithsonian Institution curator C. Malcolm Watkins credits David Melville of Rhode Island with the first domestic use of “illuminating gas.”

Although Melville, who obtained a patent on the process in 1810, apparently installed gas lights in a local textile mill and eventually added street lights outside his home, they were viewed by many as interesting novelties. In announcing his gas lighting demonstration, Melville wrote:

> gaslights will be found extensively useful in any situation where much light is required, most especially in the growing manufactories of our country, in as much as they are less expensive than those from tallow and oil, and free from the inconvenience and danger resulting from sparks, and frequent snuffing of lamps and candles–circumstances tending greatly to diminish the hazard of fire and proportionately to diminish the rate of insurance on buildings and material subject to that devouring element...[Gaslight is] a discovery that holds out so brilliant a prospect of extensive and permanent usefulness to the country.

In one of the first major public demonstrations of gas light in America, Rembrandt Peale used gas to light his Baltimore art museum in 1816. The success and popularity of the gas light installation prompted Peale and others to establish a coal gas works in 1817 to provide street lighting in Baltimore. Other northeastern and east coast cities were quick to follow suit.

Boston had a gas lighting company by 1822/1823, although the city’s first gas works were not completed until 1828. In 1823, the city of New York established a gas company, but like Boston, it was several years (1827) before it was fully operational.

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29 David Melville, 1813, quoted in Worthington 1985:3
30 Watkins, “Artificial Lighting in America,” p. 393.
An editorial in the *New York Evening Post* announced a demonstration of gas light in New York in 1824:

> the exhibition of gas lights last evening at 286 Walter Street, attracted a great number of ladies and gentlemen, notwithstanding the unfavorable weather.... Six new burners ..... rendered the display considerably more brilliant than the preceding occasion.34

By 1828, part of Broadway was lit with gas lamps, and in 1830 the Manhattan Gas Light Company was organized.35 Of course, not everyone found gas light to be a positive addition to the city. The *American Gas Light Journal* reported that “a lady resident, within the lamp and watch district of New York City, steadily refuses to have the Manhattan gas inserted into her house, because, she says, it is the breath of the devil.”36

Beginning in the Northeast and gradually moving west and south, other cities began to construct municipal gas lighting systems, following the example of Boston, New York, and Philadelphia (established 1834). Watkins notes that for the first few decades, except for street lighting, gas was confined principally to theaters, museums, and other public gathering places. By 1852, gas lighting reportedly had surpassed oil lamps as New York City's principal lighting system.37 Interestingly, Washington, D.C. had not yet begun to light with gas; it did not build its municipal gas works until 1855.38

An extensive network of pipes was necessary to deliver gas to buildings within a city. Once the main underground pipe was run along a given street, service pipes connected it to each individual building. The use of gas by individual households also necessitated the measurement of individual gas consumption, leading to the development of gas meters. The early pipes and meters used in municipal gas systems were generally made out of wood or cast iron.39 The initial cost and regular maintenance of these systems was an expensive undertaking. In fact, after twenty years of work, Baltimore’s gas works had installed only 2 miles of underground pipes.40 By mid-century, however, cities like Chicago were rapidly expanding their network of gas mains. Governor John Reynolds noted that “five miles and 2,978 feet of large gas-pipes have been laid under ground in this city [Chicago] the last year [1853], and the total of the smaller pipes laid throughout the city is thirteen miles….”41 While distribution within the city was becoming more widespread by mid-century, it was still difficult and expensive to justify running pipes to individual homes and businesses in rural or even suburban areas, therefore, these locations had to do without gas lighting until later in the century.

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38 Wright 1982:81
40 Worthington, “Beyond the City Lights,” p. 7.
People who lived in more rural areas, outside larger cities also wanted the benefits of gas lighting in their homes and businesses, but as discussed above, were unable to utilize the city gas works for their lighting needs. The invention of self-contained or portable gas systems in the early to mid-19th century offered a solution to this problem. While England and Europe were the birthplace of gas production and lighting, the self-contained or “isolated” gas machine system was America’s contribution to gas lighting technology.42 These systems utilized several fuel types: coal (small versions of municipal coal gas systems), turpentine, rosin/pitch, gasoline, and later, calcium carbonate.43 The machines operated in two principal manners: hot and cold processes. The hot process machines, like the Portable Gas Apparatus of the Maryland Portable Gas Company, required combustion to produce the gas, principally by using heat to release or vaporize illuminating gas from sources like turpentine and water, coal, and rosin; hot process machines were also later used to create air gas from liquid gasoline and other petroleum distillates. The cold process machines, like the Springfield Gas Machine, relied exclusively on simple evaporation of fuel sources to create air gas for burning.

In general, coal gas production was complicated and the machinery required for the process was expensive and difficult to operate, and so did not lend itself to use in small portable machines. Not only were these systems rather complicated to operate and maintain, but they were quite dangerous as well, as they involved open flames, high temperatures, and often, pressurized materials.

It wasn’t until the mid-19th century, that portable gas machine systems were being produced on a commercial basis; the earliest of these machines used rosin, turpentine, and other oils. The Portable Gas Apparatus of the Maryland Portable Gas Company of Baltimore, went into production ca. 1852.44 The system, discussed in more detail below, brought the “luxury [of gas light] home to every man,” and was, the company boasted, as easy to use as an “ordinary cooking stove.”45 It utilized a retort heated by coal; rosin oil was released into the retort and evaporated into gas, cleaned of impurities, and stored in a gasometer. When the gas in the gasometer was used up, the system had to be lit and a supply of new gas produced.

Worthington notes that C. R. Woodworth & Company’s “Portable Gas Works” was manufactured under patent from the Maryland Portable Gas Company.46 In order to produce a supply of gas, Worthington writes,

the user would, by burning coal, heat a closed iron cauldron to a glowing red. Rosin oil was then released into the chamber where it instantly vaporized on contact with the hot iron. From the chamber the vapor then passed through a bath

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44 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company.”
46 Worthington, “Beyond the City Lights,” p. 7.
where impurities were removed and went from there to a gas holder much like its larger municipal counterpart.47

Worthington explains that the system supplied only limited amounts of gas and required frequent recharging and regular maintenance to remove carbon build ups inside the kettle.48 Even with these drawbacks, “the value of the better light far outweighed the inconveniences, and the Woodworth machine and others like it proved the idea workable.”49

Experimentation with gas-making machinery was at a high pitch by mid-century with inventors searching for the best fuels and means of turning them into burnable gas.50 The discovery and refining of petroleum in the 1850s and early 1860s provided a variety of new fuels for experimentation. Hundreds of patents were issued in the 1860s and 1870s for portable gas machines that used petroleum-based fuels.51 Gasoline, along with naptha, was a fractional byproduct of the refining of crude oil, which was refined primarily for the production of kerosene at this time. It appears that gasoline was used to fuel portable gas machines beginning in the early 1860s.52

Gas machines that utilized gasoline generally operated by evaporating the liquid into an air/gas mixture that could be burned in standard gas burners and fixtures. Numerous types of gasoline gas machines were patented during the final three decades of the 19th century. Some systems, known as the “cold process,” operated by forcing air across the surface of liquid gasoline or other petroleum distillate like naptha, causing it to vaporize; it was then piped to burners throughout the house. These machines were subject to problems with evaporation rates of the liquid and fluctuating richness of the gas; in order to more effectively evaporate all of the gasoline or hydrocarbon fuel, other machines utilized “hot process” approach. This type of system employed fire and heat like the rosin systems to evaporate the liquid gasoline into gas; the machines varied but many used some type of radiator to indirectly warm the liquid hydrocarbon fuel. Worthington reports that by 1872 “no fewer than 100 companies were manufacturing isolated gas making machinery.”53 Both the hot and cold process systems were initially slow to catch on, as gasoline was little understood by consumers and horrific accidents were quickly reported in the press.

As cold process, gasoline machines, like the Springfield Gas Machine, began to be used, customers abandoned the older coal and rosin systems because the new machines offered simpler, continuous, automatic operation, and much less maintenance. For example, several customers reported replacing their “old rosin” systems with the Springfield Gas Machine because of the time involved in operating the rosin oil system.

47 Worthington, “Beyond the City Lights,” p. 7.
49 Worthington, “Beyond the City Lights,” p. 7.
50 Worthington, “Beyond the City Lights,” p. 12.
51 Worthington, “Beyond the City Lights,” p. 12.
52 Worthington, “Beyond the City Lights,” p. 12.
Customer Matthew Baird complained that “with the old rosin works they [his staff] were obliged to make gas at least twice a week.”

