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International Specialists in the Environment

MEMORANDUM

TO: Paul La Courreye, EPA

FROM: William J. Malloch, Ecology and Environment, Inc.

DATE: December 15, 1987

SUBJECT: PG&E Gas Facility, San Francisco, California

EPA ID#: CAD981415656

cc: Martha Walters, Ecology and Environment, Inc.

Summary:

In 1882 the Central Gas Company began operation of a combined oil and coal-gas manufacturing facility. The facility was located in the block bounded by Fillmore, Steiner, Bay, and San Francisco Streets. In 1884 the facilities were acquired by the Pacific Gas Improvement Company (PGI). The facility underwent a series of expansions and by 1893 had a daily manufacturing capacity of 2.5 million cubic feet.

In 1903 PGI was acquired by the San Francisco Gas and Electric Company. The facility buildings and surrounding area were completely destroyed by the 1906 earthquake and fire.

The processes used on-site consisted of combustion of coal and oil. Incomplete combustion results in the formation of many compounds including: polynuclear aromatic hydrocarbons (PNAs), phenolics, light aromatic hydrocarbons, various inorganic sulfur and nitrogen compounds, and trace metals. Of these compounds, PNAs are the most toxic and persistent. Because of the large gas production at this facility, a sampling program was initiated in 1985. Sampling results indicate levels of PNAs (7.4 ppm) below background levels. Levels of lead (670 ppm) were detected above designated levels to protect groundwater as established by the Regional Water Quality Contol Board's "Water Quality Objectives and Hazardous and Designated Levels for Chemical Constituents" (1985).

No information concerning target populations was provided in the Preliminary Assessment provided by PG&E.

T/PGESF2/PAM/WM

recycled paper

RCRA Status:

This facility is not listed in the RCRA data base.

Recommendations/Justifications:

PG&E has submitted the attached information to EPA as a Preliminary Assessment at this time. Although levels of lead are above RWQCB levels for protection of groundwater, no groundwater exposure is expected because there is no groundwater use in the area. Additionally, the commercial uses of the site indicate no potential exposure from the air or surface water routes. Therefore, FIT recommends no further action under CERCLA.

FIT Review/Concurrence:

Martha Walters 12/23/87

EPA Recommendation:

Concur.

No further action.

Paul for Cooper

T/PGESF2/PAM/WM

REGION: 09
STATE : CA

U.S. ENVIRONMENT
OFFICE OF EMERGENCY
C E R C L

M.2 - SITE M

EPA ID : CAD981415656

SITE NAME: PG&E GAS PLANT SAN FRANCISCO 502 1F SOURCE: R

STREET : FILMORE STEINER BAY FRANCISCO CONG DIST: 0

CITY : SAN FRANCISCO ZIP: 94123 *

CNTY NAME: SAN FRANCISCO CNTY CODE : 07

LATITUDE : 37/48/00.0 LONGITUDE : 122/26/06.

LL-SOURCE: G LL-ACCURACY:

SMSA : 7360 HYDRO UNIT: 1805000

INVENTORY IND: Y REMEDIAL IND: Y REMOVAL IND: N FED FAC IND:

NPL IND: N NPL LISTING DATE: NPL DELISTING DATE:

SITE/SPILL IDS:

RPM NAME: RPM PHONE: - -

SITE CLASSIFICATION: SITE APPROACH:

DIOXIN TIER: REG FLD1: REG FLD2:

RESP TERM: PENDING ( ) NO FURTHER ACTION ( )

ENF DISP: NO VIABLE RESP PARTY ( ) VOLUNTARY RESPONSE (
ENFORCED RESPONSE ( ) COST RECOVERY (

SITE DESCRIPTION:

PA Complete
Pul 12.26.84

NFA

EVT → A, PA1, 120187, OH ✓
SI, C, N ✓

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SAN FRANCISCO

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INTRODUCTION AND BACKGROUND

This section of the report discusses 10 former manufactured gas plant sites in San Francisco, including:

GG-SF-APT	GG-SF-HOW
GG-SF-BCH	GG-SF-KNG
GG-SF-CAN	GG-SF-NOB
GG-SF-CHN	GG-SF-SHP
GG-SF-FIL	GG-SF-TWN

These sites are discussed in chronologic order of development in San Francisco and do not include two plant sites that remain wholly owned by Pacific Gas and Electric Company (PGandE): GG-SF-POT and GG-SF-STT. Eight of the ten sites are currently owned by parties other than PGandE. The remaining two sites, Site GG-SF-APT and Site GG-SF-NOB, are partially owned by PGandE and third parties. Additional information about the two partially owned and two wholly owned PGandE sites is contained in their respective Preliminary Assessment Reports prepared in 1986 by PGandE.

Gas manufacturing in the City of San Francisco originated during the Gold Rush era, in the early 1850s, when the city was the key urban, commercial and financial center for the United States' western territories. While some people considered San Francisco to be a temporary boom town, more visionary individuals, such as Mr. Peter Donahue, had the courage to invest in it.

A machinist and iron foundryman by trade, Peter Donahue arrived by ship in San Francisco with a multitude of gold seekers in 1849. He soon gave up his mining aspirations and opened a blacksmith shop with his brother James. Their successful Union Iron Works manufactured a variety of machinery; however, Peter Donahue was ambitious beyond his beloved iron works. Certain San Francisco was soon going to be a great city with modern conveniences common in large eastern cities, he decided to develop at least one convenience--street lighting. There were several obstacles Mr. Donahue had to overcome to provide street lighting in the city. First, the Donahues knew nothing about the gas industry. Second, in the 1850s, the prerequisite of street lighting development was the establishment of a gas manufacturing facility. At that time, there were no gas manufacturing plants west of St. Louis, Missouri, and the industry was still experimental, employing unproven gas manufacturing processes. In addition, supplies needed to construct a gas manufacturing facility were not available in California.

Despite these problems, Peter and James Donahue persevered. On August 31, 1852, the first gas utility in the west, the San Francisco Gas Company, was incorporated. By 1854, the Donahues' gas manufacturing plant and gas mains had been constructed and installed, enabling the City's 84 gas lamps to brilliantly illuminate the streets.

The gas manufacturing industry in San Francisco was a big business, for which companies typically were required to expend large, upfront capital outlays for plant construction. Large profits were realized, however, from the manufacturing of a scarce commodity such as light and heat, not only for municipal use, but for private use as well. Especially important during these early years was lighting for the homes of the new rich of San Francisco. Many of this new aristocracy lived in the Rincon Hill-South Park region (before Nob Hill gained favor). The Leland Stanfords, George Hearsts, Hall McAllisters and other families lived in this area during this era and enjoyed the gas light supplied by the Donahues' Gas Company (Coleman 1952:27).

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The dominant theme in the history of San Francisco gas utilities was the rise of new competitor companies followed by a merger with the older, more established company. As a result, San Francisco had a total of 12 plants following the establishment of the first gas works, the largest number of independently owned gas manufacturing plants in California. These included some of the largest and most modern gas works in the United States.

Because of the popularity of mergers, the number of gas manufacturing companies and plants declined at the turn of the century. In addition, the great earthquake and fire of April 1906, destroyed most of the City's gas plants and only two survived this disaster to supply San Francisco with manufactured gas until an adequate supply of natural gas could be imported from Kern County in 1929. Though gas continued to be manufactured on a standby basis until the 1950s, the arrival of natural gas marked the end of an era in which many San Francisco entrepreneurs and corporations pioneered developments in the gas industry. The location of ten manufacturing plants are listed in the following table and illustrated in Figure 1. A timeline (Figure 2) identifies key dates and events associated with San Francisco gas plants.

HISTORICAL OVERVIEW

San Francisco Gas Company Plant (GG-SF-HOW)

The first gas works in San Francisco was built by Messrs. Peter and James Donahue, owners of the prominent Union Iron Works. Resolved to provide street lighting in San Francisco, the Donahues studied the gas manufacturing industry and processes, raised capital, organized personnel and acquired a government franchise needed to establish a utility company. Their utility, the San Francisco Gas Company, was subsequently incorporated on August 31, 1852. The Donahues supplied the majority of start-up capital needed to build the gas works and install gas mains and street lamps along municipal rights-of-way. Other investors were bankers, Mr. Beverly G. Sanders and Mr. J. Mora Moss, the gas company's first president and vice president.

The Donahues and their associates selected a plant site near the Union Iron Works in the block bounded by First, Fremont, Howard and Natoma Streets for their gas plant. This site was selected because it was close to the San Francisco Bay (Bay) shore, ensuring that construction and operation supplies could be transported by boat and landed adjacent to the gas works. Plant construction began in November 1852, and was completed in 1854. When the plant, gas mains and 84 gas lamps were put into operation, one writer recounted the importance of the event:

> "The beginning of 1854 saw San Francisco in many senses, a great city. One improvement had trod close upon the heels of the preceding, quite as rapidly as had misfortunes. Printing, steam, electricity had in turn been introduced, and on the eleventh of February of this year the city was lighted with coal gas for the first time. The muddy streets had been succeeded by planks and stone pavements, the darkness of 1849, and the, if possible, still greater obscurity of the oil lamps which subsequently glimmered blindingly, long distances apart, had passed away, forever. The clear light of the San Francisco Gas Company from three miles of pipe and hundreds of burners, illuminated the streets and the hearts of the people. The occasion was celebrated by a delightful reunion at the Oriental Hotel." (Samuel Colville, *San Francisco Directory*, Vol. I, San Francisco: Commercial Steam Press, 1856)

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San Francisco Gas Plants - Location Map

Table 1

Summary of Former Manufactured Gas Plants in San Francisco

Original Utility Company Owner	Plant Location*	Site Number	Dates of Operation	Manufacturing Process
San Francisco Gas Co.	Block bounded by First, Fremont, Howard and Natoma Sts.	GG-SF-HOW	1854-1891	Coal-fired retorts
Aubin Patent Gas Co.	New Montgomery & Stevenson Sts.	GG-SF-SHP	1857-1858	Compound generator using refuse
Citizens Gas Co.	Eastern portion of blocks bounded by Second, Berry & Townsend on King Street	GG-SF-KNG	1866-1887	Coal-fired retorts
Metropolitan Gas Co.	Block bounded by Ninth, Brannan, Tenth, Bryant & "Old Channel" Street	GG-SF-CHN	1872-1878	Gale & Rand process, retorts fired by coal, oil and naptha
Central Gas Co.	Third & Townsend Sts.	GG-SF-TWN	1881	Coal-fired retorts
Central Gas Light Co.	Fillmore, Toledo, & Pierce Sts.	GG-SF-FIL	1881-1906	Lowe water gas process, coal-fired retorts
San Francisco Gas Light Co.	Block bounded by Bay, North Point & Laguna Streets	GG-SF-NOB	1891-1906	Springer water gas process, generators, coal-fired retorts
Equitable Gaslight Co.	Block bounded by Jefferson, Hyde, Beach & Leavenworth Sts.	GG-SF-CAN	1898-1906	Hall process, Lowe water gas process
San Francisco Coke & Gas Co.	Block bounded by Jefferson, Powell, Beach & Mason Sts.	GG-SF-BCH	1900-1930	Lowe coke-oven process; Lowe, stut, stut-carson, and Jones oil process
Independent Gas &	23rd & Delaware Sts.	GG-SF-APT	1902-1915	Lowe process Power Corporation

