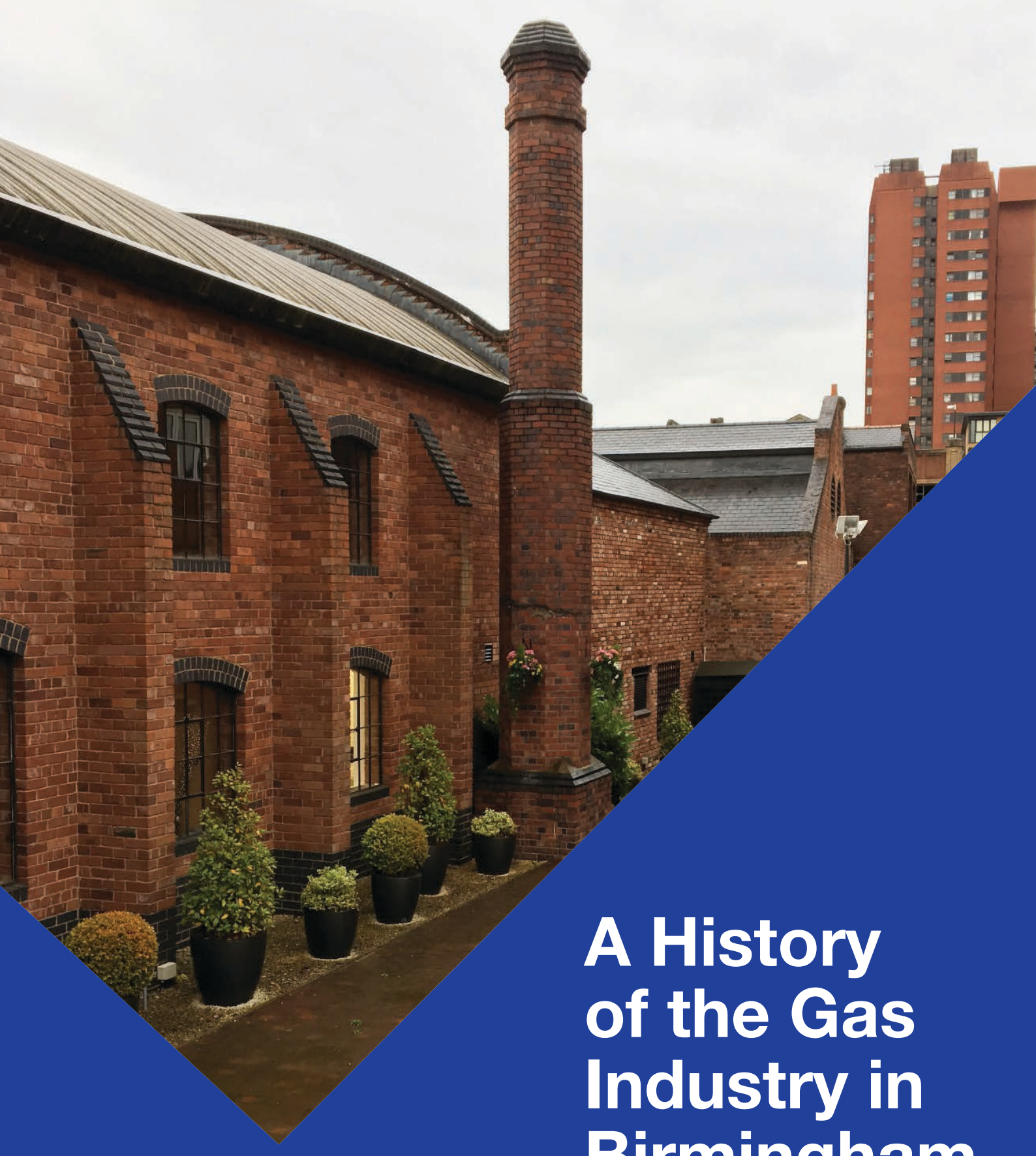

A History of the Gas Industry in Birmingham

By Prof. Russell Thomas

nationalgrid

Preface

This booklet has been written to commemorate the long association Birmingham has had with the gas industry. It coincides with the removal of the gasholders at Windsor Street – the last surviving gasholders in the city. The booklet describes the development of the gas industry in Birmingham, with a more detailed description of the former gasworks at Windsor Street in Aston.

Birmingham was a pioneer of the gas industry, through its association with William Murdoch, who developed the concept of commercial gas lighting at the works of Boulton and Watt in Smethwick.

Two gas-lit Bengal lamps formed part of a display on the outside of the works of Boulton and Watt as part of the celebration marking the Peace of Amiens in 1802, and he later installed gas lighting in all the main workshops. Privately owned gas streetlamps started to appear in Birmingham about 1811.

However, it was not until 1817 that Samuel Clegg built the first gasworks to light the streets for John Gostling, later becoming the Birmingham Gas Light and Coke Company in 1819. Competition arrived in 1825 from the Birmingham and Staffordshire Gas Light Company, who built a gasworks at Swan Village in West Bromwich.

Gasworks had been built within the city at Gas Street, Fazeley Street and Adderley Street in addition to Swan Village. By the 1840s, there was a move for the gasworks to relocate out of the city along the River Rea.

The Birmingham Gas Light and Coke Company constructed their gasworks at Windsor Street and The Birmingham and Staffordshire Gas Light Company built their new gasworks at nearby Saltley. The sometimes inharmonious competition between the two companies continued until 1875 when Joseph Chamberlain enabled the Birmingham Corporation to buy both companies.

Eventually four large gasworks were established from Windsor Street in Aston to Washwood Heath to the North East of the city centre, which replaced the smaller gasworks in the city, with the exception of the Swan Village gasworks located near West Bromwich.

The Birmingham Corporation operated the gasworks until the nationalisation of the gas industry in 1949, including during World War II, when the city and its gas infrastructure were severely damaged.

In 1949, Birmingham Corporation Gas Department became a substantial part of the West Midlands Gas Board, who reorganised the manufacture and distribution of gas, concentrating production at fewer larger gasworks across the region.

A gradual change to the use of oil and refinery by-products occurred with a new reforming plant built at Washwood Heath in 1965. From 1966, the country gradually converted to the use of Natural Gas, following substantial discoveries in the North Sea.

It is hoped that this booklet will bring to life some of the important personalities and describe some of the notable events connected with the gas industry in Birmingham over the past 200 years.

The heritage of the gas industry in the United Kingdom is maintained through the three preserved gasworks sites at Fakenham (England), Biggar (Scotland) and Carrickfergus (Northern Ireland), the National Gas Museum in Leicester and the National Grid Gas Archive in Warrington (England).

There are educational materials on National Grid's website and there is also a web page on the Historic England website which provides a series of reports on the history of the gas industry, a description of the technologies used and known locations of former gasworks in England.

They are all excellent resources for learning more about the long and interesting history of what has for a long time been a major UK industry and employer.

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Acknowledgements

The author wishes to thank National Grid Property which has supported the preparation and production of this booklet.

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About the Author

Russell Thomas has a keen interest in the gas industry. He has been working on former gasworks sites since 1997, a subject he has grown to find fascinating. Russell works as a technical director for the International Engineering Consultancy WSP, advising on former industrial sites, with a special focus on former gasworks.

Professor Russell Thomas.

He also manages research projects on behalf of clients and is a visiting lecturer at the University of Manchester and a visiting professor at the University of Strathclyde.

He has been involved with both universities in research into the legacy of Britain's industrial past. Russell is a member of the Institution of Gas Engineers and Managers, and the Chairman of their History Panel.

Front Cover: Buildings associated with the restored former Gas Street gasworks, Birmingham, which date back to the 1820s and are attributed to Samuel Clegg, regarded as the world's first gas engineer.

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01 Facts About Gas in Birmingham

- The first factory in the world to be lit by gas was Boulton and Watt's factory, located in Smethwick, Birmingham.
- The first public gasworks in Birmingham, was built in 1816. Some of the buildings still stand today.
- The Windsor Street Gasworks were first built in 1846.
- Joseph Chamberlain, a visionary Birmingham politician, was a former mayor, chairman of the Gas Department and MP. He had the vision for the council to purchase the gas companies in Birmingham and expand the Windsor Street Gasworks.
- The twin gasholders at Windsor Street were the largest in the world when they were first built in 1885.
- The twin gasholders were each 236 feet in diameter and 165 feet high when inflated, each held 6.2 million cubic feet of gas.
- The retort house at Windsor Street was the largest in existence when built in 1885.
- The City of Birmingham Gas Department was the largest municipal gas department in the world.
- During World War I, women undertook some of the most arduous jobs on gasworks.
- During World War II, the offices of the Gas Department in the town hall were severely damage by a bomb during an air raid.

02 William Murdoch and the Development of Gas Industry in Birmingham

It is hard to imagine a world without lighting, however, up until the start of the 19th Century, the choices for lighting were limited. The options available at the time were rushes, candles and oil lamps. But these gave off a very dim light and burnt with a smoky flame. Such poor lighting did little to make the streets safer at night.

The new factories of the Industrial Revolution were dark and dangerous places to work, and the home, if you were lucky enough to afford lighting, was at best dimly lit, with people still living at the whim of the daylight hours. This started to change with the invention of gas lighting.

Few places in the world can claim to have such strong connections to the gas industry as Birmingham, the city of a thousand trades. It was the place where the Scottish engineer William Murdoch (1754- 1839), aged 23, had travelled to find work with Boulton and Watt.

They were an engineering firm formed by Matthew Boulton and James Watt, which constructed the most efficient steam engines of the time. He was to spend his entire working life with Boulton and Watt. Whilst he was a notable engineer and inventor, Murdoch chose to avoid the limelight.

Figure 1. A diorama of William Murdoch demonstrating gas lighting at his home in Redruth, Cornwall. Source: National Grid Gas Archive.

Murdoch, like many before him, had experimented with distilling coal to produce gas. As a child he was reputed to have used a kettle to distil coal in a cave near his home at Bello Mill, near Lugar in Ayrshire.

He was the son of a millwright who tenanted a farm and water mill on the Bosworth family estate. Trained by his father as a millwright, William inherited his talent. He was known to entertain the local people by riding around on a wooden horse (a forerunner to a bicycle) which he had built with his father.

Murdoch was first employed as a mechanic for Boulton and Watt, but he impressed them so much that in 1778 he moved to Cornwall, where he was given the task of constructing steam engines for the Cornish mine captains. They were the most important, but also the most difficult customers.

In 1792, whilst based in Redruth, Murdoch built an experimental plant to manufacture gas from coal. It used a cylindrical iron pot as a retort to make the gas. Murdoch piped the gas 70 feet, where he used it to light his house and office, as shown in Figure 1.

It was not his only notable invention whilst in Redruth. In 1784 Murdoch also built the first working model of a steam carriage in Britain.

Murdoch experimented with the gas-making process, trying different coals and different burners for gas lights, but his attempts to develop gas lighting stalled for a few years. In 1795 and 1796 he visited the Neath Abbey Iron Works in Wales, where he again experimented with gas lighting, reputedly lighting the counting house.

In 1797 Murdoch advised James Watt Jr (James Watt's son) to apply for a patent for the gas lighting apparatus he had developed, but Watt declined. He was recalled to the factory in Smethwick in 1798.

Murdoch continued to experiment with gas lighting. He had an iron retort vessel cast, which he used to test different coals. The gas from the retort was used to light all the principal workshops.

Murdoch had continued his interest in gas lighting with little support from his employers – until 1801, when Gregory Watt (son of James Watt) visited Paris and discovered the rival work on gas lighting being undertaken by the Frenchman Philippe Lebon.

With renewed interest, he installed two gas lights as part of a wider lighting of the works with oil lamps to celebrate the Peace of Amiens in 1802. Murdoch was given the financial backing and technical assistance he required to advance the manufacture of gas.

Murdoch was assisted by some of the finest engineers in the country, such as John Southern, the Creighton brothers and Samuel Clegg. These engineers provided vital input into the gas making process, including the design of the gasholder (Figure 2).

Clegg was apprenticed to Boulton and Watt's in 1798, working on steam engines. He worked with Murdoch on the development of gas lighting in 1804, but soon realised the potential of gas and the limitations of working at Boulton and Watt.

He split from the company in 1805 and established himself as a rival gas engineer, based back home in Manchester.

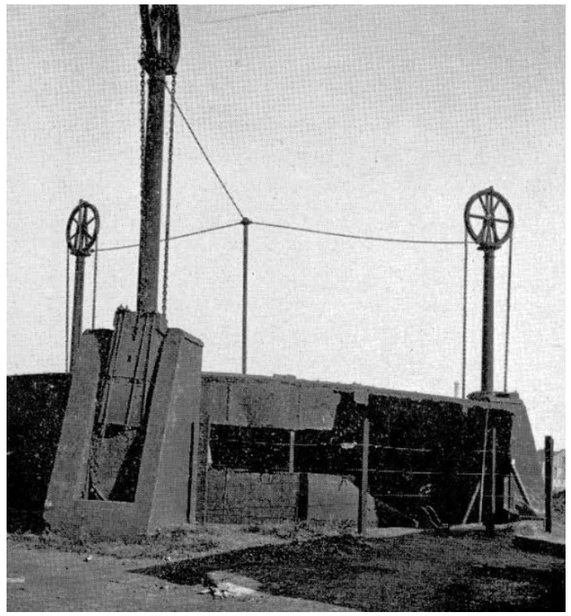

Figure 2. The former gasholder built at the Soho Works, Smethwick, once the home of Boulton and Watt. This early gasholder could store 20,000 ft³of gas and had three sets of counterbalanced wheels. Often attributed to William Murdoch, it was likely to have been a slightly later construction. Source: National Grid Gas Archive.

A keen technology enthusiast and customer of Boulton and Watt, George Lee persuaded them to design a plant to light his home and the Salford Twist Mill with gas. At this time, the mill was one of the biggest factories in the country.

Whilst Murdoch was dealing with the complexity of this large project, Samuel Clegg was installing a smaller gas plant at the mill of Henry Lodge in Sowerby Bridge, Yorkshire. Clegg beat Murdoch to install the first commercial gas plant and such rivalry continued for the next ten years.

These gas plants were designed to provide gas lighting to factories and mills, improving working conditions and extending working hours during the dark winter months. Murdoch principally lit the larger factories, however other engineers in the Birmingham area had also seen the potential for gas lighting.

Engineers such as Josiah Pemberton started designing their own gas plants for smaller works. Pemberton exhibited gas lights outside his factory in 1806. He went on to build a gas plant for Saunders Button Factory in Birmingham, where the gas was used for both lighting and the soldering of shanks onto buttons. He also lit Spooner Park Slitting Mill and Cook's Brass work, both in Birmingham.

With the increased competition from Clegg, Pemberton and their contemporaries, the gas lighting market became less attractive to Boulton and Watt and their last gas plant and lighting contract was at Birley & Hornby's new cotton mill in Chorlton, Manchester, which was installed in 1816.

Murdoch did vital work in creating the gas industry but failed to profit from it. He was awarded the Rumford Gold Medal in 1808 by the Royal Society for his work and recognised as the inventor of the gas making process.

Murdoch spent the rest of his career working at Boulton and Watt, devoting his time almost exclusively to mechanical engineering, retiring aged 76 to his home at Sycamore Hill, overlooking his old works. Murdoch was buried at Handsworth Church in 1839, along with his former employers Matthew Boulton and James Watt.

Murdoch and his rivals had focussed on building plant to provide gas to a single factory or institution. For the wider vision of a public gas network providing a supply to streetlights, public buildings and private properties, we have German impresario Friedrich Winzer (Figure 3) to thank. Winzer came to Britain in 1803, with the aim of establishing a gas company. To fit into society better, he anglicised his name to Frederick Winsor.

It was a long and difficult journey for Winsor. He lectured, he wrote pamphlets, he sought royal favour and wealthy backers. He rented houses in Pall Mall and displayed two large gas lamps to celebrate the King's birthday on Thursday the 4th of June 1807. He lit both sides of Pall Mall with gas in 1808, which continued intermittently until 1810.

Winsor eventually achieved his aim, helping to establish the Gas Light and Coke Company when it received its Royal Charter in 1812.

The gas industry became the first public energy utility, with the first gasworks providing a public supply in London in 1813. Over the next 50 years, the gas industry would expand across the British Isles and abroad.

Figure 3. Portrait of Frederick Winsor. Source National Gas Museum.

03 A Public Gasworks for Birmingham

Birmingham has a long history of industry, from its early roots as a series of smithies clustered along a street once known as “Dyrtey” and later known as Deritend. These smithies fashioned sword blades, nails and buckles from Staffordshire iron and sea coal.

Birmingham developed into a small market town, which attracted craftsman who forged iron utensils, and was known by the name of “Bremischam”. But it was not until the end of the 16th Century that iron manufacture started to dominate the town’s economy, differentiating it from its neighbours.

The population of the town grew in the 17th Century, with manufacturing activities increasing. In the 18th Century, Birmingham became known as a “haven of economic freedom”, establishing itself as the principal commercial town in the area and the leading metal manufacturer in the country.

With the arrival of the canals in the Birmingham area in the 18th century, an extensive canal network grew up around Birmingham, further improving trade and leading to greater industrialisation of the area.

The coming of the railway further increased the industrialisation of the area. At least 1700 trades were known to have been undertaken in the city giving rise to its name, “The City of a Thousand Trades”.

The city developed in an uncoordinated way. By 1800, there were 85,000 inhabitants living in 16,653 houses. There was little governance and planning, with factories and houses erected at a rapid rate, leading to poor living and sanitary conditions.

The Street Commission became the main governing body in 1769 and had introduced street lighting with oil lamps, which were largely ineffective.

A few gas streetlights were known to have been present in Birmingham from 1811. These lamps were lit from small gas plants located within private premises, such as shops. The town, however, did not officially adopt gas street lighting until a few years later.

04 The Gas Street Gasworks

In 1816 the Birmingham Street Commissioners advertised for tenders for the provision of gas street lighting in the town. John Gostling, a London entrepreneur active in the early gas industry, submitted the only tender. His offer was accepted by the Board and he was contracted initially to supply gas lighting to 10 streets.

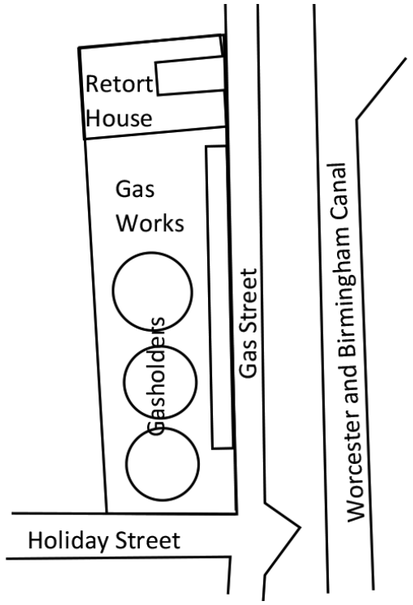

Figure 4. The general layout of the Gas Street Gaswork c1824. Based on an original drawing by Charles Hunt from 1902.

These gasworks were designed by Samuel Clegg and were located on Gas Street, off Broad Street (Figure 4). Gostling laid gas pipes in the streets to connect the gasworks to the gas street lights and consumers alike. He contracted with those individuals wealthy enough to afford gas light at an annual cost of £62 6s 0d for sixteen burners to light their house.

Payments were made half yearly in advance and consumers were limited to burners of certain dimensions. This form of payment preceded the invention of the domestic gas meter and depended much on the trust between the gas company and customer.

In 1819, a Joint Stock company, the Birmingham Gas Light & Coke Company, was formed, which had been incorporated by an Act of Parliament in the same year. Gas Street Gasworks became the company’s first gasworks.

As part of the Act, the company had to ensure that the service pipes to the street lamps were no smaller than 0.5 inch bore in diameter and that they “shall be kept fully charged with inflammable air or gas”.

Mr Gostling received £25,000 from the sale of the gasworks. The inventory for the Gas Street Gasworks when sold was recorded, and is given in the following table:

28 Cylindrical Retorts 7 feet long, 12 inches diameter.
1 Patent Retort, 12 feet 6 inches diameter.
2 Patent Retorts. 6 feet. 6 inches diameter.
4 Tar Retorts.
1 Tar Cistern of cast iron.
1 large Cistern (brick).
2 Patent Purifiers.
1 Patent Measuring Machine, with apparatus for agitating lime and water in the Purifiers.
1 Brick Cess Pool for receiving the lime alter it had been used for purifying the gas.
2 Brick Tanks for the gasometers to float in.
2 Gasometers capable of holding 55,000 cubic feet of gas.
1 Patent Governor.
Communicating Pipes connecting the apparatus together.
Iron Railroad from the Retort House to Canal Basin.
Retort House with Chimney.
Lime and Coke Houses.

