Philadelphia Gas Works:
Point Breeze Meter House
Intersection of Passyunk and Schuykill Aves.
Philadelphia
Philadelphia County
Pennsylvania

HAER No. PA-41

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Historic American Engineering Record
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD

Philadelphia Gas Works: Point Breeze Meter House

PA-41

DATE:	1851-1854
LOCATION:	Intersection of Passyunk Ave. and Schuykill Ave. Philadelphia, Philadelphia Co., PA.
DESIGNED BY:	John C. Cresson
OWNER:	Philadelphia Gas Works.
SIGNIFICANCE:	These structures represent one of America's early, large scale gas production facilities. Constructed in the Gothic Style they were important structures that contributed to the growth of Philadelphia's municipal services.
HISTORIANS:	David Orr and Herb Levy, 1975.
PREPARED FOR TRANSMITAL BY:	Daniel Clement and Donald C. Jackson, 1983

The illuminating gas industry was conceived in England during the late eighteenth century and was first developed and perfected there.[1] By the 1820's, gas was used in many English factories, banks, residences, shops, and public places. The success of the English gas industries was responsible in part for the early appearance of illuminating gas in America. The new light technology became the subject of many novel experiments in several eastern seaboard communities.[2] Its principal social and economic effect of providing additional work and leisure time was eagerly sought by many prominent individuals on the East Coast.

Philadelphia watched the young enterprise with considerable interest although they were cautious in their own attempts to set up a plant.[3] Benjamin Henfrey made the first proposal for public gas lighting in Philadelphia in 1803, with the gas to be extracted from coal and burned at the top of octagonal towers.[4] At that time Philadelphia's street lighting was woefully inadequate and had been a factor in a notorious night murder committed in 1802.[5] After the Henfrey proposal had failed, James McMurtie and his friend, Dr. Bollman, both advocates of gas illumination, traveled to England and visited several gas works. Upon their return the two men wrote the City's Common Council in 1815 concerning the feasibility of establishing a gas manufactory.[6] Although thier proposal died in a joint committee of Councils, they did manage to stimulate thinking in the local technical community. By 1817, another Committee ofthe City Council was established to investigate the possibility of producing illuminating gas. However, they were discouraged by the failure of other such companies in the United States and reported back a gloomy assessment to the Council. The 3rd Annual Trustees Report comments on this early antithesis toward the young industry:

> "Experiments made then or soon after in Baltimore, New York, and other cities were very far from successful. The filth, the stench, the Nuisances of various kinds and the pecuniary losses attending those establishments, not only preven ted our city from following the example, but they created, on the part of a large, intelligent, and respectable portion of our community,... so deep-rooted a prejudice against gas lights, as to prevent, for many years, the success of all applications to Councils to countenance them....In urging the introduction of gas lights generally, the friends of the measure were obliged to resort to evidences of success to the experince of Europe, discarding, in a great measure, that obtained either at home or in several of our neighboring cities"[7]

The feelings cited above culminated in a Remonstrance Against Lighting by Gas submitted on November 28, 1833, and signed by many prominent citizens, scientists, and engineers, including a future Engineer of the Gas Works, John C. Cresson.[8]

On January 2, 1834, the Special City Council Gas Committee, amidst the controversy raging in the city concerning the establishment of the Gas Works, selected a most able individual for reporting on the role and feasibility of such a company. Sanuel V. Merrick, prominent engineer and fire engine builder, persuaded the city to establish a gas manufactory by means of a carefully written and argued report. Using the London Regency Park Gas Works as a model, Merrick confidently stated that the English capital's successful gas production was "the kind of gas works best suited to the wants of Philadelphia."[9] Merrick toured Europe and when he returned, he and his young assistant John Towne, proposed estimates, drawings, and plans for what was to become the first Gas Works in Philadelphia. William Strickland, one of America's first great engineers and architects, had reported earlier on the possibilities of building a gas production plant. This report contained drawings by S.V. Merrick of a proposed retort house as well as gas equipment. The retort house of the first Philadelphia gas plant built at 23rd and Market closely resembles these drawings. Merrick singled out Pennsylvania

products such as bituminous coal and limestone for use in the Gas Works and stated proudly in his report that "not a lamp will shed its rays over our streets which has not paid a tribute to the internal improvements of the State"[10]

