Profession *versus* Trade?

A defining episode in the development of the gas lighting industry in the late 19th century

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Abbreviations and Acknowledgements

When quoting printed sources, I have given the full citation when the reference first occurs and short title notation subsequently. Some primary source titles and the names of record depositaries have been abbreviated as follows:

BAGM The British Association of Gas Managers
Chartered Company The Chartered Gas Light & Coke Company, London
IGEM Institution of Gas Engineers & Managers
JGL Journal of Gas Lighting, Water Supply & Sanitary Improvement
GW The Gas World
South Metropolitan The South Metropolitan Gas Company, London
Trans TGI Transactions of The Gas Institute
Trans TIGE Transactions of The Incorporated Institution of Gas Engineers
Trans TIGE (united) Transactions of the (united) Incorporated Institution of Gas Engineers
WYAS West Yorkshire Archive Service

I am grateful to Mary Mills for her helpful information about the Livesey Professorship at Leeds University, to Barry Wilkinson, Editor of the Historic Gas Times for his help in suggesting books and contacts for information, to Rachel Cook at the Institution of Gas Engineers and Managers for providing copies of Presidential addresses, and to Chris Sugg for providing copies of the House of Sugg Centenary booklet and photographs from his family archives.
1. **Introduction**

Industrial growth and expanding urban developments made the supply of coal gas for lighting one of the most important industries of the late 19th century. Gas street lighting was extensively used throughout Britain, opening up new leisure opportunities; it was brighter and safer than oil for illuminating industrial and commercial premises, extending the working day; and it became increasingly popular for lighting domestic houses. Gasworks, both publicly and privately owned, proliferated across Britain and many small works were operated by technically competent gas managers rather than by experienced engineers.¹ As the gas industry grew, it was recognised that a specialist national forum was needed to enable otherwise isolated gas managers to meet and share expertise with professional engineers.

The British Association of Gas Managers, BAGM, was founded in 1863 as a ‘learned society’ enabling its members to participate in technical discussions with their peers about new developments in gas making, and providing a professional identity for the industry. In 1881, BAGM was in financial difficulties and decided to change its name to The Gas Institute to enhance its prestige, and to allow manufacturers and traders to become Associates in order to increase its subscription revenue.

This study analyses why this change in the Institute’s membership policy caused the underlying relationship between professional gas engineers and commercial traders to reach a crisis; it investigates why a dispute between a trader and the Institute about the organisation of the gas section of an international exhibition led to the near collapse of the gas industry’s national professional body, and the formation of a rival Institution of

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¹ Even in 1900, 80% of all gas undertakings had less than 5000 customers, and almost half had less than 1000: Francis Goodall, *The British Gas Appliance Industry 1875-1939* (unpublished Ph.D. thesis, LSE 1993), p.141
The study discusses the importance of the dispute in polarising attitudes between those gas engineers who saw themselves as providing an essential utility and being professionally superior to traders, and the more commercially minded engineers who saw the need to provide a service by working with the traders who manufactured gas burners, lamps, meters and appliances. The study addresses how this dichotomy in the profession was resolved such that the Institution became once again a united national voice on gas industry issues.

The key protagonists in the dispute were George Bray, a prominent manufacturer and trader of gas burners and lamps, and George Livesey, an exceptional gas engineer and manager. Bray was born to a Leeds working class family, and his business was focused on the wholesale market for low cost but efficient gas burners, street lamps for local authorities in the North of England and very large lamps for railways, docks and piers. Livesey, who became Chairman of the South Metropolitan Gas Company, was in the forefront of gasworks design, and also of commercial innovations such as installing penny-in-the-slot meters, renting out gas cookers, and replacing the burners in street lamps with incandescent mantles. (Brief career sketches of the professionals and traders involved in this episode of the gas lighting industry are presented in Appendix 1.)