Gas Lighting Fixtures and Burners

Whether used as part of the municipal or self-contained, portable gas lighting systems, fixtures were placed in each room to burn the gas and produce light; they consisted of a body, usually ornamental, a burner, and a globe. The indoor varieties of fixtures included brackets, pendants, and chandeliers or gasoliers.\(^5\) The bracket extended horizontally from a wall, the pendant hung from the ceiling but had only one or two burners, while chandeliers or gasoliers had more than two burners.\(^6\) Russell notes that by the 1880s, the most common fixture was the wall bracket; the simplest of these included a “brass pipe projecting from the wall, with a stopcock at the wall end and a jet at the other.”\(^7\) A double-jointed version of the wall bracket also became very popular, as it allowed the position of the light to be adjusted.\(^8\) The lack of portability was one of the major disadvantages of gas light over kerosene.\(^9\) Manufacturers of gas lighting systems responded in the 1870s and 1880s with portable gas lamps that were connected to the fixed gas distribution system with flexible rubber hose.

In terms of light quality, the most important part of the fixture was the burner. The gas burner was held within the larger, often decorative, fixture, and can be divided into several types: single-jet burners, flat flame burners, Argand burners, multiple flat flame burners, regenerative burners, and incandescent burners. One of the most important considerations for good burners, writes Richards is that “the orifices for the egress of the gas should be perfectly regular in size, and sufficiently large, so as to permit it to issue with very feeble pressure or force.”\(^10\) If the burner holes are too small, the light is diminished by the increase in pressure of the gas; too large and the flame may smoke.\(^11\)

The single jet burner is the oldest form of burner as well as the simplest. An example of a single jet burner is the rat-tail burner in use by 1808. This burner consisted of a plain, upright body with a small round opening for the gas. According to Gerhard, rat-tail burners were only used on a limited basis as they gave off little light.\(^12\)

The flat flame burner included two varieties, the bat-wing or batswing, in use by 1816, and the fishtail, in use by 1820.\(^13\) Flat flame burners create a fan-like emission of

\(^{5}\) Gerhard, *The American Practice of Gas Piping and Gas Lightings*, p. 142.
gas, due to the slitted opening of the burner, and while they did not require a chimney to protect against smoking, they did need a glass globe to protect the flame from drafts. As discussed above, another important gas burner was the Argand type. It consisted of a “hollow ring connected with the gas tube and perforated on its upper surface with a series of fine holes, from which the gas issues, which formed a hollow, round flame.” Like the Argand oil lamp, these burners also required a glass chimney. This type of burner more efficiently supplied air to the flame, producing a more thorough combustion. Writing in the Gas-Consumer’s Guide, Richards reported that “when a quantity of light is required in enclosed places, as shops, warehouses, etc., Argand burners are beyond comparison superior to all others.”

Multiple flat flame burners were used mainly in order to obtain brighter street illumination, or to light large indoor spaces, such as stores or great halls. Multiple burners produced a very bright flame and were made of “several concentric rings of round burners, or three, five, or more flat-flame burners arranged in such a manner that from whatever point they are looked at, a flat side of the flame is exposed.”

The last burner to be invented, and the one that represented the greatest advance in gas lighting, was the incandescent gas burner. In this burner type, the flame is used to heat a refractory substance, or mantle, that then glows with light. In addition to vastly improved light quality, these burners used gas in a very efficient manner. For example, the Welsbach incandescent gas mantle, invented in the 1890s, significantly improved the quality and quantity of light from gas. It has been reported that “a single home burner using water gas and a Welsbach burner provided light equal to 22 to 35 candlepower,” a great improvement over the 15-17 candlepower generated using plain coal-gas burners.

The other elements of the gas lighting fixture were glasses, globes, and reflectors. Globes protected the flame from drafts and the house from fire. They were made of glass, and like the fixture itself, fulfilled aesthetic purposes by their decorative nature and ability to diffuse the light in an attractive way. Most, but not all, burners required glass chimneys and globes to eliminate drafts; the many different forms and shapes depended on the aesthetic preference of the buyer and the type of burner it protected. Richards

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64 Gerhard, The American Practice of Gas Piping and Gas Lightings, p. 113.
69 Gerhard, The American Practice of Gas Piping and Gas Lightings, p. 120.
70 Gerhard, The American Practice of Gas Piping and Gas Lightings, p. 118.
reported that the glass chimney was indispensable for use with the Argand burner, and that the batwing burner did not use a glass as the wide flame was liable to cause it to shatter from the heat; fishtail burners, he noted, commonly used glass globes.  

The proponents of gas light regularly touted numerous advantages in using gas over the other types of lighting available in the 19th century. *The Gas-Consumer’s Guide* includes observations on the advantages, economy, cleanliness, brilliancy, salubrity, and utility of gas lighting.  

The principal advantages of coal-gas, notes the author, was the “superiority” of gas in terms of the quality and “cheapness of the light obtained from it” compared to other lighting sources such as “tallow, wax, sperm-oil, kerosene, camphene, etc.” Furthermore, other advantages include its “convenience, cleanliness, brilliancy, manageability, and safety.” Gas required, according to the author, no preparation, was quickly lighted, and its intensity could be easily regulated; it also saved time and labor when compared to oil or candle light. In terms of safety, the author argues that gas was the safest means of illumination, because it was stationary and could not be knocked over like candles or oil lamps. Furthermore, Richards pointed to the “daily accidents from explosions of camphene and kerosene lamps,” to tout the “superior safety” of gas. European insurance companies, noted Richards, actually lowered premiums for buildings lighted with gas.  

Richards also touted the relative cleanliness of gas lighting over the use of candles, oil, or kerosene type lamps. He also argued that gas produced a more brilliant light that could be easily adjusted to prevent glare and eye strain. A further advantage of gas, wrote Richards, was its flexibility for uses beyond lighting; gas was increasingly being used for heating, cooking, and baths. Many of the advantages and positive aspects of gas lighting, touted by Richards and other commentators of the period, were important socially as well as technically and economically.  

Chapter 4:
The Social Uses of Gas Lighting

Gas lighting was important socially in many different ways. Improved lighting systems contributed to a public image of prosperity and currency with prevailing styles and innovations. Gas’s bright and steady light permitted people to go about their work in homes and businesses at night as they had by day. Work in factories, mills, and other businesses was made safer; however, as laborers could work into the night because of gas lighting, their employers frequently extended their work hours, often without more pay. Gas light also enabled new levels of social interaction; large rooms such as ballrooms and parlors could be brightly lit at a reasonable cost, so that parties, dances, and other social engagements could take place at night in light, festive surroundings. As Robert Louis Stevenson wrote:

when gas first spread along a city...a new age had begun for sociality and corporate pleasure-seeking....; Mankind and its supper parities were no longer at the mercy of a few miles of sea-fog: sundown no longer emptied the promenade; and the day was lengthened out to every man’s fancy.82

Commenting in the Gas-Consumer’s Guide, Richards proclaimed that gas lighting “has afforded great facilities for persons to assemble at nightly scientific, literary, musical, and other meetings; it has thus facilitated the reunion of society of every grade....”83 Gas lighting also was responsible for changes in labor in the home, as the amount of work required to maintain older lighting devices, like kerosene lamps, was greatly reduced.

The introduction of gas lighting also changed the urban streetscape. Before street lights, going out of doors after dark could be a dangerous venture.84 Watchmen were necessary to help ensure public safety, and citizens were often called upon to help light the streets. With gas lights, streets could be brightly illuminated, making it safer and more pleasant for people to move about the city at night and also eliminating the need for the night watchman.85 Gas lighting, wrote Richards in the Gas-Consumer’s Guide, has “tended to prevent crime” and “rendered life and property more secure.”86 It is most likely through the introduction of gas street lights that the general populace was first introduced to the wonders of gas lighting.

Another interesting change brought about by gas lighting was an important difference in the way things looked.87 In low light, everything seems to be colored in shades of gray, black, and white. As poet Elizabeth Barret Browning noted: “colours seen

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85 Bowers, Lengthening the Day, p. 53.
87 Bowers, Lengthening the Day, pp. 51-54.
by candle light, will not seem the same by day.”88 Light from candles and oil lamps cast a flickering, weak light, which affected the way people saw the world around them. Artists faced interesting challenges in painting scenes that took place at night, and in correctly representing the colors and tones that could be viewed in weak candle and lamplight.89 People also looked different in candle light than in brighter gas light, and one can imagine that this was a factor in changes in clothing styles and even makeup worn by people as candles and oil lamps were replaced by brighter gas lighting. Brighter colors and sharper contrasts would have been important if they were to show up in the less revealing light provided by pre-gas lighting sources.