The production of gas was initiated on the eighth of February, 1834, at the Market Street plant with S.V. Merrick as Superintendant and Chief Engineer. Two days later, on February 10, forty-six pole lights were lit on Second Street, from Vine to South Streets. During the first month of operation only two private subscribers saw their homes illuminated by gas[11] The first works were built using private capital and were operated under the supervison of twelve trustees, six elected by Common Council, and six by the Select Council. This privately owned, trustee managed corporation existed until 1841.[12] The original works, now demolished, consisted of a retort house (98'x48') accomodating 30 retorts, together with a range of sructures which included an office, meter room, laboratory, purifying and lime house, and two holders (each 50' in diameter and having a capacity of 35,000 cubic feet).[13]

The retort house included a great Doric column smokestack and a trussed iron roof.[14] The production of gas increased to accomodate the heavy demand, so that by 1850 the original works were considerably expanded. They now consisted of four separate retort buildings, two purifying houses, two meter rooms, and eleven gas holders of various sizes with a total capacity of 1,680,000 cubic feet. The 1853 report shows a production of 216,000,000 cubic feet or 33 times that shown in the first annual report issued fourteen years earlier. Each part of the expanded plant was a complete and independent factory capable of being interconnected when so required.[15] By this time the city had almost 90 miles of

street mains and 9000 customers. Additionally, its annual increase in gas consumption constantly exceeded the engineer's projections.[16] In 1850 alone, this increase was 16% over the previous year. As a result, the second Chief Engineer of the Gas Works, John C. Cresson, pressed the trustees to consider erecting a new works located beyond the densely populated bounds of the city. His desire was to have the Company purchase sufficient land for what he believed would be the ultimate extent of the works. Immediate construction was to provide one complete manufacturing facility connected to the original works through a 20" main, 3-1/2 miles long. The new plant was to have its own holder with a capacity of 1,000,000 cubic feet, an amount Cresson deemed sufficient for the next four years. Funds amounting to $300,000 were appropriated for the project; a considerable amount when compared with the $583,000 operating budget approved for the existing plant.[17]

In 1851, three properties including the Golden Swan (a famous Philadelphia tavern) were purchased at Point Breeze adjacent to the Passyunk Ferry on the Schuykill River, two and one half miles south of the original works. The area totaled 75 acres and provided a river frontage of about 1500' for the reception of coal barges. Rail service was not implemented at the new plant until 1863.[18] The Board of Trustees recommended that the company sell or lease any excess property to individuals to properly improve with dwellings for the accomodation and supply of workmen and their families.[19] This constituted a perennial and fruitless plea that Cresson made until his retirement.[20]

Work on the Point Breeze facility commenced in 1851 and by the end of the following year a 400' wharf was completed, capable of accomodating the largest vessels of the time. Piles had been driven to support the holder tank, stone work had been completed for half of the retort house foundations, and the cast iron window frames had been set during the first year of building. About two miles of the 20" connecting main to the Market Street works had also been laid.[21]

In 1853 Cresson reported that the principal structures were roofed in and nearly finished.[22] However, on February 21, 1854, a snow storm caused a partial collapse of the nearly completed holder.[23] Investigation later showed materials and worksmanship to have been of poor quality. As a result of the required repairs, no holder was available at the site for two more years.[24] When the works went into production on December 13, 1854, the newly produced gas was moved to the Market Street holders through the judicous manipulation of valves and exhausters. At about 10 p.m., when the need for sending out gas was low, a valveman at the Market Street works began walking about one and a half miles along the connecting main from Point Breeze, shutting off various commercial feeders. When he returned to the plant, exhausters were started in order to pull the gas from the new works. At 6 a.m. the exhausters were stopped and a man equipped with a socket wrench made another trip opening these same feeders, once more making the new main a distribution line.[25]

Cresson, responsible for the design, engineering, and construction of the Point Breeze Works, has left historians a good description of the original plant and its process:

"Our experience shows, that in a manufacture using large quantities of heavy materials, there is much economy in making arrangements that shall require the least possible handling of such materials and that their necessary movements shall be affected by mechanical and not manual power.