*Approximations

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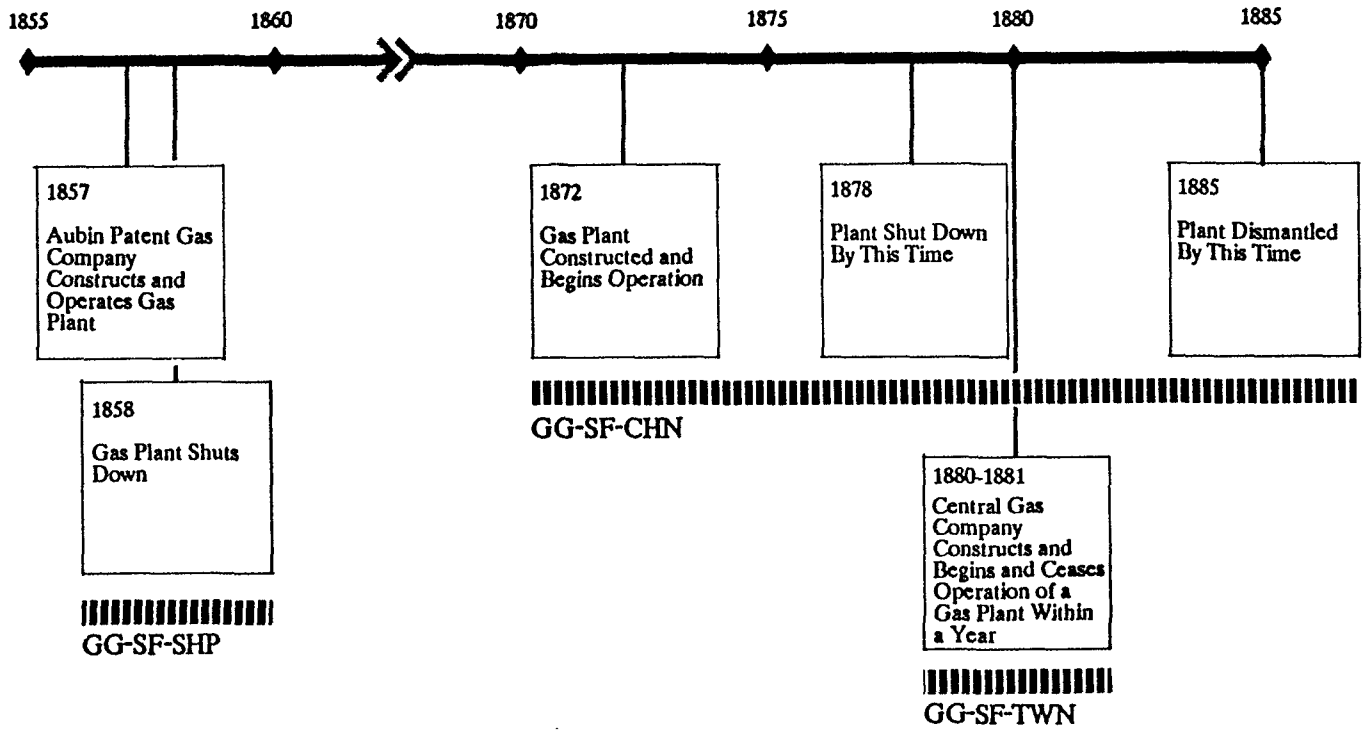

Figure 2

Timeline for the Manufactured Gas Plants in the City of San Francisco
(Cont.)

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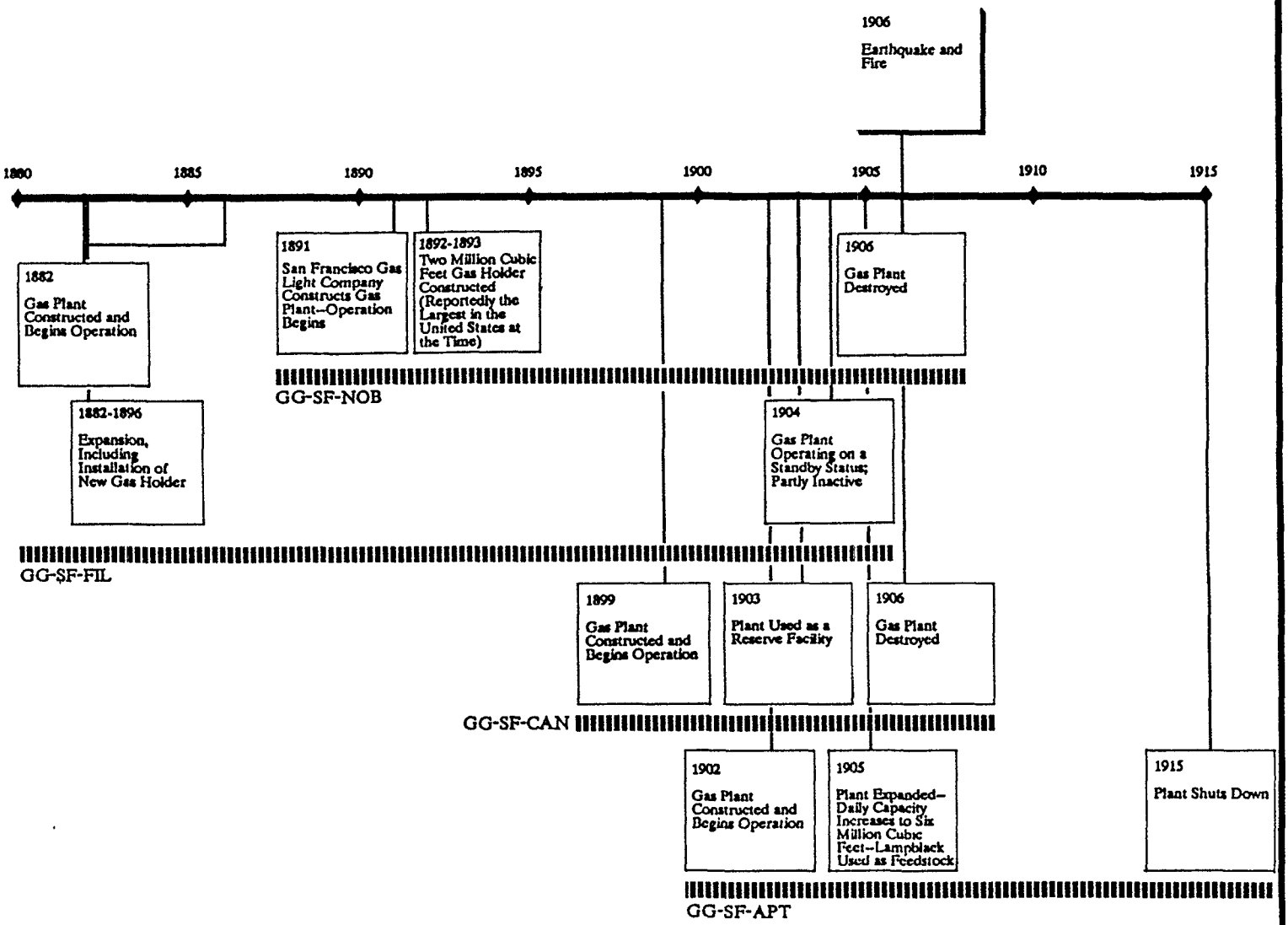

Figure 2

Timeline for the Manufactured Gas Plants in the City of San Francisco

(Cont.)

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A gala banquet at the Oriental Hotel featured Mayor Garrison and other speakers who remarked on the importance of the new lights in the City's development. A reporter for the *Daily Alta California* recorded the benefits of gas service as follows:

> "...[A] cheerfulness seemed to pervade the streets that has never been among us before. In travelling over the muddy sidewalks and in wading through the street crossings, there was a light ahead which showed the pedestrian how to pick his way, and seemed a sort of guiding star through the mud. The lights burned very brilliantly, and it required only a larger number of them to render our streets as light as day. The good results from the introduction into the city are almost incalculable. Besides the greater accommodation, the safety of the life and property will be very much increased, and when the streets are more generally lighted, the frequent midnight robberies and burglaries will materially decrease in number." (February 12, 1854)

The first detailed description of the Howard Street plant was printed in the *Daily Alta California*:

> "The Gas Works.--We yesterday took occasion to visit the Gas Works and to inquire into the method of making, purifying and confining the gas, preparatory to sending it throughout the city to be used in the streets and houses. The coal used is bituminous or cannel--at present they are using cannel coal. The first apartment is the Retort House. This contains a large structure of brick in which are distributed twenty-one retorts of cast iron. Each retort is about eight feet long, a foot and a half wide and a foot thick. These retorts are filled with coal, then a very hot fire is kindled beneath them and the gas passes off through a pipe at the top. About four hours of white heat in the retort are necessary to drive all the gas from the coal. The gas is conveyed into a large pipe, called the hydraulic main, about thirty feet long and one foot in diameter. This pipe contains water, and in it the gas cools and deposits a large quantity of tar which is carried off by a pipe to a cistern, where it is preserved and kept for sale. The gas passes off by a pipe from the top of the hydraulic main to The Purifying Room.--In the purifying room the gas is forced by the constant increase from the retorts to pass through water in which it deposits the remainder of its tar and some ammonia which escaped from the hydraulic main in which the gas is still warm. After passing through a number of pipes the gas, not yet pure, is admitted into large purifying boxes where slaked lime is kept upon shelves, and this lime absorbs the sulphur and carbonic acid gas, and leaves the gas sufficiently pure for use. From the purifying room the gas passes to The Reservoir or Holder.--Imagine a brick cistern 60 feet in diameter and 20 feet deep without a top. Then think a sheet iron tub about 2 feet less in diameter sitting inside the cistern bottom upwards. That is the Gas Holder. In the bottom of the cistern is water, and the gas passes up through it into the tub, which rests upon the water and is held up by the gas within; and the more gas inside, the higher rises the vast tub, and when there is no gas, the tub rests flat down on the water. This tub or holder is made of sheet iron, supported by a wrought iron frame work, and its weight is the force which drives the gas throughout the city. The holder has a capacity of 35,000 cubic feet, and 50,000 cubic feet might be made by the works in 24 hours. To make 50,000 feet, about 6 tons of first rate coal is necessary, and after the gas is extracted from the coal, there remains in the retort a substance resembling charcoal called coke. It is nearly all carbon and makes an excellent fire. The coke, after being taken from the retorts, is used in the furnace to drive the gas from other coal, so that the establishment is at no expense for fuel after purchasing its coke from which the coal is made." (February 21, 1854)

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Initially, the San Francisco Gas Company's service area comprised Portsmouth Square, an area bounded by California, Grant (formerly Dupont), Jackson and the Bay. The City's contract required street lamps in this area and hence, gas mains were laid in the following streets: Montgomery from Bush to Jackson; Kearny from Sacramento to Jackson; Grant from Clay to Jackson; Clay, Commercial, and Washington between Montgomery and Grant. Gas sales rapidly increased during the early years of the plant's operation. In 1856, a total of 32.6 million cubic feet of manufactured gas was sold and by 1860, gas sales had almost doubled, to approximately 60.0 million cubic feet. By 1862, approximately $2 million was invested in the gas plant.

Because of an increased demand for gas service, the San Francisco Gas Company gradually expanded its original works. By September 1863, two gas holders were located at the plant facility, and two larger holders were built at the corner of Fifth and Howard Streets. The gas plant expanded across Howard Street to include a new purifying house which was connected to the plant by underground pipes. A coal storage house was constructed across Fremont Street from the gas plant. Both the coal storage and purifying structures had the same dimensions of 180 feet by 50 feet, and were 48 feet high. The number of retorts increased to 100; 20 benches of clay retorts, five retorts to a bench. This justified the construction of the new gas holders, which by late 1864, had a combined capacity of about 600,000 cubic feet (either existing or under construction).

The two popular gas manufacturing processes employed to produce gas (carbonization and purification) were described in 1863:

> "[The retort house--where] coal is heated in iron retorts to a white heat, sufficient to expel the gas into the hydraulic main, where it comes in contact with a body of water. The gas, as it passes from the retort, goes up a stand-pipe and descends a dip pipe. This pipe is so arranged that the gas, having once come into the hydraulic main, cannot return into the retort."
>
> "[The purifying house--] When the gas leaves the retorts, it invariably contains a large quantity of tar, ammonia, sulphuretted hydrogen, and carbonic acid, from all of which it must be separated before it can be used for illuminating purposes. A considerable portion of the tar and ammonia is deposited in the hydraulic main: hence, in course of time, the water originally placed in the hydraulic main becomes displaced by the tar and ammoniacal liquor deposited from the gas. However, the process does not extract the whole of the tar and ammonia from the gas. It has to pass next through the purifier, which is a large square iron tank, with four layers of perforated sheet-iron, each of which is covered with from three to four inches in thickness of lime. This process separates the ammonia from the gas. A water condenser, a double cylinder . . . is next made use of. Through the inner cylinder the gas next passes, and in its progress it is cooled by water, with which the outer cylinder is filled, and deposits any tar which may remain in it in vessels placed at the base of the condenser for its reception." (*Bancroft Scraps,* Set W, Vol. 48:35)

The popularity of gas services inspired entrepreneurs to develop competitor gas plants between 1856 and 1872. By 1873, several competitor gas companies merged with the San Francisco Gas Company to form the San Francisco Gas Light Company. The plants were concentrated south and east of Market Street, one of the largest being the San Francisco Gas Company's plant at First and Howard Streets.