As with all new inventions, however, not everyone was overly impressed with the new ways of lighting. For example, Edgar Allen Poe complained that,

we are violently enamored of gas and of glass. The former is totally inadmissable within doors. Its harsh and unsteady light offends…The huge and unmeaning glass chandeliers, prism-cut, gas-lighted and without shade, which dangle in our most fashionable drawing-rooms, may be cited as the quintessence of all that is false in taste or preposterous in folly.90

Likewise, Frederika Bremer complained in 1850 that “evening parties do not agree with me; the heat produced by the gas-lights of the drawing-rooms makes me feverish.”91

A common complaint and fear about gas lighting was its effect on the quality of air in a room and the effects of the combustion process on human health. The burning of gas lights produced numerous byproducts along with heat and moisture vapor. The production of carbonic acid was of particular concern, causing the proponents of gas light to caution users about proper ventilation of all buildings using gas and the need for an adequate supply of fresh air in all structures.92 Richards points out that byproducts are produced whether one burns candles, oil lamps, or gas for light.93 He writes, “the actual question for the public to consider, is not whether the burning of gas be injurious to health, for, in one shape or other, gas must be burnt to procure light, but the point is—whether it is better to consume for this purpose gas of pure or impure quality?”94

The introduction of gas lighting offered many changes in household chores and activities related to providing lighting for the household. The demands of maintaining lamps were quite onerous, and frequently commented on by 19th-century writers like Laura Ingalls Wilder. For example, Norman details the tasks that were required for maintaining seven oil lamps for a domestic household:

88 Elizabeth Barret Browning quoted in O’Dea 1958b:9
90 Edgar Allen Poe quoted in Myers, Gaslighting in America, p. 35.
91 Frederika Bremer quoted in Moss, Lighting for Historic Buildings, p. 100.
1) Collecting and carrying 7 lamps into kitchen.
2) Bringing in oil can.
3) Removing carefully 7 shades and 7 chimneys.
4) Scrubbing soot from awkward inside of 7 chimneys.
5) Snuffing and trimming 7 dirty wicks.
6) Unscrewing cap of kerosene can and 7 burners to let in kerosene.
7) Filling bowls on 7 lamps with oil.
8) Screwing on 7 burners.
9) Wiping off 7 bowls and stands.
10) Putting on 7 chimneys and shades.
11) Carrying and placing 7 lamps back into their proper brackets.
12) Screwing on cap of kerosene can, and carrying and storing away can and soiled cloths.
13) Cleaning up table and trying to wash from hands and clothes the “smell that won’t come off.”

Norman goes on to report that this process was required on a daily basis, “365 days a year—while the smelly kerosene soils, sickens, and disgusts Mother.” “Compare that situation,” he continues, “with the comfort, convenience, and economy of time with lighting by gas....” The reduction in tasks related to the kitchen and household was extended with the introduction of gas stoves, waters heaters, and other innovative appliances (for clothes washing and drying).

The use of gas for lighting and a variety of other tasks also had immediate application in industry, and this modified the daily routine and raised production output in many manufacturing operations. For example, the owners of the Raritan Woolen Mill wrote to Gilbert and Barker in 1872 to report that after installing a Springfield Gas Machine system “we have been using our mill all night for some time past....” During the second half of the 19th century, gas was being used to run engines (both directly and via steam), heat furnaces, fuel brazing equipment, and for heating applications for a wide variety of industries such as glassmaking, coffee making, lumber drying, forging, etc. In particular, gas was the preferred fuel for many applications that benefited from the “automatic and absolute temperature controls” that were possible using gas. These applications were responsible for changing the daily lives and routines of many factory workers, and provided increased production for factory owners and investors.

Self-contained gas machines, like the Portable Gas Apparatus of the Maryland Portable Gas Company, had another very important social implication: they eliminated the difference between lighting in urban and rural homes for those who wanted and could afford it. People in country homes could thus entertain guests in grand style just as their city cousins could. In fact, the use of gas lighting in remote and rural areas was a demonstration of the power of technology, and the economic power of the homeowner to

purchase and use such a system. These systems eliminated some of the urban/rural social
disparity, bringing people in rural areas up to date with those in urban areas. By pitching
their machines as ideally suited for lighting cottage or country homes, companies
positioned themselves to take advantage of several trends: the developing romantic
revival in architecture and landscape architecture that began with the publications of
Andrew Jackson Downing in the 1840s, the rapidly expanding suburban landscape, and
architectural reforms of the period related to improvements in plumbing, lighting, and
heating systems. 99

Gas machine companies also promoted the use of their machines to fuel new lines
of “labor saving” products, including ranges, broilers, laundry iron heaters, stoves, gas
logs, water heaters, and radiators. The introduction of these very types of appliances,
notes Ruth Cowan in her study of the “Industrial Revolution” in the home, also brought
major changes in household structure and the work life of middle class women. 100 As
noted above, the use of gas lighting also reduced the maintenance connected with oil
lamps and simplified many tasks in the home. Yet, as Cowen argues, these new “labor
saving devices” probably introduced new expectations of women in home and really just
shifted the workload rather than reducing it.

99 Clifford E. Clark, Jr. “Domestic Architecture as an Index to Social History; The Romantic Revival and
the Cult of Domesticity in America, 1840-1870.” In Material Life in America, 1600-1860, Robert Blair St.
222-236. (The American Association for State and Local History, Nashville, 1982).
Chapter 5:
The Maryland Portable Gas Company

Chartered in 1853, the Maryland Portable Gas Company was one of the first of what would become many businesses of the time that manufactured a device capable of producing gas light for use in buildings erected outside the limits of a city’s gas lines. This self-contained device functioned in much the same way as a municipal gas plant. While commonly known as the Portable Gas Apparatus, records from 1852 refer to it as Longbottom’s Portable Illuminator after the chemist who patented its particular method of burning rosin oil as fuel. An 1855 pamphlet advertising the Portable Gas Apparatus states that the company produced models with gas capacities ranging from three hundred to one thousand cubic feet, and machines with larger capacities could be made to order upon request. In the same pamphlet, the Maryland Portable Gas Company boasted that their apparatus “has opened a new era in the mode of lighting private dwellings, churches, hotels, public and private schools, colleges, factories, foundries, as well as country towns and villages.” The company also attested that the burning process employed by the apparatus produced a clean, bright, odorless, safe and economical light, and enjoyed much early praise from engineers, chemists and private citizens who studied and used the devices. In 1865, just seven years after installing the gas machine at the Soldiers’ Home, the company disbanded following a steady decline in stock prices and without achieving any financial success. This section documents the short history of the Maryland Portable Gas Company and examines the physical means by which the Portable Gas Apparatus burned fuel and supplied light.

Short History of the Maryland Portable Gas Company

Immediately following its chartering in 1853, the Maryland Portable Gas Company enjoyed a brief period of prosperity and praise. In July 1853 an R.G. Dun & Company representative recorded that the company’s President, William G. Thomas, was “a man of high standing and large means, worth $200,000 and a shrewd business man,” and “the Board of Directors are men of some standing and means.”101 The agent further attested to Thomas’ status by noting that “I should not think he would have anything to do with the business unless the concern was pretty good.”102 Eight months later in March 1854 a second notation recorded that business was increasing and that their gas machine was “getting into favor for all country places” (Figure 7).103 The company’s 1855 pamphlet touts the success of the machine, reprinting twenty-four testimonial letters for the portable gas apparatus.104 Along with President William G. Thomas, the pamphlet lists Elisha R. Sprague as Secretary and Treasurer (Sprague was an attorney in Baltimore), Abram Longbottom as chemist, and James A. Bruce as Superintendent (likely

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104 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company.”
their plant manager). The firm’s directors are William G. Thomas, Charles E. Wethered, Lemuel W. Gosnell, Elisha Sprague, and John Kettlewell.105

Admittedly the company’s pamphlet was designed to advertise and sell products, encourage investment, and project a favorable image of the company to the public. In fact, fully one-half of its sixteen pages are devoted to these testimonials. However, as this praise came from both professional reviews of the apparatus as well as feedback from consumers, the letters represent a range of opinions about the device and constitute more than mere self-congratulation by the Maryland Portable Gas Company. James Renwick, Professor of Chemistry at Columbia College, authored the longest and most detailed testimonial in the form of an eight point review of experiments conducted on the portable gas apparatus and the gas produced by it. The professor concluded that, “the Gas is thoroughly purified, and entirely inoffensive when burning, and the light is white and brilliant,” and that, “not only is the Apparatus simple, but I do not conceive that any danger can attend its use, and that it cannot add more to the fire risks than a common stove.”106 He also addressed the question of cost, noting that in large establishments, there can be no question that a given quantity of light could be furnished by Mr. Longbottom’s method at a much lower price than is supplied by the great Gas Companies in our cities. In places where there are no Gas works, there can be no doubt that this method must be of great value.107

Given the large size of the gas apparatus installed at Soldiers’ Home, it most likely serviced multiple buildings, and Professor Renwick’s findings show that its installation was economical as well as practical since at that time no pipes had as yet been laid connecting the grounds to Washington, D.C.’s recently established gas company.