Keeping these principals in view, the grounds have been laid out so that the places of storage of coals and other bulky materials shall be adjacent to the points of reception, and also as near the retorts as is consistent with sufficient allowance of storage room....

A space, directly east of the wharves is reserved for the erection of stone sheds, 250'x600', giving room for the storage of over 30,000 tons of coal...

The ultimate plan provides for four distinct retort houses, 55' in width, and of lengths varying to suit the shape of the grounds. The one now in use, is 250' long and 56' high accomodating 48 beds of retorts which may be either of 3 or 5 retorts each, as may from time to time be deemed preferable. Those now set are with three retorts, this number having thus far given the most economical results. This house will therefore admit of either 144 or 240 retorts as one or the other of these modes shall be adopted. The second retort house [erected in 1860] will be of the same length and the third and the fourth each more than twice as long, the capacity of the whole being sufficed for 1008 retorts in beds of three, or 1660 if set five in a bed; being capable of supplying a maximum consumption of 6,000,000 feet a day in one case or 8,000,000 in the other. Large as the quantity seems to us now, there is good reason for supposing that the consumption of the consolidated city will exceed it in the lifetime of some of the present generation. As the work in the retort house has been found to be productive of much discomfort to the workmen in the summer season, unless provision has been made for an ample supply of fresh air and rapid ventilation, these retort houses are planned in such a way as to affort every desirable advantage in these respects. Instead of heavy piers of stone or brick, the front is formed of a light cast iron framework in the form of gothic arches, which allows almost the entire side of the building to be thrown open for air by the movement of rolling lattice blinds in the windows.

The great elevation of the roof, through the ridge of which are carried up separate draught flues from the retort beds, furnished a column of heated up air of sufficient height so as to protect the workmen most completely from the dingy fumes so profusely thrown out in drawing or charging the retorts."[26]

This building, constructed from a gray rubble ashlar stone, was 28' high at the eaves. It had 48 windows, 24 on a side, each 12' high with cast iron frames and a continuous crenelated cornice. The flues mentioned in Cresson's report were in pairs, 26 in number and so arranged as to provide a further crenalation at the ridge in the Gothic style of ornament. The slate roof was supported on iron trusses spanning the 50' width of the structure. At the center of each of the

long sides, an enclosed stone porch, 25' square, served as an entrance and provided shelter from the heat. Two doors at the gable ends provided access to the retort fronts and allowed complete combustion in the bed under the retorts. Coal was supplied through the retort house by trucks on a small railway which entered through the west doors. This railway also served to removed the coke.[27]

The report continues:

"When the gas leaves the retort house to pass through the condensing and purifying apparatus, it is made to travel in a direction towards the gasholder and also, towards the densely built parts ofthe city where it is chiefly to be consumed: so that the pipes of conveyance may perform the two-fold office of connection, for the works and conduits from the point of production to that of use.

A set of large pneumatic pumps, technically termed an exhausting engine, takes the gas from the washers in such a manner as to remove all pressure beyond that of the atmosphere from the hydraulic main, and forces it through the various resisting portions of the works, with out subjecting the contents of the retorts to the compression which has been found so injurious both to the retorts and gas. In order to obtain a greater economy in the use of lime (made by burning oyster shells near the wharf) a double system of purification has been adopted, in which the gas is first made to pass through a series of wet lime cylinders, with contrivances for its very minute sub-division into numerous small jets thus bringing it into most effective contact with the liquid detergent.

It then enters the condensers composed of three collateral ranks of six inch pipes, there being eighteen pipes eighteen feet long in each rank. From these it passes through dry lime purifiers arranged in the usual manner around a central hydraulic valve. These are all placed in one building 72' long and 52' wide suitably proportioned for their adjustment to each other."[28]

This "L" shaped building still stands today (1975). It is located 100' from the end of the former retort house. Built of stone similar to that used for all the original buildings, it has narrow vertical windows with cut stone sills and cast iron lancet arched heads. There is a stone bell tower on the west side containing a bell marked: Merrick and Sons, 1852. The bell, cast by the firm of the company's first engineer was used to call the workmen to charge or draw the retorts.[29]

The report continues:

"Still further east is the building for the station meters and clerks' office, one hundred feet long by thirty feet in width. A meter of suitable size is to be provided for each section of the factory so as to permit each to be worked independently or in conjunction with theothers. The meter now in use is intended for passing at regular work, 500,000 [cubic] feet per day, and can be worked up to twice that quantity if necessary; the inlet being 16" in diameter.