The gasworks originally included two rotary retorts alongside 28 conventional, cast iron retorts. The rotary retorts had originally been used at the gasworks built for the Royal Mint in London but were not used elsewhere.

The original retort house was built in the lowest part of the yard near to Holiday Street. This was moved around 1820 to the upper part of yard, where the surviving retort house is located (which dates from 1822 and was built with an additional gasholder by the company’s engineer, Alexander Smith). The sketch in Figure 4 gives a rough layout of the Gas Street gasworks from circa 1824.

In 1828, the canal basin was extended from Gas Street to Berkley Street and the company extended the gasworks by leasing land on Berkley Street. The expansion of the gasworks ceased after 1828.

It had been suggested to close these gasworks as early as 1837, the time at which the new Fazeley Street Gasworks was built.

The Gas Street Gasworks eventually closed in 1850 after the new Windsor Street gasworks were built for the Birmingham Gas Light & Coke Company.

The four gasholders at the Gas Street site were retained for use. Three of these, which were located on the corner of Gas Street and Holliday Street, were operational until at least 1872.

At the time, they were receiving gas from the Windsor Street Gasworks located just over a mile away via a 10-inch main.

The site was finally abandoned as a gasholder station in 1876. The site later found use as the Anchor Tube Works of the Imperial Tube Company and as a Galvanised Iron Works.

This site eventually fell into disrepair but has more recently been restored, redeveloped and found a new life as the Gas Street Church.

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05 Fazeley Street Gasworks and Barn Street Gasholders

The first construction activities away from Gas Street of the Birmingham Gas Light and Coke Company were to build two gasholders at Barn Street, Digbeth in 1831. The layout of the site is shown in Figure 5. These gasholders were originally supplied from Gas Street, located just over a mile away, but were later supplied from the Fazeley Street gasworks, to the North East of the site. When Charles Hunt took over as engineer of the company, he found these gasholders were in a poor state and decided to close the gasholder station. These gasholders were disused in 1873 and the site replaced by stables.

The Fazeley Street gasworks were built by the Birmingham Gas Light and Coke Company in 1837. A plan of the site according to Charles Hunt is shown in Figure 6. These gasworks operated until 1875, the year the company and gasworks were purchased by the Birmingham Corporation. These gasworks were dismantled and abandoned in 1872-3. The site then became an ice manufactory of the Patent Transparent Ice Company. The site later became the New Warwick Wharf and is now known as the Bond. The shell of a former retort house from 1836 was reused as an icehouse, and still survives today at the rear of 176 Fazeley Street, where it is locally listed. The entrance buildings to the gasworks survive as part of a modern development called the Bond on Fazeley Street, Digbeth.

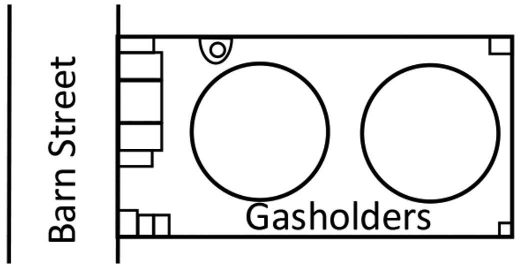


Figure 5. The Barn Street Gasholder Station, based on an original drawing by Charles Hunt from 1902.

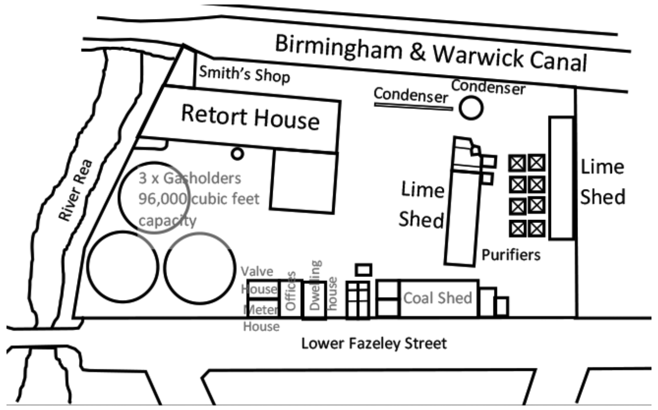


Figure 6. The layout of the Fazeley Street Gasworks based on an original drawing by Charles Hunt from 1902.

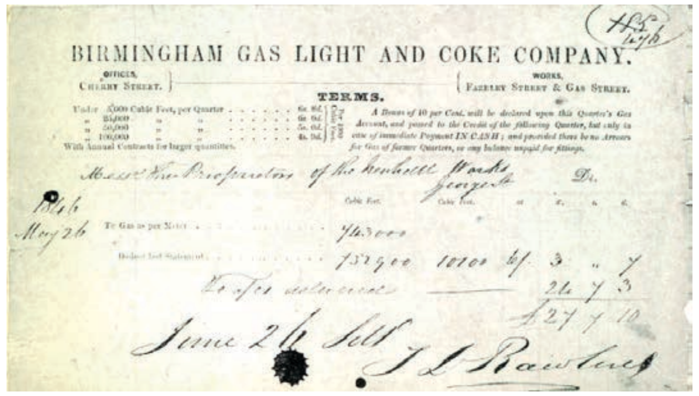


Figure 7. A bill for the Birmingham Gas Light and Coke Company, showing the location of the gasworks at Gas Street and Fazeley Street.

A bill from the Birmingham Gas Light and Coke Company can be seen in Figure 7. It predates the construction of the Windsor Street gasworks, as shown by the names of only the Fazeley Street and Gas Street works being mentioned.

06 Windsor Street Gasworks

The Windsor Street gasworks were built in 1846 by the Birmingham Gas Light and Coke Company. The site was chosen for its connections to the Birmingham & Fazeley Canal, which enabled coal to be easily imported and by-products of the gas manufacturing process to be exported.

The gasworks' development from 1854 to 1872 is shown in Figure 8. In 1854, there were three retort houses and four gasholders.

The gasworks had expanded to as shown on Figure 8, at which time it had 11 gasholders with a storage capacity of 3,568,000 cubic feet and four retort houses where the gas was made and 20 small purifiers.

To discuss the development of the Windsor Street Gasworks, we must return to Charles Hunt. Hunt was one of the most respected gas engineers of his time. Born in Great Yarmouth in 1842, he was a consulting engineer who specialised in gas engineering.

He worked in London, initially as the assistant engineer to the London Gas Light Company, from 1866 to 1872. In 1872, aged just 30, Hunt joined the Birmingham Gas Light and Coke Company as their chief engineer, replacing Mr Edward White who had resigned.

Chief engineer was a senior position for someone relatively young. The company at the time was struggling due to the embezzlement of funds by the company secretary and the competition faced from the rival Birmingham and Staffordshire Gas Company.

Hunt improved the efficiency of the gasworks, adding new larger retorts to the settings as they were rebuilt.

Hunt also focussed on the reorganisation and improvement of the gas distribution network, as the company were losing 12% of the gas from leakage in the gas mains. His efforts halved the losses in three years, helping to turn the fortunes of the company around.

The Windsor Street gasworks were transferred to the Birmingham Corporation from the Birmingham Gas Light and Coke Company in 1875 when they purchased both the Birmingham gas companies.

At that time, the area of the gasworks was nine acres. Windsor Street was not an ideal site, the land available was used and it had no rail connection to import coal.

This changed when Joseph Chamberlain, who was in charge of the Birmingham City Gas Department, visited the site and realised that a large tract of land between the gasworks and Rupert Street was used as a market garden and thought: “There is a lot of land here; I should like to have some of it”.

Chamberlain arranged for the purchase of the land and then allowed the North West Railway Company to have part of the newly acquired lands in return for extending their railway onto the site.

The siding to the gasworks were built in 1880. These changes made the Windsor Street site more favourable and gave Charles Hunt a much larger site to work with and redevelop.

Charles Hunt drew up grand plans for the Windsor Street Gasworks. A large extension to the gasworks was going to be required in the coming years to meet Birmingham's growing demand for gas.

Having made such a significant impact, Joseph Chamberlain decided to leave the gas department and pursue a parliamentary career, but he always retained his interest in the Windsor Street gasworks, if from afar. Hunt rebuilt the works, which took until 1885 to complete. His proudest achievements were his gasholders and retort houses.

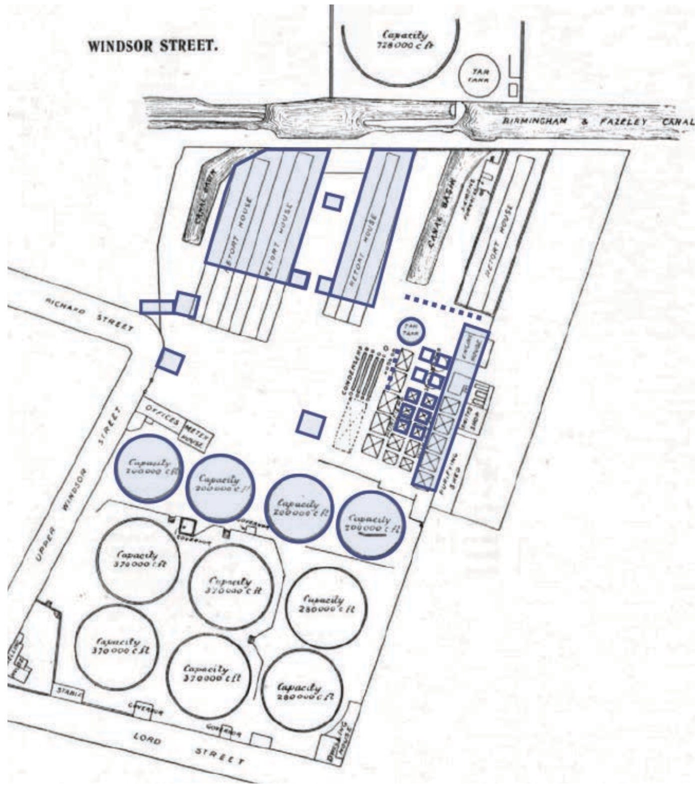


Figure 8. The plan of the Windsor Street Gasworks, in 1872, with the features which were present in 1854 shown in blue shading. Source: National Grid Gas Archive.

The twin gasholders he designed for Windsor Street were always the most striking feature of the gasworks. The tanks of the gasholders were separated by a wall just seven feet thick and had originally been planned to contain only two lifts.

Their design was being considered at the same time that George Livesey of the South Metropolitan Gas Company had designed a new 5.25 million cubic feet capacity gasholder at their Old Kent Road gasworks in South London.

Hunt had a vision to build structures of a similar scale. He prepared his gas committee by organising for them to visit the new gasholder at Old Kent Road during a pre-arranged trip to the Gas Exhibition at Crystal Palace, London, in 1883.

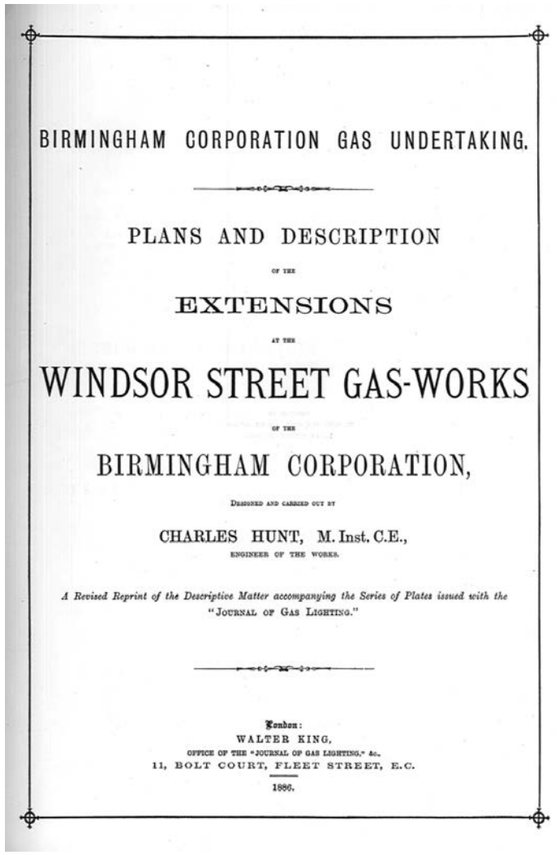
After seeing the large gasholders built by South Metropolitan Gas Company, this helped to persuade the gas committee to support Hunt's plans for building larger gasholders

Figure 9. A photograph of Charles Hunt from 1906 when elected President of the Institution of Gas Engineers. Source: National Grid Gas Archive.

These gasholders each had a capacity of 6.5 million cubic feet, which made them the joint largest gasholders in the world at the time they were built.

The construction of the gasholders is described in detail within the book, “Plans and Description of the Extensions at the Windsor Street Gasworks of the Birmingham Corporation”, the front cover of which is shown in Figure 10 and selected drawings in Figures 14 and 15.

The construction of the massive, brick, gasholder tanks, which would contain water, were subject to considerable difficulties due to the poor ground conditions encountered beneath the site.



BIRMINGHAM CORPORATION GAS UNDERTAKING.

PLANS AND DESCRIPTION

OF THE

EXTENSIONS

AT THE

WINDSOR STREET GAS-WORKS

OF THE

BIRMINGHAM CORPORATION,

DESIGNED AND CARRIED OUT BY

CHARLES HUNT, M. Inst. C.E.,

ENGINEER OF THE WORKS.

A Revised Reprint of the Descriptive Matter accompanying the Series of Plates issued with the "Journal of Gas Lighting."

London:

WALTER KING,

OFFICE OF THE "JOURNAL OF GAS LIGHTING," &c.,

11, BOLT COURT, FLEET STREET, E.C.

1886.

Figure 10. The title page of Hunt’s book describing his extensions at the Windsor Street Gasworks. Source IGEM Archive.

Hunt’s desire for large gasholders was not held by everyone. When he was showing the famous engineer Thomas Hawksley around the Windsor Street gasworks, Mr Hawksley commented on the large tank being built for the 2.1 million cubic feet gasholder: “Too many eggs in one basket”.

Charles Hunt in return, turned to the collection of small gasholders on the site and asked: “But don’t you think that here there are too many baskets for the eggs?”

Hunt’s approach was the one that was generally adopted by the gas industry over time.

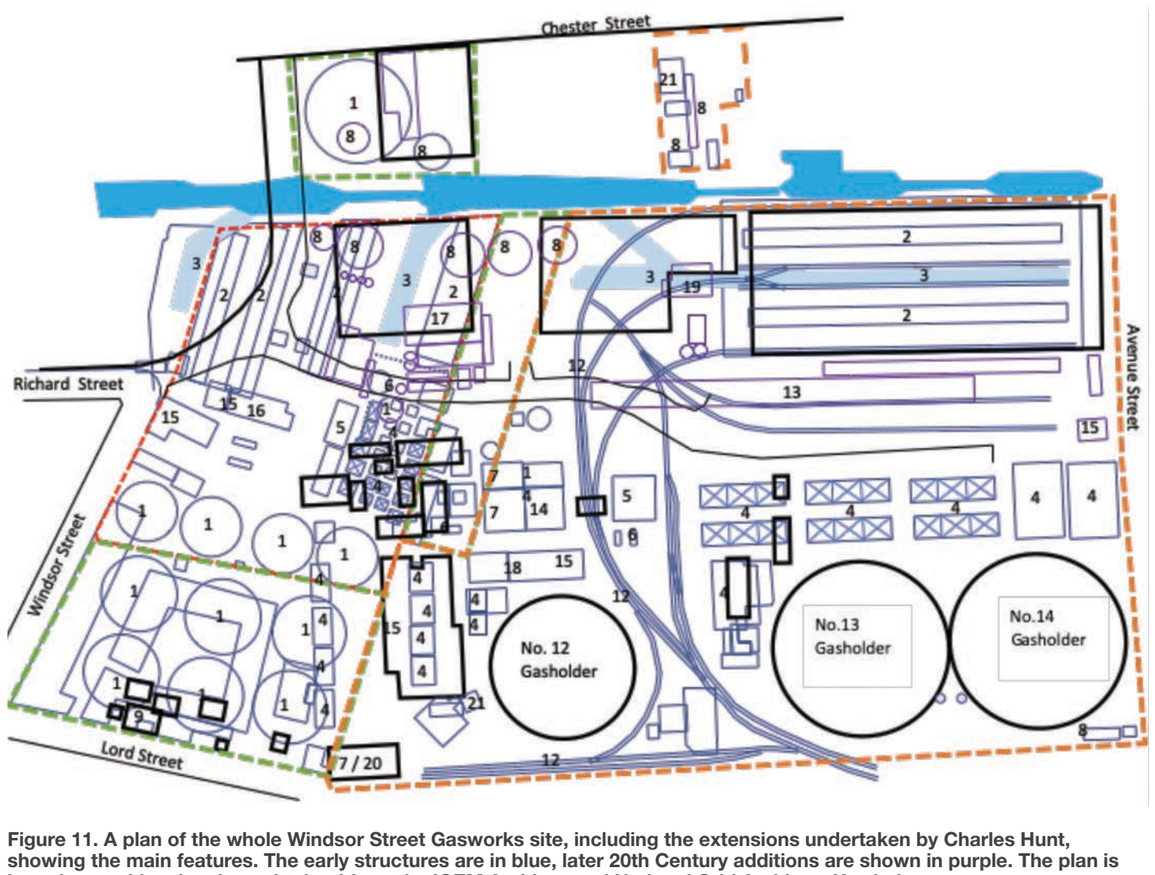


Figure 11. A plan of the whole Windsor Street Gasworks site, including the extensions undertaken by Charles Hunt, showing the main features. The early structures are in blue, later 20th Century additions are shown in purple. The plan is based on archive drawings obtained from the IGEM Archives and National Grid Archives. Key below:

1	Structures	12	Railway sidings
2	Gasholders	13	Coke handling Plant
3	Retort House	14	Boiler House
4	Canal or canal basin	15	Offices
5	Purifiers	16	Laboratory
6	Washers/Scrubbers	17	Carburreted Water Gas Plant
7	Compressor and Exhauster House	18	Workshops
8	Tanks	19	Power House
9	Governor House	20	Booster House
10	Meter House	21	Benzol Plant
11	Engine House		
Those features outlined in black are structures or roads present in 2020. Those features outlined in blue and purple are historical features and no longer standing			
Area in red dashed outline is the extent of the gasworks in 1854			
Area in green dashed outline is the additional extent of the gasworks in 1872			
Area in orange dashed outline is the additional land purchased in the extension of 1885 and afterwards			

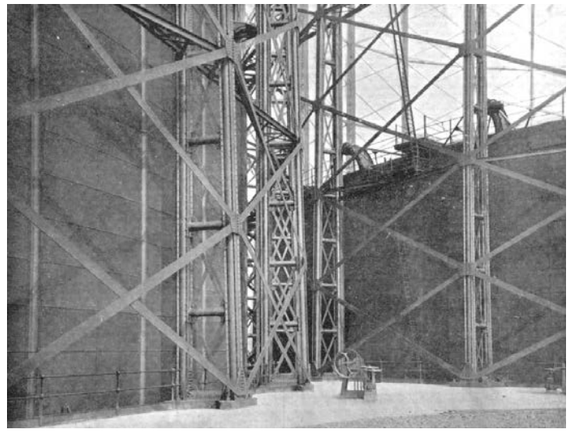


Figure 12. The point at which the twin gasholders meet at the Windsor Street Gasworks c1902. Source: National Grid Gas Archive.

Hunt's desire for scale and efficiency extended to his retort house. The retort house he built at Windsor Street was the largest in existence, measuring 487 feet by 210 feet and containing 756 through retorts in 84 beds.

Hunt ensured that he adopted the latest and most efficient method to heat the retorts, using continuous regenerative furnaces which he had first tried at the smaller Adderley Street gasworks.

The gas making plant was built and installed by West Gas Improvement Company Limited of Manchester to the designs of Charles Hunt.

Figure 13. The interior of the retort house during construction, showing the integrated connection between the canal basin and retort house, c1902, Source: National Grid Gas Archive.

The retort house had the unusual feature of being connected both by rail and canal, with a side arm of the Birmingham and Fazeley Canal going under the centre of the retort house, as can be seen in Figures 11 and 13. The site had an intricate rail network, operating at two levels, covering 4.5 miles, one 20 feet above the other, as can be seen in Figures 11 and 17.

The high-level network moved coal from the heaps to the retorts where gas was made. The lower rail network was to remove the coke residue left in the retorts after the production of gas.