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By 1878, a total of 196 retorts, 16 benches of six and 20 benches of five, existed at the plant but only 171 were utilized in the plant's manufacturing process. The 16 benches of six retorts had been installed between 1863 and 1878. Each retort carbonized 250 pounds of coal per charge and each had five charges every 24 hours. The total amount of coal processed per day, therefore, approximated 100 tons.

By 1887, a retort house had been built in the southern part of the block bounded by Howard, Fremont, Beale and Mission Streets adjacent to the coal storage area. The purifying house was on Howard Street in the northeast corner of the block bounded by Folsom, First, Fremont and Howard Streets. A gas holder, a tar kettle, another purifying room, an ammonia manufacturing building, storage facilities, meter warehouse, repair shops and offices remained at their original location, in the block bounded by Natoma, Fremont, First and Howard Streets.

By 1887, the plant was in its last years of operation and by May 1891, a more modern plant was being constructed in North Beach. In November 1891, the San Francisco Gas Light Company's North Beach plant was in operation and San Francisco's first gas works reportedly was dismantled. The San Francisco Gas Light Company subsequently sold the property at auction on May 19, 1896.

Aubin Patent Gas Company Plant (GG-SF-SHP)

Although gas utilities were natural localized monopolies--most efficiently produced by a single supplier with one set of mains--the laissez faire business philosophy of the mid- and late-19th century encouraged competition. The state and city governments passed laws and granted franchises enabling any group interested in developing gas plants to do so. The first interested parties to do so were the Aubin Patent Gas Company and Citizens Gas Company.

The Aubin Patent Gas Company, based in Albany, New York, built small gas works for villages and towns. During the late 1850s, the company's advertisements stressed that its gas plants were better than coal gas works because of their simplified compound generator design and that locally generated refuse containing hydrocarbons (e.g., rosin in the Carolinas; cottonseed in the South; and bones, oil and grease) could be used as plant fuel.

In early 1857, the Aubin Patent Gas Company built a plant at the southwest corner of New Montgomery (formerly Jane) and Stevenson Streets. By May 1857, the plant had a daily generating capacity of 20,000 cubic feet and served businesses in the block bounded by Montgomery, Sacramento, California and Sansome Streets.

The Aubin Patent Gas Company plant soon failed because its customer base was too small and its generator design did not operate efficiently. The plant site reportedly was sold to the local Sheriff and in turn was assumed by the San Francisco Gas Company in July 1858. Thereafter, the Aubin gas plant was shut down.

Citizens Gas Company Plant (GG-SF-KNG)

The first major competition for the San Francisco Gas Company was the Citizens Gas Company incorporated in December 1862, with a capital stock of $2 million (1862 dollars). After organizing the company, a contract was signed with the New York firm of J.P. Kennedy, a well known gas plant construction company. In fall 1863, a gas plant was constructed on the Bay shore near the junction of Townsend, King, Berry and Second Streets. The *Daily Alta California* reported on the construction of the plant as follows:

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"This city is growing apace, southward. A year ago the waters of the southern bay dashed against a bleak and lonely front, stretching from a rocky, barren and forlorn ridge, for a distance of half a mile or more. Since then, what a change. The foot of Third Street is now the terminus of the Omnibus Railway, and the hotel, whose enterprising proprietor, Farr, has done so much towards excavating that thoroughfare, to bring the cars to the bay waters, is reaping a rich reward for his exertions. Steamboat Point, which, but four years ago, was almost an uninhabited waste, is now covered with manufactories, shops, saloons and dwellings. The "resurrected" Comanche lies in an adjoining yard and hundreds of loyal citizens visit the spot daily to see her; to be sure, only in pieces, but with the encouraging expectation that she will soon be put together and afloat on her proper element. Just eastward of the foot of Third Street the "Citizens' Gas Company" are engaged in an immense enterprise, which, when fully carried out, must involve an expenditure of nearly a million of dollars. This company's land is bounded by Townsend, Second and Berry Streets. They have two lots of two hundred and seventy-five feet each, with a water front of two hundred and seventy five feet. In the rear of this front is a precipitous bank of soft rock and dirt, presenting a face towards the bay of at least one hundred feet in height. From this cliff the earth is obtained for filling up the water lots below. At present some seventy-five hands are employed in working into this cliff and carting the rock and dirt to the beach below. Laborers are industriously engaged in "cribbing" the water front lot, and filling is from the bank."

"At the foot of the cliff, and in front of the main bank, a great gas-holder, one hundred and fifteen feet in diameter, is being built. This is some twenty-three feet deep below the surface, and of dimensions big enough for at least four gas-holders. This pit is on a lot between King and Townsend Streets. The manufactory and coal stores are to be between Berry Street and the water front. The largest vessels can come up to the wharf, where the coal is landed and passed through the manufactory, and then delivered into the gas-holders."

"The main manufactory building is in dimensions one hundred and seventy-one feet by sixty on King Street--a portion two stories, and the remainder one story high, to be built of brick. It is to have an iron-framed roof, covered with slate, iron doors and windows, and is to be, in every respect, fireproof. A large coal depot, capacious enough to contain six thousand tons of coal, is also to be built."

"Upwards of 1,500,000 of brick, manufactured in Sacramento, have been contracted for by the company. The gas-holder, to be first constructed, will be able to furnish 500,000 feet every twenty-four hours."

"At present about one hundred men are employed, which number may be increased as the work progresses. Nature seems to have done much for this enterprise. The precipitous cliff overhanging the bay affords ample materials, in the way of stone and earth, for filling up the water lots, whilst the shallowness of the water permits the powerful steam-engine to keep the otherwise submerged lands dry. The chief engineer and main director of this enterprise is John P. Kennedy. He is the man who has lately constructed the great gas works at the foot of Forty-Second Street, New York, and which now supplies the upper districts of Gotham with gas. He has, in by-gone days, successfully built gas works for various southern cities, and latterly, "lighted" St. Paul's and other places in the upper valley of the Mississippi. The Citizen's Company are sanguine that in the course of eight months they will be prepared to furnish the public with gas." (May 2, 1864:1)

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In November 1864, a plant report was published which indicated the gas holder was built on bedrock with solid brick masonry walls which were four feet thick at the bottom. The holder was telescopic, 96-1/2 feet in diameter, 21-1/2 feet high, with a capacity of 300,000 cubic feet. Figure 3 is a photograph showing the gas holder near completion in 1865. The brick two-story main building was reported as having dimensions of 171 feet by 60 feet, and 30 feet high which housed the retorts, a purifying room, offices, storage areas and workshops. A brick coal house, 200 feet by 64 feet, and 30 feet high, was adjacent to the Berry Street wharf where ships could dock and unload coal supplies. The company also had laid 16-inch gas mains from the gas works along 3rd Street to Market Street and down Market to Battery Street and planned a similar pipe to be laid through Montgomery Street.

The Citizens Gas Company plant began operation in 1866, and was purchased by the San Francisco Gas Company in 1868. From this time, the plant operated in conjunction with the San Francisco Gas Company's Howard Street plant.

In 1878, a newspaper article reported that when the King Street gas works operated, it utilized 75 of its 100 retorts to produce coal gas from approximately 45 tons of coal every 24 hours. By 1887, the plant was shut down and its equipment idle, although the gas holder was still in use. At the time the plant shut down, plant facilities were located between Townsend and King Streets on Second Street.

The gas plant reportedly was dismantled in 1891, after the North Beach gas works had begun operation. Only the gas holder reportedly remained extant at this location by the turn of the century.

Metropolitan Gas Company Plant (GG-SF-CHN)

The Metropolitan Gas Company was incorporated in March 1871, under the leadership of Messrs. J.W. Stow and W.W. Montague. Mr. Stow was also president of the Pacific Pneumatic Gas Company, which touted itself as the oldest and most successful company erecting "domestic gas works" on the Pacific Coast.

The Metropolitan Gas Company obtained the patent rights from the Pacific Pneumatic Gas Company to make illuminating gas by using the Gale and Rand process which involved distilling liquid or solid hydrocarbons at low temperatures and passing the vapors into a red-hot retort. After incorporation, the Metropolitan Gas Company began gas plant construction in the block bounded by Ninth, Tenth, Brannan, Bryant and Channel (formerly Mission Creek) Streets. Construction at this site was completed in 1872, with the plant beginning operation in April. A description of the plant facilities recorded in 1872 appeared as follows:

> "The company has performed a large amount of work here; erecting a costly bulkhead and wharf raised the ground nine to twelve feet, bringing it up to the official grade, excavating for, and building a first-class gas-holder, having a capacity of over 400,000 cubic feet. The other works of the company consist of a substantial brick building 175 feet in length, containing still house, retort house, condensing chamber, exhauster, engine, boiler and meter rooms, and in the upper story, offices, photometric room, and engineer's apartments. The company has also erected two large reservoir tanks, capable of storing nearly 100,000 gallons of petroleum and naphtha, also a commodious coal shed. The works though smaller than those of the City Gas Company, on the Potrero, are very complete, and in consequence of the simplicity of this process, quite adequate to the manufacture of all the gas that is, or will be, consumed in the city for many years to come.

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"The holder was manufactured by Messrs. Hoy, Kennedy & Co., of the Atlantic Dock Iron Works, New York--the makers of the King Street gas holder and the gas holders of the City Gas Company. The columns and girders are on a new principle, recently patented by Mr. Kennedy, and first seen on this coast at these works, and are known as "lattice work". The holder is ninety-two feet six inches in diameter, and fifty feet high, in two lifts, being telescoped." (Henry G. Langley. *The San Francisco Directory*, San Francisco: Henry G. Langley, 1872, p. 22-23)

It is clear from this description of the gas works that it represented a pioneer attempt at a large scale production of oil gas. However, as was frequently the case with new gas manufacturing processes, the Channel Street plant reportedly suffered from frequent interruptions in production which resulted in difficulty maintaining a customer base. The Metropolitan Gas Company, therefore, merged with other small gas companies to establish the San Francisco Gas Light Company in April 1873.

The year the plant ceased operation is unknown, however, a February 23, 1878 *San Francisco Chronicle* article features the San Francisco Gas Light Company gas plants but does not mention the Channel Street plant. Similarly, official reports of the San Francisco gas inspector documented in 1885 and 1886 do not mention the plant nor its gas holders; hence, the plant had been shut down by 1878 and dismantled by 1885. By 1887 a cement and asphalt plant, a coal house, hay barn and some dwellings occupied the gas plant site.

Central Gas Light Company Plants (GG-SF-TWN & GG-SF-FIL)

Originally the Central Gas Company in 1880 and 1801, the company built a small coal gas works on King Street in the block bounded by Townsend, Third, King and Second Streets (Site GG-SF-TWN). The gas works had eight iron retorts (in two benches in sets of four each) scrubbers, purifiers, condensers and a gas holder that was 110 feet in diameter with a 37-foot lift. This gas works operated only a year or less before it was shut down and dismantled. The gas holder remained in use for gas storage.

Between 1881 and 1882, the Central Gas Company reincorporated as the Central Gas Light Company and built a new plant in the block bounded by Fillmore, and now closed sections of Steiner, Bay and Francisco Streets (Site GG-SF-FIL). The plant was completed in 1882, and had 19 miles of gas mains and 504 street lamps which represented approximately ten percent of those owned and operated by the San Francisco Gas Light Company.