The Meter room will hold four more meters, two of the same size as this, and the others of a size smaller; it being intended to use the two largest now in use at the old works."[30]

Cresson next traced the flow of gas into the holder:

"The gas holder into which the gas is next to pass, is of telescopic form, 160 feet in diameter, and 90 feet high, holding when full, 1,800,000 cubic feet. It is girded by twelve pentagonal towers, each composed of an iron structure of appropriate design, supported on a stone base, also pentagonal in form. The connecting girders are in the form of cast iron balustrades with open quatrefoil panels..."[31]

The holder was of a two lift type with a brick tank 44' deep. The cast iron towers were of Gothic design and fastened to the stone abutments which matched the stone of the other buildings. The quatrefoil was a decorative element used throughout all four of the original structures and was commonly employed in most of the Point Breeze buildings built before the last decade of the 19th century.

The Point Breeze Works went into operation with 72 retorts; each of which held 250 lbs. of bituminous coal and each was charged every four hours. At the end of one year the plant was manufacturing about one third the total production of the Market Street works and in 1855 the completion of the remaining 72 retorts was authorized.[32] In 1857 with 144 retorts in operation, production was greater than that of the Market Street works. This was due in part to an improved retort design invented by Charles M. Cresson, son of the Chief Engineer, who was serving as his father's assistant. These improved retorts had been rigorously tested by the Franklin Institute of Philadelphia.[33] Although the expenditures for the

new work did not reach the total appropriation made in 1851, Chief Engineer Cresson was accused of extravagant spending and was forced to defend his actions. In public hearings, these charges were eventually dismissed.

The year 1860 saw the erection of a new retort house, purifier house, shops, and a boiler house, all of which were designed and built under the direction and supervision of Charles Cresson. The buildings, built of a brown sandstone rather than the earlier gray granite, were almost replicas of the original structures. Gothic in style, with similar iron roof trusses covered with slate, these buildings continued the plan of the initial works.[34]

In 1861, J.C. Cresson reported on several schemes for the manufacture of gas. His report commented, for example, on: "the so-called hydro-carbon gas, made from steam in combination with various hydro-carbonaceous materials..., the gas from asphaltim or other highly bituminous substances..., and the pure hydrogen light with platinum wick."[35] He added that the above plans, however, did not "bear upon their face the evidence of absurdity, or impracticability, such as one attaches to the famous project of electric lite (sic), so much agitated a year or two back."[36]

In 1975, many of the original buildings erected during the first three decades of operation were still extant, including two of the first four structures built at Point Breeze. One of these four, the Meter House, is by far the most important part of the original plant to survive. Its present appearance is far more complicated than when first built, because of two major modifications. Initially consisting of a cellar and a floor, the Meter House was 100' long and 30' wide, with diagonal walls at the corners. Built of stone, it closely followed the

other buildings in both construction and ornament. The south, or entrance, facade featured three double doors, one pair centrally positioned, the others sited toward either end. Between each doorway were two pairs of vertical windows with granite sills. All such fenestration had lancet arched heads of cast iron. Each wall of the three that formed an end to the building contained similar windows. The north facade featured three circular arched openings, 13' wide and 13' high, each trimmed with a band of cut stone. These openings served as entries for the 11' diameter meters. After their installation, the openings were bricked up to sill height. All windows had wood frames and casement sash with small diamond shaped glass panes. The arched section of each window contained a glazed quatrefoil. A slate roof probably was supported on a wooden structural system.

In plan the the building consisted of three rooms. The central one (27'x61'), contained the meters. Beyond, at either end, were two hexagonal offices, one at each end. The cellar was similar in plan, but the central space had two 36" thick brick masonry walls, parallel to the main axis. These formed the front and rear supports for the meters. To provide access through the walls, two arches were built in each of them. The cellar was entered through an exterior bulkhead at either end, and contained little more than piping to and from the meters. No evidence remains of the original metering or heating arrangements.