The scenario which gave rise to such a schism in the gas industry was the 1882-3 International Electric and Gas Exhibition at Crystal Palace. Concerned about competition to their industry from electricity, the Institute was persuaded to organise the arrangements for gas traders to display a range of lights and appliances in half of the exhibition hall, the other half being given over to electrical lighting and appliances. The precedent for large exhibitions as a way for manufacturers to attract public interest in their products had been established by the Great Exhibition of 1851, but before 1882, gas companies had not

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2 See note on sources in Bibliography, p.77
made a combined effort to promote gas sales. Bray claimed that the Institute’s subcommittee which organised the gas section of the exhibition, and whose members were George Livesey, Magnus Ohren and Charles Gandon, had shown unfair favouritism to another pre-eminent manufacturer and trader of gas lamps, William Sugg, in relation to the site of his stand and also in the way that awards were adjudicated. Sugg’s Westminster-based business focused on gas lighting for prestigious London streets and the upper end of the London domestic market and he was a personal friend of Livesey, Ohren and Gandon, who all lived in London. Bray, coming from the north of England, was an outsider.

The issue of profession versus trade in the gas industry is only scantily addressed in historiography. Braunholtz reports on the issue and is surprised at the inept way in which the Institute refused to listen to Bray’s concerns, but his purpose is to provide a synopsis of the proceedings of the Institute and the Institution rather than to look at the broader context. Other authors have touched on the Bray dispute but not addressed the issues in depth. Garrard, writing about traders paying ‘commission’ to gas company managers, makes brief reference to ‘an unsavoury dispute about the relative visibility given to gas lighting appliances marketed by two of its [The Gas Institute] most prestigious members’. The Bray dispute was not about financial mismanagement but about fair play in the arrangements for an exhibition. Dillon says that ‘the relationship between Sugg and Bray …is central to understanding an aspect of mid and late Victorian business practices in the gas lighting manufacturing industry, where profit and protecting

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3 The charge that it was customary for the engineering profession to receive ‘commission’ from contractors was refuted with outrage by the Institution of Civil Engineers in 1863, but the practice of traders paying bribes continued, especially by coal merchants wanting to secure gas company contracts: Buchanan, The Engineers: A History of the Engineering Profession in Britain 1750-1914 (London, 1989), p.72 and John Garrard, ‘The Salford Gas Scandal of 1887’ in Manchester Region History Review, Vol. 2.2 (1988-9), p.12
and promoting one’s “name” and product meant success, recognition and status.⁴

However, Dillon presents a case study of Sugg and dismisses Bray’s concerns, saying that his allegations were never challenged in court.⁵ Otter in his book about light, vision and power in 19th century Britain, refers to Sugg’s publications and his lamp designs but does not mention the mass market achieved by Bray’s products.⁶ Buchanan indicates that it was as a result of ‘difficulties’ in The Gas Institute that the rival Institution of Gas Engineers was formed, and simplistically attributes the ‘difficulties’ to the Institute accepting ‘businessmen and administrators’ to its membership.⁷ This study explores these ‘difficulties’ from a new perspective and evaluates how the ramifications of the conflict defined perspectives of professional status between gas engineers and traders.

The approach taken by this study is to sketch the professional expertise needed to build and manage gasworks, show how innovation by traders improved the design and illumination of gas burners and lamps, and how the gas industry developed a national professional body. The Crystal Palace Exhibition of 1882-3 is described to provide context for Bray’s dispute with the Institute, after which the implications of different perspectives of status between engineers and traders are analysed, and this episode concludes with discussion of how these differences were resolved to achieve a collaborative industry.

⁵ Ibid., p.208
⁶ Sugg’s publications including his Domestic Uses of Coal Gas are referenced in: Chris Otter, The Victorian Eye: A Political History of Light and Vision in Britain 1800-1910 (Chicago & London, 2008)
2. Gas Engineers: development of professional skills and expertise

Collaboration with traders was far from the minds of the engineers who built the early gasworks. Samuel Clegg, who was appointed by the Chartered Gas Light and Coke Company to sort out the technical problems of building and operating their pioneering London gasworks, may be considered the first gas company engineer. Clegg did not consider it to be part of his responsibilities to handle commercial matters, not even arrangements for disposal of the by-products of the gas making process. Making gas from coal for lighting was a new technology in the early 19th century and this chapter discusses how gas engineers learned their skills, and how their expertise developed into a recognised profession as the gas lighting industry grew at an extraordinary rate across Britain.

