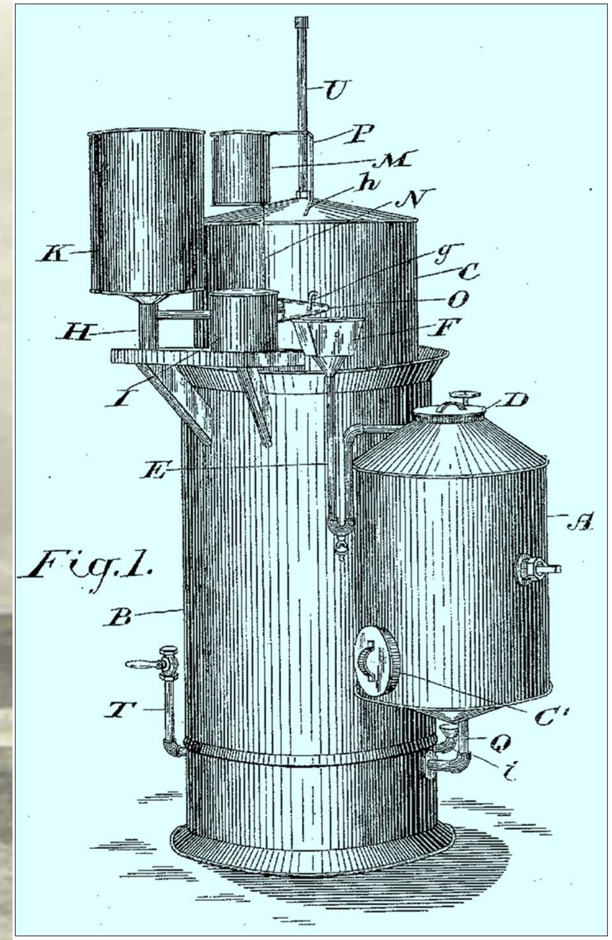
MANITOU

GAS COMPANY PLANT



David Butterfield
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St. Peter's Dynevor Windmill
John Gunn's Water Mill
Learys Brick Works
The James White Sash and Door Factory of Carberry

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On the Cover: View of the Manitou Gas Company Plant, ca. 1910 (left), and on the right the kind of generator used to produce acetylene gas.

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Introduction

AN UNASSUMING LITTLE BUILDING at the northwest edge of the Town of Manitou recalls a fascinating aspect of Victorian-era industrial history. In fact this modest building is unique – the last remaining example of a gas house in this province, the type of facility that once provided several Manitoba communities with street and building lighting as well as fuel for stoves.

At a time when smaller Manitoba communities were blossoming, buzzing with myriad industrial enterprises—flour mills, brick factories, lumber mills, amongst many others—there was a widespread optimism and even determination to make these new urban centres as sophisticated as any in the world. And enterprising town leaders were on the lookout for any new technology that would make their community completely up to date. One especially interesting and useful new technology, introduced in Western Canada in the early 20th century, was gas-lighting.

Beginning in the early 1900s, when the first such facilities were built in Manitoba, and concluding just 25 years later in the mid 1920s, when new electrical power utilities were embraced, gas houses and gas-lighting were a key feature of several Manitoba towns. This report provides a historical overview of the use of that technology, including its history in this province, and focuses on the last remaining vestige of that ingenious technology, the former Manitou Gas Company Plant, for a sense of how such facilities worked.

This report honours those enterprising pioneers, in Manitou and elsewhere. It also recognizes the sensitivity of current owners Les and Brenda Murdy, who allowed the writer so much access to this site, and who have maintained this important building so well over the years.

First Acetylene Gas Lighting in Manitou

Lighting in pioneer settlement circumstances typically involved candles, and as communities developed, kerosene lamps. Such portable lighting technologies were certainly welcome, but the opportunities gained from lighting that was more trouble-free, continuous and convenient was hard to resist, and when new gas-lighting proposals started being offered in Manitoba communities, there was great interest.

A slightly revised extract from the Manitou local history, *In Rhythm With Our Roots*, entitled "Light and Power in Our Community," by Garry Young (pages 127-28), provides a review of Manitou's first experience with the use of acetylene gas:

When St. Andrews United Church was built in 1903 (originally a Presbyterian congregation), it was decided to add a new technology to the building: a gas-lighting system. This apparatus was operated with a mechanical system that fed calcium carbide powder into water. The acetylene gas produced was fed through iron pipes to wall-mounted and suspended lighting fixtures.

The lighting worked well, and was a welcome innovation, until a frightening incident occurred during one of the first fall suppers held there. The gas pressure failed briefly due to a minor malfunction. A surge of gas was released before any lamps were relit, allowing gas to accumulate in the sanctuary. When someone struck a match, a minor explosion resulted. Fortunately, there were no injuries or damage, although an anecdote that has survived to this date suggests why many present remained suspicious of gas-lighting for some time after: Mrs. Miller, who was wearing an orange-red dress that night, was in the line of vision when the "Poof" happened, and appeared to be engulfed in flames as people looked up at the sudden blast.

St. Andrews United Church (originally Presbyterian), presumed to be in 1903 the earliest Manitou site where acetylene gas was used for lighting – supplied by a small, portable apparatus situated behind the church.

The Manitou Gas Company Plant

It was about three years after the St. Andrews church experiment with gas lighting that the community fully got behind the development of a municipal gas operation. Thus, in 1906, a company was formed to set up an acetylene gas plant and distribution system in Manitou. Those attending the annual meeting included John Wootton, President; R. J. Chalmers, Vice President; D. D. McTavish, Secretary-Treasurer; A.E. Lawton, Inspector and A. Henneberg, Manager, and a representative from the equipment company.

Again, from Garry Young's article, "Light and Power in Our Community," some basic facts about the facility are provided: The gas-producing plant was located at the northwest corner of Carrie and Ellis. A circular concrete cistern acted as a water reservoir over which an inverted metal tank accumulated acetylene gas generated by combining calcium carbide with water. Pete Speirs recalls helping his boyhood chums around 1920 to carry in sacks of calcium carbide in lump form. As a machine fed carbide into the system, gas pressure built up in the metal tank and passed through a system of iron pipes throughout most of the village, servicing many homes and businesses as well as the Normal School. Each customer had a meter installed to record consumption. A line made of 3/8 inch tubing supplied gas to wall and ceiling fixtures. Some customers owned two-burner gas stoves.

View looking to the west of the Manitou Gas Company plant, ca. 1915.

Operators of the utility included Charles Lawley and George Hodgson. They also tended the street lighting system. Lamp standards located at street corners had fixtures which could be opened with a long stick. A flint striker at the end was operated by a pull chain to light the lamps in the evening. They were extinguished at first light.

Dufferin Avenue in Manitou, showing gas light lamps, ca. 1915.

Example of a domestic gas lamp, showing the lamp and armature that provided gas to the light.

The Manitou Gas Plant in the News

The origin and operation of the Manitou Gas Company plant was occasionally featured in the local newspaper, the *Western Canadian*, and some of those entries are noted here for interest:

May 17, 1906:

- Material for new 'acetylene Gas Plant' arrives from Hamilton

July 26, 1906:

- Lighting installation complete with exception of installing meters and making connections (to be done by plumbers)
- Street Lamps – ten in number, in place, neat and attractive in appearance

June 13, 1907:

- Carload of carbide (enough for winter use) unloaded
- Mr. R.A. Wyllie, vice president and western manager of the Acetylene Construction Co. of St. Catharines, was in town yesterday attending a meeting of the local company. He considers the success of the venture here as beyond doubt as the number of subscribers to the system is such as to make it a profitable investment
- Under the present arrangements the Village Council is to pay the Manitou Gas Co $400 per year for the ten street lights, while the individual consumer will pay for what gas he uses at the rate of two cents per cubic foot
- At the end of one year from the time the plant is first in operation the Village has the option of purchasing the Company's interest
- First annual meeting of the shareholders of the Manitou Gas Company was held June 8, and a very satisfactory statement. The financial year ending Dec 31st (1906) made the present year a short one, as the company has only been in operation five months, having started to supply gas to the town Aug 1, 1906.
- The Company decided to sell the gas on a new basis…….$2.00 per 100 ft for the first 1000 consumed in any one month; above that it reduces the price to 1.80 per 1000

Early Gas Lighting

Gas lighting is the production of artificial light created by the combustion of a gaseous fuel, including hydrogen, methane, carbon monoxide, propane, butane, acetylene, ethylene or natural gas. Before electricity became sufficiently widespread and economical to allow for general public use, gas was the most popular means of lighting in cities and towns in Europe, in eastern North America, and eventually in Manitoba.

As artificial lighting became more common, desire grew for it to become readily available to the public. This was in part because towns became much safer places to travel around after gas lamps were installed in the streets, reducing crime rates. The first public street lighting with gas was demonstrated in Pall Mall, London on January 28, 1807 by Frederick Albert Winsor.

In 1809 the first application was made to the British Parliament to incorporate a company in order to accelerate the process, but failed to pass. In 1812, Parliament finally granted a charter to the London and Westminster Gas Light and Coke Company, and the first gas company in the world came into being. Less than two years later, on December 31, 1813, the Westminster Bridge was lit by gas.

By 1816, Samuel Clegg obtained the patent for his horizontal rotative retort, his apparatus for purifying coal-gas with cream of lime, and for his rotative gas meter and self-acting governor.