In the 1862 Report, an item shows charges for extension of the office spaces. This is the only documentary evidence that provides a possible date for the present second story addition.[37] Built of matching stone, the top of the original wall can now be seen as a continuous joint on the building perimeter. The roof ridge over the central section is 36'x4" above the first floor, but only

27'8" high at the end sections. On one end, which served as a laboratory, additional height was provided by lowering the level of the new floor. At the other end where this height was not needed, the floor was raised above that of the central room. The high roof has mill framing with decorative arched rib girders and double tie rods of iron. The second floor span was reduced with the introduction of two cast iron columns supported on brick piers built in the basement. Stairs between floors were added but have since been removed. Three openings were furnished on each side of the central room, each divided into four vertical windows, staggered in height. This division is accomplished through the use of narrow wood columns and trim that appear Neo Egyptian. The slate roof is gabled over the openings. On the exterior, twelve stepped buttresses were added. Four, on each side of the higher part of the building, extend above the roof eaves and ae capped with decorative stone work. Their placement on the front elevation has covered one window of the original paired units. At the interstices of the diagonal walls, the buttresses terminate below the top of the stone wall. There is no evidence that the introduction of these buttresses was any more than cosmetic since they do not align from one side to the other, nor do they receive the thrusts of the roof structure.

Before a larger meter house was erected, additional meters were installed in what were the first floor offices (1868). Present physical evidence in the original foundations indicates where the diagonal walls were removed and replaced with straight ones. First floor framing also shows signs of these alterations which provided more space in the end rooms. These newer walls on the east and west are of stone, but the north walls are of frame to allow easy access for the installation and replacement of the meters.

The second floor was used as an office and laboratory, both before and after the entire first floor was given over a metering. When it was no longer used as a meter house, the building became known as the Pyrometer Laboratory and was utilized to test the various qualities of the gas being produced in order to assure the liminous quality being sent to customers. With the addition of a corrugated metal shed, the west end began service as an experimental pilot plant. During World War Two, the cellar was designated as an air raid shelter. Today (1975) the structure is mostly unused except for recreational facilities and as an emergency storeroom. The second floor has become storage space for outdated customer sales equipment. Windows have been "modernized" or made into doors, yet the basic condition of the building is still sound.

The history of the Philadelphia Gas Works presents an important corpus of cultural documentation to scholar. In addition the buildings, artifacts, and other extant visual material form important correlatives to or existing knowledge of the illuminating gas industry. The development and eventual success of the gas works dramatically affected the lives of every Philadelphian. It created revolutions in domestic and public social activity. On the occasion of his move from his magnificent federal home Sweetbriar in Fairmount Park to his new Arch Street house in 1739, Samuel Breck wrote of his impressions concerning the potential of gas illumination:

"This day I lit for the first time to gas, and a very splendid lite it makes. I have in each parlour eight burners with tubes to add six or eight more; and there are in the vestibule and hall three; so that upon a gala occasion I can put in

play about 35 burners, and as each burner is at least equal to three astral lamps and each lamp equal to eight candles we may state the gas power thus; 35x3=105x8=920 candles! With such a lumination, (as the clown in the farce calls it), showing a light of 920 candles, the company have only to bring with them hearts as light as the refugence [sic] of the room to make a joyous part"[38]

NOTES

* Research initially began at the Passyunk Avenue or Point Breeze Plant of the Philadelphia Gas Works in the Spring of 1974. The Meter House was surveyed and recorded for the Historic American Engineering Record, and a general inventory was made of the entire complex. During the course of this work a large collection of photographic and documentary materials was discovered. This collection was removed from a perilous situation by the authors, and after months of negotiations between the Philadelphia Gas Works and the City Archives, was subsequently housed in the University Museum of the University of Pennsylvania. Currently being catalogued, this collection contains an impressive amount of material concerned with the late nineteenth and early twentieth century gas industry. This material furnished the authors with significant evidence for this study.

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[1]See Sir Arthur Elton, 'Gas for Light and Heat', in Charles Singer et al, A History of Technology, Vol.IV, (Oxford:1958), and Dean Chandler, Outline of History of Lighting by Gas, (London:1936), pp.15-30. See also E.G.Stewart, Town Gas:Its Manufacture and Distribution, (London:1958), pp.7-11, and Use of Gas in Philadelphia, Educational Pamphlet No. 10, (Philadelphia 1917).