The new plant utilized combined oil and coal gas manufacturing processes and had several Lowe water gas generators, 72 coal retorts (in twelve benches in sets of six each) and two new gas holders which were located near the one at the GG-SF-TWN site.

In October 1884, the Central Gas Light Company's facilities were acquired by the Pacific Gas Improvement Company. In 1885, the works had been expanded to include six gas generators and a daily capacity of 500,000 cubic feet. By 1886, the gas plant had expanded to include seven water gas generators using oil as fuel feedstock, in addition to 72 retorts that used coal feedstock. The plant had a daily manufacturing capacity of 1.5 million cubic feet with these additions and had 67 miles of gas mains. By 1893, the plant had a daily manufacturing capacity of 2.5 million cubic feet of gas and a storage capacity of 1.35 million cubic feet.

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Records for 1893, detail the plant's layout. The oil and coal feedstock was stored west of Steiner Street. Across the now closed section of Steiner Street were the 72 coal retorts, one of the two 335,000 cubic feet capacity gas holders and a coal and coke shed. The oil-fired gas generators and scrubbers were located in the central part of the site and to the east were two purifying houses and the second 335,000 cubic feet capacity gas holder. By 1893, the Pacific Gas Improvement Company also had a gas holder southeast in the block bounded by Francisco, Webster, Chestnut and Fillmore Streets. The Pacific Gas Improvement Company faced strong competition from the San Francisco Gas Light Company in the 1890s. The Pacific Gas Improvement Company stayed in business by encouraging the use of gas cooking and heating stoves. An article in the *San Francisco Call* pointed this out:

> "... a great feature of its [Pacific Gas Improvement Company] business is to supply customers with cooking and heating stoves of the latest design. Their use does away with soot, ashes and smoky chimneys, and they possess the additional advantage that by their use a meal can be served in less than half the time required when the ordinary coal and wood stove is used." (December 19, 1897:46)

In 1903, the Pacific Gas Improvement Company was acquired with other competitor gas companies by the San Francisco Gas and Electric Company. The gas plant was partly inactive beginning in 1904. Figures 4 and 5 are photographs showing the Fillmore plant at a distance in 1905. The works were completely destroyed the following year by the April 1906, earthquake and fire.

San Francisco Gas Light Company Plant (GG-SF-NOB)

In 1891, Mr. Joseph B. Crockett, President of the San Francisco Gas Light Company, had the ambition of constructing a thoroughly modern gas works to accommodate the City's future gas demand. The new plant's location was adjacent to a large gas holder the company had installed at Bay and Buchanan in 1886. In spring 1891, the company purchased land in North Beach, along San Francisco Bay, in the blocks bounded by Laguna, Bay, Webster and Beach Streets. The site was developed at that time in the eastern part of the block bounded by Bay, North Point, Webster and Buchanan Streets.

The gas plant reportedly was in operation by the end of 1891, and was, by all accounts, one of the finest plants in the United States. A drawing (Figure 6) shows the gas plant at completion. One source described its facilities as they existed in late 1891:

> "In up-to-date arrangement and operating convenience, this plant was not to be excelled. The gas making apparatus comprised two 12-foot diameter Springer carburetted water gas generators of 1,000,000 cubic feet each daily capacity." (California State Railroad Commission n.d.:7)

Figure 7 is a photograph showing the gas works in 1892.

Between 1892 and 1893, a two million cubic feet gas holder, the largest in the United States at the time was constructed at the plant site in the block bounded by Bay, Laguna, North Point and Buchanan. Expansion of the gas works continued until 1894 when "... 20 Weber full depth regenerative coal gas benches ..." with nine retorts per bench were built. The result of this work was a gas works, which used both coal and oil feedstock.

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The Sanborn Map for 1893 (Figure 8) indicates that the retort house was located in the eastern part of the block bounded by North Point, Beach, Buchanan and Webster Streets. In addition, coal and coke storage areas and a crude oil tank were located in this block. The oil gas was generated and purified south across North Point Street in the eastern half of the block bounded by Webster, Bay, Buchanan and North Point Streets. Across Buchanan Street to the east (in the block bounded by Buchanan, North Point, Laguna and Bay Streets) were the "giant" gas holder and a smaller 200,000 cubic feet capacity gas holder, a coal pile, office and meter rooms.

In 1893, the San Francisco Gas Light Company had two functioning gas plants, the North Beach plant and the Potrero gas works (a site wholly-owned by PGandE, not addressed in this section). The two plants' combined manufacturing capacity was 6.7 million cubic feet a day. The company's storage capacity was an estimated 4.709 million cubic feet. The 1899 Sanborn Map (Figure 9) indicates the facility remained unchanged, except the coal retorts were not being used. The San Francisco Gas Light Company merged with the Edison Light and Power Company (not a gas plant developer) and became the the San Francisco Gas and Electric Company in 1896. Although the San Francisco Gas and Electric Company acquired other small competitor companies, the North Beach Plant continued to be a key facility in the company's system. By 1904, the plant's investment cost officially was estimated at $969,990 (1904 dollars). The North Beach plant was finally destroyed by the April 1906, earthquake and fire. Although gas was never again manufactured at this location, the gas holders survived and continued to be used for years thereafter.

Current land parcelization for this former gas plant site is illustrated on Figures 10 and 11.

Equitable Gaslight Company Plant (GG-SF-CAN)

The Equitable Gaslight Company (Equitable) was incorporated in February 1898, to supply gas to San Francisco residents in the area between Bay, Market Street and Van Ness Street. The company planned to make gas cheaply utilizing the Hall process, but failed, resulting in the construction of a small water gas plant between 1899 and 1900. The plant reportedly cost $190,450 (1900 dollars) to build, much less than other San Francisco gas plants of this era.

The Equitable gas works was located in the western part of the block bounded by Leavenworth, Hyde, Jefferson and Beach Streets, the previous location of the "old Selby Smelter." It began operation in 1899, and sold a relatively small amount of gas between August 1 and December 31, 1899, with sales estimated at $26,000 (1899 dollars).

Historical records of 1899, indicate a coal wharf on the plant's north side at the foot of Hyde Street, and a 47,000-gallon crude oil tank on the wharf's western edge. South of the oil tank at the property's western edge were two gas holders, each with a capacity of 180,000 cubic feet. East of the holders in the center of the site were the plant's gas generators and purifiers.

The Equitable plant remained small compared to other plants and its gas sales for the year ending December 31, 1902, were just $130,892. The sales were small, especially compared to the $1,129,199 in sales for San Francisco Gas and Electric Company and $366,394 for the Pacific Gas Improvement Company during the same year (all 1902 dollars).

The Equitable Gaslight Company was acquired by the San Francisco Gas and Electric Company in August 1903. The plant subsequently was a reserve facility until it was destroyed in the April 1906, earthquake and fire.

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San Francisco Coke and Gas Company Plant (GG-SF-BCH)

The San Francisco Coke and Gas Company (Company) was established in 1899, by inventor Mr. T.S.C. Lowe and his son to produce coke under the elder Lowe's own patent process. The company began manufacturing gas only as a side business, as coal gas was a byproduct of the coke production process. The plant was built between 1899 and 1900, in the block bounded by Beach, Mason, Powell and Jefferson Streets. The plant began operation in June 1900, and had a four-year contract to sell all of its gas to the San Francisco Gas and Electric Company. During these years, *Brown's Directory of American Gas Companies* does not give production statistics for this gas manufacturing site (Brown 1901:10; 1902:10; 1903:11; 1904:11; 1905:12). The only information available about output is a statement that about 650,000 cubic feet a day was produced during the 1900-1905 years (*San Francisco Chronicle* January 6, 1905:14).

When the plant's contract with San Francisco Gas and Electric Company expired in 1904, a disagreement arose between the two gas companies over the terms of a new contract. After the corporate mergers in 1903, the president of San Francisco Coke and Gas evidently decided to compete with the San Francisco Gas and Electric Company and approached some of his eastern business contacts to explore this possibility. The result was that Standard Oil Company purchased the San Francisco Coke and Gas Company and completely rebuilt the plant between 1904 and 1905, converting it to a water and oil gas works. In addition, gas mains were laid by May 1, 1905, to the area bounded by Beach, Sansome, Market and Powell Streets to provide gas service to new customers.

The San Francisco Coke and Gas Company's new plant was one of only two plants in San Francisco which survived the April 1906 earthquake and fire. Figure 12 is a photo showing the plant in 1906, apparently after the earthquake. In 1907, the company changed its name to Metropolitan Light and Power Company and remained independent under that name until December 1911, when it was acquired by a larger local utility company. At that time, Metropolitan had about 13,000 customers and had invested approximately seven million dollars in the plant facility. In 1912, Jones oil gas generators were installed at the plant and in 1914, the two Stut-Carson oil gas generators were reconstructed, resulting in an increase in daily output capacity in excess of six million cubic feet of gas.

By 1913, plant facilities included two gas holders, one of which had a two million cubic feet capacity and the other had a 200,000 cubic feet capacity located on Powell Street. West of the largest holder were purifiers and near the center of the block were two oil gas generating machines housed in the generator building. The lampblack separators stood west of this building on Mason Street near Beach Street. Oil tanks were located north of the separators along Jefferson Street. A photograph (Figure 13) shows the gas plant around the mid-1920s.

After the arrival of natural gas in the Bay Area between 1929 and 1930, the Beach Street plant was shut down. An order to abandon this plant was issued in early 1931, but the abandonment was not accomplished until 1934.

The Independent Gas and Power Corporation (GG-SF-APT)

The Independent Gas and Power Corporation was founded by "sugar king" Mr. Claus Spreckels and two of his sons in 1901. An often repeated, but never fully confirmed story explains why Spreckels entered the gas and electric business: Claus Spreckels owned a large building near Third and Market Streets, which stood in front of San Francisco Gas and Electric

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Company's electric generating plant on Jessie Street. The Jessie Street plant reportedly put out enough smoke to cause complaints from the tenants of Spreckels' office building. Soon thereafter, Mr. Spreckels saw San Francisco Gas and Electric Company president, Mr. Joseph B. Crockett, at the Pacific Union Club and asked him what could be done about cutting down or eliminating the smoke. Mr. Crockett, reportedly a man active in the leadership of several important Bay Area social clubs, informed Mr. Spreckels of his rule never to discuss business matters at club functions. When Mr. Crockett appraised Mr. Spreckels of this rule, offering instead to discuss it at his office, Mr. Spreckels took offense and decided to "punish" Mr. Crockett by competing with him in the gas and electric utility business.

Mr. Claus Spreckels soon thereafter entered the gas and electric business and between 1901 and 1902, built a plant in the Potrero District adjacent to his sugar refinery and the San Francisco Gas and Electric Company's Potrero Gas Works. The plant site was located along Delaware and 23rd (formerly Nevada) Streets near the Bay shore.

Gas plant equipment initially consisted of two Lowe double superheater water gas units with a combined capacity of one and a half million cubic feet, together with the necessary gas holders, scrubbers, condensers, purifiers and other apparatus. This equipment was reportedly installed in 1902, at a cost of $341,450 (1902 dollars). By the end of 1902, the plant was just barely in operation. In a report to the City authorities dated December 31, 1902, the company stated that it was providing gas service to a limited area, covering only a small part of their anticipated distribution area. Figure 14 is a photograph showing the interior of the works. The date of the photo is unknown.

The plant only operated about a year as an independent entity and in the fall of 1903 was sold to San Francisco Gas and Electric Company. Thereafter, the gas plant operated as part of the Potrero Gas Works. The plant was expanded in 1905, by the addition of four coal-fired generators which increased the gas plant's daily capacity to six million cubic feet. A year later, the plant feedstock was changed to lampblack. By 1915, the gas plant's water gas generators were no longer needed and the plant was shut down. Ancillary plant facilities continued to be used for a number of years as part of the Potrero Gas Works.