The coke was a valuable product with a variety of applications. Not only was it used to heat the retort furnaces, it was also utilised as a smokeless fuel in domestic and industrial settings and had further uses in metal production.

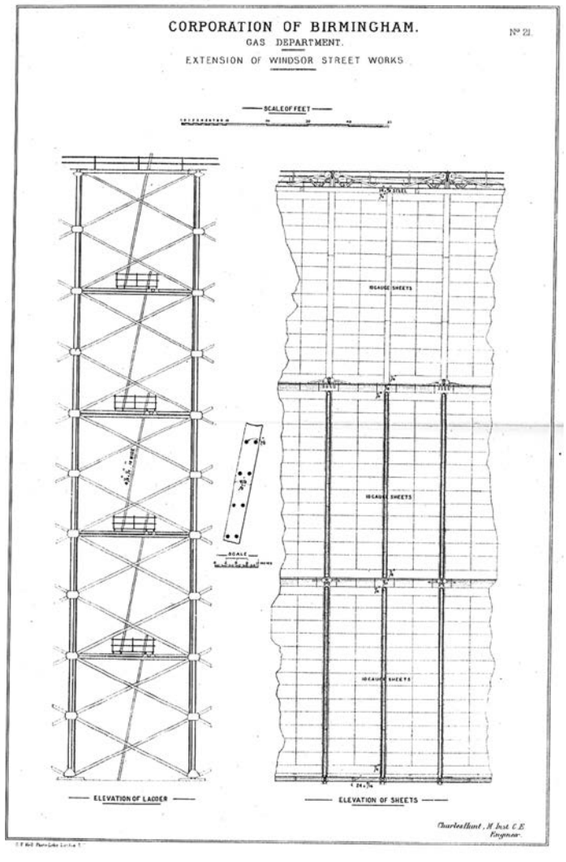


Figure 14. Extracts of the design of the giant twin gasholders built at Windsor Street, showing the frame and lifts. Source: IGEM Archive.

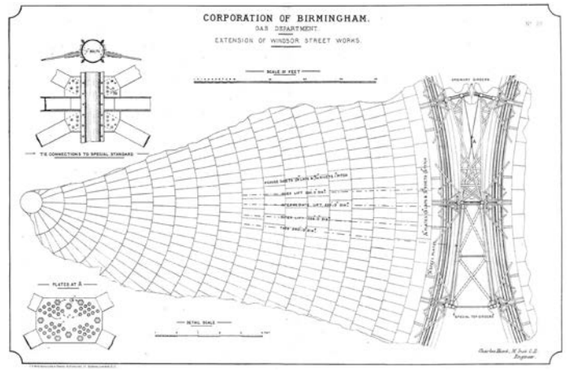


Figure 15. Extracts of the design of the giant twin gasholders built at Windsor Street, showing the interconnection between the two gasholders. Source: IGEM Archive.

Hunt's original vision was for the Windsor Street Gasworks to cover nine acres. By the time he left in 1902, they had stretched to 26 acres.

Only five of the original gasholders, the offices, a former meter house and two of the original retort houses survived. Under his supervision, the site had been transformed into the largest gasworks in Birmingham and one of the biggest in the country.

His achievements at Windsor Street were published by the Gas Journal and as a book (Figure 10). The book contained a description and plans of the extension to the gasworks along with engineering drawings of the work undertaken, including the two giant gasholders; an example of which can be seen in Figures 14 and 15.

The gas produced was measured using a station meter, with each meter being assigned to a different set of gas-making plant. By the time the gasworks closed, there were five station meters in use. Figure 16 shows how the station meters were built within a protective and ornately decorated shed.

After Charles Hunt left, the gasworks continued to develop due to the progressive approach of the City of Birmingham Gas Department, which was always willing to adopt new technologies to improve gas making.

One of the new developments was the adoption of continuous vertical retorts (CVR). These were built inside the existing retort house, which had originally been designed by Charles Hunt for horizontal retorts. There were several benefits of the CVR over the traditional horizontal retorts.

They could be operated continuously, with coal fed into the top of the retorts and coke continuously removed from the base. They also required much less floor space, which enabled more gas to be made in the same area of land.

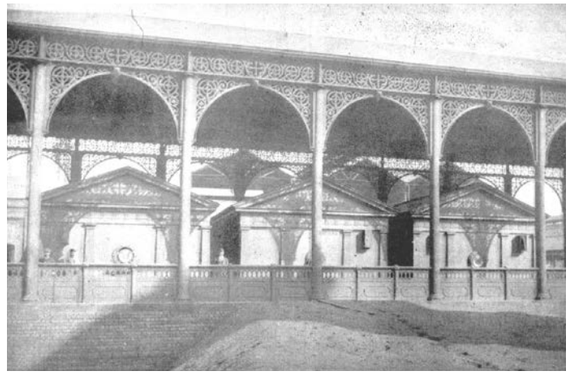


Figure 16. The meter shed with three station meters shown c1902. Source: National Grid Gas Archive.

The first installation of the CVRs at Windsor Street was built in 1912 by Woodall-Duckham, a pioneer of the new technology. At the time, it was the largest installation of its kind and proved so successful that a second installation was constructed in 1917 and a third in 1918. In each case the CVR replaced the original horizontal retorts.

By 1928, Windsor Street had converted entirely to CVR, all built in the original retort house as shown in Figure 17. This was the largest installation of CVR ever built in a single retort house.

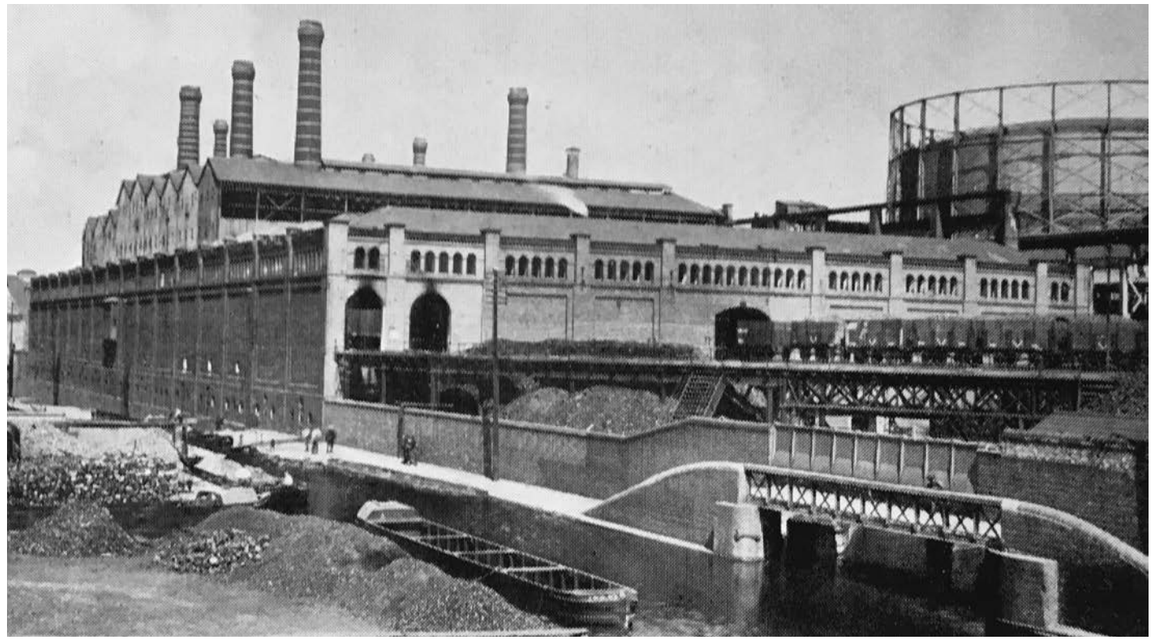


Figure 17. The canal with retort house behind. The taller vertical retorts can be seen to the back of the retort house with the tall chimneys. Source: IGEM Archive.

The retorts were cleverly designed so that the excess heat generated from heating the retorts was used to power boilers to make steam, the first CVRs to have used this system.

The steam was used for a range of purposes across the gasworks. The CVRs continued in service until closure, being rebuilt in 1961.

The No.12 gasholder was originally designed by Charles Hunt and built by Messrs Thomas Piggott & Company Ltd in 1877. Pictured in Figures 18 and 19, it had two lifts and could contain 2 million cubic feet of gas. The original gasholder had cast iron columns and wrought iron girders connecting the columns.

In 1934, a new gasholder was built in its place by Messrs Clayton Son and Company Ltd of Leeds. The old brick tank was reused, but the framing was replaced and increased in height from 70 feet to 180 feet, with each of the new four lifts being 35 feet deep.

The conversion of the gasholder took nine-and-a-half months and required the 5 million gallons of water within the tank to be pumped out over a period of days so that alterations could be made to the tank structure before it was refilled.

Figure 18. Reconstruction of Gasholder No.12, during the lowering of the 2nd lift. Source: National Grid Gas Archive.

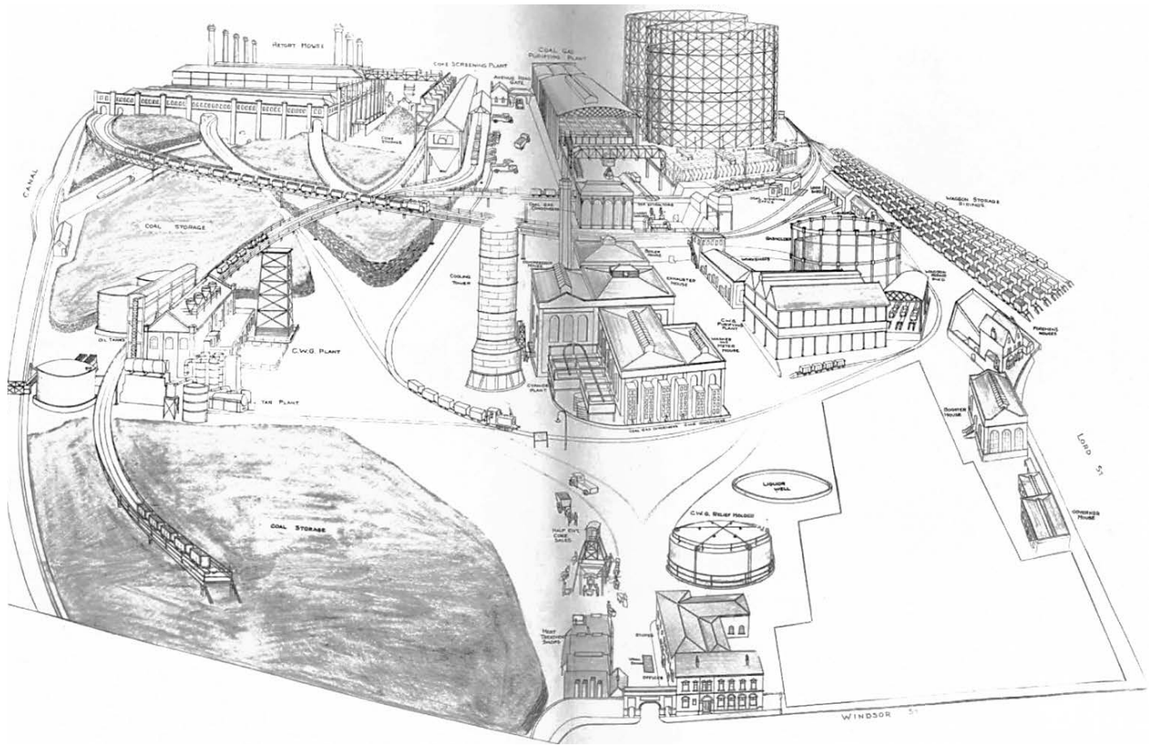


Figure 19. Views and a sketch of Windsor Street gasworks. Top – Panorama across the works 1928 Middle – Sketch of the gasworks from the entrance c1928; Bottom Left – an aerial view of the gasworks c1950 Bottom Right – A view of the gasworks c1940 showing the purifiers, new coke plant and cooling tower in the foreground. Source: National Grid Gas Archive.

When the columns of the original gasholder were taken down, they were found to be internally bolted together. This meant that someone had the dangerous job of crawling inside the column to undo the bolts. The old lifts of the gasholder were cut into sections and removed in rail waggons from the site.

The new columns were constructed from mild steel in 23 feet sections. They were again internally bolted to give the impression that they were one continuous column and attached to the original bases.

The inner lift and its crown were constructed within the tank, with each of the rivets placed by hand. Each of the three outer lifts were built at ground level and then lowered in 6 feet sections down into the tank.

This was quite a tricky task as the lift was supported by 44 screws which all had to be adjusted simultaneously. When the time came to lower the lift, the foreman would stand towards the centre of the gasholder crown and shout instructions to ensure the actions were synchronised, as shown in Figure 18. After all the lifts had been built, the rest of the columns and framework were carefully assembled.

The gasholder was constructed from over 5,000 steel plates, 14,000 nuts and bolts, and over 1 million rivets and accompanying rivet holes. The final gasholder was painted in aluminium, which not only protected it, but also gave it a striking silver appearance.

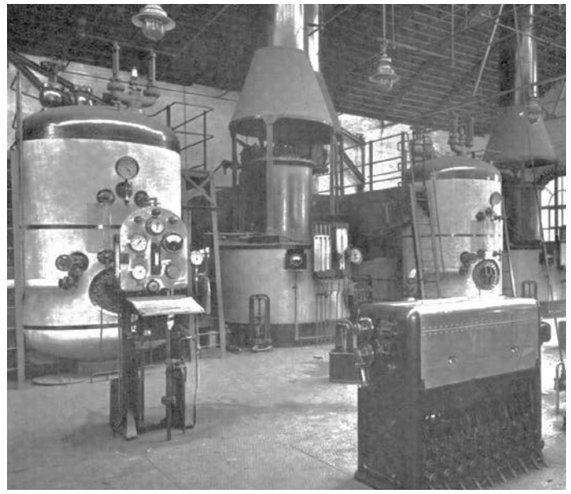


Figure 20. The upper floor of the automated Carburetted Water Gas Plant at Windsor Street. Source: National Grid Gas Archive.

A sketch of the Windsor Street Gasworks from 1930 and a panorama across the site from 1928 are shown in Figure 19.

This also includes two later photographs from the 1950s showing the notable features of the site, including the retort house, gasholders and purifiers house. The bottom left photograph shows the rebuilt No.12 gasholder with the larger framing, compared to that shown in the earlier photograph.

Retorts had a drawback that they could not suddenly be brought into use to produce more gas. They would take a few days to get prepared and up to temperature.

This posed a problem to the gas engineer if there was a sudden increase in demand due to cold weather. This could be offset by more storage in gasholders, but sometimes this was not enough. Luckily an American engineer called Thaddeus Lowe greatly improved a type of plant which could make gas quickly, known as a water gas plant.

The process made gas by injecting steam into a chamber containing red hot coke. It produced a gas composed of hydrogen, carbon monoxide and carbon dioxide. The calorific value of this gas was lower than normal coal gas, but this could be increased by injecting oil into the hot chamber, which enriched the gas.

This process was called carburetted water gas (CWG). Four of these CWG plants were built at Windsor Street gasworks. Their location can be seen in Figure 11 and on the left side of the sketch in Figure 19, labelled CWG Plant. The top floor of one of the CWG plants can be seen in Figure 20, showing the control apparatus.

Steam would be raised in coal-fired boilers and the waste heat boilers described earlier. As well as being used in the CWG plant, steam also drove pumps and generators that produced electricity to power the gasworks' plant machinery.

One of the more unusual by-products produced at Windsor Street gasworks was cyanogen salt. Cyanide that formed in the gas during the gas-making process was extracted by washing it with a solution of iron salts in the presence of ammonia.

About 2 lb. of Prussian Blue were recovered for each tonne of coal carbonized. The cyanide salts were used by the local metal industry, but eventually became uneconomical by about 1922. The cyanogen plant can be seen in the centre of Figure 21.

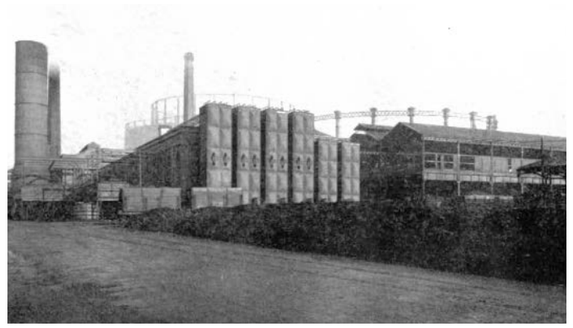


Figure 21. A view of Windsor Street Gasworks from the entrance gates in 1928. Source: National Grid Gas Archive.

The site also operated a tar drying plant, which was used to dehydrate coal tar to make it suitable for the construction of tarmac road surfaces. As the city council owned the gasworks, they had a ready use for the tar to make or repair the city roads.

The Windsor Street gasworks ceased production in 1974, but the site was retained as a gasholder station with the three column guided gasholders used to provide storage of natural gas when demand was high. These gasholders are no long used and at the time of writing are in the process of being dismantled.

07 Birmingham and Staffordshire Gas Light Company

On the 20th of May 1819, the Royal Assent was given to the Bill incorporating the Birmingham and Staffordshire Gas Light Company, with a share capital of £20,000.

The Act recited: "that the town of Birmingham is but partially lighted with gas and that the continuous line of the great Holyhead Road from Birmingham to Bilston and the towns in the vicinity which are not at all lighted with gas are intended to be lighted from one station to be erected at West Bromwich" and further " that it would be a great public advantage to all inhabitants of the said district and to all persons travelling through the roads, streets and ways thereof if the same were lighted with gas."

The Act authorised the company to supply "inflammable air or gas from coal, oil, tar, pitch or other material for lighting Birmingham, Bilston, Wednesbury, Tipton, West Bromwich, Darlaston, Walsall, Handsworth, Edgbaston and Aston".

The company had the added advantage of being authorised to supply all the other towns as well as competing with the Birmingham Gas Light Company to supply Birmingham.

08 Swan Village Gasworks

The company was authorised to purchase land in the parish of West Bromwich for its gasworks and, with the consent of the Street Commissioners, to erect buildings and lay gas mains in Birmingham.

Under the agreement, the company was bound to supply the public roads with gas that provided better and cheaper light than oil lamps otherwise their power and authority to dig up streets to lay gas mains would be revoked.

The Swan Village Gasworks was built in 1825. At the time of completion, it was the largest in the country. It supplied part of Birmingham, but also the parishes of West Bromwich, Handsworth, Wednesbury, Darlaston, Bilston, Tipton and Oldbury.

Such a large gasworks built some miles from its main customers was unique at the time, something that would not happen in London for many years to come. Its large area of supply was also quite unusual.

By 1836, the company had already installed 90 miles of mains and the gasworks boasted 200 retorts and six gasholders that could store about 64,000 cubic feet of gas.

On land purchased next to the site off Jervoise Street, a large gasholder was erected in 1856 with a capacity of 400,000 cubic feet. In order to feed this rapidly rising production, coal was delivered by canal to a wharf on the site.

The gasworks at that time covered about a third of its later size. Tar was of such little value that the vessels containing it were emptied on the main roads as a way of disposal and to alleviate dust, a practice ahead of its time before the development of Tarmac.

The gasworks were managed by a works committee of the gas company's directors. Around 1870, the gasworks were enlarged, requiring additional land adjoining the site to be acquired. This later became known as Gas Street.

When the Birmingham and Staffordshire Gas Light Company was purchased by the Corporation of Birmingham in 1875, the Swan Village Gasworks became isolated because it was outside the Birmingham area of supply.

Most of the towns supplied by the gasworks objected to the purchase of the gasworks by the Birmingham Corporation. They then sought to build their own gasworks and exercise their right to take over the mains in their districts.

Each town had to purchase gas from the Swan Village Gasworks until they had built their own facility.
Of the original areas supplied, only Wednesbury and Darlaston remained as customers of the gasworks, an arrangement which continued until nationalisation in 1949.

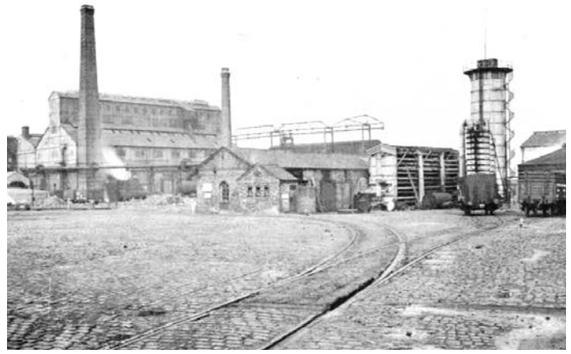


Figure 22. A view from the entrance of the Swan Village Gasworks towards the vertical retort house c1928. Source: National Grid Gas Archive.