Coal Gas Lighting

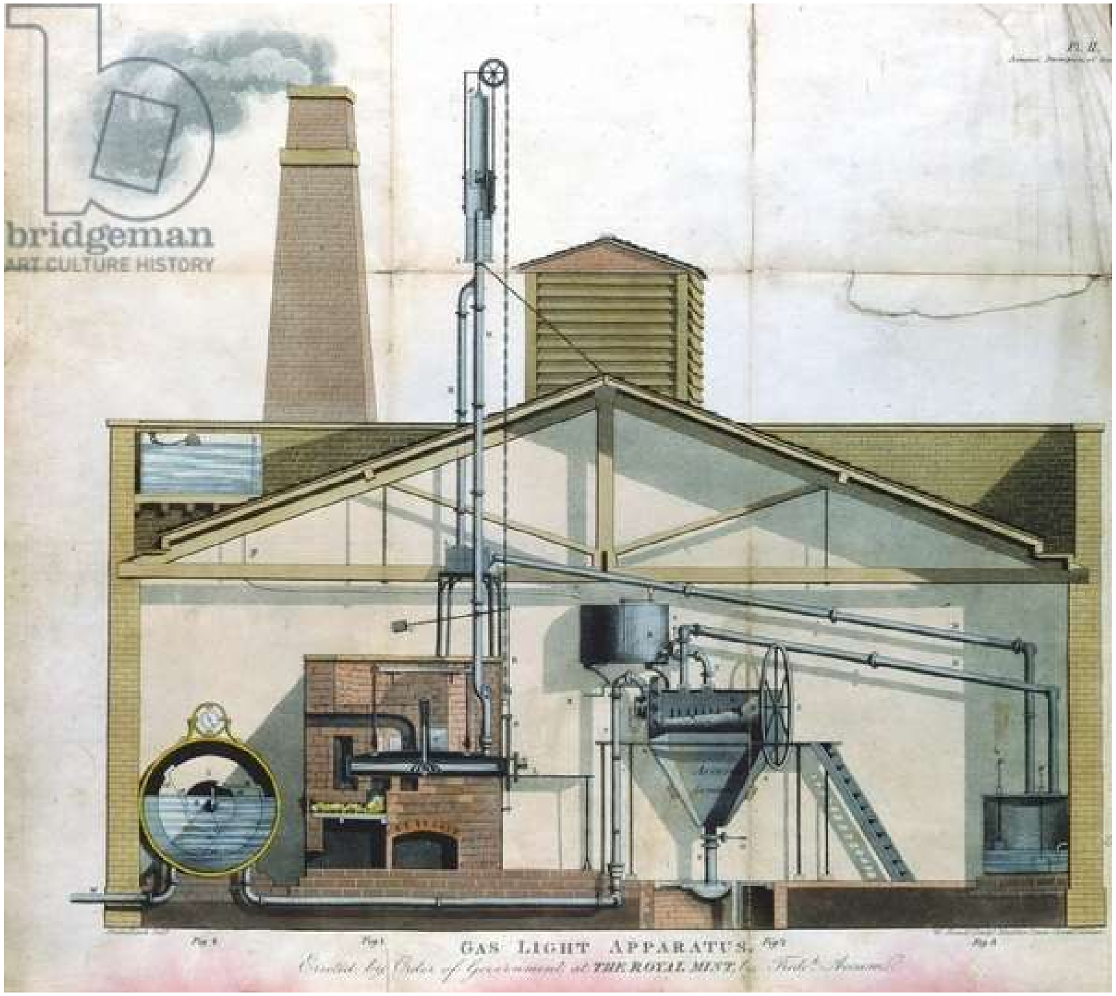
The most common and popular source for gas-lighting was from the use of coal. The basic process for making gas from coal used in the early 19th century remained essentially unchanged right through until the last coal gas works closed in the 1970s. Coal in a closed tube called a retort was heated in a furnace. The gasses given off—mainly hydrogen and carbon monoxide—passed through a water trap (hydraulic main) and were then cooled in a condenser, where tar and some other liquids were removed. The gas then passed through a purifier to remove sulphur compounds and other impurities before being used or stored in a gas holder. Later in the 19th century, steam driven exhausters were introduced to pump the gas through the gas works and into the mains system.

Originally, gas was only used for lighting for a few hours at the start and end of each day so it was soon realized that it would be more efficient to make gas over a longer period and store it. The first gas holders just consisted of a “bell” floating in a tank of water. Calibration marks on the floating bell showed how much gas was being made or used, so these devices became—and are sometimes still—wrongly called “gasometers.” Later in the 19th century, gas holders became larger and more sophisticated, with telescopic sections. Early gas pipes were generally made of cast iron with socket and spigot joints which were packed with hemp and sealed with molten lead.

By 1823, numerous towns and cities throughout Britain were lit by gas, derived mainly from coal. Gaslight cost up to 75% less than oil lamps or candles, which helped to accelerate its development and deployment. By 1859, gas lighting was to be found all over Britain and about a thousand gas works had sprung up to meet the demand for the new fuel. The brighter lighting which gas provided allowed people to read more easily and for longer. It is supposed that this new technology helped to stimulate literacy and learning, speeding up the Industrial Revolution.

Gas holder in West Ham, East London.

Lamplighter lighting a gas streetlight in Sweden, 1953. By this time remaining gas lamps were rare curiosities.



A small English coal gas production facility. This fine illustration suggests the complexity of equipment and processes of such an operation. The ladder shown on the right side of the drawing provides a sense of scale.

Acetylene Gas Lighting

A major innovation in gas lighting occurred around 1898 with the introduction of acetylene gas, which could be used for gas lighting on a small scale.

Acetylene was discovered in 1836 by Edmond Davy of Dublin, and in 1862 by Friederich Wohler, who found how calcium carbide reacted with water to produce acetylene. Acetylene's properties for lighting were known at that time, with observations about its illumination with a bright smoky flame. The problem was that it was extremely expensive and dangerous to produce.

In 1892, Canadian Thomas Willson discovered an economically efficient process for creating calcium carbide in an electric arc furnace from a mixture of lime and coke. The arc furnace provided the high temperature required to drive the reaction. In 1895, Willson sold his patent to Union Carbide, and using Willson's discovery the first plant for the manufacture of acetylene in North America was established at Niagara Falls. Another large plant was in operation at Hull, Quebec in the late 1800s. At these two points great water power could be had cheaply and the electric furnaces were constantly going in its manufacture.

Chunks of calcium carbide, the constituents used in the production of acetylene gas.

Calcium carbide is a chemical compound with the chemical formula of CaC2, and at least in industrial settings is produced in an electric arc furnace from a mixture of lime and coke at approximately 2000 C. The high temperature required for this reaction is not practically achievable by traditional combustion, so the reaction is performed in an electric arc furnace with graphite electrodes. The carbide product produced generally contains around 80% calcium carbide by weight. The carbide is crushed to produce small lumps that can range from a few mm up to 50 mm.

Thomas Willson

At a location in North Carolina, in his search for a more economical way to make aluminum, Canadian inventor Thomas Leopold Willson accidentally discovered the first commercially viable process for making calcium carbide, which is used for production of acetylene gas.

Thomas Willson, c. 1914

Willson was born on March 14 on a farm near Princeton, Ontario in 1860 and went to school in Hamilton. By the age of 21, he had designed and patented the first electric arc lamps used in Hamilton. He moved to the United States in search of opportunities to sell his ideas. In 1892 he discovered an economically efficient process for creating calcium carbide, which is used in the production of acetylene gas. In 1895, he sold his patent to Union Carbide.

In that same year, he married Mary Parks in California and moved back to Canada. He built a house for his mother in Woodstock, Ontario in 1895. During the years 1900 and 1901, he moved to Ottawa and opened carbide plants in Ontario (Merritton & Ottawa) and Quebec (Shawinigan). In 1911, he founded the International Marine Signal Company to manufacture marine buoys and lighthouse beacons that employed acetylene gas for their lighting operation.

Willson was the first person to own a car in Ottawa. In 1907 he built a summer house on Meech Lake in what is now Gatineau Park. The house is owned by the federal government, and was notable for being the site of negotiations on the Meech Lake Accord.

In 1911, Willson began experimenting with the condensation of phosphoric acid in the manufacture of fertilizers at a mill on Meech Creek. Due to this venture, and running out of capital, he lost nearly all of his estate to his creditor, American tobacco king J.B. "Buck" Duke. On December 20, 1915, Thomas Willson died of a heart attack in New York City while trying to raise funds for a hydroelectric project in Labrador. His dream was finally realized in 1974 as the Churchill Falls project.

Acetylene-Gas Lighting Technology

As noted, acetylene gas for lighting is produced by the reaction of water with calcium carbide. And once calcium carbide became readily available on a commercial basis, it did not take long for acetylene gas to become a popular aspect of lighting technology options in the late 19th and early 20th centuries.

The conventional process of producing acetylene in a lamp involved putting calcium carbide in the lower chamber (the generator). The upper reservoir was then filled with water. A threaded valve or other mechanism was used to control the rate at which the water was allowed to drip into the chamber containing the calcium carbide. By controlling the rate of water flow, the production of acetylene gas was monitored. This, in turn, controlled the flow rate of the gas and the size of the flame at the burner, and thus the amount of light produced.

Acetylene gas lamps were used to illuminate buildings, as lighthouse beacons, and as headlights on motor-cars and bicycles. Portable carbide lamps, worn on the hat or carried by hand, were widely used in mining in the early 20th century. This type of lamp generally had a reflector behind the flame to help project the light forward. An acetylene gas-powered lamp produces a surprisingly bright, broad light. When all of the carbide in a lamp had been reacted, the carbide chamber contained a wet paste of slaked lime (calcium hydroxide). This was emptied into a waste bag and the chamber would be refilled.

In residential and commercial situations, calcium carbide pellets were placed in a container outside the home or business, with water piped to the container and allowed to drip on the pellets, releasing acetylene. This gas was piped to lighting fixtures inside the house, where it was burned, creating a very bright flame.

Advertisement from the Union Carbide Gas Company for home carbide lighting, 1922. The text reads: "Before winter sets in, install Union Carbide Gas." The mother and son are bathed in bright light from the overhead lamp.

Manitoba Acetylene Gas Houses

In 1895 the first carbide plant in Ontario—Willson Carbide Works Company of St. Catharines—was built, with later plants at Ottawa and in Quebec, in 1900 and 1901. As noted above, Thomas Willson was the Canadian inventor who developed the process that allowed for the economical production of calcium carbide (1892) and in 1899-1900, acetylene gas (a product of calcium carbide) was the technology used in lighting plants for small urban and rural areas.

In 1903 Willson was instrumental in formation of the Acetylene Construction Company (of St. Catharines) which built town lighting plants in the Canadian Northwest. In towns, municipal franchises were held for ownership – installation and upkeep of plants was said to be comparatively minor.

The comfort the public had for acetylene-gas lighting was slowly gained, and in Western Canada a goodly number of gas plants came into use, gradually displacing kerosene lamp and early gasoline lighting systems. In Manitoba, there were 11 municipal acetylene gas plants, at:

- Birtle Operated by the Town of Birtle
- Virden Operated by the Town of Virden
- Waskada Operated by the Waskada Gas Company
- Kenton Operated by David Brown
- Gladstone Operated by the Acetylene Construction Company
- Carberry Operated by the Acetylene Construction Company
- Hamiota Operated by the Acetylene Construction Company
- Deloraine Operated by the Acetylene Construction Company
- Manitou Operated by the Acetylene Construction Company
- Souris Operated by the Acetylene Construction Company
- Morris Operated by the Acetylene Construction Company

This information was developed in 1914 by the Manitoba Public Utilities Commission, in its third annual report, and described by Mr. Hugh McNair, Gas Engineer, under the supervision of the Public Utilities Commissioner at the time, Mr. H.A. Robson, K.C.

Mr. McNair opened his report with the observation that "I have inspected the various acetylene gas plants in the Province which come under the jurisdiction of this Commission, and while the majority of them were kept in a clean and tidy condition and were operated with the greatest degree of safety, there were one or two plants which left a great deal to be desired, both in safety of operation and in tidiness. I noticed also that in a few cases calcium carbide was being delivered in larger quantities than could be accommodated in the store, with the result that about half of the shipment was left out in the weather. This was not desirable, and I have taken up the matter with Mr. A.E. Lawton, superintendent of the Acetylene Construction Company, which company operates the works where this took place, and I expect that he will put this matter right."

Mr. McNair noted in his report that "the plants, with a few exceptions, were in good order and well operated, but in a few cases some carelessness was shown in operation. While dealing with the acetylene plants, it should be stated that some of the hotels of the Province are equipped with acetylene or gasoline plants. I had no authority to inspect such plants, but I think that someone with a knowledge of gas operation should be given authority to visit such plants regularly, as they are frequently operated by porters or other persons who have no idea of gas plants of any description. Such plants, even if they are placed outside the main buildings are, if carelessly handled, a source of danger to life and property, and should certainly be inspected at least once every year."