Testimonials continued to arrive at the company’s office, including letters from other professors and Julius W. Adams, chemical engineer and editor of Mechanics’ Magazine. Additionally, in a letter dated April 10, 1854, James Higgins, State Agricultural Chemist of Maryland, reported that he examined a gas apparatus which had been in use for at least twelve months “to ascertain, by actual observation, the effects of the Gas upon the pipes.”108 He concluded that the presence of the gas had not produced any damaging effects on the pipe, and that “there is and can be no deposit from this Gas that will injure the pipe sooner than it would be destroyed by rust.”109

Letters submitted by consumers, while less technical in nature, are no less valuable in documenting the early praise of the portable gas apparatus. In a letter dated March 14, 1854, E.W. Candee of Yonkers, New York, expressed his satisfaction with the gas apparatus, stating that, “its operations are most beautiful. As to quality of light, I have

never seen any thing better.” He also noted that his coachman attended to the device, illustrating, he thought, its ease of use by non-professionals. Additionally, on April 13, 1854, Baltimore resident Thomas M. Smith drafted a letter stating that his mill saved an average of two-thirds the cost of illumination by kerosene oil upon switching to the portable gas apparatus. Perhaps most significantly, T. G. Robertson, Secretary of the Hagerstown Gas Light Company, wrote to the Maryland Portable Gas Company on November 28, 1854, to inform them that the previous evening the town of Hagerstown was lit by gas produced from the apparatus, and that “the result has far surpassed what you led us to anticipate.” Robertson further explained that the gas produced a quality of light superior to any other he had seen, that though the apparatus was located at the center of town it did not constitute a nuisance to residents or produce any odor, and that he expressed “the sentiments of the whole community in assuring you that the result is most satisfactory.”

The 15 or so testimonials from “satisfied” customers in Maryland, Pennsylvania, Virginia, and New York, also provide some insight into the marketing of the firm’s gas apparatus. The 1855 Maryland Portable Gas Company pamphlet lists the sales agents of the firm in six major U. S. cities. In addition to its own sales staff in Baltimore, the company had agency arrangements with firms on both the east and west coasts: S. Coates & Co. in New York, John C. Appleton in Boston, Ferris & Garrett in Wilmington, Delaware, Jas. H. Taylor in Charleston, Geo. C. Laurason and Jas. M. Slaughter in New Orleans, and Jas. S. Wethered in San Francisco.

Although the 1855 Maryland Portable Gas Company pamphlet contains many letters of praise, by the following year R.G. Dun & Company reported that the company was already beginning to fail. While the company would survive for about another ten years, its decline was precipitous. In January 1856, the agency reported that “this concern does not seem to prosper, think the stock is below par and success is rather difficult,” and by February the agent recorded that he would not give $50 per share of the company’s stock though par value was $100. The Woods’ Baltimore Directory for 1856-57 confirms the company’s location at 202 Baltimore St., in Baltimore. For the first time, Elisha Sprague’s occupation is listed as the treasurer of the Maryland Portable Gas Company, but he is also reported as maintaining his law partnership. A small, four line advertisement appears in the Woods’ volume:

112 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company,” p. 16.
113 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company,” p. 16.
114 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company,” cover.
115 Matchett’s 1855-56 Directory lists the company for the first time, and its address is listed as “office over 202 Baltimore.” Importantly, its name is just the Maryland Gas Company (no “Portable”), and it seems that for the company’s entire existence it goes by both the Maryland Portable Gas Company and the Maryland Gas Company.
By June 3, 1856 the firm’s stock had fallen farther still, and the R.G. Dun & Co. agent estimated that it might be sold for $15. The 1858 edition of *The Baltimore City Directory* lists the office of the Maryland Gas Co. as the Bank of Baltimore Building at the corner of West Baltimore and St. Paul streets (later Sanborn Maps confirm this is 202 Baltimore St.). By the publication date of *The Baltimore City Business Directory, 1863-64*, Sprague is listed as the President of the firm, now known as the Maryland Gas Company, and Louis Morrison as the Secretary and Treasurer. The firm’s office has by this time moved to 5 St. Paul. Given the lack of any references to William G. Thomas, it seems possible that he had died and that Sprague had assumed the presidency of the Maryland Gas Company.

Finally, the R.G. Dun & Company representative suggests that the Civil War may have played some minor roll in ultimately bankrupting the Maryland Portable Gas Company. An entry on September 28, 1864, notes that the company was “not paying debts contracted before the war. Doing very little now. We think they pay small bills made for own materials, but not considered safe & we can’t recommend credit. Stock not worth anything.” By April 19, 1865, the company was officially out of business.\(^{117}\)

While the Civil War no doubt contributed to the final demise of the Maryland Portable Gas Company, the R.G. Dun & Company records indicate that its economic decline actually began years before the war’s outbreak and clearly had other sources. Between May 1, 1856, and January 8, 1858, the *New York Daily Times* carried a series of classified ads highlighting a patent dispute between the Maryland Portable Gas Company and S. Coates & Co., an agent of the company operating in New York City. The Maryland Portable Gas Company brought suit against Coates and Co. alleging that they had violated a patent held by the Maryland Portable Gas Company for the portable gas apparatus. However, on June 6, 1856, J. P. Pirsson of the Office for American and Foreign Patents concluded that the patent taken out in 1852 by Abram Longbottom, who would become the chemist for the Maryland Portable Gas Company when it incorporated in 1853, applied only to the particular composition used for purifying the gas within the retorts of the apparatus, not the apparatus itself. Pirsson therefore concluded that, “hence, so long as no use is made of Longbottom’s composition, no infringement whatsoever takes place,” and “the patent has nothing to do with the construction of the retorts, or works, but is applicable to all kinds, whether for oil or coal or gas.”\(^{118}\) One can easily see that without rights to the patent for the actual apparatus the Maryland Portable Gas Company lost the principal component of its business; especially since shortly thereafter S. Coats and Co. went into business on its own, forming Coates’ Improved Portable Gas Works, presumably manufacturing the same portable gas apparatus. With other Maryland


Portable Gas Company agents in Boston, Wilmington, Charleston, New Orleans, and San Francisco, similar patent incidents could have easily created additional competitors and helped bankrupt the Maryland Portable Gas Company. The loss of this patent, thus, likely created an economic situation just as damaging as, or even greater than, the impacts of the Civil War. As discussed above, the other important aspect related to the failure of the company and others like it was the introduction of gasoline gas machines in the mid-1860s. As consumers became more confident in cold process systems like the Springfield Gas Machine, they began to replace their old systems or simply to choose the gasoline gas machines over the more complicated rosin systems.

The demise of the Maryland Portable Gas Company also led to the financial collapse of at least one of its directors. The 1853-54 Matchett’s Baltimore Director lists Elisha R. Sprague, soon to be the secretary of the Maryland Portable Gas Company, as a member of the law firm of Sprague and Root, mercantile agents with an office at 202 Baltimore St., Baltimore, Maryland. Sprague became the Secretary of the Maryland Portable Gas Company in 1853 and the company used his law office as its address. Secretary Sprague, not President Thomas, functioned as the public face of the company, receiving correspondence, attaching his name to the advertisements placed in the New York Times, and also acting as Treasurer. According to an entry recorded by the R.G. Dun & Company agent on April 19, 1865, Sprague “did own a fine house in this city [Baltimore] but it sold in 1860. He may own a small place in the country, but whether in his own name or not I cannot say.” The same entry continues by stating that Sprague has a suit standing against him in court for $500, and a May 6, 1865, entry recorded that the either the case was still pending or that a second had been opened. Sprague also became involved in the management of the Automatic Gas Company and People’s Gas Company (1865/1866), but neither fared any better than the Maryland Portable Gas Company.

Interestingly, Sprague died in July of 1867, two years after the collapse of the company, while traveling on business in Guayaquil, Ecuador. An obituary in the Baltimore Sun on August 15, 1867, stated that

Mr. Sprague contracted a fever on the Isthmus of Panama, from which he recovered in Guayaquil, and was on his way to Quito, on business for the government of that country, when he suffered a relapse and returned to Guayaquil where he died at the residence of Mrs. L.V. Prevost, formerly of this city.

While it is possible that the obituary report is accurate, Sprague’s failed businesses, financial problems, and suits in court, coupled with the fact that Mrs. Prevost was a former Baltimore resident, suggest that Sprague might not have been on business in Ecuador but on the run when he died. Finally, the only documentation found pertaining to

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120 Matchett’s Baltimore Director 1853-1854
any of the other men involved with the Maryland Portable Gas Company following its
death was a single note recorded by the R.G. Dun & Company agent on February 13,
1872, stating that Lemuel W. Gosnell, a former Director of the company, was an “honest
reliable high toned man,” with an estimated worth of $30-35,000, showing that at least
not all met the same fate as Sprague.123

Portable Gas Apparatus of the Maryland Portable Gas Company

As noted in the history of gas lighting above, there were really very few types of
portable gas machine systems available in the early 1850s.124 The gas apparatus
developed by the Maryland Portable Gas Company was one of the earliest of this type of
self-contained, “portable” gas generating systems designed for homes beyond the reach
of the city gas lines. Several companies attempted to market small coal gas “plants” that
were similar in design to the large municipal plants of the era, but they tended to be very
complicated and difficult to operate for the average homeowner or their domestic help.125
The development of the rosin oil, gas generator was an important breakthrough and
became the most popular portable machine until the introduction of gasoline gas
generating units in the mid-1860s. With the introduction of “automatic,” gasoline gas
machines, the older rosin oil systems quickly fell out of favor.