On losing these additional areas of supply, the Swan Village Gasworks had to reduce production and rearrange its gas mains so that excess supply could be transported into Birmingham.

By 1928, the Swan Village Gasworks was operating both horizontal and continuous vertical retorts (CVR) – as described earlier – following the introduction of vertical retorts in 1914.

The horizontal retorts were phased out by 1949, with only CVRs being used. A German-designed MAN dry gasholder was built at the site in 1930 which had a capacity of 4 million cubic feet. This novel gasholder was emptied and not used during WWII for fear of sabotage by the German military.

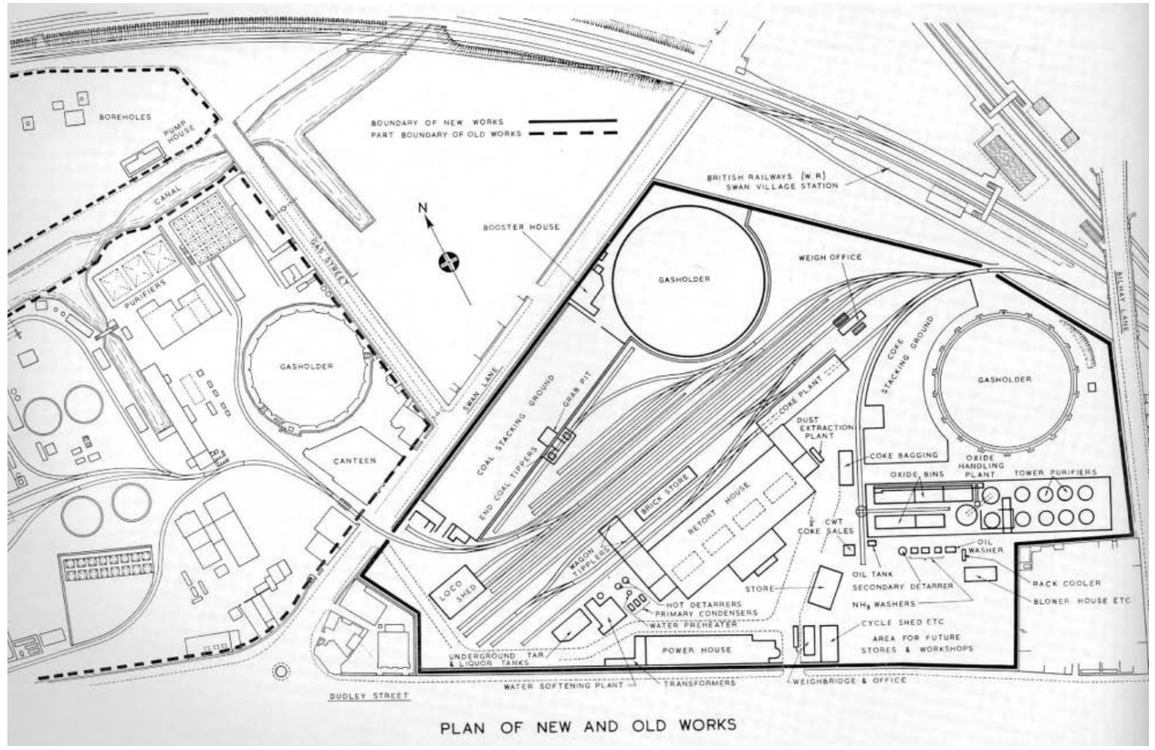
Like the Windsor Street gasworks, the Swan Village Gasworks also operated two carburetted water gas plants, which were able to produce gas rapidly when demand increased. The gasworks also had a plant which manufactured sulphate of ammonia from gasworks by-products, used as a fertiliser by farmers.

By 1946, the Swan Village Gasworks existed almost entirely to supply Wednesbury and Darlaston and was then the smallest of the department's gasworks.

When the West Midlands Gas Board was established in 1949, these limitations were removed and gas mains were built to reconnect adjacent towns.
Given its convenient location and available land, the gasworks were updated.

An area of the site was cleared and a state-of-the-art new gasworks was built by 1953. The new retort house and gasholder are shown on the bottm right side of Figure 23b.

Figure 23a. Aerial view of the gasworks showing the MAN waterless gasholders. Source: National Grid Gas Archive.



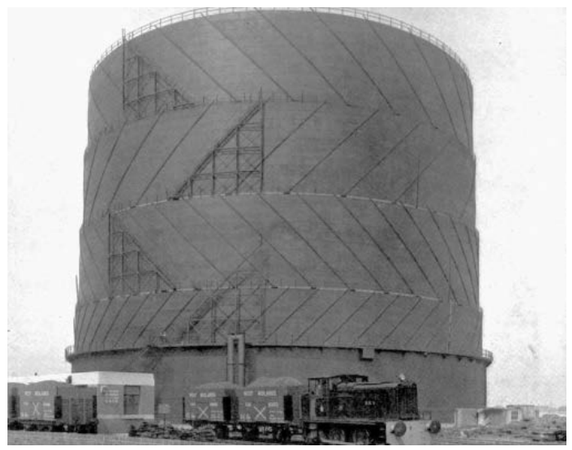


Figure 23b. Views and a plan of Swan Village Gasworks. Top – a plan of the old and new gasworks c1953 Middle – Panorama across the old gasworks c1928. Bottom Left – the spiral guided gasholder. Bottom Right – a view of the new vertical retort house built for the West Midlands Gas Board, with the railway in front. Source: National Grid Gas Archive.

09 Adderley Street Gasworks

The Adderley Street Gasworks were constructed about 1844. These were the second gasworks of the Birmingham & Staffordshire Gas Light Company.

They were built in Central Birmingham, unlike their original gasworks located at Swan Village in West Bromwich, Staffordshire.

The Adderley street land, which formerly housed the Pagoda Foundry, was purchased in 1841. Gas production started in 1844 and benefitted by being close both to Birmingham consumers and transport links (the canal).

By the 1850s, the Adderley Street Gasworks had four gasholders on the west side of Bowyer Street and another on the east side. The site had hardly changed by 1889, although the latter gasholder had been removed by 1905.

Many of the features of the gasworks were retained throughout its operation. The gasholders, purifiers and meters were all installed before the Birmingham Corporation acquired the gasworks in 1875 and were retained until closure in 1940.

The one significant change at the site was the No.2 retort house, which was built in 1909, although it looked much older.

It was designed by Birmingham City Council's gas department, under the supervision of the engineer-in-chief, Walter Chaney, and with the involvement of the young gas engineer, Cecil Carrington Barber.

This building survives today, although in an altered form. The building has a steel-framed structure which was clad in brick. The long elevations originally had arched openings over three levels, as seen in Figure 26b, but the interior comprised a cellar and a double-height main floor.

Adderley Street was the first gasworks in Birmingham powered by electric drives, with the electricity being produced on-site with a gas engine and dynamo.

Humphreys and Glasgow built a water gas (WG) plant at the site around the time of World War I. It was housed within a reinforced concrete building, adjacent to the retort house.

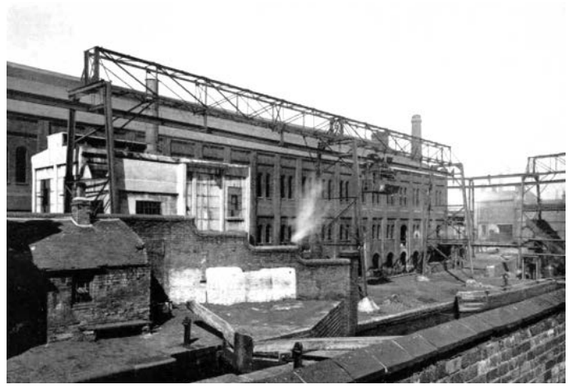


Figure 24. The Adderley Street Gasworks, with the retort house in the background and canal in the foreground. Source: National Grid Gas Archive.

Figure 25. Women gas workers at Adderley Street Gasworks during WWI. Source: National Grid Gas Archive.

The gas production at the works varied between two and three million cubic feet per day, depending on the season. After the construction of the new retort house in 1909, no significant further reconstruction of the plant was undertaken.

Like the other gasworks of the City of Birmingham gas department, Adderley Street employed women workers in some of the most arduous tasks during World War I.

A group of these women is shown in Figure 25. The forewoman, who coordinated the work, is pictured in the centre of the front row.

Figure 26a. A plan of the gasworks c1928. Source: National Grid Gas Archive.

The practice at Adderley Street of carbonising coal in horizontal retorts was never changed, unlike the other Birmingham gasworks, where continuous vertical retorts were introduced from 1912.

The Adderley Street Gasworks effectively became obsolete. This was not helped by its lack of a rail connection, with trains now the primary source of transport for the Birmingham gasworks.

Coal was delivered at the Landor Street Railway Depot and transferred by horse and cart or, later on, using a Fordson tractor (Figure 26d).

The gas department had been considering closing the gasworks for many years as it neared the end of its useful life. In reality, it was only the looming threat of World War II that delayed its closure.

The gasworks were operational until the 9th of April 1940, when they closed, after nearly100 years' service. The gasholders were retained initially but then removed between 1951 and 1965.

The total size of the site was 5½ acres, bounded by Adderley Street and New Bond Street, and situated on the banks of the Birmingham and Warwick Canal.

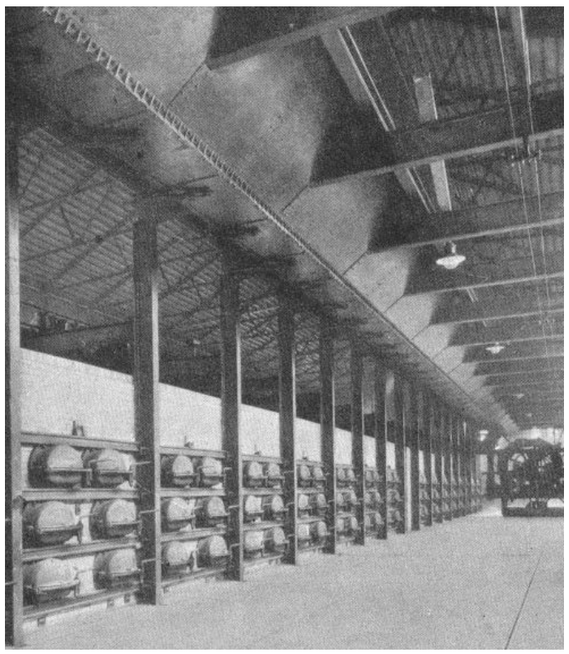


Figure 26b. A view of the retorts and charging machine at Adderley Street Gasworks c1928. Source: National Grid Gas Archive.

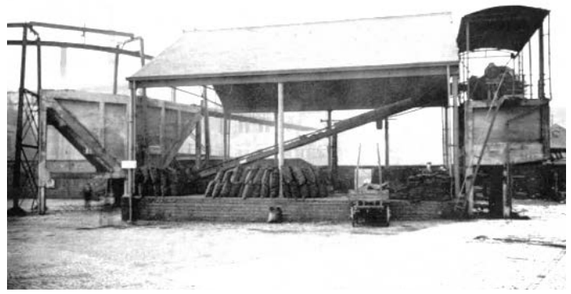


Figure 26c. The coke bagging plant at Adderley Street Gasworks c1928. Source: National Grid Gas Archive.

Figure 26d. Fordson tractor used to deliver coal at Adderley Street Gasworks c1928. Source: National Grid Gas Archive.

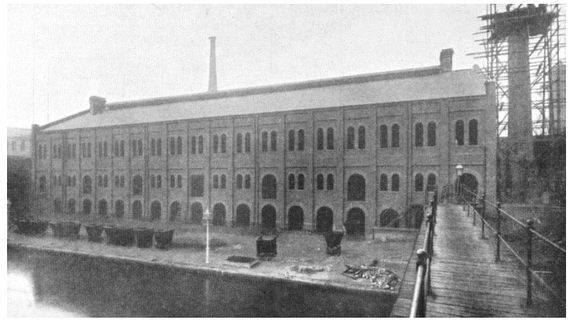


Figure 26e. Construction of the new retort house at Adderley Street Gasworks c1928. Source: National Grid Gas Archive.

10 Prepayment Gas Meters and Gas for the Masses

Prepayment gas meters were invented in 1870 by T. S. Lacey. This was a major development, making gas available to working class people who, up and till now, couldn't afford to buy and install their own appliances, nor were offered credit.

When gas meters were more widely introduced, around the middle of the 19th Century, customers paid in arrears, once the meter had been read.

This meant that the gas company, who were providing credit, had to be careful about the credit worthiness of their customers.

The prepayment meter changed this approach by allowing the customers to pay in advance for the gas they used.

Figure 27. An advert for a prepayment gas meter by Smith Meters from 1949. Source: R. Thomas.

Prepayment meters (example shown in Figure 27) were first trialled in Liverpool and were a great success, attracting a significant number of new customers.

George Livesey, an important figure in the gas industry at the turn of the 20th Century referred to the prepayment meter as: "This extension of gas supply to weekly tenants is the most extraordinary and remarkable development of the business that has ever been known".

Gas became a viable, alternative fuel to a whole new group of people and led to a great expansion in the gas industry in Britain. British gas companies also started to hire out cookers and other appliances to customers (Figure 28).

Figure 28. Dispatching appliances to consumers from the Lord Street workshops and stores. Source: National Grid Gas Archive.

There were a number of drawbacks from using prepayment meters for the gas company. For a start, meter collectors had to carry large amounts of change with them on their rounds.

The use of fake coins was also rife. The fakes could take the form of washers, foreign coins, buttons or even pieces of tin. Some examples are shown in Figure 29.

The meter collectors would expect the customers to swap the fakes for the equivalent money as they were mostly used when people had no change to hand, but the gas companies were not keen on persistent offenders.

Figure 29. Fake coins found in gas meters by the meter readers. Source: National Grid Gas Archive.

11 Saltley Gasworks

The Saltley Gasworks were originally built by the Birmingham and Staffordshire Gas Light Company in 1858. The early history of the gasworks has not been recorded, but the site was chosen due to its proximity to both the railway and Birmingham and Warwick Junction canal, which it sat between.

The Saltley Gasworks were transferred to the Birmingham Corporation in 1875 following the purchase of the Birmingham and Staffordshire Gas Light Company.

The Saltley Gasworks were separated by the later Nechells Gasworks by the River Rea and the Railway. The entrance to the site was from the Duddleston Mill Road. The adjacent railway was used for the delivery of coal.

The early gas making plant at the site is not recorded, although it would have originally used horizontal retorts. There were four gasholders present in 1898, all of which were frame guided and had the following capacities: 1.03 million cubic feet, 1.2 million cubic feet, 2.15 million cubic feet and 2.15 million cubic feet of gas.

These gasworks were extensively remodelled around 1900 by the engineer in charge of the gasworks, Henry Hack, with much of the earlier plant removed and inclined retorts installed.

By 1928, the Saltley gasworks covered an area of 18 acres and were producing 12 million cubic feet of gas per day.

The gasworks were not typical and had some unusual features. Most notably, the battery of 66 “Koppers” type Coke Ovens, which were installed in two sections between 1912 and 1914 (Figure 30).

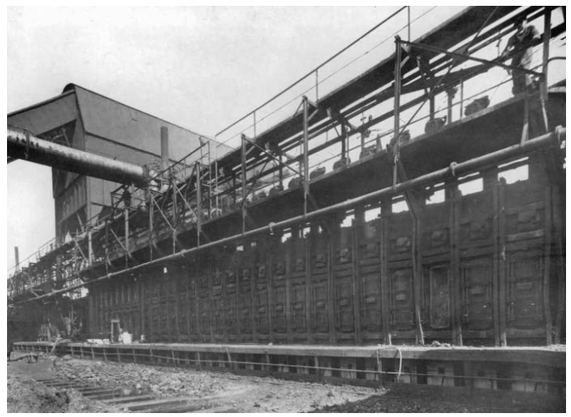


Figure 30. The Saltley coke ovens. Source: National Grid Gas Archive.

These were the only coke ovens built on a gasworks outside of London. The coke produced in the ovens was used in the Birmingham metallurgical trade for blast furnaces and foundries.

These coke ovens were heated by another unusual feature – a mond gas plant (Figure 31) which produced a low-quality gas suitable for heating purposes. Mond gas plants were typically used for chemical production as they produced a large amount of ammonia as a by-product, in addition to the low-quality gas.

In addition to the coke ovens, there were 56 Woodall Duckham continuous vertical retorts (CVR) built at the site in 1926 (Figure 32). These had replaced an earlier installation of inclined retorts. The CVRs were modernised in 1939. An inclined retort house with 208 retorts was also operational in 1928.

Unlike the other Birmingham gasworks, there were originally no water gas plants built on this site. The neighbouring Nechells gasworks had up to six water gas plants, which provided this capacity to make gas rapidly.

Automated water gas plants had been installed at the Saltley gasworks by 1930. A panorama across the Saltley gasworks c1928 is shown in Figure 33 and is also represented in the sketch which dates to 1930 in the same figure.

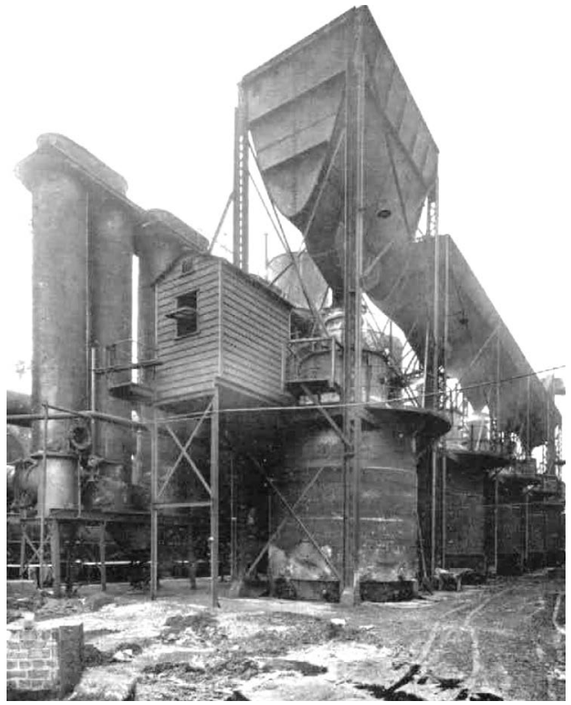


Figure 31. The Mond gas plant, Saltley. Source: National Grid Gas Archive.

Sulphate of ammonia was produced on the site using the by-products of the mond gas plant. Pitch and creosote were also produced from the by-products by a tar distillation plant.

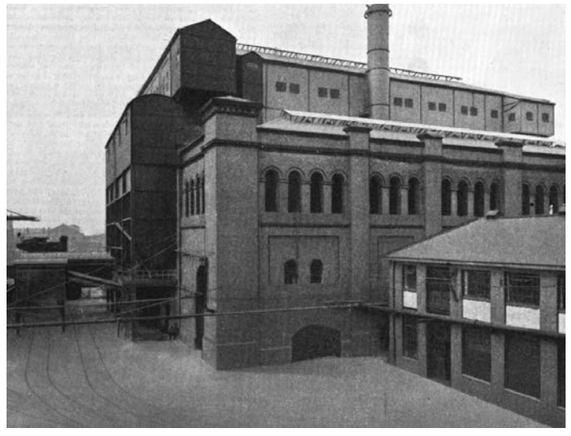


Figure 32. The Woodall-Duckham continuous vertical retort house at Saltley, 1928. Source: National Grid Gas Archive.