Mr. McNair provided detailed observations about several of the operations in the 1914 report:

"The Carberry plant consists of one gasometer, 14 ft. 6 in. [diameter] by 12 ft. deep; one station meter, 100-light; one round dryer, 18 in. by 36 in.; one purifier, 2 ft. by 2 ft. by 1 ft.; one generator for handling granulated carbide, with a capacity of 1,000 feet of gas per hour. This plant is all housed in a brick building 35 ft. by 24 ft. and is kept in a tidy condition. The plant is all in good order with the exception of the generator, which is beginning to show signs of weakness at the plate round the spinale. The rule of "safety first" seems to have been pretty well observed here."

"The Deloraine plant is housed in a brick building 17 ft. by 22 ft., and consists of one gasometer, 12 ft. by 9 ft. deep; one 100-light meter; one dryer, 18 in. by 36 in.; one purifier, 24 in. by 24 in. by 12 in.; one generator for granulated carbide, capable of producing 1,000 cubic feet per hour. This plant is in good condition, is well kept, and the door is constantly kept locked, a thing which should be observed by more of the operators."

"The Gladstone plant is housed in a brick building 35 ft. by 24 ft. and consists of one gasometer, 16 ft. by 10 ft. deep; one 75-light meter; one dryer. 18 ft. by 3 ft.; one purifier, 2 ft. by 2 ft. by 1 ft.; two generators, having a capacity of 1,000 cubic feet per hour. This plant is in good condition, is well kept, and is operated with due regard to safety."

"The Morris plant is housed in a brick building 20 ft. by 30 ft. and consists of one gasometer, 12 ft. 6 in.. by 8 ft. deep; one 100-light meter; one dryer and purifier, 2 ft. by 2 ft. by 3 ft.; two generators one for large lump and one for granulated carbide, each generator capable of producing 1,000 cubic feet per hour. This plant is in good condition and well kept."

“The Hamiota plant is housed in a brick building, 32 ft. by 20 ft., and consists of one gasometer, 13 ft. 6 in. by 8 ft. deep; one 100-light meter; one dryer, 3 ft. by 1 ft. 6 in.; one purifier, 24 in. by 24 in. by 12 in.; two generators, one suitable for granulated and one for lump carbide, each capable of producing 1,000 cubic feet per hour. This plant is in good condition and has been well kept.”

“The Souris plant is housed in a brick building 24 ft. by 35 ft., and consists of one gasometer, 16 ft. by 10 ft. deep; one 100-light meter; one dryer, 18 in. by 3 ft.; one dryer, 2 ft. by 2 ft. by 3 ft.; one purifier, 2 ft. by 2 ft. by 1 ft.; two generators, one for granulated and one for lump carbide. This plant is in first-class condition and is kept clean and tidy. I have observed, however, that the door of the building where the plant is housed is frequently left unlocked. I called the attention of the operator to this, and he has promised to pay particular attention to this in future. This is also one of the plants where an excess quantity of carbide has been shipped to, and I noticed that some of the cans had become damaged in transit and quite a number of them had holes in them. As already stated, Mr. Lawton’s attention has been called to this.”

“The Manitou plant is housed in a brick building, 26 ft. 6 in. by 19 ft., and consists of one gasometer, 12 ft. 6 in. by 10 ft. deep; two dryers, 18 in. by 3 ft.; one purifier, 2 ft. by 2 ft. by 1 ft.; one 100-light meter; one generator for use with granulated carbide and having a capacity of 1,000 cubic feet per hour.”

“All the foregoing plants are operated by and are under the supervision of the Acetylene Construction Company of Brandon, and are visited frequently by their district superintendent.”

Other observations were made by Mr. McNair about plants at Birtle, Virden, Kenton and Waskada:

“The Birtle gas plant is owned and operated by the town, and is housed in a brick building 35 ft. by 24 ft. This plant is well kept and in good condition. I observed when visiting this plant that a gas bracket was installed in the generating house here, but I was assured that this was never used. I pointed out, however, that its presence was a temptation for someone lighting it at some time, with perhaps serious results. I therefore, advised its removal. The plant consists of one gasometer, 16 ft. by 10 ft.; one dryer, 18 in. by 3 ft.; one purifier 2 ft. by 2 ft. by 1 ft.; one generator, having a capacity of 1,000 cubic feet per hour. There is no station meter here, and I advised that one be installed so that a record could be kept of the gas manufactured, gas sold and gas lost in distribution.”

“The Virden gas plant is owned and operated by the Town of Virden and is housed in a brick house 24 ft. by 34 ft. and consists of one gasometer, 16 ft. by 10 ft.; one combination dryer and purifier, 2 ft. by 2 ft. by 3 ft.; one round dryer, 18 in. by 3 ft.; one 100-light meter; two generators, one for lump and one for granulated carbide, and each having a capacity of 1,000 cubic feet per hour. The plant is well kept and in good condition, and due regard is paid to the “safety first” rule.”

“The Kenton plant, when visited, could not be said to be in good condition. The owner was out of town when I called, and I was shown the plant by a young lad who stated he operated it in the owner’s absence. I found an open fire set close up against the generator here, and had anything gone wrong with this generator and the gas had escaped, there would without doubt have been a serious explosion. I ordered the boy to have the fire taken out at once and to inform the owner that it was not to be installed in the same building again. Your order, No. 133, has since covered cases of this kind.”

"The Waskada plant was in anything but well-kept condition. The door was not locked, and the whole place had a neglected appearance, and, in fact, was in such a condition that I did not care to go round the various units of the plant to get particulars of them. I hope, however, to find both this plant and the one at Kenton in much better condition on the occasion of my next visit, now that the operators know that they are under inspection. I impressed upon Mr. McLean the necessity of keeping the doors continually locked and the plant in such a condition that it could be inspected conveniently at any time."

While repetitious in his observations, Mr. McNair's detailed descriptions of these 11 sites provides important clues for an understanding of the Manitou Gas Company plant. In general terms, it can be observed that all plants were housed in a brick building, often about 20 x 30 feet in plan. All featured one gas holder (called by Mr. McNair the gasometer, including the concrete cistern in the excavation under the plant). The gasometer was on average about 12 to 16 feet in diameter and 8 to 10 feet deep – it is not clear if this latter dimension was for the depth of the cistern or for the complete depth of cistern and equipment, a key point that will be explored later in this report. Manitou's gasometer was average in this regard; the largest were those at 16 foot diameters and 10 foot depths, at Birtle, Gladstone, Souris and Virden.

Other standard pieces of equipment in each of the gas houses included:

- one 100-light meter – used to measure record of gas manufactured, sales and losses
- two dryers, 18 in. by 3 ft. – a pressure vessel used to absorb moisture in the gas
- one purifier, 2 ft. by 2 ft. by 1 ft. – a vessel likely with two wire mesh frame networks to remove impurities from the gas, and to avoid a litany of safety and odour problems
- two generators, one for granulated and one for lump carbide; most with a capacity of 1,000 cubic feet per hour for gas production

Anecdotal information is also available for some of these plants from associated local histories and newspapers.

From *The Virden Story* for example comes this recollection: “The next innovation, on a scale that assured success, was the introduction of acetylene gas. The first mention of it appears September 15th, 900, when J. A. McLachlan and E. M. Conroy appeared before the council to ask permission to lay pipes for acetylene gas, one to two feet underground for lighting certain parts of the streets. In 1902 there was a reference to McLachlan and Conroy offering their plant for sale and in the following year a public meeting of ratepayers was called to consider the advisability of corporation ownership of an Acetylene Gas Plant, and of borrowing $5,000.00 for the purpose. A by-law was passed later authorizing a loan of $6,000.00. Negotiations followed. Claims of the old company were assigned to the "Acetylene Construction Co." of St. Catherine's, Ontario, represented by a Mr. Wylie. John Cain received the contract for pipes and fixtures. Five light posts were installed, at the corner 6th and Wellington, 8th and Queen, 9th and Queen, Raglan and 7th, Nelson and 9th. Mr. Huston, hotel keeper, bought his own light post. Charge per street light per year was $25.00. On October 23rd, 1903, Mr. Jesse C. King notified Council that the Acetylene Gas Plant was now ready and being used by the town. As time went on, more street lights were added, and a familiar sight as darkness fell was W. C. Lidington with his long-handled lighter walking briskly from post to post bringing some degree of light to the dark streets. Beginning at about 11 p.m., he made the same rounds again, leaving the streets in darkness. Those who lived in residential suburbs such as Quality Hill and Poverty Flats made their way about at night as best they could. Electric torches were coming into use, but the faithful old lantern was still doing duty. The first gas plant was accommodated on the site of the present W. A. Bridgett store. Then it was moved to the small brick building by the creek at the corner of Nelson and 9th, from that time known as the Gas Works, which housed it during the remaining years that it functioned.”

From *Deloraine Scans a Century* the following three anecdotes suggest the convenience and potential danger of gas plants:

"I remember Charlie Stevens, the town policeman. All kids under sixteen years of age would have to be home at nine-thirty - curfew time - or C Stevens would want to know what was doing in the park. Then he would be sure we were home. Charlie Stevens lit the gas lights on each street corner in the town. He did not have to use a sparkling stick as he could reach any lamp in town, being six feet six inches in height. He also ran the gas works. One day, when he was making the gas, which was a mixture of carbide and water, an explosion occurred nearly blowing up the whole town. It did blow the top off the plant and Charlie lost one eye in the blast."

"Peter Green also was the operator of the local gas producing plant which supplied gas to a number of residents and businesses of the town as well as approximately twenty-eight gas-lit street lights. As a point of interest these street lights were hand-lit each evening, and turned off at approximately 11:00 p.m. each night. It was approximately a three mile trip around to light or turn off the lights. They were not usually lit on a bright moonlight night. In the later twenties he also was the operator of the local gas producing plant."

"Part of the town was shaken at an early hour when the acetylene gas plant of the Revere House [hotel] exploded. Robert McKibbin, porter of the hotel, was killed, and the bartender, Ed Harrison, badly injured. The northwest part of the building is a complete wreck, and the buildings in the near neighborhood considerable damaged. All windows in the new stores in the Montgomery Bros. block were blown out. Thos. Anderson intends to repair the front part of the hotel and remove the ruins from the back.

A newspaper report from 16 July 1898 recounts the activities in Morden, where a portable acetylene gas operation was developed:

“Acetylene gas machines for its production are arousing a lot of interest at this year’s fair. A short time ago this gas was regarded as a somewhat dangerous experiment, but now that is practical utility and safety are being ably demonstrated by its very general use as a bicycle light and by its adoption on many large buildings in preference to both electric light and gas, the choice of the best machine for its manufacture becomes a live question. The machine manufacture by the Morden Acetylene Gas Machine Co. of Morden has some points of merit over its competitors, especially in the way the water is fed to the carbide much of the efficiency and economy of the light depends. It is on this very point that the Morden Acetylene gas machine is superior to others. The patent automatic feed preserves a uniform light without any personal attention. With Mr. Garrett the manager of the Morden Acetylene Gas machine Co [sic], the manufacture of Acetylene [sic] gas has long passed the experimental stage for there are over 75 of these machines in actual use in churches, stores and dwelling houses all over the country. Without a single exception these are giving the utmost satisfaction and Mr. Garrett receives many letters testifying to the economy, cleanliness, safety and general efficiency of the Acetylene [sic] light plants furnished by his company.”