The machine sold by the Maryland Portable Gas Company actually grew out of a
design and patent for a “Gas Purifying Apparatus” developed by chemist Abram
Longbottom of New York; Longbottom became the firm’s chemist in 1853. On February
3, 1852, Longbottom received Patent No. 8705 from the U.S. Patent Office for his
invention related “to certain improvements in the method of purifying illuminating gas,
whereby the washing apparatus is wholly done away with, so that the gas comes from the
retorts or furnaces completely purified and ready for consumption” (Figure 8).126 As
discussed above in relation to later lawsuits over the patent, Longbottom’s work really
focused on the process of purifying the gas generated by the apparatus, rather than on the
design of the rosin oil, gas generating system itself. In Longbottom’s apparatus, rosin oil
was dripped from a storage reservoir into a retort or chamber, heated by a coal-fired
furnace. The liquid oil vaporized immediately upon hitting the red hot metal of the retort
and was then run through a filter of animal charcoal and quick lime, in the top of the
retort chamber. Once the impurities, such as ammonia, carbonic acid, and tar, were
removed from the gas, it was directed into a storage chamber or gasometer.

As described by the company in their 1855 pamphlet, the Portable Gas Apparatus
contained “an oil can or reservoir for the raw material [Figure 9, “A”], a stove, in which
is set the retort or Generating Apparatus [“B”], a siphon box or condensing box [“C”], the

Business School.
124 Patents for these portable gas machines generally begin ca. 1850 and then slowly built throughout the
125 Typical purchasers of the machines during this early period were wealthy owners of second, “country
homes or cottages,” that were generally run by paid staff in service.
Patent Office, Washington, D.C.
water tank [“D”], and the gas holder [“E”], which sets into the water of the tank like an inverted tumbler." The company reported that the reservoir was a simple cylindrical vessel, containing the oil from which the Gas is generated. The retort is an iron hollow cylinder, with a spheroidal bottom and flat cover, bolted and screwed to a projecting rim. The stove containing the retort is of sheet or cast iron, arranged upon the most approved plans to economize the heat.128

The component known as the “siphon box, or condenser,” was a case iron vessel, with a movable lid bolted and screwed upon it. This is divided into compartments and half filled with water, with a siphon attached, so as to keep the water at all times to its proper level. The water tank, in which the gasometer floats is made of wood or iron, and placed upon the surface of the ground, or which is better, sunk to the level of the water. The gasholder is of sheet iron, suspended upon fixed pulleys, and forms the receiver for the Gas, when generated and ready for consumption.129

Referring to a Portable Gas Apparatus with a gasometer (or gas storage tank; gasholder) that held 130 cubic feet of gas, an article in the Horticulturist and Journal of Rural Art and Rural Taste reported that the “machine, as above described, occupies a space of eight feet by twelve, and in height thirteen feet, with the tank upon the ground.” The company’s pamphlet noted that if the tank was placed into the ground to the level of the water, the total height needed would be seven feet.

In general, the operation of the machine was reported to be reasonably simple, but required the periodic manufacture of gas to restock the gasometer or gas holder. Thus, the system had to be monitored and regularly “fired up” to create gas as the gasometer was emptied. The process of making gas and operating the machine was fairly straightforward, and the company reported that the “management of it requires no more than ordinary skill, and may be safely entrusted to a domestic.” As described in the company’s 1855 pamphlet (Figure 10), the process begins when a fire is made in the stove as in an ordinary furnace, and the retort is heated to a bright cherry-red heat. The cock is then opened to allow the oil to pass in through the pipes from the reservoir, upon the heated sides and bottom of the retort, where it is instantaneously concerted into Gas.

Ascending from this decomposing chamber, the Gas is forced through a superstratum of chemical substances suspended upon an iron grating for its

Figure 10. Annotated detail of Abram Longbottom’s “Gas-Purifying Apparatus” patent drawing explaining the operation of the system. Patent No. 8,705, dated February 3, 1852. U.S. Patent Office, Washington, D.C.
purification into a vacant upper chamber, thence it is conducted by an iron pipe into the condensing box. This iron pipe passing through the cover of the condensing box descends below and discharges the Gas into the water of the condensing box. Thence it rises into the vacant chamber above the water, which, becoming filled, forces the gas again into the water under one of the several compartments above referred to, into a second chamber, and then on through consecutive baths before it finds its exit form the last of the series of consecutive chambers.

This exit is through a pipe which communicates from the condenser with the water tank into which it enters, and passing through the water above, again descends, and discharges the Gas into the water for its last bath, thence it rises into the vacant chamber of the gasometer ready for use. Connected with the siphon of the condenser is a small covered vessel, which receives the impurities washed from the Gas in its passage through the baths.132

The water from the condenser, containing the various impurities, was then drained away from the system into a pipe that carried it from the building; the continuous flow of water to “wash” the gas required that the water be carried away from the building where it could seep into the ground or be run into a culvert.

The fuel used to create the gas “is an oil from rosin, though not what is general understood as rosin.”133 As described by the company, the rosin oil used is an earlier, cheaper and better product of collophony [rosin], decomposable at a lower, and therefore more economical degree of heat. There cannot be found in the whole range of chemistry, a compound more richly laden with illuminating qualities, or yielding gases more innocuous in respiration, or less injurious to furniture; for it contains neither carbonic acid, nor sulphureted hydrogen.134

The company reported to potential customers that the supply of rosin oil was “inexhaustible, and any anticipated demand can scarcely enhance the price.”135 The Maryland Portable Gas Company sold it at their works in Baltimore at the price of 12 ½ cents per gallon.136 Each gallon of the liquid rosin oil was estimated to generate 100 cubic feet of gas in the portable gas apparatus. Thus, the system rated at 300 cubic feet (gasometer volume) would require 3 gallons to generate enough gas to fill the gas holder, and this volume would be “an average of a week’s supply to an ordinary family the year round.….”137 The company’s pamphlet noted that the typical consumption per burner was 2 cubic feet of gas per hour, allowing for the calculation of the appropriate size machine for a dwelling (by estimating the number of burners × typical use [# hours] × 2 cubic feet

The company made standard size machines ranging from a capacity of 300 to 1,000 cubic feet; a system with a capacity of 300 cubic feet used one retort, 500 and 600 cubic feet - two retorts, 800 cubic feet - 3 retorts and 1,000 cubic feet - 4 retorts. The firm also reminded readers that they would make system “of any required capacity, and adapted in form and size to the necessities of the space they are to occupy, and the requirements of the burners they are to gratify.” These larger machines operated very similarly to the smaller capacity systems; the company reported of the large units that their “simplicity is in all things retained—its efficiency is in nothing lessened.” Of the larger commercial systems they wrote: “larger generating surface, and an economical application of the heat is secured by arranging the series of retorts in beds…each communicating with the same reservoir of raw material, and forcing its generated gas into the same gasometer.”

The prices for the Portable Gas Apparatus system ranged from $350.00 for capacity of 300 cubic feet to $1,000.00 for a unit with a capacity of 1000 cubic feet. The price reflected the cost of delivery and erection of the machine “within a reasonable distance from the Company’s Works” in Baltimore. Transportation beyond this region and the costs of extra labor for more complicated installations was an extra cost to the purchaser.

In summary, the portable gas apparatus of the Maryland Portable Gas Company was an important and innovative technological advance in lighting for homes and businesses outside of then limited area served by municipal gas companies. Prior to the introduction of this technology, rural homes and businesses had to rely on candles and various types of oil lamps. In general, rosin oil systems used coal to heat a retort or chamber red hot. The oil was slowly dripped onto the red hot metal and instantly vaporized. In the Maryland Portable Gas Company’s system, the gas was then filtered of some impurities as it moved up through the top of the retort. From the retort the gas was piped into a condenser or water bath that removed additional impurities; from the condenser the gas flowed into a gasometer or gas holder for storage until needed. These systems ranged in size from small machines for domestic use, capably of producing and storing 300 cubic feet of gas, to large commercial and institution systems like the one used at the Soldier’s Home. Larger systems utilized multiple retorts arranged in “beds” and connected to common oil reservoirs and gas holders. The system was designed to be operated as needed; when the gasometer began to run out of gas, the retort was “fired up” to produce gas and refill the gasometer.

138 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company,” p. 3.
142 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company,” p. 3.
143 Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company,” p. 3.
Chapter 6:  
The Maryland Portable Gas Lighting System  
at the Soldiers’ Home and Lincoln Cottage

At the time that the Maryland Portable Gas Company installed its portable gas apparatus, the Military Asylum or Soldiers’ Home would have relied on various types of oil lamps, most likely kerosene or coal oil, for the majority of its lighting needs. Although a great improvement over candles, kerosene lamps would have produced a weaker light compared to gas, and also posed safety risks and required regular maintenance. Installed in 1858, the gas works at the Soldiers’ Home provided gas lighting for the campus until 1872 when the complex was connected to the municipal gas lines of Washington’s gas company. 144 The portable gas apparatus installed at the Soldiers’ Home is known primarily from references in the minutes of the Board of Commissioners and through examination of the Lincoln Cottage during its preservation work.