[2]Rembrandt Peale illuminated his Baltimore Museum in 1816. A city ordinance passed that same year officially established the Gas Works, and the first lamp was lit on February 7,1817. New York recieved its first gas illumination in 1823.

[3]Third Annual Report of the Trustees of the Philadelphia Gas Works to the Select and Common Councils of the City of Philadelphia, 1838, The report comments that certain documents relating to the establishment of the Gas Works,"will sufficiently manifest the extreme caution with which our Council acted in this matter." Yet, by 1816, Charles Wilson Peale's Museum(housed in Independence Hall), the Chestnut Street Theatre, and a residence at 200 Lombard St. had been successfully lit with gas. William Strickland had also included a private manufacturing plant into his design for the Masonic Hall, built in 1809.

[4]Walton Forrestal, History of the Philadelphia Gas Works: One Hundred Years 1836-1936, unpublished typescript,(Philadelphia 1934-36), p.2

[5]Ibid.

[6]Ibid.

[7]Third Annual Trustees Report, 1838, Preface pp. IV.&V.

[8]Remonstrance against Lighting by Gas, November 28,1833. Cited also in Forrestal, pp.5&5a.

[9]Forrestal, p.6.

[10]Ibid.

[11]Ibid.

[12]Philadelphia's municipal government then consisted of two Councils, one the Common and the other the Select. The mayor was appointed by the councils as the chief executive officer, and with their approval he appointed a board of commissioners. The mayor and this board carried out the executive business of the city.

[13]Sixteenth Annual Trustees Report,1851, pp.13-20.

[14]William Strickland et al, Reports, Specifications and Estimates of Public Work in the United States of America, (London 1841), Atlas Folio Volume, Pl.I.

[15]Sixteenth Annual Trustees Report,1851, p.13.

[16]Seventeenth Annual Trustees Report, 1852, pp.5-7, also cited in Forrestal, p.36.

[17]Sixteenth Annual Trustees Report,1851, pp.19&20.

[18]Forrestal, p.56.

[19]Eighteenth Annual Trustees Report, 1853,p.7.

[20]It should be noted that the stench and heavy smoke associated with the manufacture of gas would naturally have discourged any workers from living adjacent to the works.

[21]Eighteenth Annual Trustees Report, 1853, pp. 6&12.

[22]Nineteenth Annual Trustees Report, 1854, p.10.

[23]Public Ledger, February 22, 1854.

[24]Warren Powell and Thomas B. Tinney, History of Station A, unpublished typescript, undated.

[25]Ibid. pp.4&5.

[26]Twentieth Annual Trustees Report, 1855, pp.18&19. "Charging" (filling) the retort with coal was accomplished by either a large semicircular scoop or with a large shoval. Several men pushed the coal into the retort with the scoop, turned it over and withdrew it, leaving the charge in the retort. The coke (spent charge) was drawn from the retort by two men using a long iron hoe. Although mechanical charging and discharging machinery was introduced in the early 1890's, hand charging persisted into the twentieth century.

[27]Powell and Tinney, p.4.

[28]Twentieth Annual Trustees Report, 1855,pp.19&20.

[29]Many present day workers at Point Breeze are convinced beyond a reasonable doubt that the bell was used to summon Swedish monks to prayers and meals.

[30]Twentieth Annual Trustees Report, 1855, P. 20, also Public Ledger, November 16, 1854.

[31]Twentieth Annual Trustees Report,1855, p. 20.

[32]Powell and Tinney, p.10.

[33]Committee on Science and the Arts, CSA #702, Franklin Institute Archives, manuscript.

[34]Powell and Tinney, p.10

[35]Forrestal, p.53.

[36]Ibid.

[37]Twenty-seventh Annual Trustees Report, 1862, p.10.

[38]Samuel Breck, Diary, entry September 4,1839, Collection of the Historical Society of Pennsylvania.

ADDENDUM TO: HAER PA-41
PHILADELPHIA GAS WORKS, POINT BREEZE METER HOUSE *HAER PA,51-PHILA,699A-*
(Point Breeze Works)
Intersection of Passyunk & Schuylkill Avenues
Philadelphia
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FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001