It is possible that the portable gas plant that served Manitou’s St. Andrews Presbyterian Church in 1903 (see earlier in this report) came from the Morden factory, given that it was just 20 miles to the east.

Operation of an Acetylene Gas Plant

There are no readily available historic images of municipally-sized carbide-acetylene plants. In fact, the exterior photograph of the Manitou plant seems to be the only image in Manitoba of such a place. And there are no images of the interiors of such facilities. Moreover, there are no local descriptions of the technical aspects of the plant operations, nor are there any readily available archival resources in Manitoba, or in fact in other likely Canadian locations, that illustrate or even describe how such plants functioned, at least in their details.

This section has been developed with some known resources pertaining to domestic-scaled acetylene production units, with the expectation that evidence and observations about key features and aspects of the technology can be used for an exploration of the operation of the former Manitou Gas Company plant.

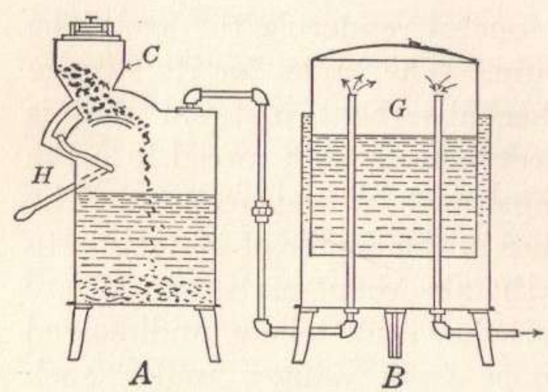


FIG. 209.—Diagram of a carbide-to-water acetylene-gas generator.

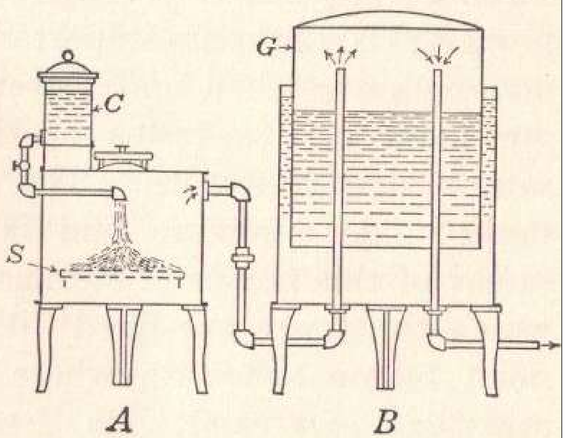
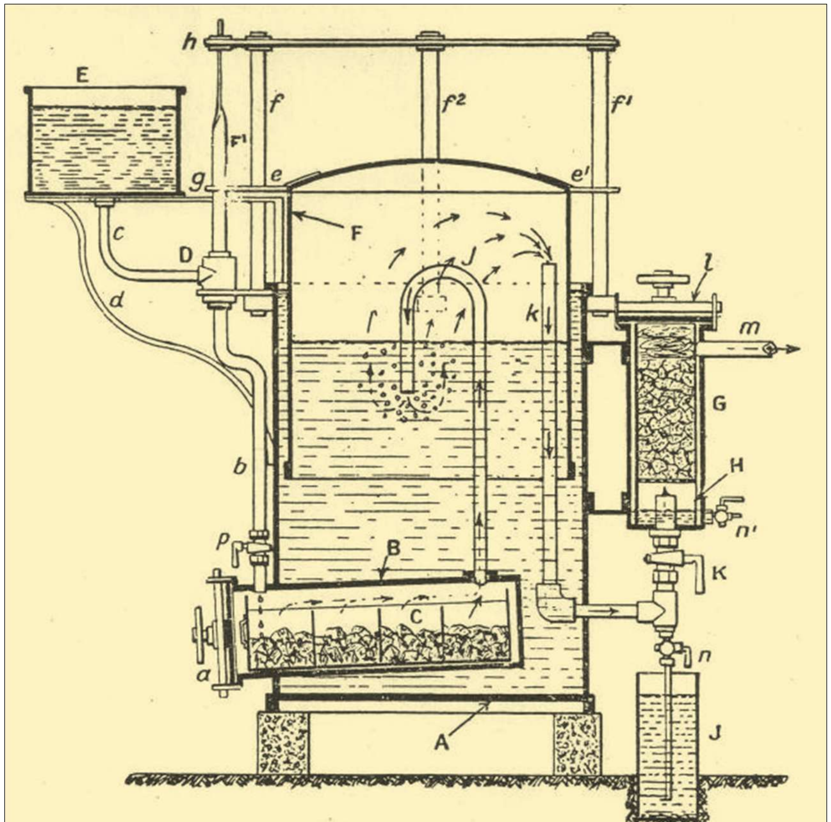


FIG. 210.—Diagram of a water-to-carbide acetylene-gas machine.

These basic illustrations show two potential acetylene gas operations, and identify a few notable aspects of nearly all production facilities for the creation of the gas. In each drawing there are two major pieces of equipment – two large vessels with clearly different functions and linked by piping. It is understood that these drawings are schematic, and thus are not to scale and do not suggest relative sizes of equipment or details.

On the left side of each drawing is a chamber where calcium carbide is mixed with water to form acetylene gas (in one by adding carbide to a tank of water and in the other by adding water to a small pile of carbide). And on each right side is a slightly larger chamber where the resulting gas is stored, brought there by the pipes joining the two main vessels.

Further reading on the subject suggests that the latter configuration for gas production, in which water is added to a supply of calcium carbide (i.e., Fig. 210), was the more common practice.

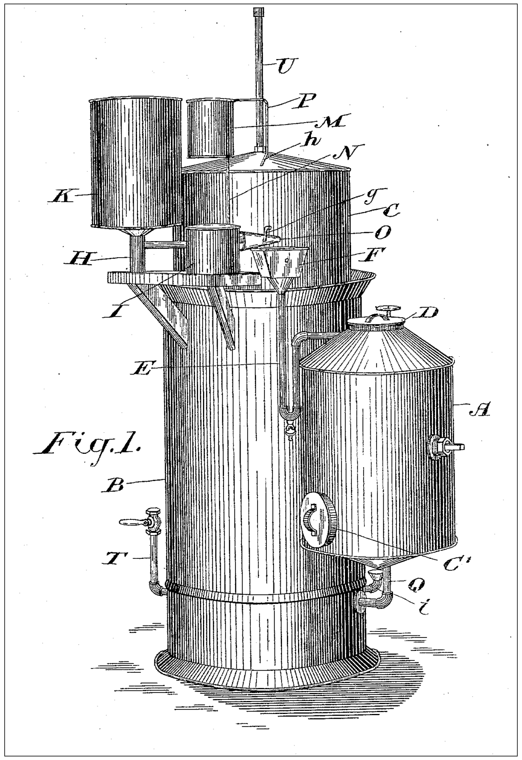


Acetylene. Fig. 1. Diagram illustrating the working parts of a Gas plant

This illustration was not analyzed in detail for this project – it is far too complex and of little relevance for an understanding of the operation of the Manitou plant.

It is included merely to suggest the enormous complexity and ingenuity that was brought to bear on this particular aspect of gas-lighting technology and production. It is impressive and humbling just to pause for a moment and consider such a drawing, and imagine the amount of intellectual energy and determination brought to bear on a subject whose moment of utility was over in Manitoba in just 25 years.

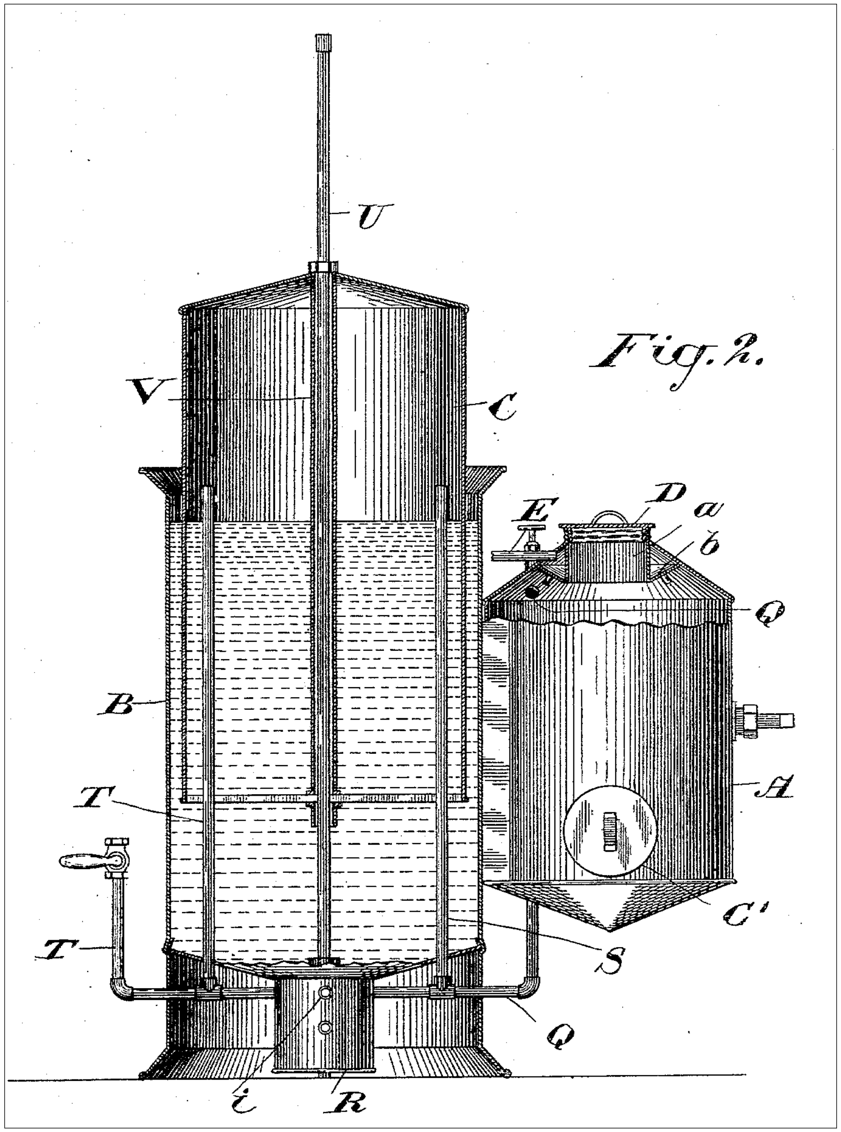
The following archival images and accompanying specifications have been the most useful for an understanding of how the Manitou Gas Company plant was organized, what equipment was used, how each piece functioned, how each piece likely looked, and how the gas production process proceeded from start to finish.



This information is from patent materials developed in January 1898 by Harold J. Bell of the Niagara Falls Acetylene Gas Machine Company, for what was termed a "new and Improved Apparatus for the Production and Storage of Acetylene Gas." All materials are presented in full in an appendix to this report.