Until late in the 19th century, opportunities for scientific training relevant to gas engineers were very limited, and there was a strongly traditionalist attitude to the education of engineers as a whole, based on pupilage and empirical engineering rather than formal theoretical training. Young men learned about gasworks by practical experience from being apprenticed to a family member or a senior professional engineer at one of the large gasworks. A number of engineers began their careers by working at the Chartered or other London companies’ gasworks, and then went on to build gasworks at places such as Preston, Wolverhampton and Liverpool. George Livesey was one of many engineers following their family traditions when he was apprenticed aged 14 to his father, Thomas, at London’s South Metropolitan Gas Company. Livesey’s exceptional technical ability rapidly led him to develop his own innovative ideas, patenting a variety

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10 There was also some contra-flow of engineers from the early formation of gas companies in Edinburgh and Glasgow. London’s Imperial Company appointed John Kirkham, a Leith engineer as their Company Engineer in 1829: Everard, *The History of the Gas Light and Coke Company*, p.174
of technical improvements to gas production plant, most notably the gas purification process. In later years, Livesey was much in demand as a gasworks consultant; his design for the South Metropolitan’s East Greenwich works included two gasholders, which were the biggest in the world when they were built in 1887.\(^\text{11}\)

Gasholders are the end point of the gas making process, before gas is distributed through mains to customers. The process starts with distillation of gas from coal in closed retorts, after which impurities are removed from the raw gas, before it is stored for distribution. Engineers starting out to build a gas works had to ensure that a suitable plot of land was available with good transport links, preferably with access to a navigable river, canal or railway, so that the many tons of coal needed to produce gas could be efficiently delivered to the site. It was important that engineers were knowledgeable about the quality of coal from different mines, as the brightness of gas lighting varied with the coal used. Plant and equipment for the gasworks had to be specified, purchased and installed, and mains laid. Figure 1 illustrates the key components of a gasworks.

Engineers also had to advise on the most commercially attractive way of disposing of the substantial quantities of residual products, including coke, tar and ammonia liquid, which resulted from the gas making process. Coke could be broken into pieces of small, uniform size and sold for domestic use with the benefit that it would produce heat without the polluting black smoke of coal fires.\(^\text{12}\) Tar could be mixed with clinker, ashes and ground granite for surfacing footpaths, and processed to make creosote to preserve railway sleepers.\(^\text{13}\) Ammoniacal liquor from the gas scrubbers could be

\(^{11}\) George Livesey personally designed the East Greenwich gasholders, which were each large enough to accommodate the Albert Hall: David, J. Jeremy, ed., *Dictionary of Business Biography: a biographical dictionary of business leaders active in Britain in the period 1860-1980* (London, 1984), p.813


\(^{13}\) From the 1850s, 12 million gallons of tar were processed each year at Silvertown, making enough creosote to preserve 1½ million railway sleepers: Sheppard, *London 1808-1870*, p.164
converted into sulphate of ammonia for use as a powerful agricultural fertiliser. Sale of the residual coke and other by-products from the gas making process could recoup about half of the cost of coal."14

**Figure 1: Typical gasworks with horizontal retorts**

Source: The Open University Press, ‘Coal, the Basis of Nineteenth Century Technology’ in *Science and the Rise of Technology since 1800, Block II Unit 4* (Bletchley, 1973)

**Key to principal processes in diagram:** A= furnace; B = horizontal retort filled with coal, made airtight and heated to a high temperature from the furnace below (later gasworks had vertical retorts). When the heat had distilled gas from the coal, the residual coke was removed from the retort, which was refilled with fresh coal; C = raw gas rises through an ascension pipe to pass to treatment vessels; D = hydraulic main; E = condensers to cool gas and remove tarry vapours; F = washer where gas bubbles through water which absorbs ammonia, carbonic acid gas and some hydrogen sulphide; G = scrubber; H = purifier to remove sulphuretted hydrogen (initially using lime, but later iron-oxide); I = gasholder frame; Q = gasholder which expands and rises as it fills with gas to provide gas storage; O,N = well to store liquid and tar

Specifying the capacity of a gasworks was a key problem since production needed to be sufficiently flexible to cope with the variation in demand for lighting between long summer evenings and dark winter days. In industrial towns with factories and workshops, there was a substantial demand for gas during working hours and a drop in demand on

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Sundays when large factories were closed. Thriving city centres with shops, theatres, and multi-occupancy housing had different consumer demand patterns from suburban districts with low density housing. By the late 19th century, gas companies had to significantly increase production from their gasworks as shops and factories demanded brighter illumination levels, and domestic demand increased as householders wanted gas lamps in every room. In some urban areas, the nightly volume of gas consumption doubled in just a few years. Engineers had to try to anticipate this rapid growth in demand when designing gasworks so that they had space to allow their plant capacity to be easily and effectively expanded.