Figure 15 shows the current land parcelization of this former gas plant site.

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CURRENT SITE USES

The following table summarizes the current land uses of former manufactured gas plant sites in San Francisco.

Original Utility Company Owner	Site Number	Current Site Uses
San Francisco Gas Company	GG-SF-HOW	commercial and industrial
Aubin Patent Gas Company	GG-SF-SHP	commercial
Citizens Gas Company	GG-SF-KNG	commercial
Metropolitan Gas Company	GG-SF-CHN	commercial and interstate right-of-way
Central Gas Company	GG-SF-TWN	commercial
Central Gas Light Company	GG-SF-FIL	residential
San Francisco Gas Light Company	GG-SF-NOB	residential and utility (Figures 10 and 11)
Equitable Gaslight Company	GG-SF-CAN	commercial and retail
San Francisco Coke and Gas Company	GG-SF-BCH	commercial and retail
Independent Gas and Power Corp.	GG-SF-APT	industrial and utility (Figure 15)

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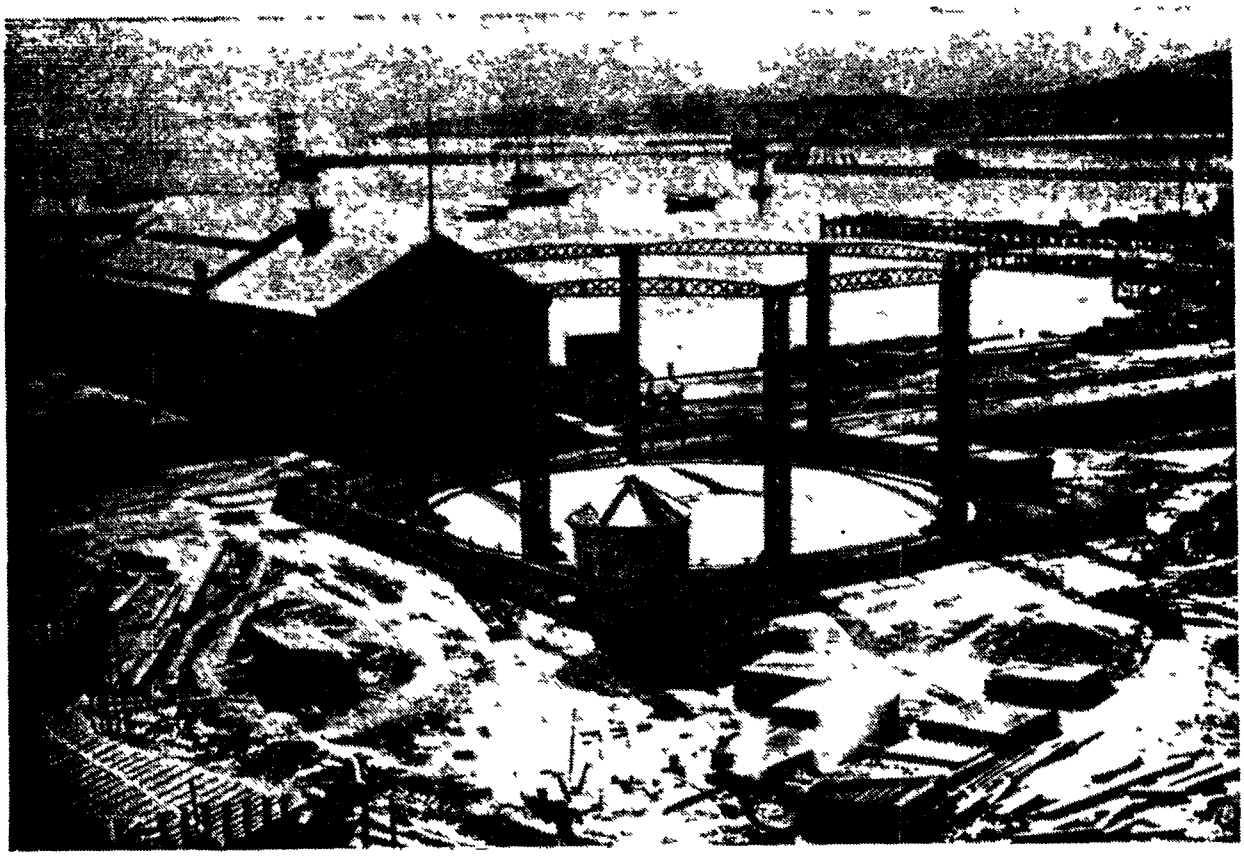
Figure 3



San Francisco Gas Plant (GG-SF-KNG) - Photograph

The gas plant at King and Second Streets under construction in 1865. View is easterly (Used courtesy of the Bancroft Library. University of California, Berkeley)

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Figure 4

San Francisco Gas Plant (GG-SF-FIL) - Photograph

"Marina District Harbor View Circa 1905." Pacific Gas Improvement Company's works are on the left with their gas holders in the center of the photo. View is to the north. (Used courtesy of the Bancroft Library. University of California, Berkeley.)

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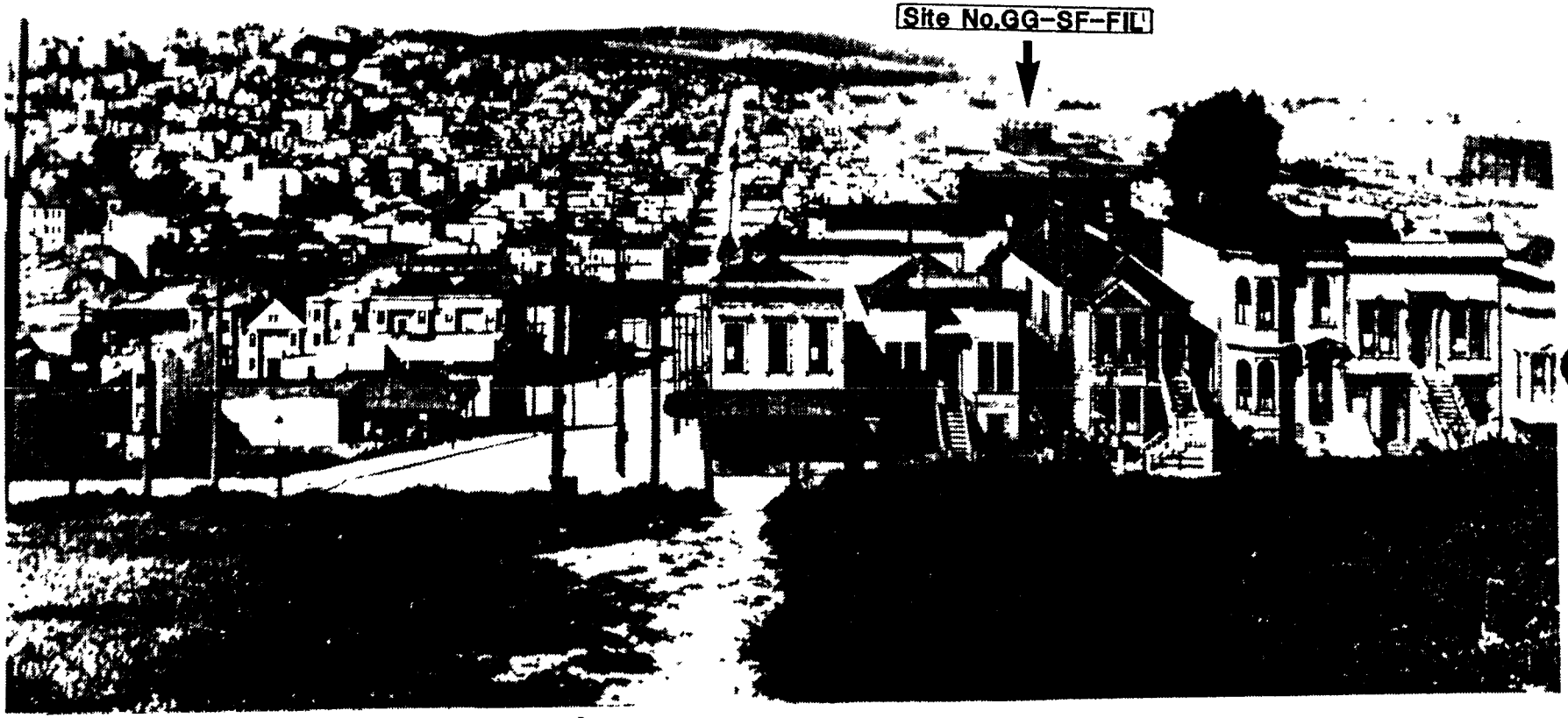

San Francisco Gas Plant (GG-SF-FIL) - Photograph

Looking west from Nob Hill towards Marina District and Presidio circa 1905. Pacific Gas Improvement Company's gas holder at the Fillmore site, GG-SF-FIL, is in the center right of the photo. San Francisco Gas Light Company's North Beach works, GG-SF-NOB, is on the extreme right. (Used courtesy of the Bancroft Library. University of California, Berkeley.

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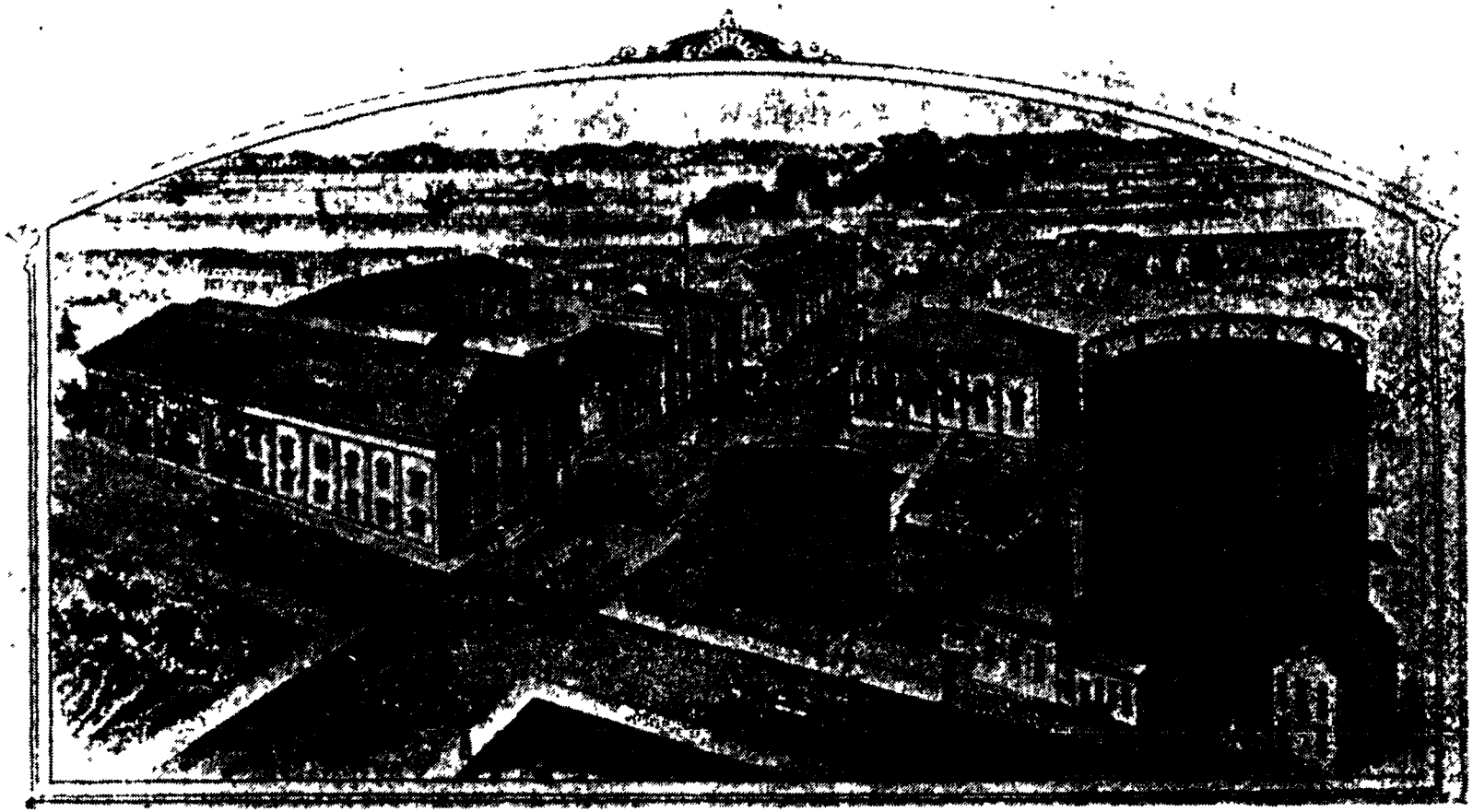
Figure 5



San Francisco Gas Plant (GG-SF-NOB) - Photograph (#59774)

"The North Beach Gas Station. Built in 1891." Direction of view is north. Date of illustration is undetermined.