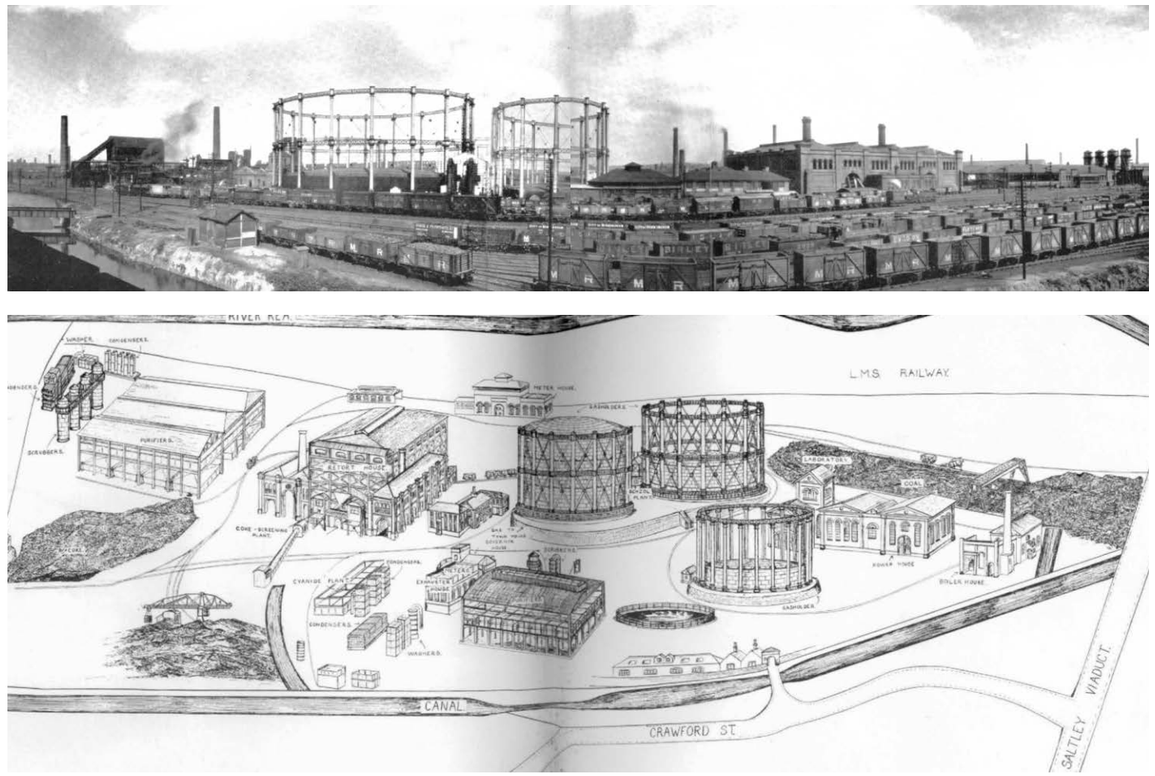


Figure 33. A view and a sketch of the Saltley gasworks. Top, Panorama across the gas works c1928 (this has been rotated horizontally so that is shows the same orientation as the sketch); Bottom, sketch of the gasworks from the entrance c1930. Source: National Grid Gas Archive.

In 1900, a separate gasworks was created when an inclined retort house was built on the Nechells site. The Saltley gasworks finally closed about 1974, with only the gasholders retained for storage.

12 An Unhappy Rivalry and Municipalisation

With the two rival gas companies in competition in Birmingham from 1825, the vigorous competition did not always benefit the general public or the consumer. Streets were continually being dug up to lay gas mains, with each company claiming equal rights to do so, and showing scant regard for residents.

It led to confusion as to which customer was supplied by which gas company, occasionally leading to households being connected to the wrong gas mains.

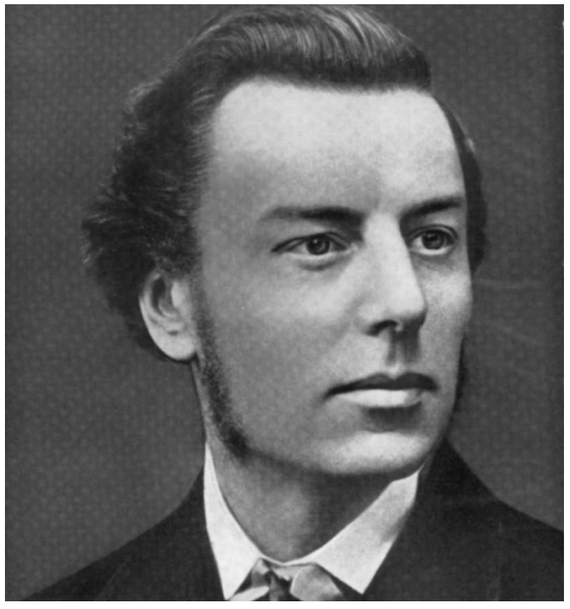


Figure 34. Joseph Chamberlain. Source: National Grid Gas Archive.

At the end of the 1860s, progressive members of Birmingham society began to make their voices heard, putting forward ideas to make Birmingham a town where people lived a healthy and decent life, with parks, baths and libraries.

These people also had the vision to bring both gas and water supplies under the control of the Corporation. These progressive elements crystallised under Joseph Chamberlain (Figure 34), mentioned earlier.

It was said that “he dreamt dreams and saw visions of what Birmingham might become and resolved that he, for his part, would do his utmost to fulfil them”. Joseph Chamberlain was elected to the Council in 1869, which marked a new era in the civic administration of the town, one which involved a fight for control of its local gas industry.

With the continued need for expansion both companies were required to raise additional capital. The two companies lodged Bills in Parliament in 1874 to sanction the raising of additional capital.

Joseph Chamberlain had the foresight to oppose both Bills and lodged his own Bill to purchase both companies. In 1875 the companies were purchased, and Joseph Chamberlain became the first Chairman of the Gas Committee (The title and coat of arms of the City of Birmingham Gas Department are shown in Figure 35), the first of Birmingham’s municipal enterprises, with plans to enlarge and improve the department.

Such municipal gas undertakings then became directly linked to local politicians through the gas committee which was appointed with oversight of the undertaking. By 1910 there were 298 gas plants operated by municipal gas undertakings in Britain.

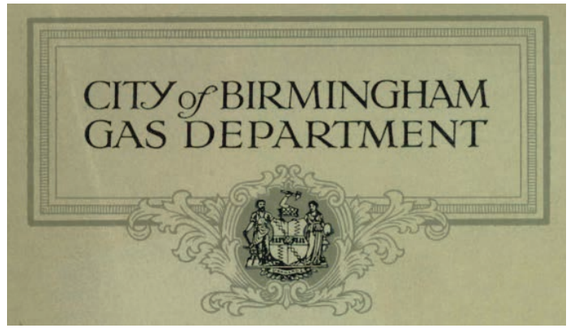


Figure 35 The title and coat of arms of the City of Birmingham Gas Department. Source: National Grid Gas Archive.

Whilst the purchase of the two gas undertakings was greeted with cheer in Birmingham, the other towns supplied by the Birmingham and Staffordshire Gas Light Company were not happy.

All the districts supplied by the gas company had the right to purchase the plant and mains within their respective areas on obtaining Parliamentary sanction. At the time, none of these areas had their own gasworks, so had to purchase gas from the Swan Village Gasworks until they had constructed their own gasworks.

Walsall purchased their gas main and a supply of gas by agreement in 1877. West Bromwich, Smethwick, Oldbury and Tipton went to arbitration on the question of price, which became a lengthy process.

It had been suggested that the local authorities should have grouped together at the time to acquire the Swan Village Gasworks jointly, instead of each building their own gasworks.

However, this never occurred and Birmingham Gas Department owned a gasworks located some distance from their area of supply.

Of the original areas of supply, only Wednesbury and Darlaston remained as customers of the gasworks, an arrangement which continued until nationalisation (See Figure 68).

When the two companies merged, they inherited two engineers, Charles Hunt of the Birmingham Gas Light and Coke Company and Henry Hack of the Birmingham and Staffordshire Gas Light Company.

The corporation gas department continued to employ both engineers and divided the gasworks between them. Charles Hunt took responsibility for Fazeley Street Gasworks, Windsor Street Gasworks and Adderley Street Gasworks and organised for the mains of the two companies to be combined.

He was also given charge of the new site at Nechells which the Corporation had purchased when the gas department was formed. Henry Hack was given charge of the Saltley and Swan Village Gasworks.

Hunt’s position was not strong, as it was recommended to close the Fazeley Street and Adderley Street gasworks. The position with Windsor Street was little better due to a lack of land and no rail connection.

These gasworks would have also probably closed had it not been for Joseph Chamberlain, who visited the site, identified adjacent land and oversaw its purchase. Crucially, he also struck a deal with the North Western Railway Company, who took over part of the newly-acquired land in return for bringing their railway to the site. These changes made the Windsor Street site more sustainable and the site was redeveloped.

Charles Hunt received favourable treatment by the City of Birmingham Gas Department over his plans for Windsor Street and for many years later.

He was made the president of the British Association of Gas Managers in 1881. By the time Hunt left the Department in 1902, he had quadrupled the gas production from the gasworks under his control.

Despite these significant achievements, Hunt’s departure was not a happy affair. He had been approached by the London-based Gas Light and Coke Company (GLCC) to become their chief engineer in 1901, the most prestigious engineering position in the gas industry.

This would have required Hunt to leave his role one year early. However, the committee of the City of Birmingham Gas Department refused to honour his pension if he left prematurely – a position which became intractable.

As a result, Hunt lost the coveted opportunity with the GLCC and eventually moved to London to take a role as an independent, consulting engineer.

When Hunt left Birmingham, he was still held in high regard by his peers and was elected president of the Institution of Gas Engineers in 1906. His presidential photograph is shown in Figure 9.

He was also a member of the Institution of Civil Engineers. By 1912, Hunt had taken up a role as the chairman of the large, South Suburban Gas Company in South London. He died aged 86 in Bromley, South London.

Like many gas industry families, his son, Philip Charles Holmes Hunt, followed has father into the gas industry and was manager of the Adderley Street Gasworks, Birmingham between 1900 and 1903.

He moved to Australia in 1903 and took up the role of assistant engineer and later engineer of the Metropolitan Gas Company in Melbourne.

Ultimately, he became one of the most prominent and influential people in the Australian gas industry.

13 New Uses for Gas

For the first 60 years, gas was used purely for lighting in Britain. This was certainly not due to a lack of alternative applications. Some proponents, such as John Barlow, had claimed to light their house, and cook and heat water using gas as early as the 1830s. Similarly, engineers including James Sharp were making cookers by 1830 and undertaking demonstrations.

The most notable advocate was the Frenchman, Alexis Soyer, at the time the most famous chef in Victorian England, who cooked on gas at the Reform Club. Despite this early interest, gas cooking did not catch on until the 1870s.

Figure 36. An advert for the Mars gas-heated steam radiator, manufactured by Birmingham-based Arden Hill.

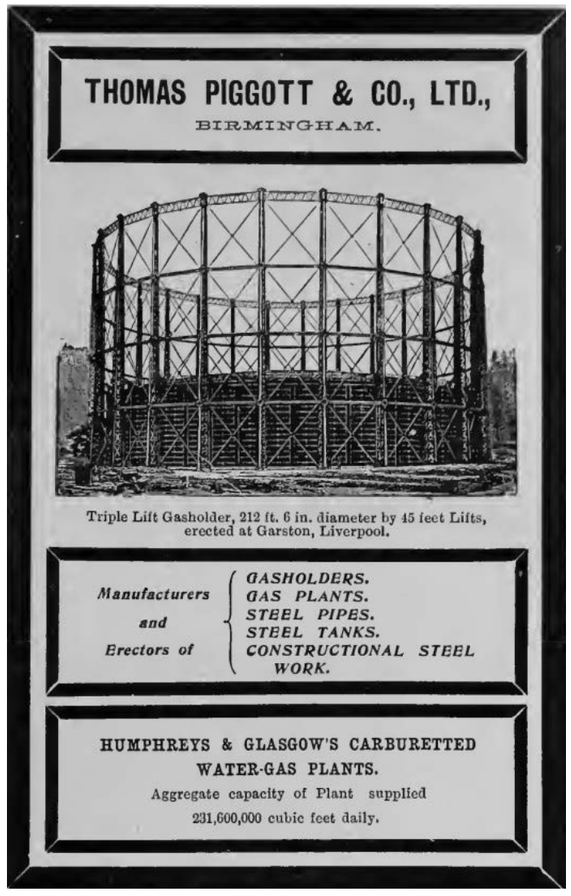


Figure 37. An Advert form Birmingham-based engineers Thomas Piggott & Co. Ltd. Source: R. Thomas.

A big improvement occurred in 1855 when the German Scientist, Dr Robert Bunsen, developed the aerated burner. This made gas burners much more effective and efficient for heating purposes, both in the home and also in industrial applications.

The gas industry indirectly employed many people in the Birmingham area through companies manufacturing gas plant or appliances.

Arden Hill was a Birmingham-based manufacturer of gas appliances, including cookers, radiators (Figure 36) stoves, fires and even gas-heated baths.

The manufacture of gas plant was undertaken by local companies such as Thomas Piggott and Co. Ltd, who were based in Birmingham (Figure 37). They were particularly well known for their gasholders.

Figure 38. An Advert for Brierley Hill-based engineers Westwood and Wright, who specialised in gasholders, but constructed a wide range of other items fabricated from iron and steel. Source: R. Thomas.

Further afield, Westwood and Wright (Figure 38), based in Brierly Hill, Staffordshire, specialised in gasholders and valves for gas pipes.

The areas of Dudley and Stourport were renowned for manufacturing fireclay retorts – the vessels used for heating coal in gas manufacture. One of the best-known names was Gibbons, an advert for which is shown in Figure 39.

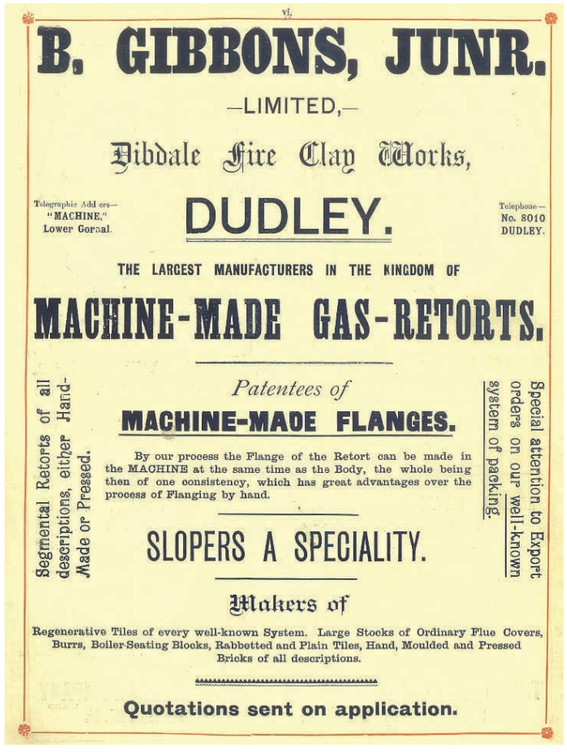


Figure 39. An advert for B. Gibbons, Junior one of the largest manufacturers of clay retorts who were based in nearby Dudley.

Another major industry in the Birmingham and the West Midlands was the manufacture of iron and steel tubes and pipes. These were used to construct the gas distribution networks in the streets. An advert of the Wolverhampton based John Brotherton company is shown in Figure 40.

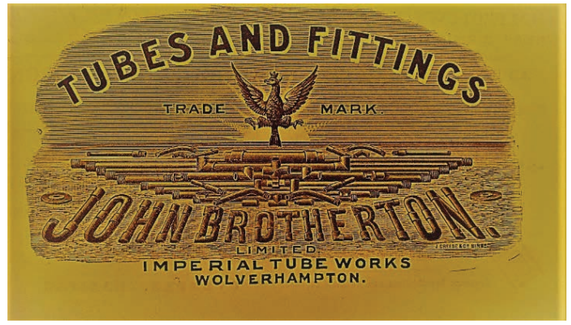


Figure 40. An advert for John Brotherton who manufactured steel tubes and pipes used by the gas industry.

One of the more novel uses for gas was for filling air balloons. This has been one of the earliest drivers for manufacturing gas, dating back to the 18th century.

Many wealthy individuals wanted to find a cheaper alternative to produce hydrogen gas to fill their balloons.

The gas produced at gasworks was not as buoyant as hydrogen as it contained heavier gases such as carbon monoxide and carbon dioxide, but it was much cheaper, so became popular.

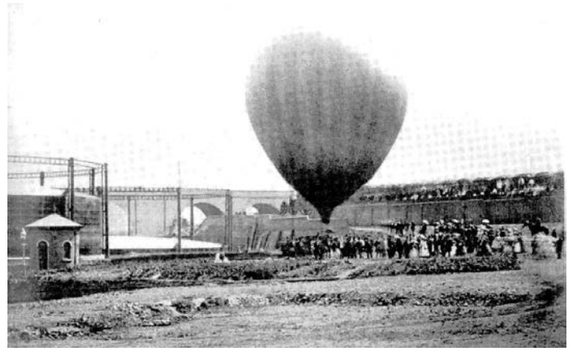


Figure 41. The Launching of James Glaisher and Henry Coxwell's altitude record balloon attempt from Wolverhampton Gasworks in 1862. Source: National Grid Gas Archive.

Balloon flights were a common occurrence from gasworks in the 19th Century, notably by the aeronaut Charles Green who pioneered the use of coal gas in balloons.

Such balloonists would fill up their balloons at the gasworks and launch them nearby. The photograph shown in Figure 41 was of a balloon launch from the Wolverhampton gasworks in 1862 when the British Association arranged for two scientists, James Glaisher and Henry Coxwell, to attempt an altitude record for a balloon. They attained a record height of seven miles and almost died of Hypoxia in the process.

14 The Gas Industry and the Unions

Work within the gas industry was always seasonal, with demand increasing over the winter. This seasonal nature led to tension with the workforce.

In March 1889, many men were laid off from the Beckton Gasworks in London, which led to a protest meeting on the 31st of March attended by gas workers from across the capital.

One of the speakers at the meeting was William Turner Thorne (Figure 42). Thorne had been born in Hockley, Birmingham and moved to the Beckton area in 1881.

Thorne had been well versed with the hardship of working in a gasworks. Whilst in Birmingham he had worked winters at Saltley Gasworks and summers at Brickworks.

Whilst at Saltley he negotiated a modification to weekend working hours and tried without success to organise a union. He was sacked from the gasworks in 1881 after which he travelled to London and found employment at the Old Kent Road Gasworks.

He later found employment as a stoker at the Beckton Gasworks. Although poorly educated, Thorne was interested in politics and joined the Social Democratic Federation in 1884, the first Socialist party in England.

He met other leading trade union figures, including Eleanor Marx-Aveling, the daughter of Karl Marx, who taught him to read and write and played an important role in his future political struggles.

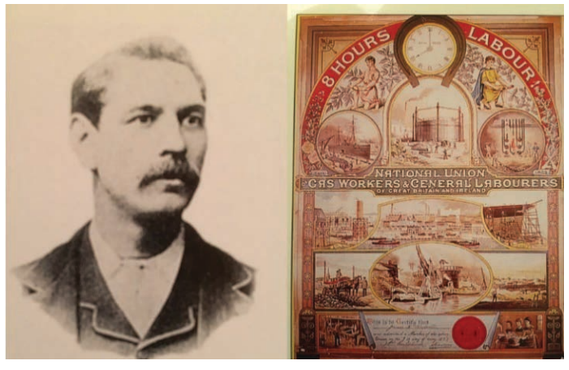


Figure 42. William Thorne and a Certificate of Membership of the National Union of Gas Worker and General Labourers. Source: IGEM Archive.

In 1888, William Thorne, along with Ben Tillett and William Byford, formed a three-man committee and soon recruited more than 800 members.

The committee established the National Union of Gasworkers & General Labourers (Figure 42), the first union for non-skilled workers. It was the forerunner of today's GMB union.

Thorne defeated Tillet in the elections to become the first General Secretary of the Union. Thorne and the union were successful in their negotiations with the GLCC and other London gas companies to reduce the length of manual workers' shifts to eight hours, to receive regular breaks and to introduce either a rest day or overtime on a Sunday.

These conditions became standard for the gas industry and were adopted in other industries, leading to strikes up and down the country. The gas industry became an early adopter of sick pay schemes, pensions and works' committees, with all ranks of employees represented.

Thorne became a founding member of the Labour Party, town councillor and Mayor of West Ham. He was elected as Member of Parliament for West Ham in 1906 and MP for Plaistow, 1918-1945.

As an alternative to the establishment of unions, some gas companies developed co-partnership schemes where members benefitted from the profits generated by gas companies.

The London-based South Metropolitan Gas Company, led by its mercurial chairman, George Livesey, had introduced paid holidays, sick pay and pension schemes in the 1870s and was a pioneer of co-partnership schemes in the gas industry.

Although Livesey had argued for a much earlier introduction, unrest and strikes forced the SMGC to introduce co-partnerships in 1889.

Livesey thought that co-partnership could be used as an alternative to unionisation and was insistent that his work force 'in the interests of the consumers' should not be union members.

As a council department, the City of Birmingham never operated co-partner schemes, but many private companies did.

15 Nechells Gasworks

Nechells was first identified as a site for further expansion by the Birmingham Gas Light and Coke Company, prior to their purchase by the Birmingham Corporation.

These plans were followed through by the Corporation, who purchased the land. The site was on the opposite side of the Midland Railway to the adjacent Saltley Gasworks which had belonged to the Birmingham and Staffordshire Gas Company.