References to the installation of gas lighting begin in the summer of 1857, when the Board of Commissioners of the Military Asylum ordered that “the subject of supplying gas for the Officers Houses and Asylum buildings in the District of Columbia be referred to the Executive Committee.” 145 In October of 1857, the Executive Committee reported to the entire board that they had reviewed numerous proposals and plans, and that they preferred “the apparatus of the Maryland Portable Gas Company, for use at the Asylum.” 146 Thus, the board ordered that the Treasurer should invite a visit to the premises from the proper agents of the said company and obtain from them a full report as to the size, location for, and entire cost of the erection and completion of their apparatus at the Asylum – with any other particulars that may be requisite prior to a contract with said company for said apparatus. 147

It appears that this visit took place quickly, because on October 19, 1857, the Executive Committee and board received a formal proposal from the Maryland Portable Gas Company’s agent E. R. Sprague, that “reported as to the cost & dimensions of their gas apparatus, necessary for the use of the Military Asylum.” 148 Upon review, it was ordered that the written proposal of the aforesaid Company, dated “Baltimore, Oct. 19, 1857,” to “Construct and put up at the Military Asylum, on the spot pointed out by Doctor King, a complete Gas apparatus of the capacity of five thousand cubic feet__of sixteen retorts, - and tank of brick, laid in cement,” as described in said proposal “the sum of five thousand six hundred dollars ($5,600.00)” be, and the

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144 As noted above, Washington, DC did not have a municipal gas company until ca. 1855.  
145 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., August 28, 1857. Record Group 231, National Archives, Washington, DC.  
146 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 15, 1857.  
147 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 15, 1857.  
148 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 19, 1857.
same is, hereby approved & accepted, and that the Treasurer of the Board of Commissioners of the Asylum, be, and he is, hereby authorized & directed, to enter into the necessary contract with said Company by a formal acceptance of the aforesaid proposal – and that he proceed to cause said contract to be carried into effect.\textsuperscript{149}

Based on this list of specifications, the system to be installed at the Asylum was capable of producing and storing 5,000 cubic feet of gas. As noted by the company in its 1855 catalog, a “larger generating surface, and an economical application of the heat...[was typically] secured by arranging the series of [16] retorts in beds...each communicating with the same reservoir of raw material, and forcing its generated gas into the same gasometer.”\textsuperscript{150} Thus, the system at the Asylum would have been large and would have needed a building capable of holding the beds of 16 retorts, the condenser, the rosin oil reservoir, and the large gasometer. Given that the smallest system, containing one retort and a gasometer capable of storing 300 cubic feet of gas, needed a floor space of approximately 8 × 10 feet (80 ft.\textsuperscript{2}), the unit installed at the Asylum clearly was large; it is estimated that the gas works building(s) would have needed a minimum of approximately 1,200 ft.\textsuperscript{2}. That the gasometer itself was large is suggested by the description of the tank, or lower portion of the gasometer, as built of “brick, laid in cement”; the tank held the water that provided the seal as the upper portion of the gasometer floated or expanded up and down when gas was generated or used.

As the system could manufacturer and store 5,000 cubic feet of gas, it could clearly power a large number of burners; as noted above, the typical burner used 2 cubic feet per hour. If a burner was used on average of 3-4 hours per evening, the system could supply between 625 and 825 burners per day. As will be developed below, this seems to be more than enough to light the entire complex of buildings at the Asylum at this time, and would require operating the system once each day to produce the required amount of gas.\textsuperscript{151}

On October 27, 1857, Doctor King, the Asst. Surgeon, ordered that “the necessary gas pipes & fixtures...be at once put up in the Officer’s houses, including the “Riggs Mansion,” at the Asylum in this District.”\textsuperscript{152} The other business completed at this meeting of the board was the approval of the cost of the system and an advance of $2,000 to be paid to the Company toward construction.\textsuperscript{153}

By February 1858, the Commissioner’s were dealing with “the subject of the required water for the gas works at the Asylum in this District,” and were discussing the digging of a well to provide this water.\textsuperscript{154} As discussed above, the system required running water to supply the condenser and the gasometer tank; fresh water was fed into

\textsuperscript{149} Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 19, 1857.
\textsuperscript{150} Maryland Portable Gas Company. “Gas Apparatus of the Maryland Portable Gas Company,” p. 7.
\textsuperscript{151} It is estimated that Lincoln Cottage had approximately 75-100 burners.
\textsuperscript{152} Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 27, 1857.
\textsuperscript{153} Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 27, 1857.
\textsuperscript{154} Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., February 1, 1858.

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the condenser and gasometer, where it picked up impurities from the gas and was drained off away from the building. Although it is unclear who actually dug the well for the gasworks, in April the board got a “proposal of Foster Henshaw to dig and complete the well at the District Asylum.”

In April 1858, the board also approved the recommendation of Major J. A. Haskins, Deputy Governor, “that gas-posts be placed, upon the North-east of and not far from the main building at the District Asylum, and another near the Privy; and that the gas pipe be connected with the Privy so as to give one burner there, were severally approved, and ordered to be carried into effect.” The privy referenced here seems likely to be the unidentified building shown between the Cottage and Scott Hall (now Sherman Hall) on the 1861 Boschke, 1866/67 Michler, 1873 Bootes, Carbery and Carpenter maps, and illustrated in several period photos and drawings (see Figure 4) (Figures 11-16). The final business of this April meeting was to order that “gas meters be placed in the houses of the several Officers at the Asylum; and that said Officers be allowed the use of the gas at such rates as shall hereafter be fixed by the Board.” Thus, the officers living in the various quarters began to be charged for the use of gas.

The minutes for June 1858 indicate that the gas works at the Asylum had been completed, as an order is made to pay the “bill of the Maryland Gas Company, for balance due on their contract for erecting Gas works at the Asylum…. It seems that the system was originally less than satisfactory, in that less than a year after it was completed and paid for, the board ordered “improvements.” Major T. L. Alexander was to “proceed to contract for the alterations, additions, and improvements to the present gas apparatus at the ‘Home,’ agreeably to the plans and explanations made by him to the Commissioners.”

Although the board minutes go quiet on the gas works during much of the 1860s, disbursement records for the Military Asylum confirm that the system was still in operation. In March 1860, the firm of Hamilton and Shryock was paid “for putting up 2 self acting Gas regulators, at Main Building and House “2,” and in September J. W. [?] Thompson & Co., was for Gas fixtures for “Ho. No 1” / $30.75. In September 1862, Jas. Skirving was paid for “Gas fixtures &c. for ‘Ho No 1’ & Hospital,” and similarly, the Maryland Gas Company (the new name of the Maryland Portable Gas Company), was

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155 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., April 3, 1858.
156 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., April 3, 1858.
158 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., April 3, 1858.
159 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., June 14, 1858.
paid for “for repairing Gas Fixtures, New Burners &c.” in October and for “Iron Castings &c. for Gas House” in November. This final reference confirms that the gas works were housed in their own building known as the “Gas House.”

Figure 11. Stereopticon of part of cottage, Scott Building with a carriage path or footpath in foreground, flag and other features including outbuilding (possible privy) and possible fence located east of the cottage. ca. 1860s. Source: Edward Steers, Jr. (LIN_BWpostcard.jpg).

Figure 12. This illustration, which is nearly identical to another illustration by Proctor – Sachse, entitled “Washington. Military Asylum.” (LIN_chs4394.jpg) shows another perspective of the Lincoln Cottage and Scott grounds. 1861 (date of illustration per the Historic Structures Report). Note outbuilding (possible privy) between Cottage and Scott Hall. Source: Private collection of Richard Hyers. (LIN_056.jpg).

Figure 13. “Soldier’s Home, Washington, D.C.” color lithograph published by Chas. Magnus, similar to other collected images. c.1868. Note outbuilding (possible privy) between Cottage and Scott Hall. Source: Library of Congress (LIN_3g03269r.jpg).
While the initial 1857 order to “Construct and put up” a complete gas apparatus only references locating it “on the spot pointed out by Doctor King,” an 1872 order provides a more precise location. In April of 1872, the board minutes note that in relation to improvement of the grounds east of the Main Building, the new road and outlet by North Capitol street, the necessity for a culvert at the head of the ravine near the Gas House, the continuance of the culvert down the south-west corner of the first garden, for the purpose of draining that portion of the grounds and suggesting that Mr. Clark, Architect, be requested to give the subject his attention, and give a plan for it, together with the grading suggested, a new Lodge House, the building in the Gas establishment and removal of some of the present unsightly outhouses, so that the approach from the East may be made as attractive as any of the other entrances, was considered.

This reference clearly places the Gas House on “the grounds east of the Main Building,” and further notes that it is near “the head of the ravine.”