Figure 6

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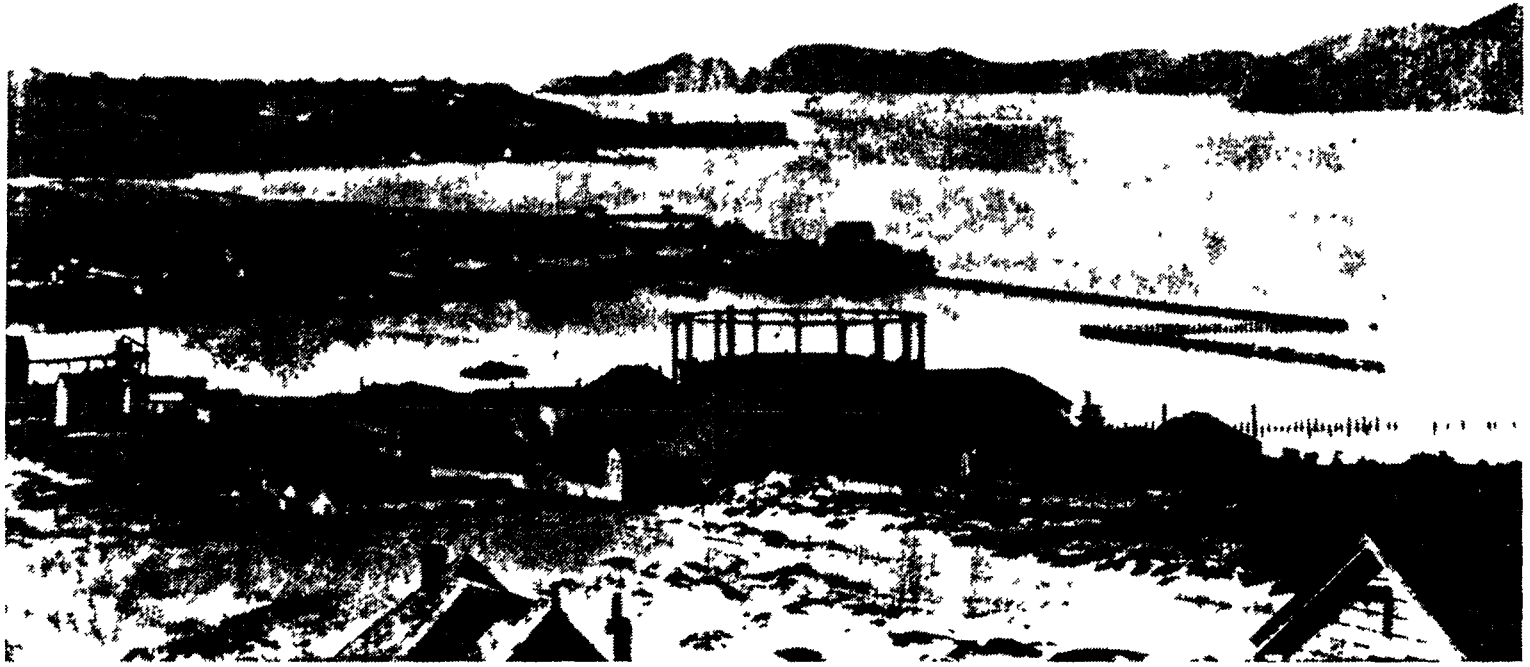

San Francisco Gas Plant (GG-SF-NOB) - Photograph (#1586)

A view of Fort Point and the North Beach Street gas works in 1892 Direction of view is westerly

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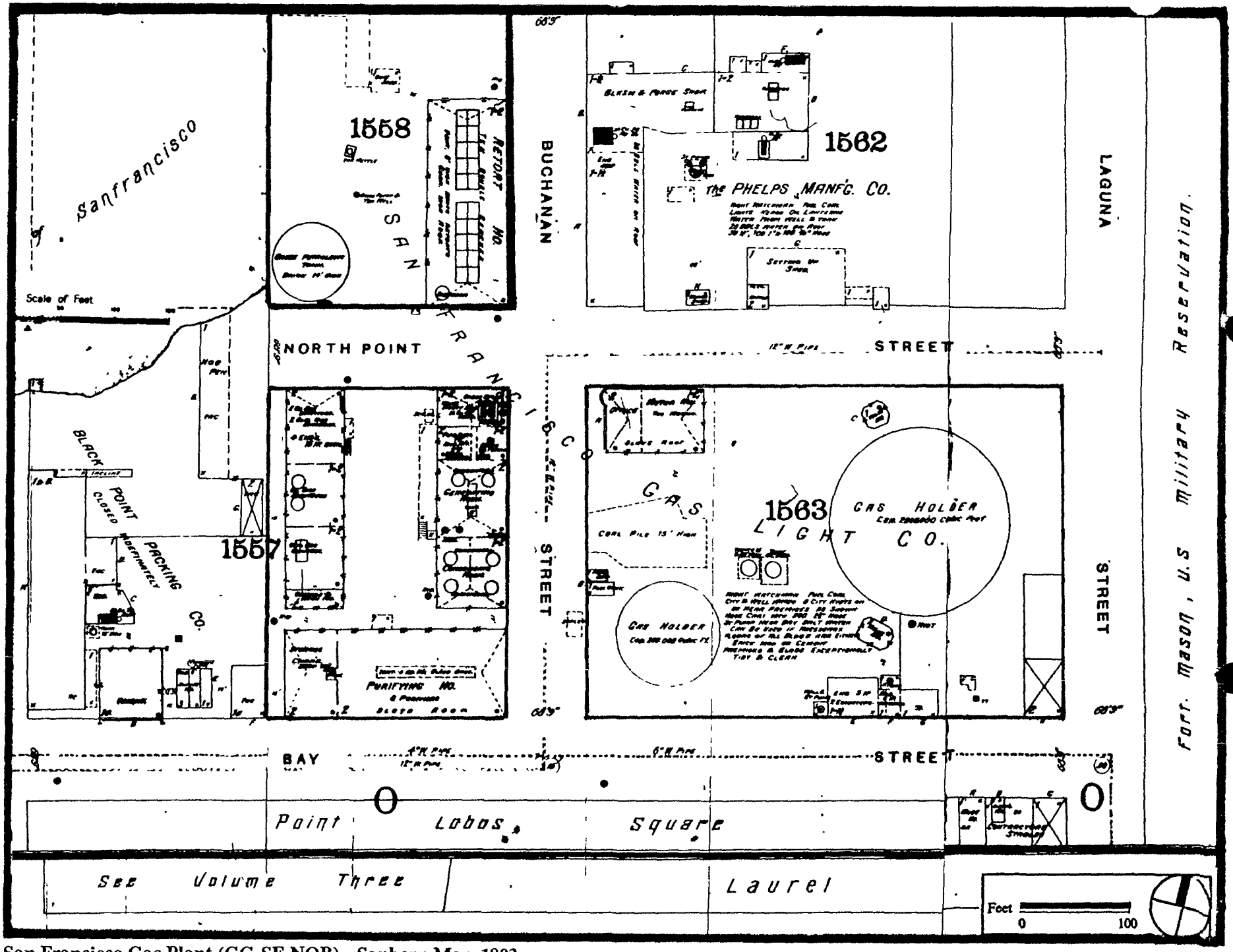


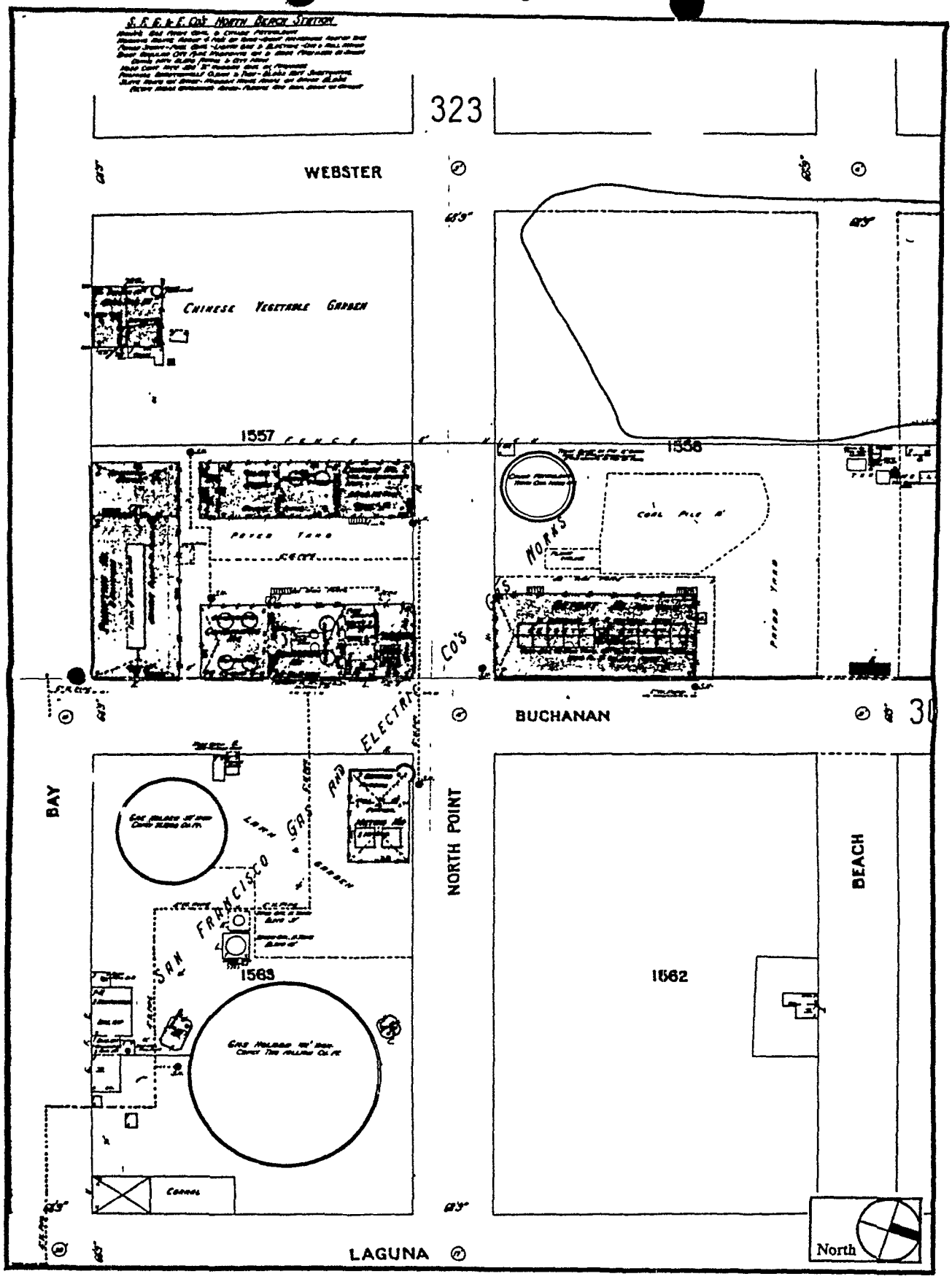
Figure 8

San Francisco Gas Plant (GG-SF-NOB) - Sanborn Map, 1893

Supplemented by PGandE.