Mr. Bell's apparatus was for a "portable" unit, typically used for a large building, and thus not for a municipal-lighting venture such as at Manitou. But the principles and descriptions here help very much as an understanding of the Manitou operation is pieced together.

In this perspective drawing, there are two main pieces: the large tank of the gas-holder, on the left (often called the gasometer), B, where gas was stored; and the generator, A, attached to the gas-holder and quite a bit smaller. The plethora of other pieces, and other letters identifying those pieces, are not immediately relevant to a basic understanding of gas production and storage, the two key functions of the apparatus.

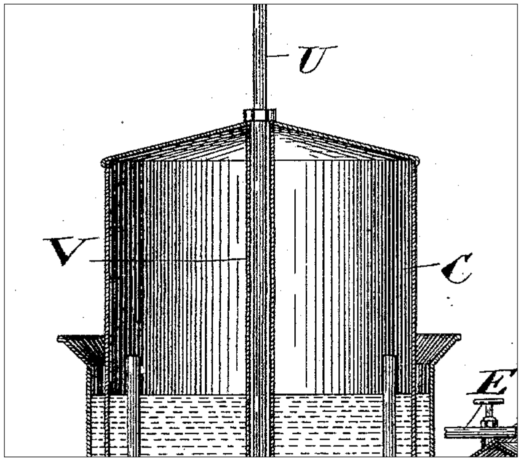


The sectional drawing of Mr. Bell's apparatus is even more instructive about the basic nature of acetylene gas production, and of the placement and functions of the generator and the gas-holder.

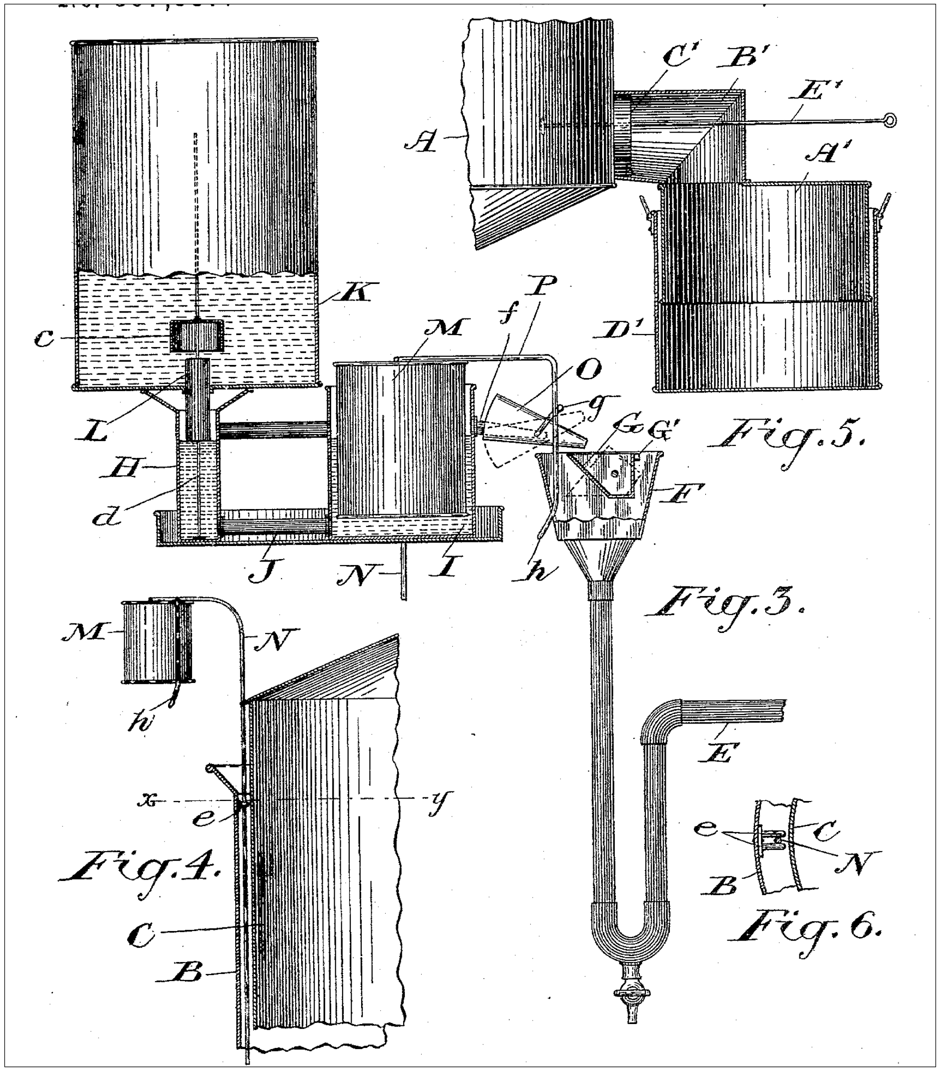
It is in the generator (A) where acetylene gas is produced, from mixing calcium carbide with water. From this tightly enclosed vessel the resulting gas flows through a pipe (marked Q, at the base of the generator) and into other pipes beneath the gas-holder (B).

It is at this point that a major salient point about this apparatus, and any gas-production apparatus (including the one at Manitou), must be understood – and this drawing conveys that perfectly. In section it is apparent that the gas-holder actually consists of two pieces, a lower cylindrical chamber filled with water and a slightly smaller cylindrical crown (C) stabilized with a shaft (U). It is to this crown that the gas produced in the generator flows through the arrangement of pipes. The two schematic drawings presented earlier show exactly the same procedure and equipment arrangements.

A more focused view of the crown (right), and its situation within the gas-holder, makes this key piece of the operation more easily understood. While the production of the gas is straightforward, it is how that resulting gas is stored that calls for an interesting and elegant solution, one used in nearly any gas-producing operation, be it generated from calcium carbide or coal: the operation needs to have a vessel that contains the gas, allows for it to be expended and replenished, holds it safely, keeps it from being diluted from contact with air, and most importantly ensures that it does not leak – creating a dangerous combustible situation and of course losing value for the gas company. It is noted in historic sources for such operations that water will dissolve its volume of acetylene if intimately mixed, but if the acetylene rests on top of the water, the top layer of water becomes saturated and prevents the gas from penetrating farther.



A simple analogy for this feature involves two glasses, one larger than the other, and a quantity of water. The larger glass is filled to about three-quarters of its height with the water and the smaller glass is inverted and submerged into the larger glass so that no air is contained within it. This is the essential situation with the gas-holder, with the crown in place of the smaller glass. And following further with this analogy, the produced gas is piped to the crown, which in this inverted and enclosed situation is capable of rising as gas is introduced and falling as gas is expended. The water in the lower vessel acts as a perfect seal for the operation, and because it does not react with the gas, ensures that all the gas produced is available for use. In fact that water feature of the operation is critical – providing a flexible, consistent and renewable seal.



One final drawing from Mr. Bell's "new and Improved Apparatus for the Production and Storage of Acetylene Gas" (left) focuses on the intricate pieces of equipment that were designed and positioned to ensure that the amount of gas produced was controlled, and that the storage and distribution from the gas-holder crown were also regulated.

These parts of the apparatus also ensured nearly automatic feeding and control of the whole gas production process. A careful reading of the specifications from the patent application (featured in the appendix) is required to fully appreciate the carefully considered actions and results of this part of the design. It need only be noted here that the design is sensible, elegant and efficient.

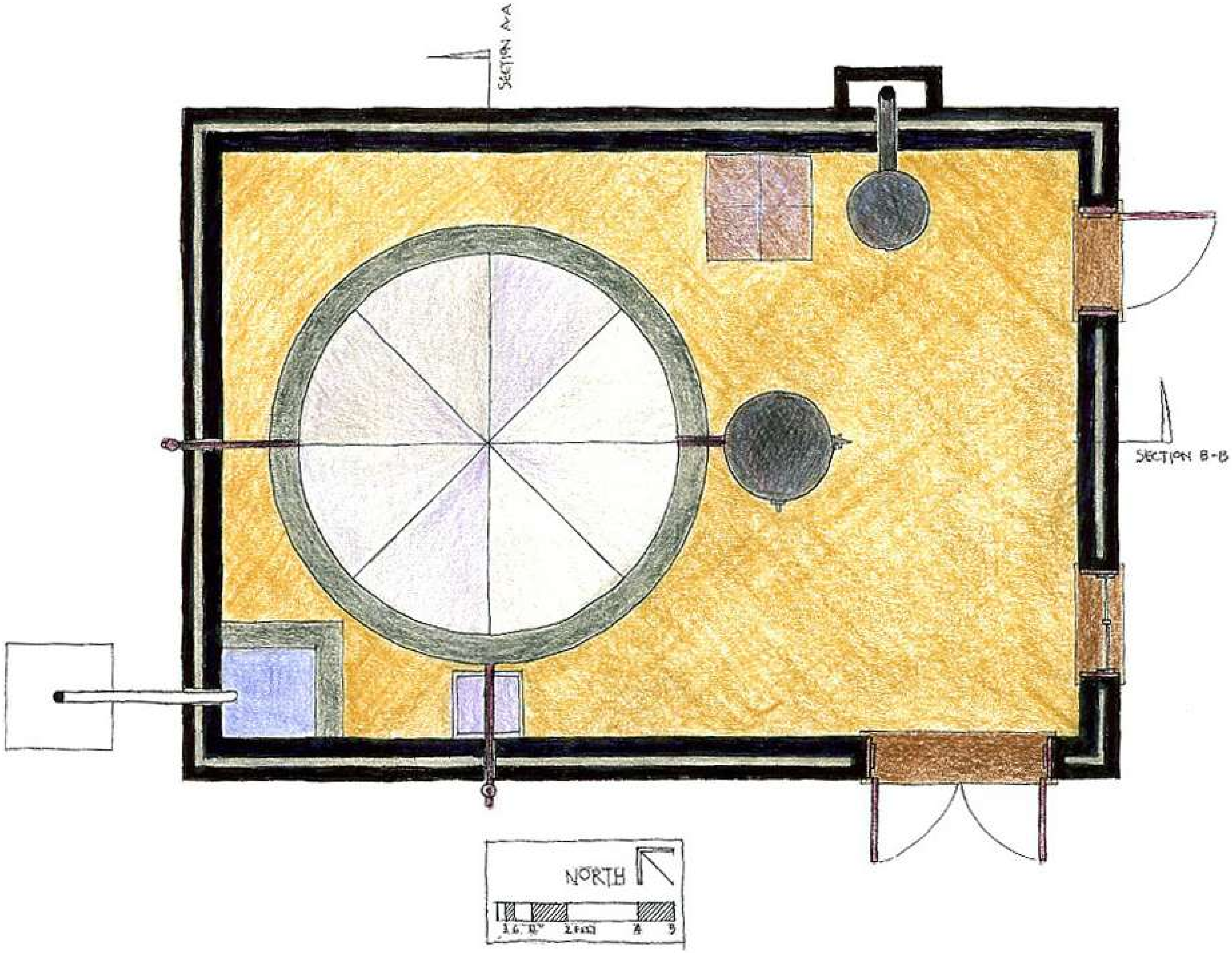
Operation of the Manitou Gas Company Plant

As noted above, the absence of photographic images and descriptions of technical operations of a municipally-sized acetylene gas plant has meant that the description of the Manitou facility is slightly conjectural. At the same time, there is enough physical evidence at the site, some personal recollections, and sufficient research as noted in the previous section, to fairly confidently approximate what this place looked like, and how it operated during its working life, from 1906 to 1926.