By 1888, it was estimated that there were some 1500 gasworks operating in Britain, directly employing about 60,000 people and gas engineers were much in demand. A substantial number of municipal authorities, particularly in the industrial North of England, operated gasworks which they had purchased from private companies in order to reduce the cost of street lighting, and to supplement their income from rate payers by selling gas to industrial and commercial customers. Municipal corporations and small gas companies would usually contract with an engineer to design, cost and supervise modifications to expand the capacity of gasworks or to build new works, and to provide advice on an ‘as needed’ basis. They would then employ a gas manager to be responsible for the day-to-day operation of their gasworks. Larger gas companies would employ their own engineers, not only to design and build but also to maintain their gasworks.

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15 JGL June 16, 1885, p.1114
16 Parliamentary Returns in 1888 indicated that there were 384 works operated by statutory gas companies and 168 municipal gasworks. In addition Newbigging estimated that there were about 950 gasworks operated by non-statutory companies: Newbigging, Handbook, pp.411-2
17 By 1865, 28 municipal corporations had taken over their own gas supplies. Over the next 20 years, 82 further private undertakings had been purchased by municipalities: Goodall, Burning to Serve: Selling Gas in Competitive Markets (Ashbourne, Derbyshire, 1999), p.53
After gaining experience and technical knowledge, engineers often set up as independent consultants. They advised gas companies and junior engineers, often acted as arbitrators and valuers, were called in to report on the condition of works, appeared in legal cases, and some gave evidence to parliamentary and other enquiries. Thomas Newbigging, a prominent consulting engineer (see Appendix 1), wrote a *Handbook for Gas Engineers and Managers*, first published in 1870. The *Handbook* provides advice on all aspects of building and managing a gasworks and also guidance on internal fittings and gas lights. Written in very practical language and published in a handy size to fit into (big!) coat pockets, the *Handbook* was a very important source of technical information and was so popular with both engineers and traders that it ran to at least eight Editions – there is a copy in George Bray’s archives.

The *Handbook* covers everything from how to test coal for its gas producing qualities, to designing retorts, and from methods of removing impurities from gas, to the design of gasholders. The amount of detail which Newbigging provides is typified by his 42 pages on laying mains pipes, which include everything from specifying the diameter and thickness of the pipes, testing for leaks, depth at which the pipes should be laid to protect them from heavy traffic, the labour and tools needed to lay the pipe, and a series of tables to calculate the weight and cost per yard of cast-iron mains gas pipes. For gasworks managers, Newbigging recommended that a number of Account books should be kept including a Collectors Book, Wages Book, Stock-taking Book, and a Public Lamp Register for street lighting as in The Strand, London (Figure 2).

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18 Newbigging was awarded the degree of Doctor of Science in 1912 by the University of Leeds: Walter T. K. Braunholtz, *The Institution of Gas Engineers: the First Hundred Years 1863-1963* (London, 1963), p.31
19 Additional information was added to successive editions of the *Handbook*. The 5th Edition, comprising 524 pages, measured approximately 5in by 7in but was more than 1in thick.
20 Newbigging, *Handbook*, pp.218-259
21 Ibid., pp.448-450
Newbigging advised that gas managers should keep a Test Register for noting test results of the illuminating power and purity of the gas, and record the number of lamps lighted each night, the hours of lighting and extinguishing, and the hours of gas burning per lamp.

Writing the Preface to the Fifth Edition of his *Handbook*, Newbigging said that

‘The Book is the fruit of long experience and of much reading and thought. My ambition is that it may be referred to by the members of the profession, especially the younger members, and that it may afford them valuable assistance on occasions of difficulty and doubt.’