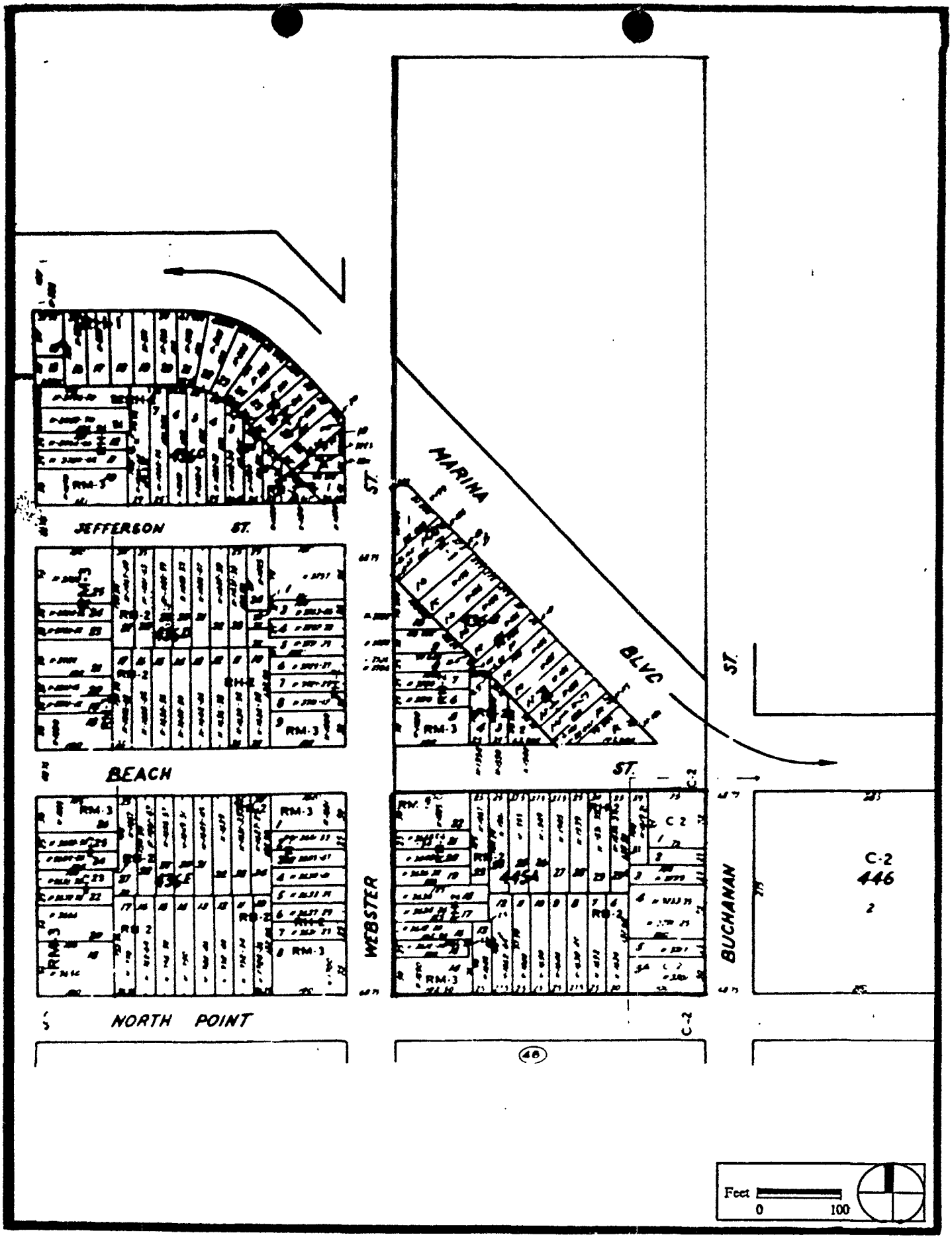
Reprinted by permission of the Sanborn Map Company, 1987.

Figure 9



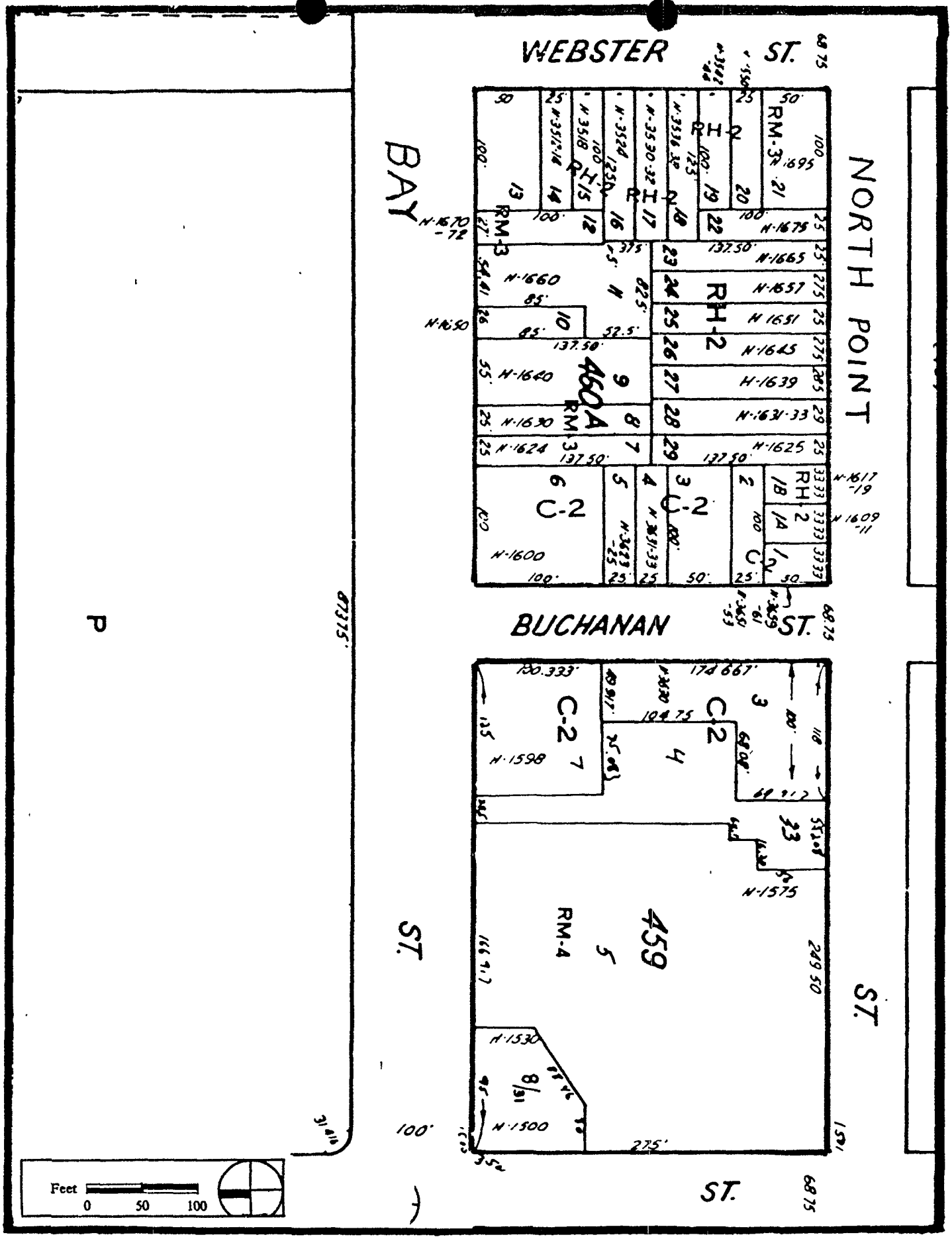
San Francisco Gas Plant (GG-SF-NOB) - Sanborn Map, 1899

Figure 10

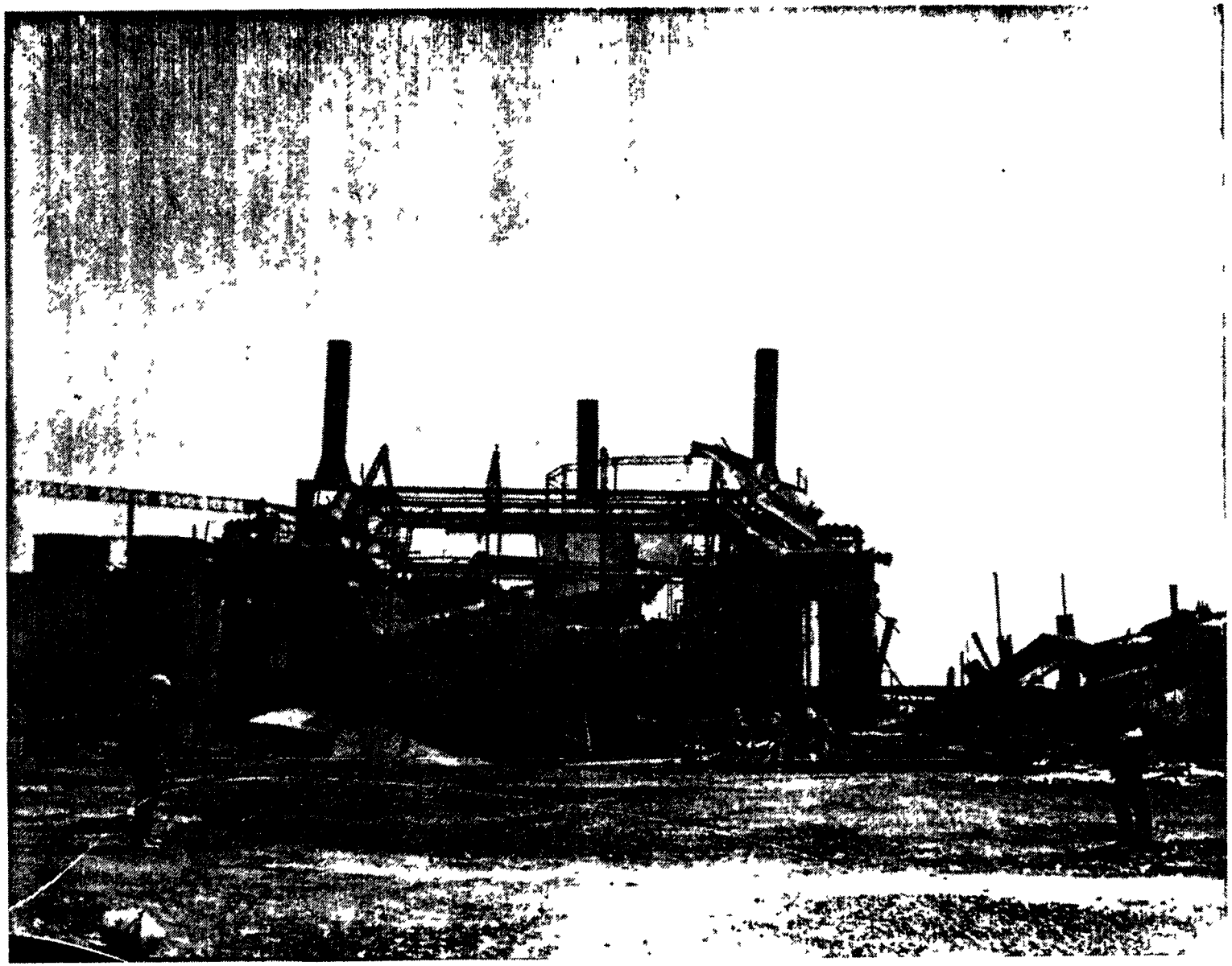


San Francisco Gas Plant (GG-SF-NOB) - Assessor's Parcel Map (1 of 2)

Figure 11



San Francisco Gas Plant (GG-SF-NOB) - Assessor's Parcel Map (2 of 2)



San Francisco Gas Plant (GG-SF-BCH) - Photograph

"Coke Oven-Metropolitan Gas Works 1906" Possibly post-earthquake damage. Direction of view not determined In 1906 the plant was still operated by the San Francisco Coke and Gas Company.