This section is focused on three drawings that have been developed for this project – a plan and two cross sections showing placement of features and operations. The development of these drawings required regular review of the information gathered in earlier sections of this report, to place known facts and presumptions about acetylene gas house operations against the physical reality of the building and the remaining features and details from its original function. The narratives that accompany each drawing focus on key parts of the building and the operation, and together should be seen as fairly accurate description of a municipal acetylene gas operation – and of a fascinating aspect of Manitoba's early industrial history.

This part of the report has relied greatly on the architectural historians of the Historic Resources Branch. The author is grateful for the advice and assistance of Nicola Spasoff and David Butterfield, who have proved knowledgeable and patient as this important aspect of the project was developed.

Plan



Plan

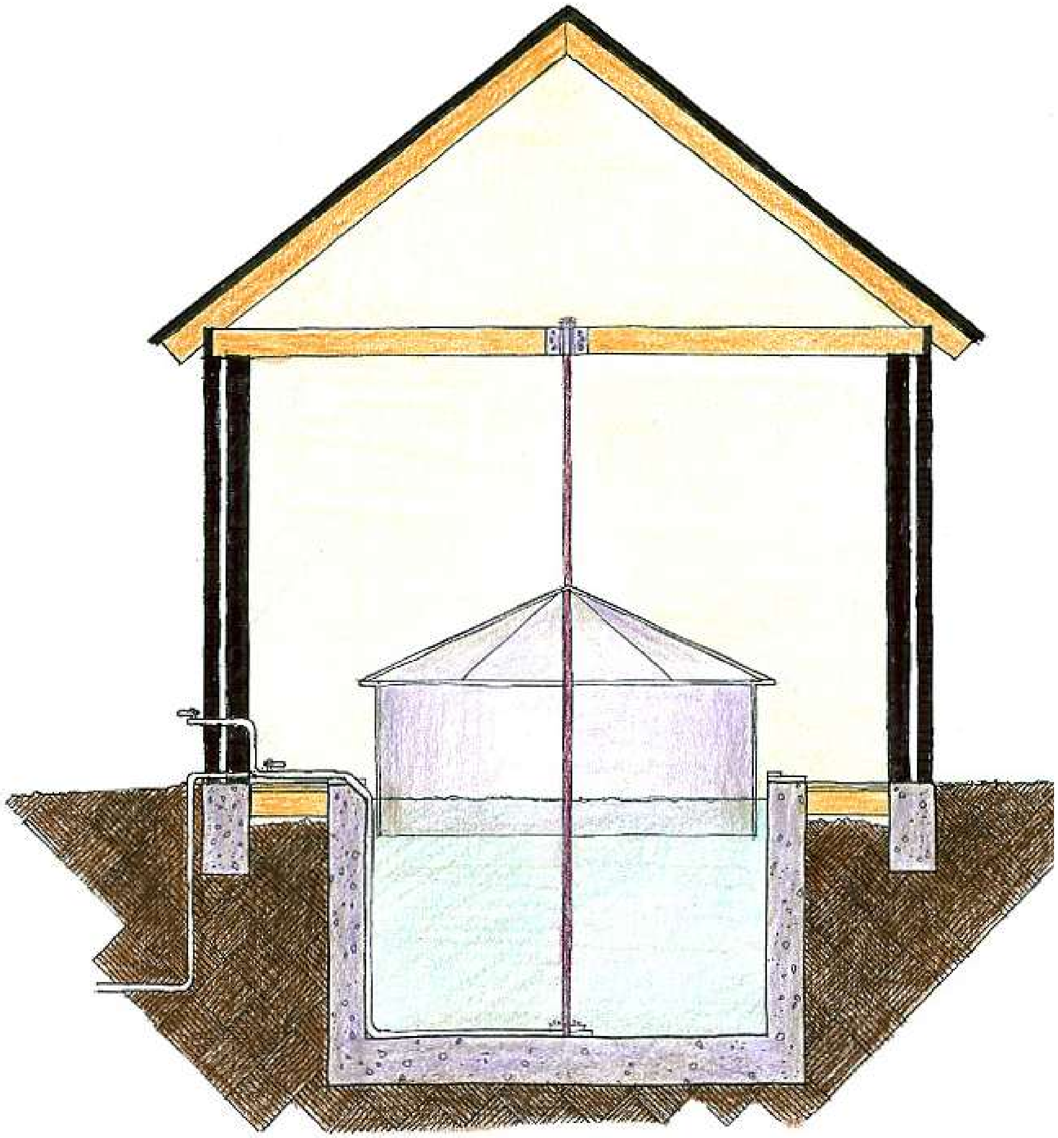
Certain facts about the building are known from the historic record, and from corroboration from site investigations. It was a small building, measuring 19 feet by 26 feet six inches. The gasometer included a circular concrete cistern measuring 12 feet six inches in diameter, with a wall thickness of one foot. The building was faced with brick, possibly from a yard in Morden. The cistern was at the western end of the building, leaving a large work area at the east end for other necessary apparatus required for the plant's operation: one purifier, one 100-light meter, one generator for use with granulated carbide, and two dryers.

Measurements and information provided by current owners add to the record: the walls are approximately 18 inches thick, comprised of facing brick, approximately a six-inch air space and an interior wall of concrete blocks of about one foot thickness. The foundation was of poured concrete. The single surviving photograph of the main face of the building shows one door and two large windows, the one opening into the main floor space quite low to the ground. Traces of a two-door opening on the south side of the building are still visible in the application of the current stucco covering. There was a fairly large brick chimney on the north side. A water well and windmill were located just outside the plant at the southwest corner. Well water was collected in the main building in a small squarish cistern, about four feet by three feet.

All of these facts have been developed for this drawing. Certain other aspects are conjectural, especially regarding the placement and appearance of the generator, purifier and dryers. Given information developed above, and the application of some common sense, it is supposed that the generator (where the acetylene gas was produced) was near the cistern, and likely convenient to the dryers – we have placed it to the east of the gasometer, with the understanding that the gas would be more efficiently distributed into the hood of the gasometer in this position. The hood of the gasometer is shown here as the faceted top of the cistern,

The purifier, which was designed to remove noxious chemicals from the process, was likely placed at the south edge of the building, where the gas was moved before being distributed to the town. As an aside, it is noted in the historic record that acetylene gas possesses an offensive odor similar to decayed garlic, and so penetrating that one part of gas in ten thousand of air was distinctly noticeable – a valuable property, as by it leaks could be known long before they became dangerous. When the gas was burned after passing through a purifier and in a proper jet, there was no odor.

The placement and appearance of the dryers has eluded us – we surmise that they would have been close to the generator but also likely close to the stove that was vented by the chimney (at the northeast corner of the building) so that the heat could be used in the drying process.



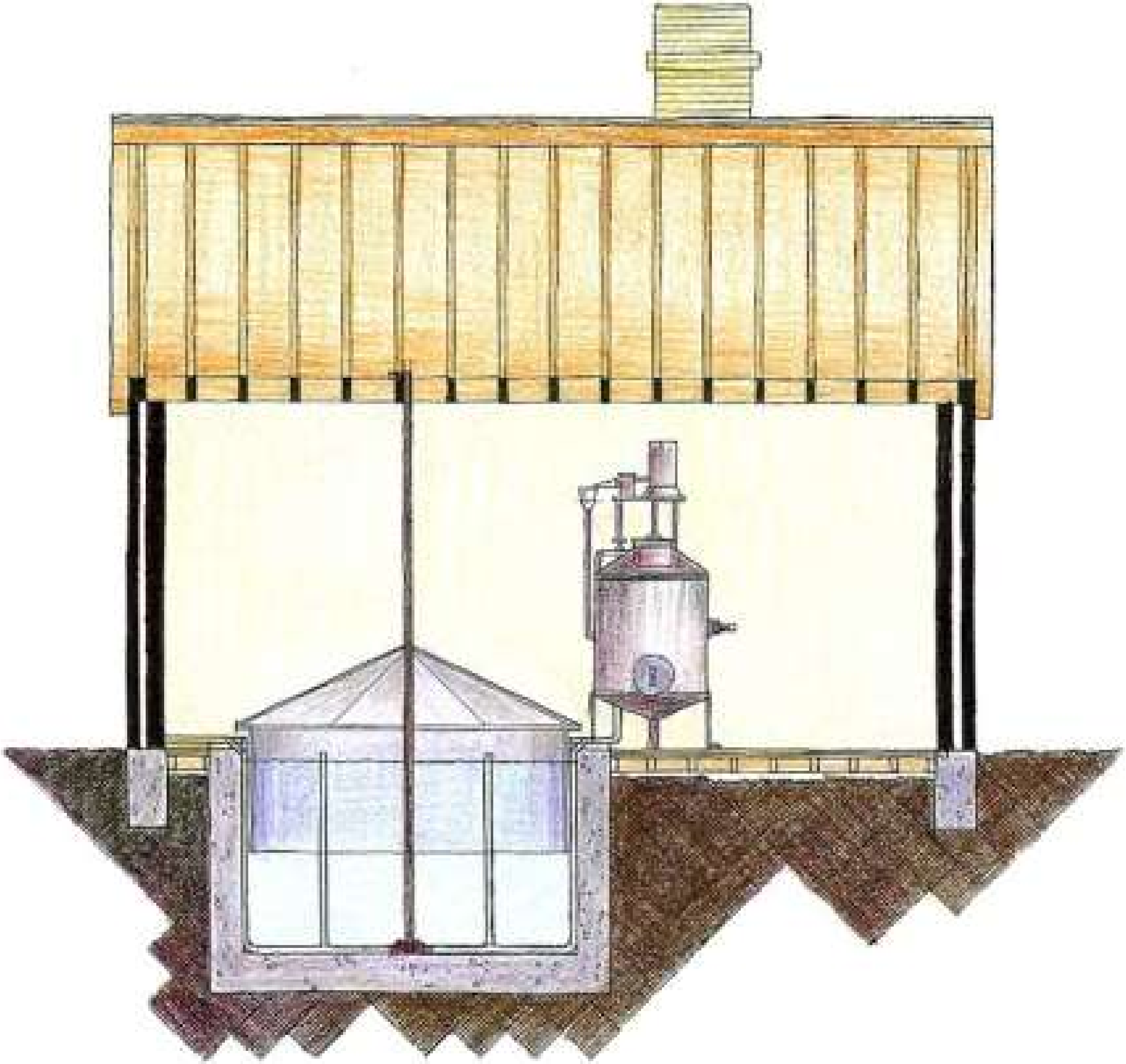
Section A-A
The scale for this drawing is the same as for the plan.