The site had been intended for a new gasworks for the Birmingham Gas Light and Coke Company, but under the ownership of the Corporation it was originally viewed as an extension of the Saltley gasworks.

Charles Hunt was given charge of the new site at Nechells, although it was adjacent to the Saltley Gasworks, whose engineer was Henry Hack.

Hunt was the engineer in charge of constructing a new gasholder on the site, which was built between 1876-1881 and, at the time, was believed to be the largest gasholder outside London.

The Nechells site became its own complete gasworks in 1900 with its entrance and offices in Nechells Place, off Saltley Road.

The gas production and storage were undertaken at the Nechells Place site, to the North of the Saltley Viaduct, and the gas purification and water gas plant were located off Devon Street to the South of the Saltley Viaduct.

These gasworks were connected to the Saltley Works by a subway under the railway.

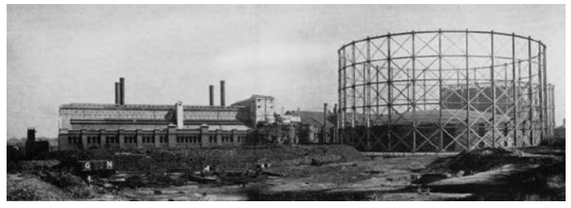


Figure 43. Nechells gasworks c1928, showing the No.1 retort House (left) and the No.6 and No.5 gasholders (right). Source: National Grid Gas Archive.

The retort house first built at Nechells in 1900 was very large at 324 feet long by 114 feet wide and 42 feet high. It contained inclined retorts which were originally a French invention and at the time still relatively new in Britain.

The retort house was designed by Henry Hack – who had taken over as the works engineer – to be wider than many previously, so they were better ventilated, more spacious and gave workers better conditions.

The retort houses were connected both by railway and canal. Rail wagons were used to bring the coal to the retort houses and the coke from the works was loaded into canal barges via a crane feeding a coke screening plant.

The barges were located in a side arm of the Birmingham and Warwick Junction Canal.

Keeping abreast of new innovations, the City of Birmingham Gas Department installed a Woodall Duckham continuous vertical retort (CVR) as a trial in 1912 and introduced a large number of CVRs at the Windsor Street Gasworks at the same time.

By 1916, all the inclined retorts had been removed from the gasworks and replaced by either Woodall Duckham CVRs in the No.1 retort house or mechanised regenerative horizontal retorts in the No.2 retort house.

In 1949, the horizontal retorts were replaced by Glover-West continuous vertical retorts.

The No.5 gasholder was extended from two to four lifts and was 197 feet in diameter and 144 feet high, holding 4 million cubic feet of gas.

The No.6 gasholder, built in 1898, had four lifts, was 261 feet in diameter and 168 feet high, holding 8.25 million cubic feet of gas. Both gasholders had a flying lift which extended above the framing.

This can be seen on the left-hand gasholder in the sketch in Figure 45. Both gasholders are visible in the photographs in Figures 43 and 45.

All the gas manufactured at Nechells Gasworks was transferred via pipeline to the Saltley Gasworks for distribution.

The purification plant, laboratory and water gas plant were located across the Saltley Viaduct. The gasworks originally used conventional box purifiers.

The houses which contained these can be seen in the background of the left-hand side of Figure 45. Two installations of tower purifiers later replaced the box purifiers.

The water gas plant was used to supplement gas production at times of peak demand, as described earlier for Windsor Street.

Two Humphreys and Glasgow carburetted water gas plants were built in 1896, a relatively early installation. These plants were originally hand-operated, but were later fully automated.

By 1946 there were four of these automated plants. From 1952-56, new CWG plants were built for the West Midlands Gas Board that could use heavy fuel oil. These developments made the gasworks the largest in the West Midlands.

As the coal gas manufacturing era drew to a close, two German designed Otto low pressure gas reforming plants were built at the Nechells gasworks in 1961.

These produced gas from oil and the coal gas plant was gradually removed from service. The gasworks finally closed around 1974, with the gasholders retained for storage. Like the other gasworks in Birmingham, Nechells was severely damaged during World War II.

The Nechells gasworks were also the home of the coal test works (Figure 44) and laboratories, which are discussed in more detail in the Section "Gas Research in the Midlands". The Coal test works had closed by 1962.

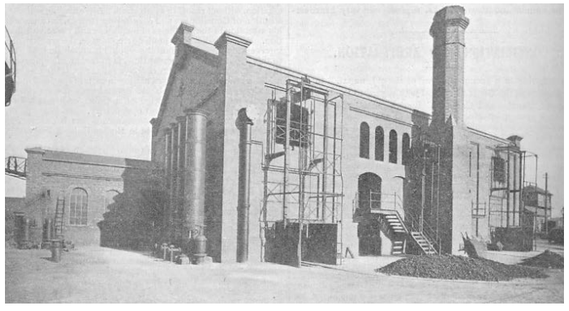


Figure 44. The coal test plant, Nechells Gasworks, 1905. Source: National Grid Gas Archive.

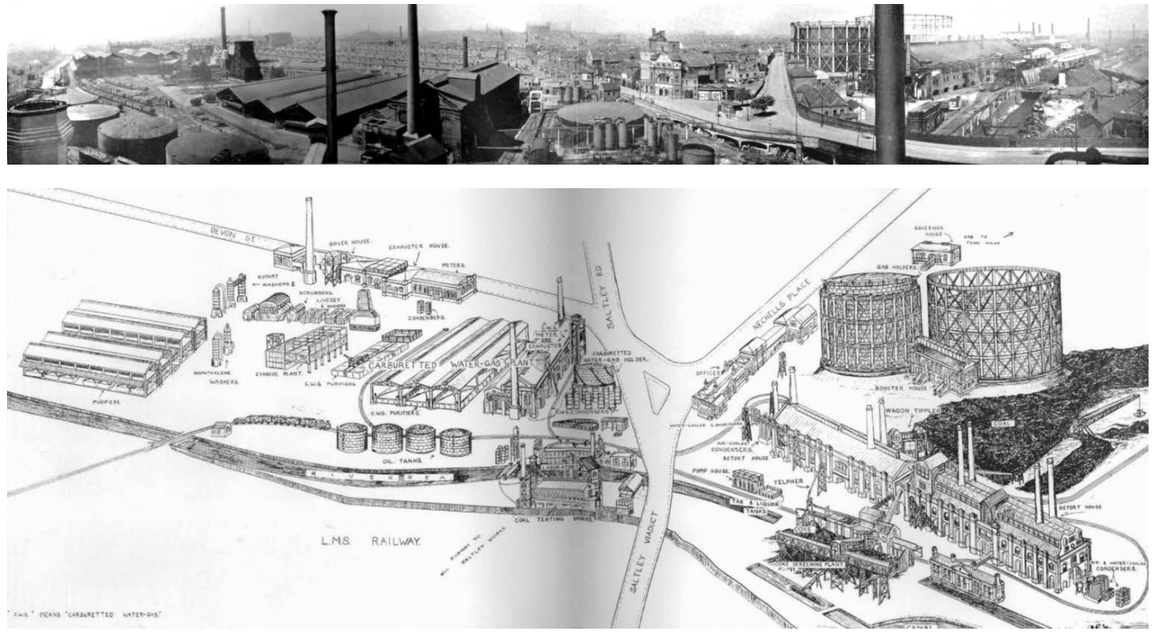


Figure 45. Views and a sketch of Nechells gasworks. Top, Panorama across the gas works 1928; Bottom, Sketch of the gasworks from the entrance c1928. Source: National Grid Gas Archive.

16 Electricity, the Young Pretender

Electricity was long heralded as a new rival to replace gas, making it obsolete. Humphrey Davy demonstrated the first electric arc lamp in 1806, but it was impractical for lighting purposes and it took many years for electricity to return as an effective competitor.

The first serious attempts at street lighting took place in London, starting in the 1870s.

Repeated demonstrations of new types of electric lighting were trialled during the 1870s and 1880s. The more robust light bulb for everyday use was developed by Joseph Swan (1878) in the UK and Thomas Edison (1879) in the US.

After legal disputes, they later collaborated to form the Edison Swan Electric Company Limited, otherwise known as Ediswan. They became a dominant force providing domestic and street lighting to rival the gas companies.

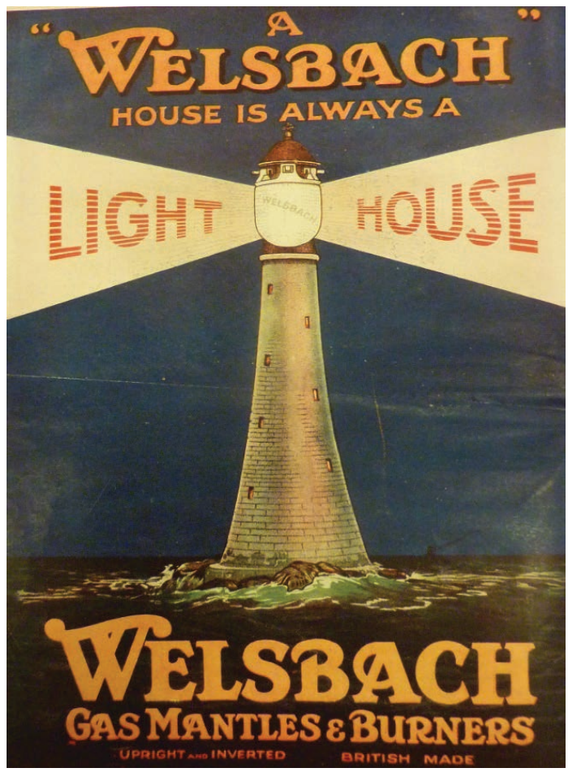


Figure 46. The advert for Welsbach gas mantles and burners, circa 1925. Source: National Grid Gas Archive.

Gas, however, did not give up. It first fought back with the gas mantle, developed by the Austrian chemist, Carl Auer von Welsbach, in 1887.

He discovered that the oxides of certain rare metals had the ability to emit light when heated to a high temperature. By soaking a fabric structure, called a mantle, in these rare metal oxides and heating it with an aerated (Bunsen) burner, it produced a brilliant light.

These incandescent mantles allowed gas to compete with electricity for much longer than would have otherwise been possible.

Some towns even kept their gas lights until the 1960s. There are a few today that still operate in the picturesque town of Malvern, South West of Birmingham. The Welsbach brand shown in Figure 46 was one of the most popular.

Figure 47. High pressure gas lighting at Victoria Square in Birmingham c1931. Source: IGEM Archive.

Another development to compete with electricity by the gas industry was the introduction of brighter, high-pressure gas lighting. This was first introduced on Blackfriars Bridge in London in 1901.

High pressure, incandescent burners could eventually produce a light of 3000-4500 candle power, like that seen in Figure 47.

17 A Social Conscience and Community Spirit

The City of Birmingham Gas Department was viewed as more than merely an employer. It became seen more as an extended family, looking after the welfare of its employees, organising recreational activities, sports days leagues, and competitions, all of which was relayed back through the Department's magazine. The front cover of an edition from 1941 can be seen in Figure 51.

Figure 48 shows an annual family day out for the members of the catering department. These were common across all the departments of the Gas Department. A train would be specifically chartered for the trip and refreshments provided for everyone during the long day.

Such an event was a real bonus to the workers as it was not commonplace by employers at the time.

Figure 48. Families of the Swan Village Catering Department at the works station before a day trip to Rhyl. Source: National Grid Gas Archive.

Another popular event would be the annual sports day (Figure 49), with competitions held between members of staff and their families.

Leagues were also established with teams made up of staff representing various departments. Popular activities were football, cycling and fishing. The Department had its own sports ground at Hollyfields.

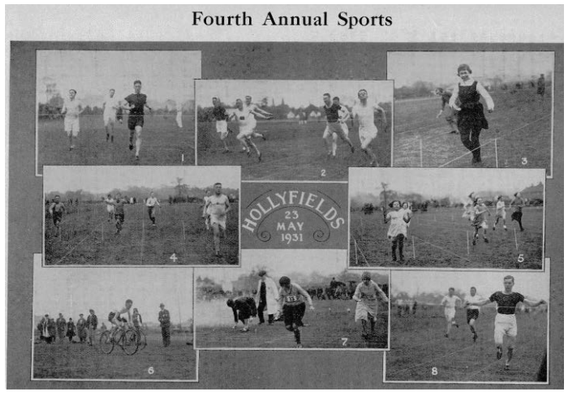


Figure 49. The City of Birmingham Gas Department, Fourth Annual Sports Day, Source: National Grid Gas Archive.

The children's Christmas party was always an eagerly awaited event. Held annually in a large venue, entertainment, food, music and dancing were all laid on at the expense of the Department.

A group photograph from the 1930s of the employees and their families is shown in Figure 50.

All these events organised by the Department helped to build staff loyalty, and it was not unusual for workers to stay for life and to encourage their children to join when they reached working age.

There are many stories of three generations of the same family working for the same gas undertaking, if not more.

Figure 50. Group photograph of the annual Christmas party for workers and their families at the Windsor Street Gasworks. Source: National Grid Gas Archive.

The City of Birmingham Gas Department even had its own Orchestra, which entered competitions and put on events across the city throughout the year.

This family approach to work did not end with Nationalisation in 1949, but continued long afterwards, as did the Departmental magazine which consolidated into a regional publication, West Midlands Gas Board Magazine (Figure 51). By this time, each regional gas board had its own magazine.

Figure 51. Examples of the magazines of the City of Birmingham Gas Department from 1941 and West Midlands Gas Board from 1950. Source: National Grid Gas Archive.

18 The By-Products of Gas Manufacture

Coke was the most important by-product of gas manufacture. The coke was the light, spongy material left in the retorts after the gas was extracted.

Its size, which varied, would determine its use, including, domestic, commercial and industrial heating, in open fires, boilers and stoves and in the metal processing industries.

A large quantity of the coke from Birmingham was exported to Scandinavia where it was used for heating during the cold winters.

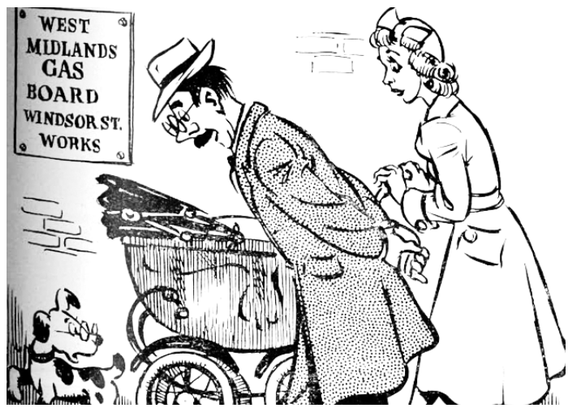


Figure 52. A Cartoon from the West Midlands Gas Board Magazine, which had the punchline "Well what a handsome bag of coke", a comment based on the fact that people often collected coke from the gasworks in an old pram. Source: National Grid Gas Archive.

Coke was sometimes sold directly from the gasworks, collected by local people in whatever form of transport was to hand. The cartoon in Figure 52 is based on the fact that people would often take an old pram to the gasworks to collect the coke.

Ammoniacal liquor was another by-product of gas manufacture, often used as a fertiliser by farmers. The West Midlands Gas Board promoted its use as a fertilizer by selling it as nitrogenous liquor.

They attended local country shows where they gave examples of its use and offered advice to farmers. The liquor could be sprayed directly on to farmers' fields by the type of lorry shown in Figure 53.

Figure 53. A tanker used by the West Midlands Gas Board to spray liquor on a farmer's field. Source: National Grid Gas Archive.

Benzol was a type of oil which could be extracted from gas. It was used as a replacement for petrol. Before oil was found in the North Sea, it had to be imported long distances. A similar substance, Toluol, was also extracted for use in the manufacture of explosives.

Both Benzol and Toluol formed a vital contribution to the war effort on the part of the gas industry. Such plant could be found on all the Birmingham gasworks in the early and mid, 20th Century.

Cyanogen, which was mentioned in connection to the Windsor Street Gasworks, was used by the chemical industry to manufacture cyanide salts.

These were then supplied to the metal industry. Spent Oxide – a by-product rich in sulphur, formed by passing the raw gas over a powdered form of iron – was often sold to chemical works, which used the sulphur to manufacture sulphuric acid.

Some large gas undertakings would manufacture the sulphuric acid themselves.

Coal tar was another vitally important by-product of gas manufacture. It could be distilled and refined into many different products, ranging from creosote for fence posts, morphine and aspirin for pain relief, dyes for textiles, nylon and pitch for making tarmac roads.

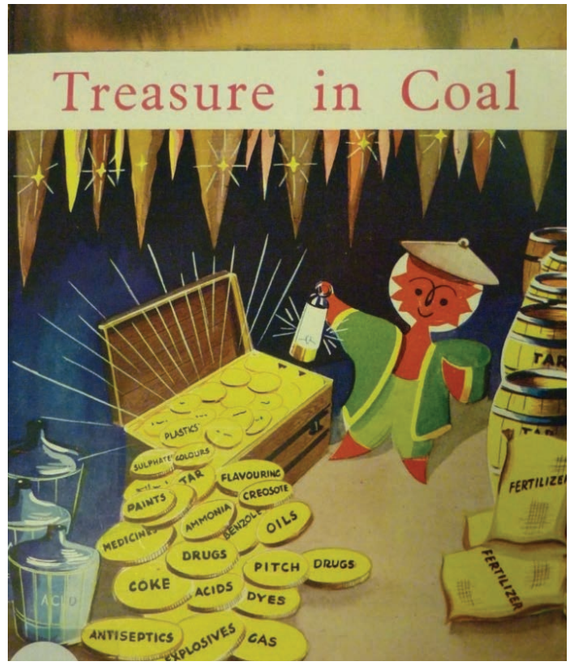


Figure 54. Mr Therm, the gas industry mascot, demonstrating the valuable by-products obtainable from coal. Source: National Grid Gas Archive.

19 World War I and its Impact on the Gas industry in Birmingham

World War I had significant impacts on the gas industry. Luckily, air raid attacks on the Birmingham area were limited to the German Zeppelin airships.

One attack caused damage to the Black Country towns of Tipton, Wednesbury and Walsall but such incidents were uncommon. Rare though they were, they served to drive recruitment for military service locally.

A bigger issue for the gas industry was that many skilled staff were lost to the war effort. By 1916, 800 employees of the Gas Department were on active, military service and a further 650 were in the military reserve forces.

Many joined the Royal Warwickshire Regiment. By the end of the War, 1239 members of the Department had served in the armed forces and 156 of those had died in active service, 34 of whom had worked at the Windsor Street Gasworks.

Such a large demand on labour meant that older employees retired later or came back from retirement, but this was still not enough.

To address the acute shortages of labour, many women were recruited to roles right across the Gas Department, from meter collectors (Figure 55) to some of the most arduous roles, including stoking the retort, carrying coke and loading and emptying the oxide from the purifiers (Figure 56).

There was a certain amount of reluctance and scepticism about whether the women would be able to undertake some of the tasks. But they proved to be very efficient and effective as they were often drawn from the families of gas workers and had a keen awareness of the types of work involved.

The gas industry had a key role to play in providing light, heat and power for those industries directly, or indirectly, manufacturing arms and munitions in the Birmingham area. Gas production had to meet the substantially increased demand, despite the reduced staff numbers.

The personal losses incurred by the Gas Department were sorely felt and after the War a memorial to the fallen was built in the Department's Council House offices (Figure 57).

It became a regular occurrence to have an Armistice Day service at the memorial in the years that followed. A fund was also established to support the families of those from the Department killed in action.

Figure 55. Female meter inspectors, City of Birmingham Gas Department, 1917, during World War I. Source: National Grid Gas Archive.

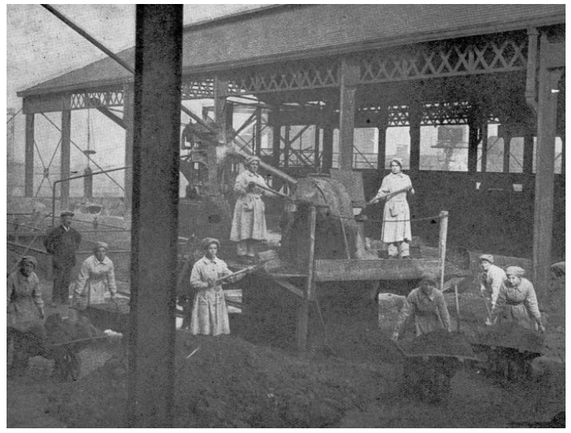


Figure 56. Female gas workers working on the Oxide Crusher at Nechells Gasworks, Birmingham, 1918, during World War I. Source: National Grid Gas Archive.