A review of maps from 1861, 1866, and 1873, suggest that the Gas House was near the head of the ravine that ran up the east side of the property, just west of the access road from North Capital Street. The 1861 map (Figure 14) clearly shows this ravine and three possible structures that are partially obscured by top of the letter “T” and the base of the letters “A” and “R” in the word “MILITARY.” The 1867 Michler map (Figure 15) also clearly illustrates the ravine, and shows three possible locations for the gas house: 1) what seems to be a building right at the head of the ravine; 2) a grouping of three structures just west of the access road; and 3) another grouping of three buildings immediately west of the first group. The possible building shown at the head of the ravine on the 1867 Michler map is not present on the March 1873 Bootes, Carbery and Carpenter map of the Soldiers’ Home (Figure 16), however the two groups of three buildings (1 and 2) west of the access road both appear on this map. By 1877, neither the building at the head of the ravine nor the other groups west of the access road are present (Figure 17). They have all been removed “in relation to improvement of the grounds east of the Main Building,” suggested by the 1872 minutes: “a new Lodge House, the building in the Gas establishment and removal of some of the present unsightly outhouses, so that the approach from the East may be made as attractive as any of the other entrances, was considered.” The 1877 map shows the new “Sherman Gate” and a new road leading from the gate to the Main Building. Thus, it seems likely

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163 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 19, 1857.
164 Minutes of the Board of Commissioners, Soldiers’ Home, Washington, DC., April 13, 1872. By 1872 the name had official been changed to the Soldiers’ Home.
165 Minutes of the Board of Commissioners, Soldiers’ Home, Washington, DC., April 13, 1872.
170 Minutes of the Board of Commissioners, Soldiers’ Home, Washington, DC., April 13, 1872. By 1872 the name had official been changed to the Soldiers’ Home.
that the gas works building was located north of the Boiler House/Electric Plant building shown on the 1903 map of the complex, between this structure and Stanley Hall (Figure 18). As discussed in the previous chapter, the location of the Gas House near the head

Figure 14. Detail of Topographical Map of the District of Columbia showing the Soldier’s Home with possible locations of the Gas House circled in red. 1861 A. Boschke. Source: Historical Society of Washington, DC (G3850.1861, B6 vault).

Figure 15. Detail of *Topographical Sketch of the Environs of Washington, DC* showing the Soldiers’ Home with possible locations of the Gas House circled in red. July 18, 1866. N. Michler. Source: National Trust for Historic Preservation (G3850.S10.M51 vault).
of the ravine would have been practical as the water exiting the condenser could have been drained into the ravine and away from the complex.

While a May 1872 letter from the Secretary of the Board of Commissioners to the Governor of the Soldiers’ Home indicates that the old gas works was to be replaced with a new gas works, “ordered that a new Gasometer and Gas Works be erected upon the most favorable site near the new workshops,” the minutes of a “special” board meeting on October 16, 1873, provide clear evidence that the Soldiers’ Home had connected to the municipal gas distribution system sometime in 1872.172 By October 1873, the

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172 Levi Davis, Secretary of the Board of Commissioners to Brig. General Pitcher, Governor of the Soldiers’ Home, May 14, 1872, Record Group 231, National Archives, Washington, DC; Minutes of the Board of Commissioners, Soldiers’ Home, Washington, DC., October 16, 1873.
Figure 18. Detail of “Map of the Soldiers’ Home,” showing area of former location of gas house building in red, 1903.
Commissioners noted that this conversion to municipal gas “has enabled us to remove the old unsightly Gas Works from the grounds…”\textsuperscript{173} The Commissioners explained that part of the reason for the change to a municipal system was cost:

> a comparison of the [gas] bills for the year [1873], with the manufacturing of it on the ground for the previous year 1872], has demonstrated the economy of the change. The cost of Gas consumed from the year ending September 30, ultimo, was $2,372.00, while the cost of our works for the preceding year was $3,596.00, showing a saving of $1,224.00.

While gas continued to light the Soldiers’ Home for almost another quarter century, the introduction of electric lighting in the United States in the early 1880s meant that its time was limited. As it matured, electric light gained supporters; it provided brighter light with less effort than gas. Electric light also came to be regarded as safer and was more portable than gas; thus lights could easily be moved around a room. While in 1885 the Governor’s annual report indicated that the “rooms are kept in good order, are well warmed in winter, and well ventilated and lighted at all times,” by 1889 there was consideration of building a “plant for lighting the barracks, hospital, and other buildings, and the grounds which are now insufficiently lighted at great expense…”\textsuperscript{174} In 1896, the Commissioners ordered that

> the Building committee obtain estimates of the cost for the construction of an electric plant at the Home, and the probable cost per annum of furnishing electric light in place of gas, the committee to expend not exceeding $100 for this purpose, and to report at the next meeting.\textsuperscript{175}

A reference to the “recently finished power house” in the Annual Report of the Governor for 1909 is a bit confusing as the 1903 map of the Soldiers’ Home indicates a Boiler House and Electric Plant just east of the King Building. This indicates that the Electric Plant was completed as early as 1903 or at least under construction at this point.\textsuperscript{176} The 1909 report notes that the “lighting plant consists of 3 turbo generators. The plant is used for heating, lighting, pumping, cooking…. The number of arc-lights is reported as above 25, the number of incandescent lights is not known, and about 2,000 gas lights are used.”\textsuperscript{177} Thus, it is clear that gas lighting continued to be used after the completion of the electric generating plant.

Although the conversion to electricity occurred almost 100 years ago, evidence of the earlier gas light system exists in many of the Home’s buildings as gas pipes within the walls were simply abandoned.

\textsuperscript{173} Minutes of the Board of Commissioners, Soldiers’ Home, Washington, DC., October 16, 1873.
\textsuperscript{174} Annual Report of the Affairs of the Soldiers’ Home, October 1885, Record Group 231, National Archives, Washington, DC; Board of Commissioners, Soldiers’ Home, Washington, DC., October 1889.
\textsuperscript{175} Minutes of the Board of Commissioners, Soldiers’ Home, Washington, DC., December 19, 1896.
\textsuperscript{176} Annual Report of the Governor of the Soldiers’ Home, June 30, 1909. Record Group 231, National Archives, Washington, DC.
\textsuperscript{177} Annual Report of the Governor of the Soldiers’ Home, June 30, 1909. Record Group 231, National Archives, Washington, DC.
Evidence for the Lighting Plan in the Lincoln Cottage

Little obvious evidence remains of the gas lighting system within the Lincoln Cottage at the Soldiers’ Home. Aside from one exposed and capped pipe in Room 113, the remainder of the system lies buried in the walls, floors, and ceilings of the structure. Ongoing work has exposed some sections of gas piping within the house, and a remote sensing study was completed last year to map the gas pipes within the structure. This section of the report will detail the investigation of the gas piping system within the Cottage, and provide a conjectural lighting plan based on pipe location and extant or documented examples of gas lighting plans in other houses.

Plan drawings of the basement, first floor, and second floor were produced that show the projected locations of gas pipes on each floor. The current investigation started with this set of plans of “Conjectured Gas Line Locations.” These plans were prepared by Hillier Architecture and were based on a survey to locate the pipes in the Lincoln Cottage. This survey utilized a system that involved attaching a signal to an exposed piece of gas pipe and then using a remote finding device to pick up the signal of gas pipes in the floor. The surveyors marked their “gas line hits” on the floor with tape; at a later date the Hillier crew mapped the taped marks.

The initial work of the current investigation was to relocate the tape marks and verify or correct the pipe locations as necessary, and to visually inspect any exposed sections of pipe. This work resulted in the addition of several pipe locations to the original map (tape marks that were not mapped or not correctly mapped), as well as placing several hypothetical gas lines to connect known points in the line or to projected fixture locations. The new set of plans clearly distinguishes the original mapping, the current field verification, and the hypothetical locations. In addition, the plans note the location of all visually inspected, exposed gas pipes on each floor. It should be noted that no changes were made to the plan of the basement piping; all tape marks were correctly mapped and no exposed sections were identified.

Baseline

The plan of the conjectural gas lines in the basement of the Lincoln Cottage suggests that each of the small rooms likely had one fixture and the larger rooms, Rooms 004 and 006, for example, may have had two fixtures (Figure 19). The pipes are in the floor of the basement and it is now covered in concrete. It is likely that the pipes would have risen up the walls to supply wall brackets with single burners.

First Floor

The plan of the conjectural gas lines for the first floor of the Lincoln Cottage suggests that these public rooms had both wall brackets and gasoliers or pendants (Figure 20). The plan of gas pipes suggests a main distribution pipe that ran almost the length of the main block of the house from Room 105 on the west to Room 108 on the east. A 1%
Figure 19. Basement plan showing conjectural gas line locations. (Hillier) (Foldout next page).
Figure 19 basement foldout
Figure 20. First floor plan showing conjectured gas line locations. (Foldout next page).
Figure 20 first floor foldout
in. gas pipe (OD) was located in the wall in Room 109 and vertically connects the first floor piping with the second (Figure 21). In general, fixture locations are found on exterior walls, mimicking natural light from windows or along fireplace mantels, where they provided light for activities around the fire in colder weather. Room 113 contains the only exposed, capped pipe stub in the house that represents an exact fixture location (the cap is 1 in. OD and is located exactly 6 ft. above the floor) (Figure 22). A cutout in the ceiling in Room 105 revealed a gas pipe in the center of the room that turned down to supply a gasolier or pendant in this room (Figure 23); this opening also revealed a pipe that ran to the outside (west) wall where it turned up to supply a wall bracket in Room 205 above (Figure 24). It seems likely that the other large rooms on the first floor also had gasolier or pendant fixtures and the distribution and placement of piping in the second floor adds to this notion.