Section A-A

This vertical section through the building's western end shows a key aspect of the plant's operation: the position of the cistern that formed the lower part of the gasometer and the position of the hood (or crown) that fit into the vat, and which was used to enclose and retain the acetylene gas. It is notable that the observations cited earlier in this report from Mr. McNair, the inspector of gas plants in the province, included the specific measurement of the gasometer as 10 feet deep. In fact the Manitou cistern is six feet six inches deep, so it is assumed that the original measurement also included the height of the crown – thus about four feet. It is known that this part of the apparatus featured a shallow hood and was faceted. Research also suggests it rose and fell as gas was supplied or expelled, and so there is an assumption that there might have been a three to six inch clearance in the cistern for the hood, and that it likely was secured with a rod that ran from the bottom of the cistern to one of the joists in the roof structure. In this drawing the hood is presented near its highest point, with a large quantity of gas having been introduced. It is possible that a pulley and chain or rope system allowed the hood to be raised independent of gas production, for inspection and cleaning of the cistern. It is important to remember that the water in the cistern acted primarily as a seal to enclose the gas in the hood, and secondarily as a benign agent holding the slightly volatile acetylene gas from contact with air in this small space.

Some helpful hints developed in various handbooks for the operation of an acetylene gas plant include:

- Carbide should be kept in air-tight cans and stored in a dry place.
- The generator should be situated in a place where the water will not freeze.
- All pipes should be very carefully tested for leaks. A leak can be found by putting soapy water in the suspected part. Never hunt for a leak with a light.



Section B-B
The scale for this drawing is the same as for the plan.

Section B-B

This section through the middle of building on its long side shows the two key features of the gas plant: the gasometer (with cistern and hood) on the left and a conjectural suggestion for the generator to the right. This latter feature is based on drawings presented above by Harold J. Bell of the Niagara Falls Acetylene Gas Machine Company. The generator in that smaller, portable apparatus is here scaled for the larger municipal situation at Manitou. Other aspects of Mr. Bell's water-feeding system are included here as well. In this drawing the hood of the gasometer is low, to suggest its appearance at the onset of a gas production cycle.

Some selections from an article on operation for a "Good Stationery Acetylene Generator for House Lighting" help in imagining the daily workings of the Manitou plant:

- Generators must be entirely automatic in their action – that is to say after a generator has been charged, it must need no further attention until the carbide has been entirely exhausted.
- The various operations of discharging the refuse, filling with freshwater, charging with carbide and starting the generator should be so arranged that it is not possible to do them out of their proper order.
- The operations mentioned above must be so simple that the generator can be tended by unskilled labor, without danger of accident.
- The pressure should remain equal in all parts of the machine, and must never exceed that of a six-inch column of water.
- There must be a convenient way of getting rid of the slaked carbide without escape of gas.
- When the lights are out, the generation of gas should cease.
- The gas should be delivered to the burners clean, cool and dry.
- Heat of generator must not exceed two hundred degrees Fahrenheit.

Last Days of the Manitou Gas Plant

The Manitou Gas Plant opened for operation in 1906, and was a going concern for 20 years, until 1926. In 1927 it all changed, and Pete Speirs, in Manitou's local history, *In Rhythm With Our Roots* (page 73), recounted the arrival of electrical contractors from Winnipeg to begin wiring the many homes and businesses, spelling the end of gas lighting in Manitou:

"One [of the electrical] contractors [to arrive in Manitou in 1927] was Bubbs Electric, which is still operating in Winnipeg. Instructions were left with their contractor as the Speirs family were going East for a holiday. On their return they found their home as well as many others converted from gas to electricity. Some customers were able to afford electric hot plates or ranges, toasters and clothes irons and radios. However, many customers found it difficult to pay for their electricity during the Great Depression and used their lights sparingly.

"In the late 1930s electric refrigerators and, later, deep freezers became available, making it much easier to store meat and vegetables. Incandescent street lamp fixtures had replaced the gas light standards and were strategically located on utility poles.

"In the late 1940s and early 1950s the first mercury vapor street lights were installed by Manitoba Power Commission, later Manitoba Hydro. Unfortunately the first mercury vapor lights gave everything a purple hue. Later on bulbs which supplied clearer illumination were installed and in the late 1980s high pressure sodium units were installed offering greater efficiency; these were made for Manitoba Hydro by Lovell Electric in Manitou.

"The rural area had to wait another twenty years for electrification. In 1946 plans were made to extend service to Kaleida, with the construction of a three-phase line south from the existing substation at the intersection of PTH #3 and PR #244 south to the correction line, east 2 1/4 miles, then south, then east, then south once more to the Village of Kaleida, providing light and power to the residents, stores and grain elevator.

“Farmers with yardsites located within five-wire spans or less from the main line were given a chance to sign up. Most took advantage of the opportunity. However, owing mainly to a shortage of transformers, power was not delivered until the fall of 1947. With the passing of *The Rural Electrification Act* in the Manitoba Legislature, a bold initiative was launched to provide hydro electric power to most of rural Manitoba.

View from the southeast of the former Manitou Gas Company plant. Recognized by the Town of Manitou for its heritage value, the building received a plaque in 2012. After the plant ceased operations in 1926 it was converted for use as a dairy operation by Mr. and Mrs. Jacob Frank Marten. Today, much enlarged and renovated, it is the home of Les and Brenda Murdy.

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Sources

Wikpedia
(Gas Lighting, Acetylene, Calcium Carbide, Thomas Wilson, Lighting Systems) –

Manitobia
"The Rhythm With Our Roots"
"The Story of Manitou", Vrooman, C.H. p.73

Legislative Library
Following articles found under index of terms – ie Manitou, gas lighting, etc.
"A Heritage of Light" Lamps and lighting in early Canadian Home, Loris S. Russell, Chpt 11, Light the Gas, p. 287, Acetylene Lighting, p. 299
"Gas Power Age", Vol 11, Aug, 1910, p. 29; Acetylene for Commercial Lighting
"Gas Power Age", Vol 11, No. 3, Sept 1910, p.
"Gas Power Age", Vol 11, Nov 1910, p. 53
"Mb Public Utilities Commission" – Annual Reports 1914, p. 122

Provincial Archives - (Sept 17th)
Fire Underwriters Map of Manitou – shows location of Acetylene plant – digital photograph
With Assistant – searched Government Keystone Archives – located document "Manitou Gas Company Ltd" – it is located offsite - pulled and copied.

Bette Mueller
Western Canadian – May 17, 1906
Material for new 'acetylene Gas Plant' arrived from Hamilton
Western Canadian – July 26, 1906
Western Canadian – June 13, 1907

Appendix

Following is the specification text and three drawings developed by Harold J. Bell, of Niagara Falls, Ontario in 1898 for an "Improved Apparatus for the Production and Storage of Acetylene Gas," (applications also for British Letters Patent, No. 19,411, of August 23, 1897). This is the material that was used above to help understand the operation of the Manitou gas plant.

DESCRIPTION
(No Model.) 3 Sheets-Sheet 2.
H. J. BELL.
AGETYLENE GENERATOR.
No. 597,987. Patented Jan. 25,1898.
Lax-N u i II In In Q Wimesses [TO/611501 (No Model.) 3 Sheets-Sheet 3. H J BELL
AOETYLENE GENERATOR.
No. 597,937. Patented Jan. 25,1898.
WCMeases UNITED STATES PATENT rricn.
HAROLD J. BELL, OF NIAGARA, CANADA, ASSIGN OR TO THE NIAGARA FALLS ACETYLENE GAS MACHINE COMPANY, OF SAME PLACE.
I AcETYLENE-e EN ERATO R.

SPECIFICATION forming part of Letters Patent No. 597,937, dated January 25, 1898. Application filed August 12. 1897.

To all whom may concern.-

Be it known that I, HAROLD J. BELL, temporarily of the town of Niagara Falls, in the county of W'elland and Province of Ontario, Canada, have invented a certain new and Improved Apparatus for the Production and Storage of Acetylene Gas, (for which I have applied for British Letters Patent, No. 19,411, of August 23, 1897,) of which the following, is a specification.

The object of my invention is to devise a machine for generating and storing acetylene gas which will be simple in construction and effective in operation; and it consists more especially in an improvement in the means of feeding measured quantities of water to the generator and in such other details of construction as are hereinafter more particularly described and then definitely claimed.

Figure 1 is a perspective view of my improved machine. Fig. 2 is a vertical cross section of the same. Fig. 3 is a sectional elevation of the water-feeding device on a larger scale. Fig. 4: is a sectional detail showing the means for supporting the float of the water feeding device. Fig. 5 is a sectional detail showing the means for withdrawing the lime from the machine, and Fig. 6 is a section through the line a: y in Fig. 4.

In the drawings like letters of reference indicate corresponding parts in the different figures.

A is the generator, which may be of any approved form, although I prefer the one shown in the drawings, which has the screw-top D; B, the tank of the gas-holder, and C the dome of the gas-holder. A short cylinder at extends through the top for the admission of carbide. An annular plate 12 connects the cylinder with the conical top of the generator. This plate is perforated and provided with suitable teats for the discharge of the water upon the carbide.

E is the water-supply pipe, which enters the space above the plate I), as indicated in Fig. 2. This water-supply pipe is provided with a suitable trap and petcock and terminates in a small water-tank F, within which is journaled the tip-tank G, provided with a stop G. This tip-tank G is journaled at a point which is above and to one side of the center of gravity when empty and below and to the other side of the center of gravity when filled, so that when it becomes full it will, owing to the change of the center of gravity, automatically tip into the position shown in dotted lines in Fig. 3 and empty, thus discharging its contents into the tank F. When it empties, it instantly

assumes its normal position, as shown in full lines in Fig. 3, and to maintain it in said position when empty the above mentioned stop G is provided.
Supported upon a tray suitably connected to the tank B are the water-chambers H and I, suitably connected by a pipe J, so that the water-level will always be the same in each.

K is a closed water-holder having a short pipe L extended from its lower end within the water-chamber H, the bottom of the holder normally resting upon the flaring top of the said chamber. From this construction it will be seen that the water-level in the chambers H and. I will always be maintained at the level of the lower end of the pipe L. In order to prevent the contents of the holder escaping when it is being placed into position or removed, I connect a cap 0 to a wire 02, extending through the pipe L and resting upon the bottom of the chamber II. When the holder is raised, the cap drops over the upper end of the pipe L, and thus prevents the escape of water. The lower end of the wire is preferably provided with a small button to prevent injury to the bottom of the chamber.

M is a displacer or displacement-float carried by a rod N, connected to the dome O of the gas-holder. This rod preferably extends down the side of the dome and passes through the guide 6, connected to the inside of the tank B.

Extending from the side of the water-chamber I is the discharge-spout f, opening into the chamber slightly above the normal level of the water therein.

0 is a conical sleeve journaled upon the spout f and provided with a crank-arm g, whereby it may be rocked. When in the position indicated in Fig. 3, the sleeve 0. will discharge any liquid passing from the spout into the tip-tank G. When, however, it is dropped to the position shown in dotted lines in Fig. 3, the water in the spout will flow into the tray supporting the water-chambers. This device prevents any leakage passing into the chamber and thus generating an undue quantity of gas.