Figure 57. The War Memorial, the Gas Department, Council House, Birmingham. Source: National Grid Gas Archive.

20 The Public Face of Gas

As a result of being the largest gas undertaking outside of London, the City of Birmingham Gas Department had many customers. Estimates put this at 324,000 in 1936, across a district of 200 square miles.

The Department catered for all the different urban and suburban areas of the city, with their varying wealth and needs. Most customers would never visit the gasworks, so the public face of gas would often be found at the showroom, where bills could be paid, and appliances bought or hired.

The main showroom was in the Council House in the city centre, but each local area had its own showroom. The displays would cater to the local areas where they were located. The large showroom in the prosperous suburb of Sutton Coldfield is shown in Figure 58.

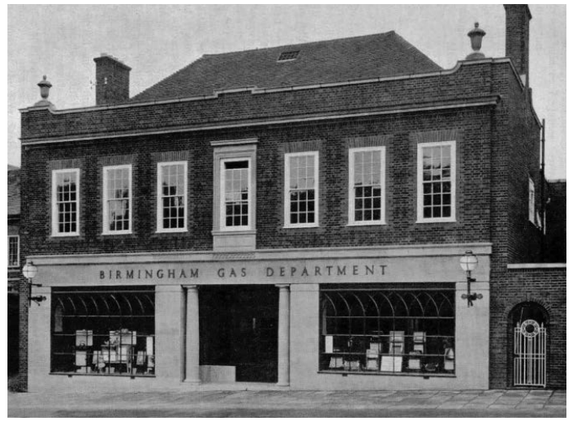


Figure 58. The Gas Showrooms at Sutton Coldfield, 1946. Source: National Grid Gas Archive.

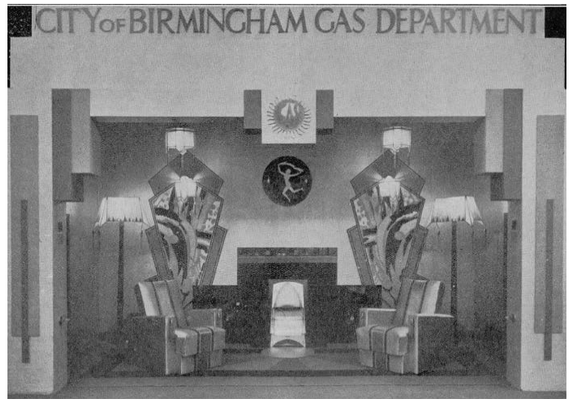


Figure 59. A fashionable showroom display of the City of Birmingham Gas Department, c1930. Source: National Grid Gas Archive.

The displays could incorporate the cutting edge of fashion, such as the display in Figure 59 from the 1930s, or more mundane budget items.

The larger showrooms often had a theatre where demonstrations of appliances and, more often, cooking were given by the Home Service (HS) department.

You could arrange for advisors from the HS to visit your house and show you how to get the best out of your appliance. Sometimes they would even bake you a cake!

Gas would be advertised through different media, often in local newspapers or magazines. Other forms of advertising included displays in the foyer of local cinemas and the creation of floats or tableaus for local events or carnivals, such as that shown in Figure 60.

Figure 60. A Gas Department tableaus from a Birmingham carnival, c1930. Source: National Grid Gas Archive.

Figure 61. A gas display of the industrial research laboratories of the City of Birmingham Gas Department, c1920. Source: National Grid Gas Archive.

Efforts were made to attract new customers from the many industrial companies in Birmingham. The industrial research department would exhibit at local trade fairs (Figure 61) to promote the range of furnaces and other industrial gas appliances available to potential customers.

They would even design and manufacture specialist equipment, such as furnaces, when required.

21 The Lord Street Offices, Stores and Workshops

In 1936, a large new office and workshop was built adjacent to the Windsor Street Gasworks on Lord Street (Figure 62). The buildings housed the fittings section, maintenance section and distribution section of the Gas Department and were built on top of part of the Windsor Street Gasworks which had housed seven of the original gasholders.

The various functions of the Gas Department had been spread across different sites in the city, so the buildings were designed to bring the departments together in a single building, which was eventually achieved in 1936.

The fitting section was responsible for any new gas installations in buildings, and the maintenance section was responsible for maintaining the customers' meters and appliances.

In 1936, there were 330,000 meters, 322,000 cookers and 170,000 gas fires in use by the 326,000 customers of the Gas Department, within its 200 square mile district. The Distribution Section was responsible for all the mains laying in the city streets.

Figure 62. The Lord Street offices, Stores and Workshops. Source: National Grid Gas Archive.

The Lord Street offices were responsible for the administration and technical services of the Department. The workshops were used for the repair, cleaning and maintenance of meters and appliances. The stores were used to store and dispatch meters and appliances to customers.

22 World War II

During World War II, the situation was even worse than in World War I. The gas industry suffered a combination of damage to the gasworks and gas mains, a loss of staff to the war effort and underinvestment.

At the outbreak of World War II, 801 men and 21 women joined the military, were transferred to other industries or were seconded to full-time civil defence duties. Non-technical roles, such as meter inspectors, were significantly depleted and this led to the recruitment of many women.

A new "army" of 170 women were recruited as meter inspectors as shown in Figure 63. Staff from the Birmingham Gas Department served in every theatre of war and 67 of those paid with their lives.

To support those who did sign up for military service, the Gas Department made up their pay to the tune of £287,000 during the war years.

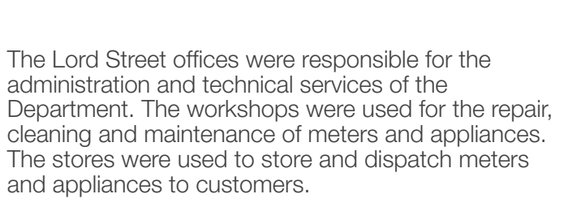


Figure 63. Female meter inspectors, City of Birmingham Gas Department, 1945, Source: National Grid Gas Archive.

Whilst many staff ended up in active military service, others – such as Mr S.A. Bennett, a clerk in the Gas Department – were required to become "Bevin Boys", working in the coal mines to boost the flagging coal production which had powered much of the UK industrial output.

They were named after Ernest Bevin, a former trade union official and then British Labour Party politician who served as Minister of Labour and National Service in the Wartime Coalition Government. It was not an easy option.

After just a month's training, the Bevin Boys were dispatched to work in the coal mines, working over 1000 feet below ground in often cramped and dangerous conditions, with the risk of tunnels collapsing or explosions due to the build-up of mines' gas.

Figure 64. A City of Birmingham Gas Department carriage coupled to a Falkirk Corporation Gas Department locomotive, during WWII, when the wagons had been requisitioned by the Government. Source: National Grid Gas Archive.

With labour so short, the Department had to ask the armed forces to release some key staff. They also scoured the British Isles to recruit new people and introduced a seven-day week during 1943 and 1944.

The Department had to cope with the challenges of poor-quality coal, overburdened railways, a loss of most of their 2000 coal wagons and blackout conditions, on top of labour shortages and enemy attacks. Their wagons were requisitioned by the Government and were found all over the country, such as the example found at the Falkirk gasworks (Figure 64).

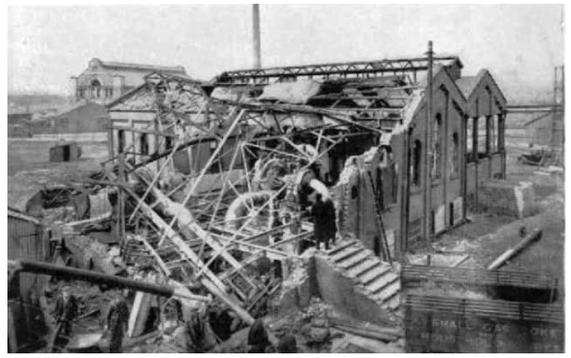


Figure 65. (Top) Destruction of the Booster House at Washwood Heath and (below) an unexploded bomb dropped on the Nechells Gasworks. Source: National Grid Gas Archive.

During the war years (1939-1945), gas manufacture had to increase by 22% to 20.5 billion cubic feet to meet the demand, with around 46% of gas production going to industry.

Such was the situation that carburetted water gas plants, normally only used in peak periods, were run continuously, using about 5 million gallons of oil per year.

Unlike many gas undertakings, Birmingham was able to completely reorganise the gasworks at Saltley during the war years. To aid the war effort, Birmingham installed Benzol plants at all four of the works, which produced 14.4 million gallons of Benzol and 2.3 million gallons of Toluol, a chemical used for explosives manufacture.

Figure 66. The Gas Department head offices after the air raids on the 21st/22nd of November 1940. Source: National Grid Gas Archive.

The Department also provided gas for topping up barrage balloons, which defended the city from aerial attack, and supported smaller gas undertakings with technical assistance and bulk gas supplies. The gas from the Department was vital in the production of munitions, arms, tanks and aircraft.

As a major industrial area, Birmingham was targeted by aerial bombardment during the years 1940 to 1943, the first occurring in October 1940.

The air raid precautions taken by the Department, and the extensive, interconnected gas mains, allowed both the gasworks and the distribution systems to keep functioning during the War.

No area lost its gas supply for more than a few days, even though 1,127 gas mains were damaged during hostilities. Sadly, six workers lost their lives from enemy attacks whilst doing their job, three workers received the George Medal and five were commended for their gallantry.

During the War, a mutual aid scheme was established which allowed the different gas undertakings to support each other if attacked by enemy air raids.

The engineer-in-chief of the City of Birmingham Gas Department, Mr G.C. Pearson, was put in charge of Region 9, which covered Birmingham and 75 other gas undertakings. In his role, Mr Pearson had to be available 24 hrs a day to coordinate responses to enemy attacks.

He had first-hand experience of the bombing raids at the gasworks in Coventry and Walsall. He was awarded an O.B.E. for his contribution to the War effort and was later made the president of the Institution of Gas Engineers.

By 1946, the area served by the City of Birmingham Gas Department included 2,156 miles of gas mains within an area of 200 square miles.

Supplying such a large and gas-hungry district from its four gasworks proved a challenge. In response, it developed a high-pressure gas network, supported by gas-boosting stations and governor houses (Figure 67), to enable the gas mains to be kept full.

Figure 67. The high-pressure Governor House (centre) and attendants' houses (left and right), Birmingham 1946. Source: National Grid Gas Archive.

A key factor that enabled the City of Birmingham Gas Department to succeed in adversity was that it was alive to the needs of its inhabitants.

It offset the loss of its domestic lighting market to electricity by solving the problem facing industry of wanting to use gas but not knowing how. The Department provided the technical know-how to achieve this.

The City of Birmingham Gas Department achieved the status of being the largest municipal gas undertaking in the world. Its area of supply is shown in Figure 68.

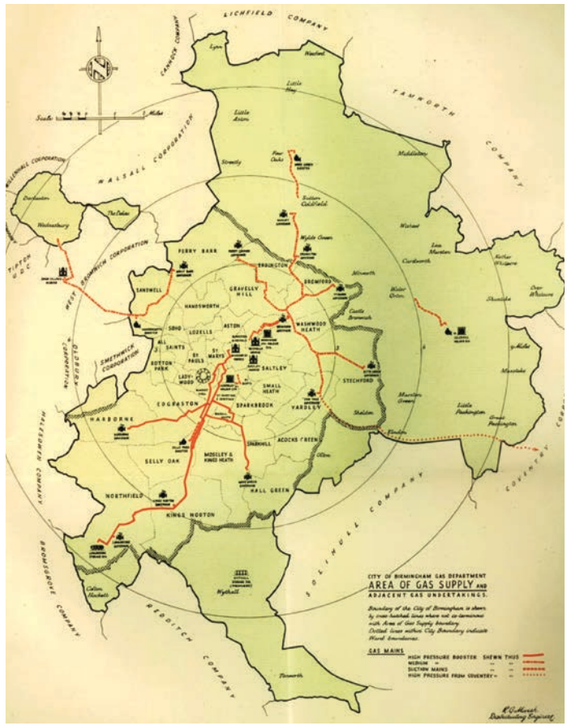


Figure 68. The area of supply of the Birmingham Corporation Gas Department, showing gasworks, holder stations, gas boosting stations and governors. The surrounding gas undertakings are also listed. Source: National Grid Gas Archive.

23 Industrial Uses of Gas

The industrial use of gas was a major market for the gas industry in Birmingham and later the West Midlands Gas Board.

In the early years of the 1800s, gas found industrial applications for soldering buttons, but the market did not grow to be substantial until much later. In the early 20th Century, the industry started to employ engineers solely to support industrial clients and construct burners for new applications and industries, some of which became very large users of gas.

The West Midlands even had a separate gasworks at Tipton, dedicated to producing a cheaper lower grade gas, called Mond Gas, suitable for industrial purposes. It had its own gas network which supplied up to 300 different, industrial customers.

Some industries produced their own cheap crude gas called "producer gas" to power industrial processes, instead of taking a supply from the local gas undertaking.

As the price of gas produced by the gas undertakings dropped, the industries gradually switched supply and closed their own gas-making plant. Such a company was the Birmingham Aluminium Casting Company, who used gas for furnaces, stoves, torches and drying ovens. Support was provided by the undertaking to redesign the replacement burners.

The large steel manufacturer, Stewarts and Lloyds, adopted mains gas for powering their furnaces at the Bromford Tube Works.

These furnaces heated billets of steel alloy ready for processing into tubes. The amount of gas used by the furnace was estimated to have been equivalent to the gas demand of a medium-sized town.

The large Birmingham, galvanising industry switched to gas for heating galvanising baths. These baths contained molten zinc into which steel items were dipped and coated to stop them from rusting.

Other industries such as potteries in the north of the West Midlands became major uses of gas for firing kilns, a change which greatly improved air quality.

24 Nationalisation and the West Midlands Gas Board

Following the end of World War II, Sir Geoffrey Heyworth was appointed by the Government to undertake a review of the gas industry. The review identified that fundamental change in the structure of the industry was required, which involved grouping gas undertakings into larger units.

The incoming Labour Government decided the best way such change could be achieved was to nationalise the industry and amalgamate the gas industry into 12 regional boards.

Each Board had its own board and chairman. The chairman of the West Midlands Gas Board (WMGB) was Mr G. le B. Diamond, shown in Figure 69.

He was new to the West Midlands area having previously worked in the South East of England, where he had been a director of the Rochester, Chatham and Gillingham Gas Company and of 16 associated gas companies in that area.

Alex Lee, who had been the secretary and general manager of the City of Birmingham Gas Department was made a member of the Board of the West Midlands Gas Board.

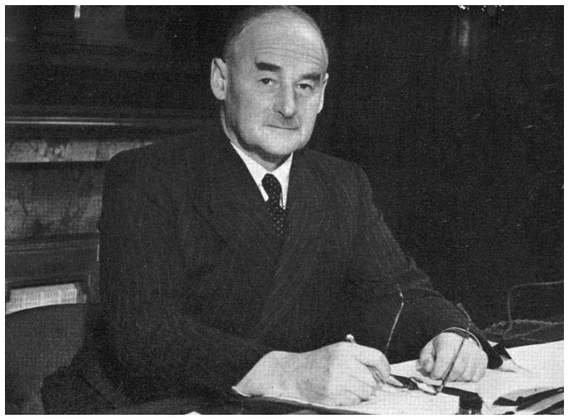


Figure 69. Mr G. le B. Diamond. The first chairman of the West Midlands Gas Board. Source: National Grid Gas Archive.

The main driver of nationalisation was to help rationalise the gas industry into more efficient units. Having all the regional gas undertakings in a single organisation allowed the boards to focus on making the larger gasworks more efficient and closing those that were smaller and less efficient.

Investment went into the construction of gas-making plant and new gasholders at the larger gasworks in the region. This helped to minimise the cost of making gas and would aid the growth of the industry.

The gas mains were also replaced and, in many areas, extended to new suburbs or villages. In its first year, the WMGB had to refuse many requests for new gas connections from domestic customers. Industrial companies' requests to provide an increased gas supply, were also often refused due to limited gas production capacity.

Each gas board developed its own emblem. The emblem of the WMGB is shown in Figure 70.

Figure 70. Logo of the West Midlands Gas Board. Source: National Grid Gas Archive.

In Birmingham, all the gasworks were improved. The Swan Village Gasworks benefitted greatly from nationalisation, as the shackles which had effectively been imposed by being outside the City of Birmingham Gas Department's area of supply, disappeared.

Being well positioned with rail connection and underutilised land, the gasworks were significantly expanded with new gas-making plant.

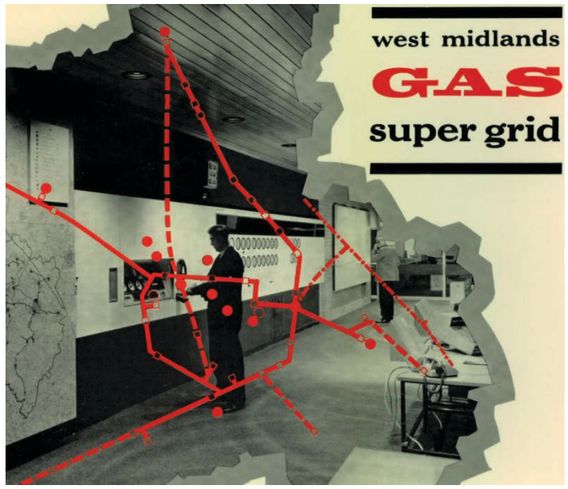


Figure 71. The high-pressure super grid of the West Midlands Gas Board. Source: National Grid Gas Archive.

The 1950s started to see the decline in the availability of quality gas-making coal. The industry looked to new research to develop more effective ways of using poorer quality coal or using the by-products of the oil industry as potential feedstocks for gas making.

At the time, oil refineries in Britain had cheap by-products which could be converted into gas through a process called gas reforming.

The economic advantages of gas manufactured from the reforming of petroleum feedstocks marked the beginning of the end for the production of gas from coal.

This was keenly observed at Coleshill in Warwickshire, east of Birmingham, where two gas making plants were built. A coal utilising Lurgi plant had been trialled at the Midlands Research Station in Solihull, which had led to the construction of the full-scale Lurgi plant at Coleshill. Alongside this, an ICI reforming plant of similar production capacity by was built, which could make gas from refinery by-products.

The reforming plant proving to be much more cost-effective than the Lurgi gas plant, which had been identified as the only feasible option for future gas making from coal. More information about gas research in the West Midlands is provided in the following section.

To aid supply across the West Midlands, the WMGB built a super grid which piped gas throughout the region at a high pressure of 250 pounds per square inch from the new, gasworks at Coleshill. By 1967 it had reached 260 miles long.

25 Gas Research in the Midlands

As a result of being the largest gas undertaking outside of London, the City of Birmingham Gas Department had a history of undertaking research suited to the needs of its customers. In 1892, they recruited a trained Chemist, Dr H. Colman, (Figure 72), who had assigned a portion of his time to undertaking research.

Dr Colman then applied his knowledge of chemistry to improving gasworks processes. He held the post until 1902 when he moved into consultancy, although he continued to work privately for the department for a further two years.

In 1903 the secretary of the Gas Department, Mr. Hampton, wanted to access more accurate data about the coal used at their gasworks.

To achieve this aim, a number of test plants were built. Small test units were built at Windsor Street and Saltley Gasworks, a larger five tonne-per-day unit was constructed at Swan Village and, in 1905, a 20-tonnne-per-day coal test plant was introduced at Nechells.

Figure 72. Chemists of the City of Birmingham Gas Department Clockwise, from top left, Dr H.G. Colman (1892-1902), Dr W.R. Davidson (1905-1912), Mr T.F.E. Rhead (1920-1949) and Sir Ernest Smith C.B.E. D.Sc. (1912-1920). Source: National Grid Gas Archive.

Figure 73. The Greek Prime Minister (centre) inspecting the Nechells gasworks in 1932. Source: National Grid Gas Archive.

The latter formed a brand new research facility, later named the Central Test Works. Each of the test plants were completely self-contained gasworks, with all the necessary screening and gas treatment plant.

By carrying out the testing themselves, the Gas Department could ensure they were receiving the right quality, and size, of coal both of which were important factors affecting the quality of the gas, the life of the retorts and the quality of the coke produced.

In 1905, the Gas Department decided to recruit a new, fully qualified chemist in order to aid the scientific development of the gas Industry.

They employed Dr W. B. Davidson (Figure 72) who found on arrival that the laboratories were inadequate and poorly placed.

He pushed for a scheme that would create a chemical and testing works around a proposed, central laboratory adjacent to the coal test works. A new two-storey laboratory was then commissioned in 1905.