Figure 21. Gas pipe (1 ⅝ in.) in wall of Room 109, vertical riser to supply second floor (see Appendix B for map of photo locations).
Second Floor

The plan of the conjectural gas lines for the second floor of the Lincoln Cottage suggests that these smaller, more private rooms had only wall bracket fixtures (Figure 25). The plan of gas pipes illustrates a main distribution pipe that, like the first floor, ran the length of the house from Room 205 on the west to Room 208 on the east. An 11/16 in. pipe (OD) is visible in the floor in Room 207 and it runs into the wall cavity and turns up to supply a wall bracket fixture alongside the fireplace in the room (Figure 26). The main supply line, a 15/16 in. pipe (OD), is visible in the floor of the doorway between Rooms 206 and 207 (Figure 27). A “T” connection in this pipe can also be confirmed running toward the center of Room 206 (see Figure 25). An approximately ½ in. gas pipe was also located in the floor between Rooms 201 and 202 (Figure 28). Finally, a 1 ¼ in. gas pipe was identified in the floor running from Room 208 into Room 209 (Figure 29).

Figure 22. Pipe stub in south wall, Room 113. Located 6 ft. above floor level and just left of the window.
Figure 23. Drop pipe for gasolier in ceiling of Room 105.

Figure 24. Pipe in ceiling of Room 105, turning up into west wall cavity to feed a wall bracket in Room 205 above.
Figure 25. Second floor plan showing conjectured gas line locations. (Foldout next page).
Fig. 25 second fl. Foldout
Figure 26. Gas pipe in floor of Room 207 running into wall next to fireplace and turning up to feed a wall bracket.
Figure 27. Gas pipe (15/16 in.) in floor of doorway between Rooms 206 and 207.

Figure 28. Pipe identified under floorboards between Rooms 201 and 202.
Like the first floor, fixture locations on the second appear to be on the exterior walls, mimicking natural light or along fireplace mantels, where they provided light for activities around the fire in colder weather. There is no evidence of gas piping in the attic floor, suggesting that these spaces were not lit and that the second floor did not have gasoliers or hanging pendant fixtures.

Conjectural Lighting Plan

As noted above, the rooms in the basement most likely had one fixture per room, except for the two larger rooms, which might have had two. These fixtures were probably single burner fixtures with adjustable arms. Lighting in these spaces would have been very low and may have had to be supplemented when these were used as work spaces.

The first floor plan suggests a combination of fixtures in each room, with wall brackets placed either on exterior walls, mimicking natural light, or along fireplace mantels (Figure 30); there is evidence for fixtures on both or just one side of the fireplaces (the conjectural maps propose fixtures on both sides of the fireplaces, but some may have been single or asymmetrical). The wall bracket fixtures for the first floor were either single or double burners; a photo of the south wall of Room 107 shows the likely
Figure 30. First floor plan showing conjectured lighting locations. (Foldout next page).
location of two double burner fixtures (Fixture 31). The level of light from the wall brackets in the principal public rooms of the first floor was enhanced with either hanging pendants (2 burners) or four burner gasoliers. A historic “Rambler” photo ca. 1905 shows a four burner “combination” fixture in the Lincoln Cottage that used both gas and electric light (Figure 32). Combination fixtures, using gas and electric, were popular during the early conversion to electricity in that electricity was not as reliable as gas; the gas light was also seen as softer and more appropriate for certain social activities. In that the electric plant seems to have come on line by about 1903, the use of combination fixtures is no unexpected; as noted above, gas lighting is referenced as late as 1909. As noted above, Room 105 contains the only firm evidence of a centered pendant or gasolier. Room 113 contains the only definite fixture location in the house, and this is shown in a mock up in Figure 33.
Figure 32a. “Rambler” photograph of interior room in Lincoln Cottage, ca. 1905, showing four burner “combination” fixture in upper right hand corner of photo. Combination fixtures were designed to use both gas and electricity (Washington Historical Society, Glass Plate #0054).

Figure 32b. “Rambler” photograph detail showing four burner “combination” fixture. (Washington Historical Society, Glass Plate #0054).
Figure 33. South wall of Room 113 showing projected single burner, wall bracket.
Like the first floor, the second floor plan suggests the use of wall brackets placed either on exterior walls, mimicking natural light, or along fireplace mantels (Figure 34). Wall bracket locations in Rooms 205 and 207 can be verified by exposed pipes (Figure 35). The wall bracket fixtures for the second floor were either single or double burner fixtures.

As noted by Moss, the typical coal gas burner of this period would have produced a light equal to between 15 and 17 candlepower.\textsuperscript{178} Thus, the light from a single burner would be relatively weak; it was only by using burner with multiple fixtures and gasoliers that a reasonable light level could be achieved. For example, Room 107 is estimated to have had three double burner fixtures and a gasolier with 4 burners. With a total of 10 burners in the room, the light level would range from 150 to 170 candlepower. Moss also notes that the typical burner would have produced the equivalent of a 10 watt light built, so a four burner gasolier would have produced 40 watts and the three, two burner wall brackets another 60 watts; a total of approximately 100 watts or one 100 watt light bulb.\textsuperscript{179}


\textsuperscript{179} Roger W. Moss. \textit{Lighting the Past: Reproduction Lighting Fixtures in Historic Interiors}.
Figure 34. Second floor plan showing conjectured lighting locations. (Foldout next page).
Figure 34. 2nd fl. Plan foldout
Figure 35. West wall of Room 207 showing projected single burner, wall brackets. Note location of pipe in floor on right of fireplace (see Figure 26).
Chapter 7:  
Conclusions and Recommendations

The Maryland Portable Gas Company’s apparatus installed at the Soldiers’ Home in 1858 represents an important and innovative technological advance in lighting technology for homes and businesses outside of the then limited area served by municipal gas companies. Prior to the introduction of this technology, rural homes and businesses had to rely on candles and various types of oil lamps. In general, rosin oil systems used coal to heat a retort or chamber red hot. The oil was slowly dripped onto the red hot metal and instantly vaporized. In the Maryland Portable Gas Company’s system, the gas was then filtered of some impurities as it moved up through the top of the retort. From the retort the gas was piped into a condenser or water bath that removed additional impurities; from the condenser the gas flowed into a gasometer or gas holder for storage until needed. These systems ranged in size from small machines for domestic use, capable of producing and storing 300 cubic feet of gas, to large commercial and institution systems like the one used at the Soldiers’ Home. Larger systems utilized multiple retorts arranged in “beds” and connected to common oil reservoirs and gas holders. The system was designed to be operated as needed; when the gasometer began to run out of gas, the retort was “fired up” to produce gas and refill the gasometer.

As detailed above, the system was likely located in a Gas House that was sited east of Scott Hall (now the Sherman Building) and just north of the old power plant. The gas house existed until ca. 1872 or 1873, when it was razed following the conversion of the complex to municipal gas. The likely location of the Gas House structure may contain foundation evidence, particularly of the large “tank of brick, laid in cement” called out in the specifications.180

It also seems likely that the remains of piping could still be found archaeologically, and with careful excavation these pipe trenches could be dated and then further traced with geo-prospecting equipment (ground-penetrating radar, magnetometer, conductivity) and excavation. It also appears likely that the building identified on the 1861 map between the Lincoln Cottage and the Scott Building and shown in several subsequent photos and drawings was the privy that was lighted with a single burner fixture. Although this area was tested in 2004 without identifying evidence for the privy, the relatively small number of shovel tests and the single text unit may well have missed this feature.181 The report notes that the fill soil between the Lincoln Cottage and the Scott Building suggests ground disturbance that may have destroyed evidence for the privy, it seems likely that at least a portion of the generally deep pits associated with privies would have survived. This area should be explored more fully using geo-prospecting equipment and systematic archaeological testing. If intact, the privy feature could provide important data for the early period of the site. In addition, locating this

180 Minutes of the Board of Commissioners, U.S. Military Asylum, Washington, DC., October 19, 1857.
feature may help to further identify the gas piping system and allow it to be traced underground.

Although this investigation has developed a conjectured lighting plan, it is recommended that additional data be gathered and the plans updated as the project progresses and sections of the building are opened to view.

Finally, the Maryland Portable Gas Machine at the Soldiers’ Home and Lincoln Cottage was an innovative technology and clearly important in terms of the basic quality of life for President Lincoln and his family while living in the Cottage, and for all of the residents of the Home. The system certainly provided some small amount of light during what were certainly some of the darkest days for the President. Therefore, given the surprising amount of documentary and material and physical evidence available, this study recommends preparation of an exhibit on the Home’s gas lighting system for sharing with the public.
Appendix A – Abram Longbottom’s Patent.
Longbottom 3
Appendix B – Photo Keys
First floor
Second Floor
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**Social Implications of Lighting**


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