In order to operate the sleeve 0, I connect a wire P to the displacer M and bend a portion thereof to form an inclined plane h. When the dome is raised, the sleeve is in the position shown in Fig. 1. When the gas is nearly exhausted and the dome falls to its lowest position, the incline 77. engages the crank g and tilts the sleeve into the position shown in Fig. 3. At the same time the displacer M descends into the water-chamber I and displaces a portion of its contents. The water so displaced flows through the spout f and sleeve 0 into the tip-tank G, which becomes filled and then tips and discharges its contents into the generator.

The object of interposing the tip-tank between the chamber I and the generator is that unless the measured quantity of water displaced by the displacer be discharged in bulk into the generator an insufficient quantity of gas would be generated to raise the displacer from the water-chamber I and unless the displacer is so raised the water-level in the chamber II will not drop sufficiently to permit of the discharge of a further quantity of water from the water-holder K.

Q is the gas-exit pipe from the generator, which passes to the safety-trap R, and need not be further described. From the pipe Q a vertical pipe S ascends above the water-level in the tank B. The gas-supply pipe T, running to the house, is also connected With the safety-trap R.

U is a vertical rod connected at its lower end to the tank B. The upper end of this pipe extends through an opening in the top of the dome O.

Vis a sleeve connected to the top of the dome and extending around the rod U. T is sleeve extends downwardly to the bottom of the dome and is suitably braced thereto. The rod U thus forms the vertical guide for the dome O, which is held from turning by the construct-ion shown in Fig. 4, which has been previously described.

2' is a pipe extending outside the safety-trap B, through which the trap may be filled as found necessary.

In Fig. 5 is shown the device for removing the lime from the machine without creating a disagreeable dust and odor. A cylinder A with a closed top and open bottom is provided. From an opening in the top extends an L-shaped pipe B, which is adapted to fit closely about the wall of the opening 0. A scraper E extends through the vertical wall of the L-shaped pipe B, and which may be used to rake the lime from the generator through the pipe 13 and cylinder A into any suitable receptacle, such as D.

From the above construction it will be seen that I have devised a very simple and efficient acetylene gas generator and holder in which measured quantities of water may be discharged with great precision into the generator and in which absolute immunity is insured from any undue generation of gas caused by water leakage. It will also be seen that I have devised efficient means for removing the lime from the machine without causing any annoyance and for the introduction of both water and carbide at the same point at the top of the machine.

It should be mentioned that in Fig. 3 the displacer M, as shown, is dropped very low in the water in the chamber 1, as it would appear when the carbide is almost exhausted. Under ordinary circumstances its position would be so adjusted that its fall will only displace enough Water to fill the tip-tank G once, or, at most, twice. In the same figure it will be noticed that a petcock is located at the bend of the U-trap in the pipe E. The outer limb of this trap is longer than the inner, as, owing to the pressure of gas in the generator, the water always stands higher in the outer limb. When the generator is open and the pressure removed, this extra water will flow back into the generator and cause a generation of acetylene gas, which goes to waste. By putting a petcock in the trap the extra water can be drawn off when the generator is open and all waste avoided.

What I claim as my invention is:

1 In a machine of the class described, a generator and a water-supply tank therefore, a tip-tank interposed between said water-tank and generator and arranged to deliver measured quantities of water to the said generator in combination with a displacer

controlled by the supply of gas and arranged to enter said tank and discharge a portion of its contents, substantially as described.

2. In a machine of the class described a generator; a water-supply pipe for the generator; a tank discharging into said pipe; a tip-tank journaled in said tank and a water chamber adapted to discharge into said tip tank in combination with a displacement float controlled by the supply of gas and adapted when the gas supply is low to enter the water in the said chamber and discharge a portion of its contents substantially as and for the purpose specified.

3. In a machine of the class described a generator; a water-supply pipe for the generator; a tank discharging into said pipe; a tip-tank journaled in said tank; a waterc hamber; a spout for said chamber; a suitably journaled tilt-able sleeve surrounding the said spout; and means for automatically tilting the said sleeve to discharge into the said tip-tank when the gas-supply is low or to waste when the supply is large; in combination with a displacement-float controlled by the supply of gas and adapted when the gas supply is low to enter the water in the said chamber and discharge a portion of its contents substantially as and for the purpose specified.

4. In a machine of the class described a generator; a gas-holder; a-pipe connecting the generator and gas-holder; a water-supply pipe for the generator; a water-chamber; a spout for said chamber adapted to discharge into said pipe; a suitably-journaled tilt-able sleeve surrounding the said spout; a crank arm connected to the said sleeve; a rod connected to the dome of the gas-holder and formed with an inclined plane to engage the said crank arm in combination with a displacement float connected to the dome of the holder, and adapted when the gas supply is low to enter the water in the said chamber and discharge a portion of its contents substantially as and for the purpose specified

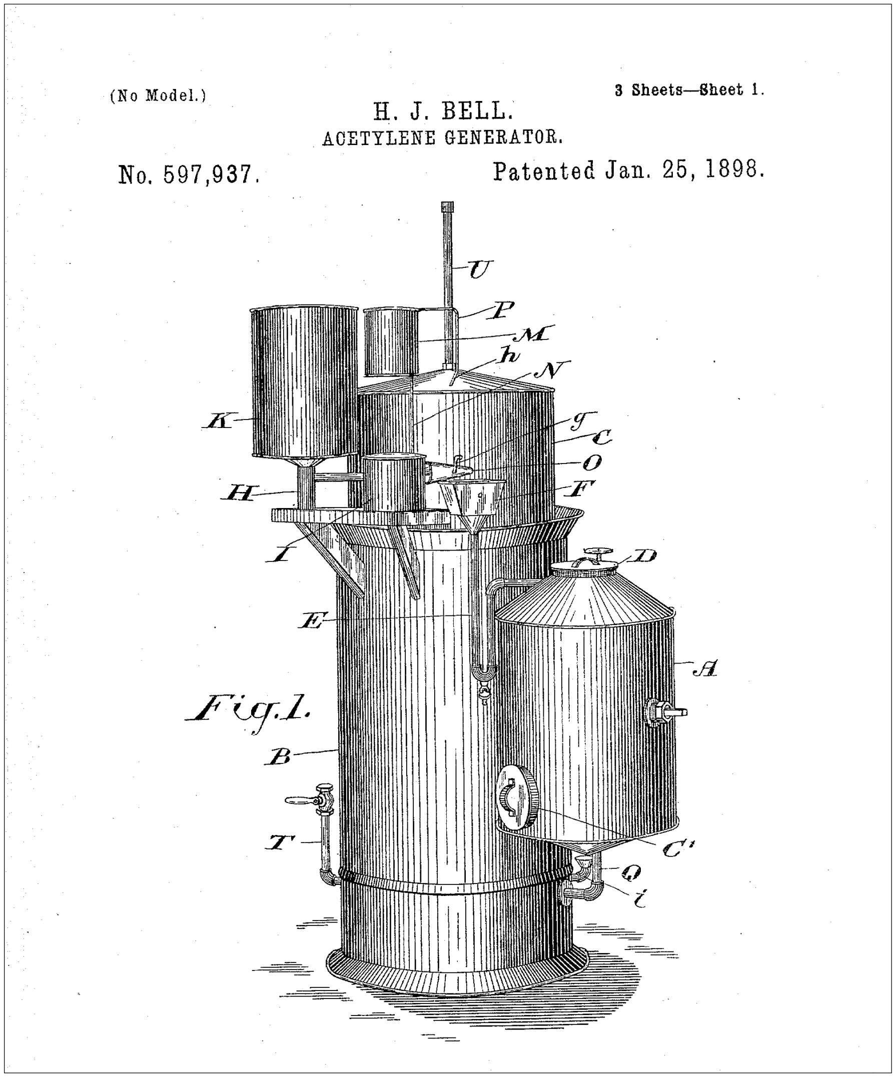
5. In a machine of the class described a generator in combination with a cylinder having an open bottom and an upward L- shaped extension adapted to fit the wall of the lime-opening of the generator; and a scraper-rod passing through an opening in the vertical wall of the L-shaped extension substantially as and for the purpose specified.

6. In a machine of the class described the generator A, having a1in1e-opening G,for1ned therein in combination with the cylinder A, with a closed top and open bottom; the receptacle D, fitting closely about the cylinder A g the L.-shaped pipe 13', extending from initially as and for the purpose specified.

7. In a device of the character described, a water tank, a displacer coacting therewith and arranged to displace water therefrom by entering therein, a generator, a pipe to convey the water from said tank to the generator, a gas holder and tank, a guide connected with the holder-tank, a rod secured to the gas-holder and moving therewith and passing through said guide, the said rod supporting the said displacer at its upper end, whereby the said rod, through its guide and connections with the gas-holder, maintains the said water-tank and displacer in their relative positions, substantially as described.

8. In a generator a short cylinder extending through the top of the generator and provided with a suitable cap in combination with a perforated annular plate extending from the side of the cylinder to the generator so as to enclose an annular water space; and a pipe communicating with the said space substantially as and for the purpose specified.

Toronto, August 6, 1897.
HAROLD J. BELL.
In presence of- J. Enw. MAYBEE, A. J. COLBOURNE.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3 Sheets—Sheet 1.
H. J. BELL.
ACETYLENE GENERATOR.
No. 597,937.
Patented Jan. 25, 1898.
Fig.1.
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(No Model.)

3 Sheets—Sheet 2.

H. J. BELL.

ACETYLENE GENERATOR.

No. 597,937. Patented Jan. 25, 1898.

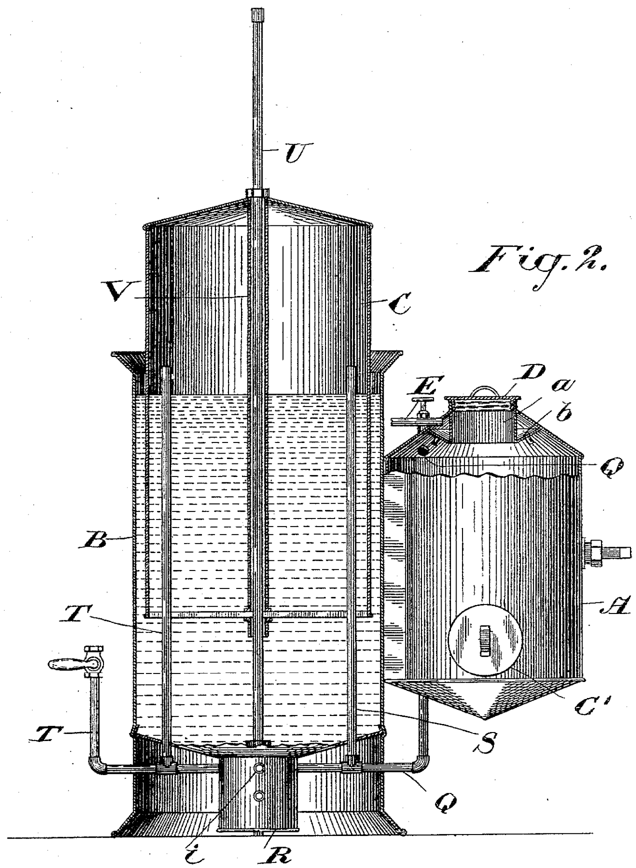

Fig. 2.

(No Model.) 3 Sheets—Sheet 3.

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ACETYLENE GENERATOR.

No. 597,937. Patented Jan. 25, 1898.