Dr Davidson became the engineer of the Nechells Gasworks in 1912 and his role of chief chemist was filled by Ernest Smith (Figure 72), who had spent the previous two years working on high pressure gas processes. The increasing workload led to an extension to the laboratories in 1914.

The skills of the Department chemists were in high demand during World War I. As they outgrew their facilities, any available building was used. In 1920, Ernest Smith left to take on an important business role and went on to be knighted. His legacy was in giving the chemistry of gas-making an increased profile.

Smith was replaced as chief chemist by his assistant, Mr T. F. E. Rhead (Figure 72), who remained in the role until nationalisation in 1949.

The importance of the facility can be seen in Figure 73, which shows the Greek Prime Minister inspecting the Nechells gasworks, laboratories and coal testing plant in 1932. He was on a fact-finding tour to learn about gas-making technologies used in Britain and how they might improve equipment in Greece.

Figure 74. The central and research laboratories, Nechells Gasworks, Birmingham. Source: National Grid Gas Archive.

The laboratories provided a vital role in developing and modifying furnaces and heat treatment processes used in the manufacture of military equipment in World War II, especially aircraft production. A complete set of new laboratories were built by 1940 (Figure 74) but, due to the War, these were only fitted out in 1949 in time for the New West Midlands Gas Board.

The combination of the coal test plant and the laboratory allowed laboratory work to be scaled up at close quarters. The facility was initially known as the Central and Research Laboratory of the West Midlands Gas Board, and one of its initial aims was to disseminate knowledge of chemistry to the wider gasworks in the region.

As a result of the Gas Act of 1948, a research station was Established in the Midlands. The Gas Act which had nationalised the gas industry in Great Britain had put a responsibility on the newly created Gas Council for Research. In response, the Gas Council set up a high-level research committee in 1950 to provide advice in this sphere.

One of its first actions was to suggest the creation of two research stations. The first was created at Fulham, London, born out of the research facilities of the Gas Light and Coke Company, the largest gas undertaking.

The second was established at the Nechells Gasworks of the West Midlands Gas Board, using the former Central laboratory and test works of the former Birmingham Corporation Gas Department as a temporary base.

This site initially became known as the Birmingham Research Station. It came under the directorship of Dr F. J. Dent (Figure 75) in 1951, a chemical engineer, who was the former assistant director of the Gas Research Board at their Poole laboratories.

The Birmingham Research Station had clear objectives from the start. The high price and shortage of good, gas-making coals and the high cost of imported oil for enriching gas was impacting the gas industry, so research was to be focussed on the complete gasification of coal.

This work had been the focus of the independent Gas Research Board, based at Poole, and was continued with the support of the Gas Council. The Gas Research Board also employed 10 scientific staff at Leeds University and 12 at a laboratory in Beckenham, Kent. They all came under the ownership of the Gas Council in 1952.

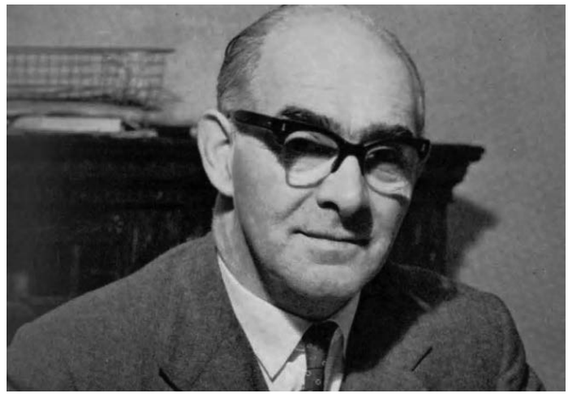


Figure 75. Dr F. R. Dent, the Director of MRS. Source: National Grid Gas Archive.

Initial experiments were continued at Poole, where pilot scale plants had been built, and were also carried out at the laboratories at Nechells. A small German Lurgi Gasifier was constructed at the Nechells site.

To gain experience on the Lurgi process, some of the scientists also visited Germany, where the process originated, to undertake tests using British coals.

By 1954 a site adjoining the Solihull Gasworks, eight miles from Birmingham were acquired for the construction of a new Midlands Research Station (MRS, Figure 76) and in 1955 the first occupants moved in.

The adjacent gasworks had been established in 1869 by the Solihull Gas Company. It was a relatively small gasworks compared to those in Birmingham and, as a result, was less efficient.

As the gas network expanded from Birmingham and connected to the network in Solihull, there was no further need for a separate gasworks. By 1962/63, the Solihull gasworks had closed.

Figure 76. The Midlands Research Station, Solihull. Source: National Grid Gas Archive.

The research effort at MRS concentrated on chemical engineering and on producing cheaper and purer gas under high pressures. The London Research Station at Fulham focused more on chemistry and producing gas at ordinary atmospheric pressures.

MRS identified new, high-pressure, gas-making techniques, using either coal or oil as a feedstock as well as industrial applications of gas. Much of this work had centred on Dr Dent's research on the German Lurgi process, which had been developed to use low-grade German Brown coals.

Dr Dent's work had looked at adapting the system for the gasification of the black coals found in Britain. The work also focused on the hydrogenation of powdered coals and oil, and the gasification of light oils.

26 Washwood Heath and Gas Reforming

In 1912, 34 acres of land at Washwood Heath was purchased by the City of Birmingham Gas Department to build a gasworks.

The proposed gasworks as shown in Figure 77 was never constructed and the Department instead just built two large gasholders, capable of storing 5.7 million cubic feet of gas (as shown on Figure 77), a gas boosting station, governor house and a wagon construction and repair shop.

The gasholders were originally intended to have five lifts and hold 10 million cubic feet of gas each, however, they were only built with three lifts, but designed such that the further two lifts could be added.

The additional two lifts were introduced in 1933, along with three more tiers of guide framing, which increased the height of the gasholder to 220 feet.

The rest of the site became a coal stocking ground for the other Birmingham gasworks, freeing up space on those sites for further development.

Figure 77. Drawing of the proposed gasworks to be built at Washwood Heath c1928. Source: National Grid Gas Archive.

During 1966, the Washwood Heath site was redeveloped after being selected as one of the sites across the West Midlands to build new gas reforming plants. This plant, which was the second large gas reforming plant built by the West Midlands Gas Board, can be seen in Figures 78 and 79.

Originally, it made town gas from reforming naphtha, but later switched to natural gas as a feedstock when this first became available.

The first trial imports of natural gas to the UK were cargoes of liquified natural gas (LNG) from the USA, which were received at a specially built importation facility at Canvey Island, Essex.

Regular imports of LNG from Algeria were made from 1964. To handle these large volumes of imported natural gas, a cross-country transmission pipeline was constructed from Canvey Island in Essex to Leeds, Yorkshire, known as Feeder 1. It had connections to eight of the regional gas boards, including the West Midlands Gas Board, and signalled the development of a National Gas Transmission System (NTS).

The NTS has since expanded significantly and is an essential part of delivering and storing gas in Britain.

The use of reforming to produce town gas, as undertaken at Washwood Heath, provided a stop gap supply of gas until the discovery of significant natural gas reserves in the North Sea.

This occurred in the 1960s, when it was found that there was plenty of gas available to meet all existing demand at the time.

Whilst imported LNG had previously been reformed into town gas, in 1966, the Chairman of the Gas Council, Sir Henry Jones, formally announced that Britain was switching to natural gas and the manufacture of gas would gradually be phased out, with all gasworks planned to close.

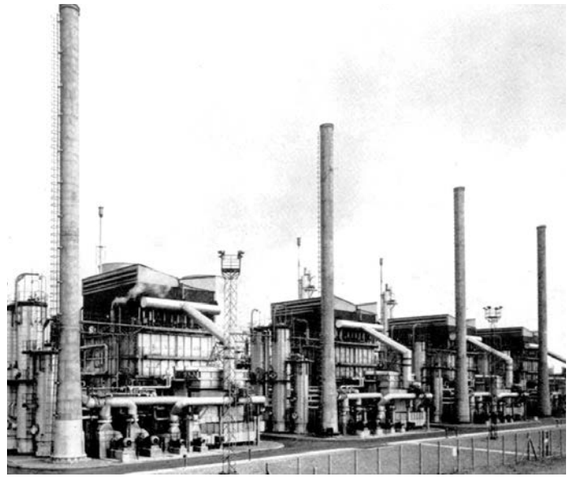


Figure 78. The gas reforming plant built at Washwood Heath. Source: National Grid Gas Archive.

Figure 79. The Washwood Heath site in the early 1970s showing the two gasholders and reforming plant. Source: National Grid Gas Archive.

27 Conversion to Natural Gas and the British Gas Corporation

To be able to burn natural gas efficiently, all gas appliances operating off mains gas had to be converted throughout Great Britain.

This required the largest engineering feat undertaken in Britain since the end of World War II. Known as the ‘conversion programme’, it required the physical conversion of every gas appliance in the country.

The West Midlands Gas Board was converted between July 1968 and August 1976, starting in Tipton/Coleshill Staffordshire and finishing in Bromford, Birmingham. The very last gasworks in Great Britain, in Millport on the Isle of Cumbrae, ceased production in 1981.

Most gasworks across the country were decommissioned and demolished as the country switched to natural gas. Fakenham in Norfolk was the only one to survive in England.

The gasholders were retained at Swan Village, Windsor Street, Washwood Heath and Nechells to provide gas storage. These were gradually removed, leaving those at Windsor Street as the last surviving gasholders in Birmingham.

These developments led to amendments to the organisational structure of the gas industry. Halfway through the conversion programme, the Gas Act of 1972 abolished the Gas Council and the British Gas Corporation was formed, which assumed control of the 12 area boards.

This centralised the gas industry into a single business, although the regional structures were retained, with the West Midlands Gas Board changing to West Midlands Gas.

28 Today

Today, there are still a few reminders of Birmingham’s long history of gas manufacture. These include the old Gas Street Gasworks and the former retort houses at Adderley Street and Fazeley Street, as well as the former Gas Department offices in the Council House.

The Windsor Street gasholders – with their distinctive claret and blue paintwork, symbolising nearby Aston Villa FC – are now being removed.

The type of fluctuating, diurnal storage that these large, low-pressure gasholders once provided has been met by alternative means and they are surplus to demand.

This includes increased storage capacity in the gas transmission and distribution pipelines, in a process called line packing, new below ground storage facilities and new, liquified natural gas (LNG) import terminals. Dismantling of the gasholders at Windsor Street is the first step towards returning the land to beneficial use.

Birmingham has a unique position in the world as it can claim to have been associated with the gas industry for over 220 years.

Whilst the industry is now less visible, it is still thriving. It has evolved into a segmented industry, consisting of North Sea gas producers, a National Gas transmission system operated by National Grid, regional gas transportation companies such as Cadent Gas who distribute gas in Birmingham and the Midlands and energy suppliers who sell gas to customers.

Large LNG importation facilities such as that operated by National Grid on the Isle of Grain in Kent, help supplement gas supplies from the North and Irish Seas and those imported from the continent through underwater interconnector pipelines. Gas fired electricity generation provides an important back up to supplies of renewable electricity when there are lulls in wind or solar powered electricity generation.

New alternative forms of gas, such as biomethane, are starting to be utilised and the potential for carbon free hydrogen gas to provide future gas supplies is on the horizon.

While the gas legacy in Birmingham will no longer be quite so visible, the gas distribution infrastructure is still present beneath the streets operated by Cadent Gas and supported by the national gas transmission system owned by National Grid.

Figure 80. An aerial photograph of the Windsor Street Gasholders whilst still operational, with their characteristic claret and blue paintwork, the colours of the nearby Aston Villa Football club. Source: IGEM archive.

29 Suggested Further Reading

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30 A Brief Description of the Gas Manufacturing Process

Unlike natural gas, which is extracted from underground reservoirs, manufactured gas was produced from coal or oil heated within a sealed vessel called a retort. Retorts similar to those which would have been originally used in the gasworks in Birmingham are shown in Figures 81 and 82.

The coal used to make the gas can be seen on the retort house floor in Figure 81. The retort was a long, circular or D-shaped chamber with a mouthpiece containing a door on the front into which the coal was thrown. The retort was then heated by a furnace beneath the retort, releasing gas and leaving behind coke.

The gasworks was a very hard, working environment. It required strength, stamina and skill to throw coal into the retorts and to remove the hot coke with a rake as can be seen in Figure 82.

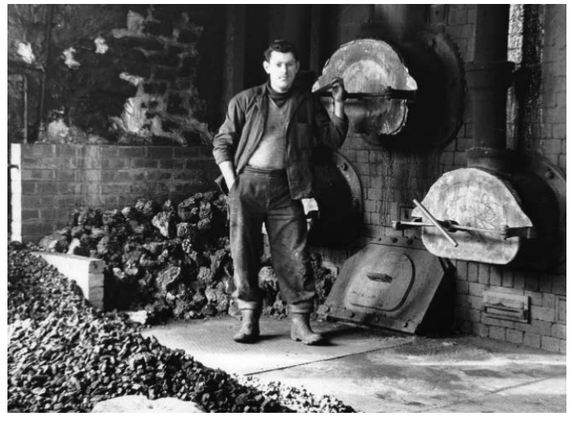

Figure 81. The stoker and horizontal retorts at the small, former gasworks at Robin Hood’s Bay, Yorkshire. Source: IGEM Archive.

With the door shut on the retort and sealed, air could not enter. As the coal was heated, the absence of oxygen in the air, meant the heated coal did not burn.

Instead, the moisture in the coal was driven off and the large organic molecules were broken down by the heat into smaller and smaller molecules.

This produced flammable gases such as methane, hydrogen and carbon monoxide. Additional products were water vapour and impurities such as ammonia, hydrogen sulphide and hydrogen cyanide.

There were also larger, organic compounds that formed the oily, tarry impurities in the gas which could block the pipes.

Leaving the retorts, the gas passed up the ascension pipes and through the hydraulic main, which acted as a water seal to prevent the gas flowing back into the retorts.

The hydraulic main also cooled the gas and removed some of the oil and tar. The gas then passed via the foul main to the condensers, which further cooled the gas, removing most of the tar and oil vapours.

The gas was drawn into a pump called an exhauster. This pushed the gas through the tar washer, removing any remaining tar trapped in the gas.

The gas then passed through further washers and scrubbers. These used water to wash the gas to remove soluble compounds such as ammonia and phenol.

When dissolved in the water they formed ammoniacal liquor. Both the coal tar and ammoniacal liquor were drained to below-ground tanks or wells for storage.

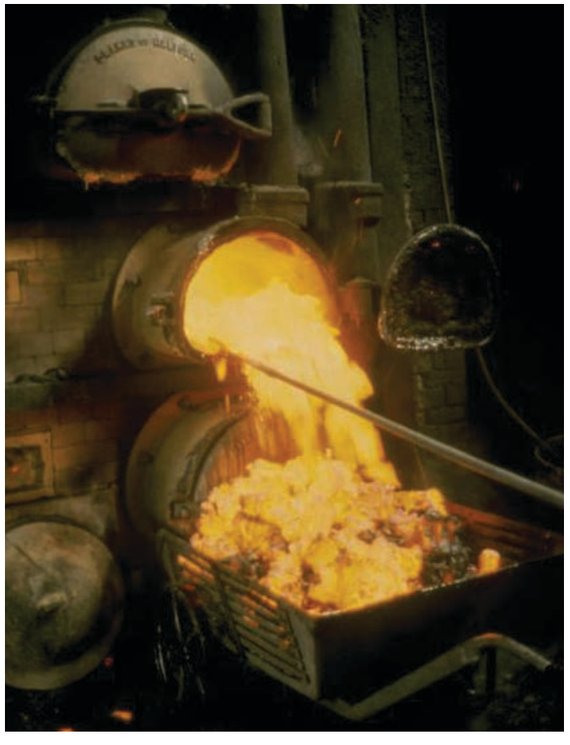

Figure 82. Removing hot coke from the retorts. Source: National Grid Gas archive.

The gas then continued its journey through the purifiers, which were large rectangular iron boxes. They contained wooden racks onto which granular lime or iron ore was placed.

These substances removed both sulphur and cyanide compounds from the gas, which could otherwise produce toxic gases when burnt. These gases could also corrode the gas fittings and damage the furnishings in the house.

Sometimes the gas would then be passed through a benzole plant which stripped volatile organic substances from the gas, such as benzene and toluene. These were used in early forms of motor fuel and for the manufacture of explosives. Both were particularly important during World War I and World War II.

The treated gas, sometimes called ‘town gas’, was measured using a station gas meter and was subsequently stored in the large gasholders, such as those at Windsor Street.

The gasholders allowed the gasworks to keep more of a surplus of gas ready for times of peak demand, such as Sunday lunchtime.

The gas was distributed to customers through mains beneath the streets. After the gas-making process was complete, the coke which remained in the retort was removed (Figure 82) and either shovelled into the furnaces or cooled by dousing with water.

The coke was sold to industrial or domestic customers for heating purposes. Retorts were later developed which had a mouthpiece and door at each end, known as ‘through retorts’. They allowed the processes in a gasworks to be mechanised.

The equipment described in this booklet would have been much larger than that shown in Figures 81 and 82. The later horizontal retort houses, such as those built at Windsor Street gasworks, were very large and mechanised, with special machines that loaded and unloaded coal from the retorts, as can be seen in Figure 83. These machines reduced a lot of the labour involved in moving the coal and coke.

The gasworks at Saltley and Nechells switched to using Inclined retorts at the beginning of the 20th Century.

These retorts were set at an angle of 42° which allowed gravity to assist with the movement of the coal and coke.

They were popular for about 20 years, after which they were replaced by vertical retorts. An illustration of a set of four Woodall-Duckham continuous vertical retorts is shown in
Figure 84.

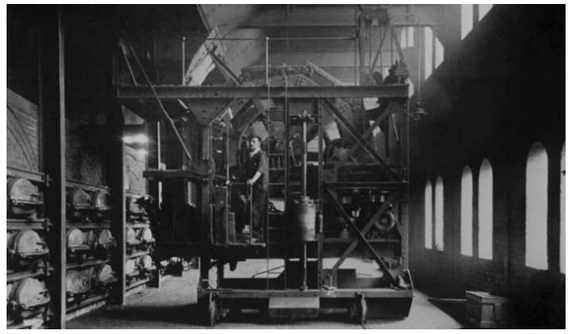

Figure 83. Fiddes-Aldridge charging and discharging machine at the Adderley Street Gasworks in Birmingham. Source: National Grid Gas archive.

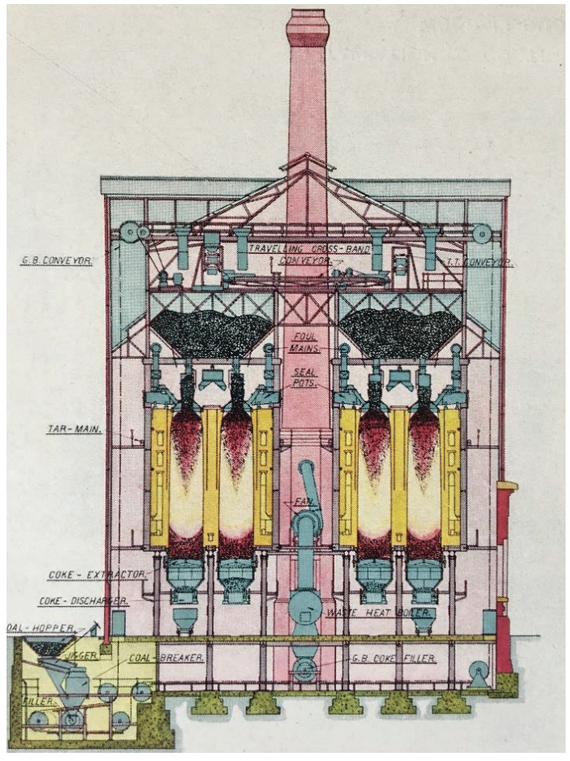

Figure 84. A drawing by Woodall Duckham of an installation of continuous vertical retorts. Source: IGEM Archive.

Vertical retort plants operated with the coal being fed by gravity down the retort, which was set in a vertical position. The coke produced by the process was extracted at the base of the retort.

This replaced the complex, charging and discharging equipment required in horizontal retort. It also allowed the process to operate on a continuous basis and the design of the system allowed it to be enclosed, so less atmospheric pollution was emitted.

The City of Birmingham Gas Department offices, The Council House Birmingham 1928, with the War Memorial in the centre of the building.

National Grid plc
National Grid House
Warwick Technology Park
Gallows Hill
Warwick CV34 6DA
United Kingdom

nationalgrid.com

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