Figure 12

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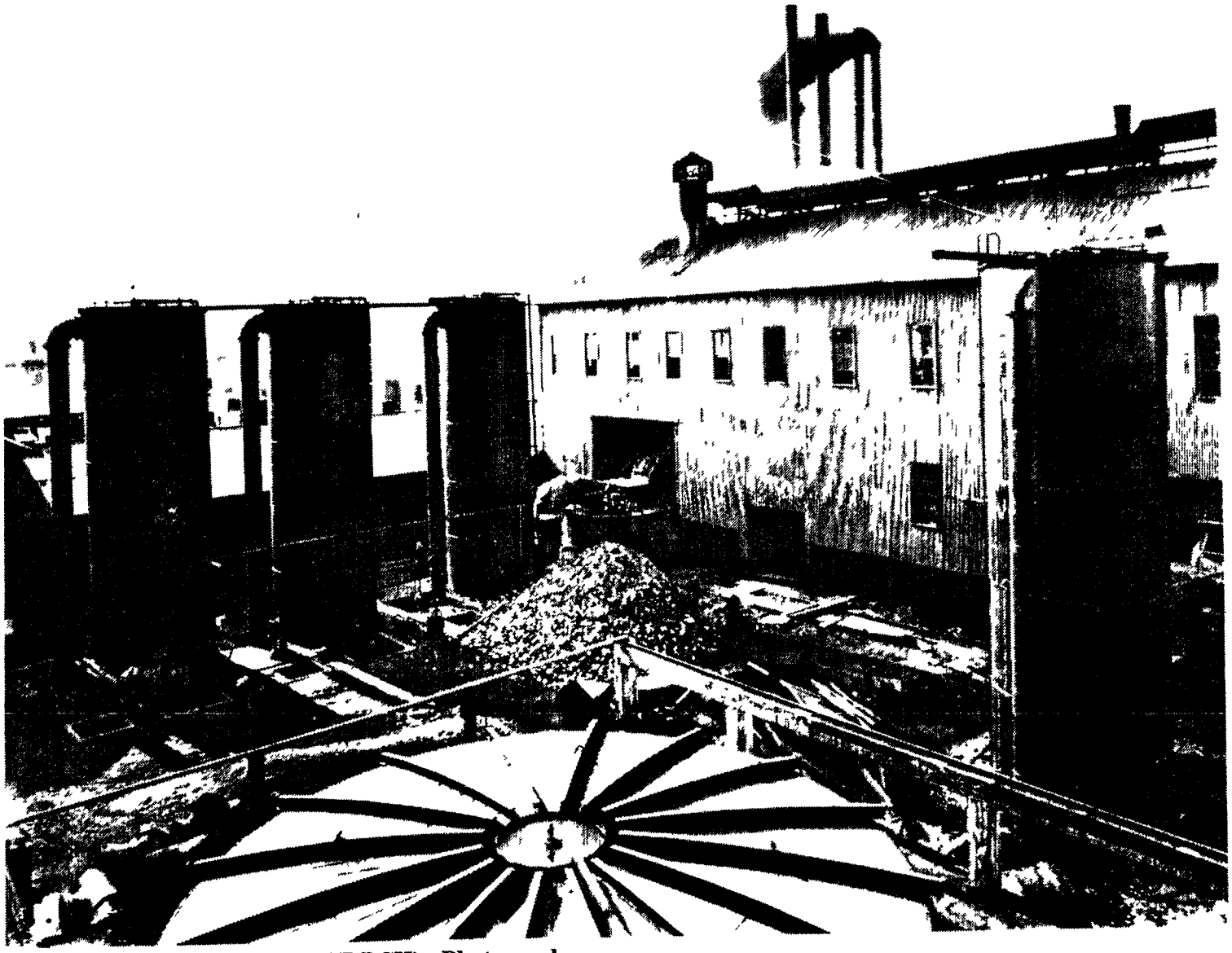

San Francisco Gas Plant (GG-SF-BCH) - Photograph

"Metropolitan Gas Works." Date and direction of view are unknown. From the appearance of the equipment the photo was probably taken in the 1920s or 1930s.

Figure 13

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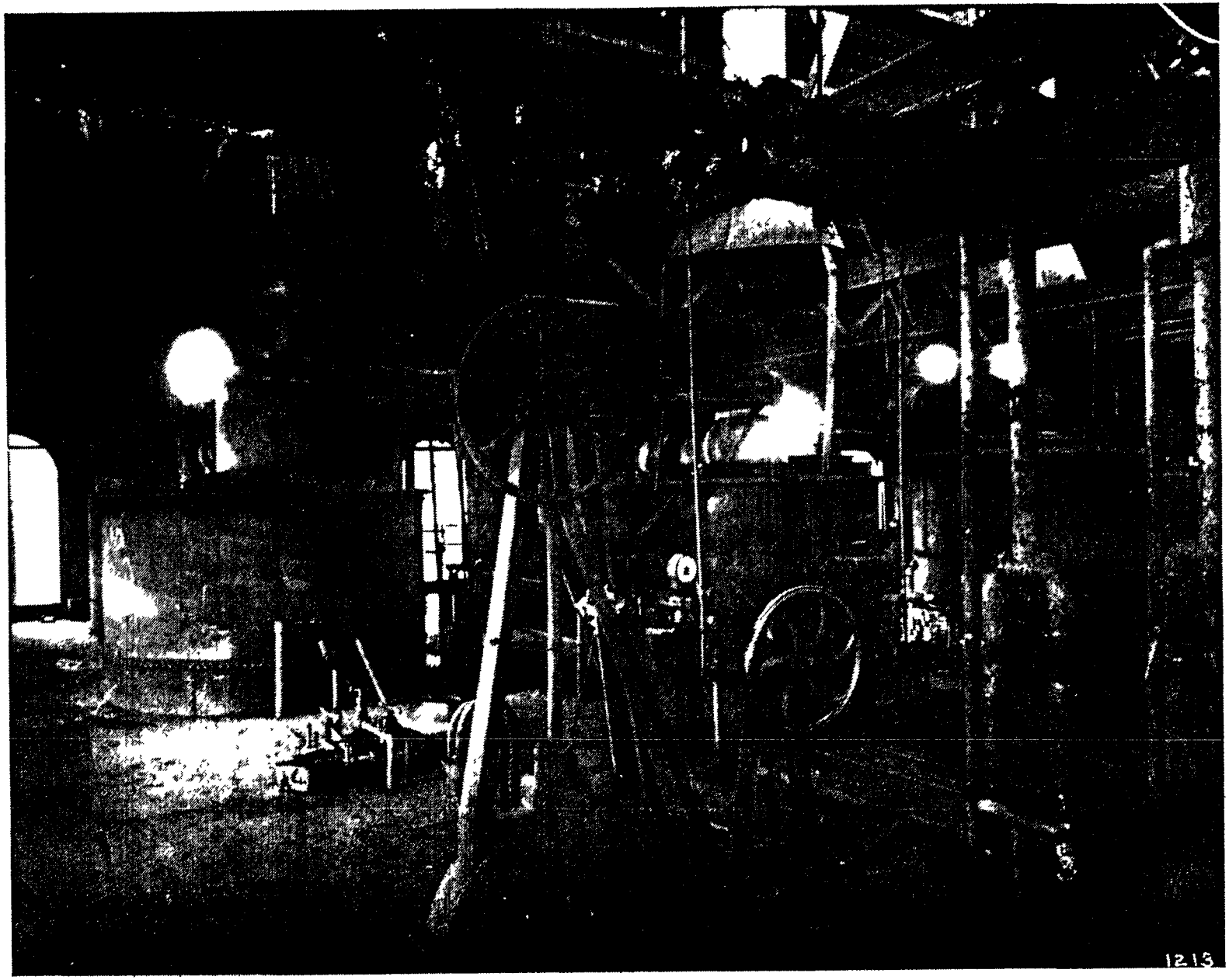

San Francisco Gas Plant (GG-SF-APT) - Photograph (#1213)

View of second floor generator room. Date and direction of view are unknown.

Figure 14

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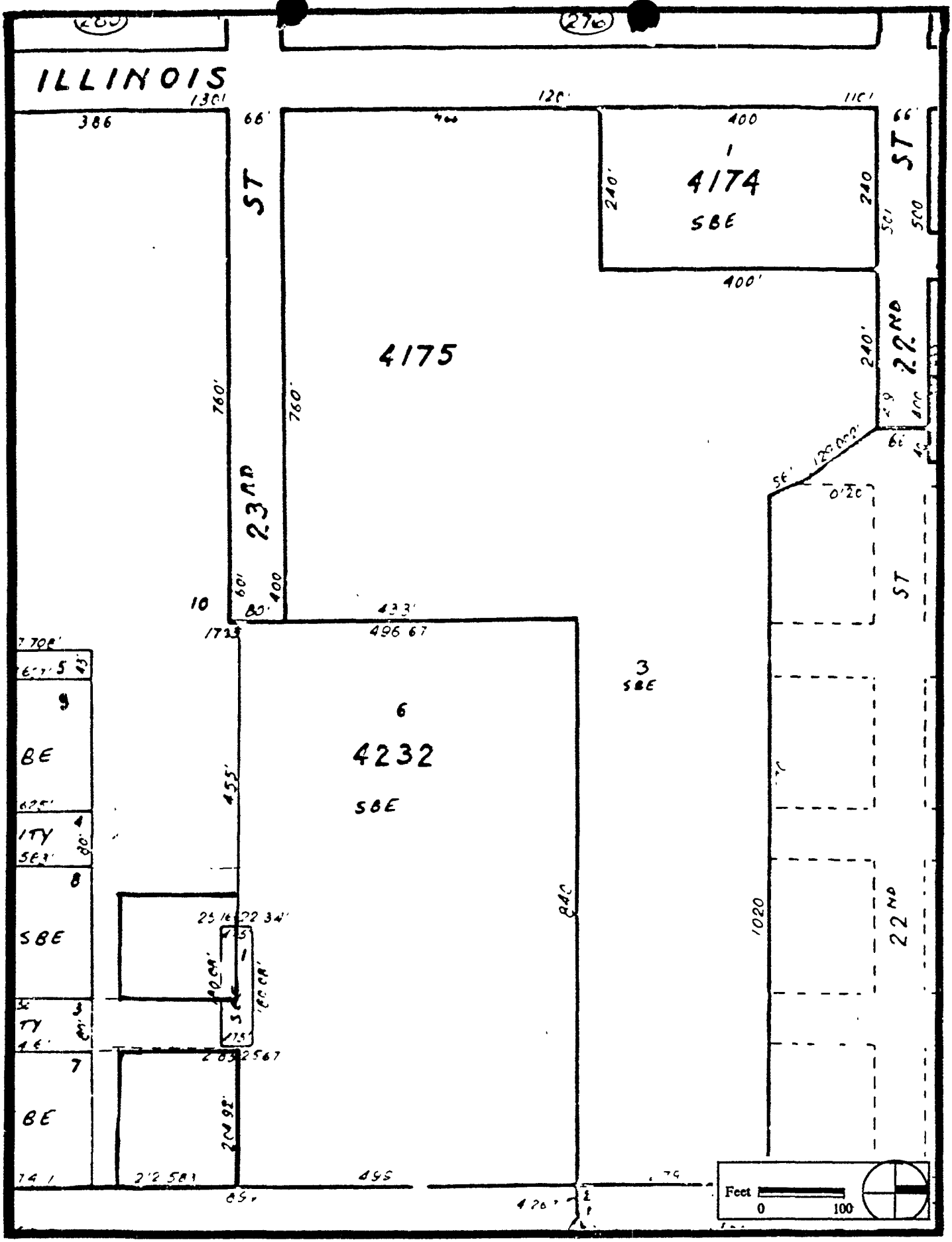
Figure 15



San Francisco Gas Plant (GG-SF-APT) - Assessor's Parcel Map