It was a reflection of the outstanding calibre of the leading gas engineers in the middle years of the 19th century that they were able to educate themselves, and pass on their knowledge to a younger generation. Newbigging stressed in his *Handbook* that although practical insight into gas making was very necessary, it was also essential that those responsible for managing gasworks should study and understand the theoretical aspect of...
gas manufacture. Examinations in Gas Manufacture were introduced in 1874 by the Society of Arts, and later became City and Guilds examinations. The Institution of Gas Engineers collaborated with the Department of Technology of the City and Guilds of London Institute in 1907 to agree syllabuses for its examination in *Gas Engineering* and for a new examination in *Gas Supply* (see Appendix 2). However, there was continuing concern that higher education for engineers lagged behind that of continental universities and that ‘there was too little research in the educational system of this country’. This was not unique to the gas industry; it was also prevalent in the electrical engineering and chemical industries. Gas making may be said to have fully matured into an engineering profession when the Livesey Professorship of Coal Gas and Fuel industries was established at Leeds University in 1910 (see page 54).

The syllabus for the City and Guilds examination in *Gas Supply* specifies the knowledge that traders would require for construction of different types of gas burners, gas meters and street gas lanterns. The next chapter discusses how the technology of gas burners and lamps developed and why gas traders were important to the promotion of the gas industry.

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23 Buchanan, *The Engineers*, p.96
24 *JGL*, June 4, 1907, p.649
25 Braunholtz, *The Institution of Gas Engineers*, pp.64,65
26 Goodall, *The British Gas Appliance Industry*, p.207
3. Traders: innovation and competition in gas lighting

Technical education was important for the designers and manufacturers of gas burners as well as for engineers, since the best burners could give twice as much light as the worst for the same gas consumption. Gas burners and lamps had to be designed to suit not only a range of premises and illumination requirements, but also for varying qualities and pressures of coal gas. Innovation and competition between traders led to significant improvements in efficiency and lighting levels of gas burners, culminating at the end of the 19th century in lamps with incandescent mantles, which could give ten times the illumination compared to simple flat flame burners.

Many gas engineers and managers considered that the efficiency of gas lamps and fitting of internal gas piping was not their concern, and should be left to traders to specify and manage. However, this could rebound on the gas company as gas fitters were mainly local tradesmen and customers often complained that their gas gave only poor illumination, when in fact the problem was caused by the bad workmanship of the customer’s gas fitters, or poor quality design and manufacture of the lamps they installed. In the first half of the 19th century, gas lighting of railway stations and public buildings used cast iron burners which corroded and gave poor quality illumination for the volume of gas consumed. Two traders, who each patented a solution to this corrosion problem using different materials, were George Bray and William Sugg (see Appendix 1 for career sketches). Both traders were ambitious entrepreneurs of a similar age, who invented and patented many improvements in the design and manufacture of gas burners.

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27 Before governors were introduced to regulate gas pressure, turning on a gas light in the top floor of a tall building could dim lights on lower floors. This was used as a key part of the plot in Patrick Hamilton’s *Gas Light, a Victorian thriller in three Acts* (London, 1939).

28 Goodall quotes the *Ironmonger* of March 1, 1875, as saying that the typical workman carrying out servicing or installation work was likely to be ‘not a gasfitter but Jack-of-all-trades, a blacksmith, glazier, brazier, plumber and bellhanger all rolled into one’ and that very few ever proceeded systematically to test pipes for leaks before leaving the job: Goodall, *The British Gas Appliance Industry*, pp.282-3.
and lamps, but they took different approaches to how they developed their gas lighting businesses.

**Figure 3: Gustave Dore’s drawing of a scripture reader in a night refuge, 1872**

Flat Flame gas burners were designed so that the flame fanned out in various shapes, such as fishtail or batswing, to give more light. The gas lights in the wall brackets appear to be fishtail burners.

George Bray started experimenting with ways to improve the quality of gas burners after listening to a demonstration lecture about gas lighting. He solved the problem of gas light flickering by inventing a brass, flat flame burner with a porcelain tip. The flat flame burners illustrated in Figure 3 may have been of this type. Gas burners

29 Water vapour in the gas supply caused the tips of cast iron burners to corrode so that the gas made a roaring sound and the gas light flickered.

30 The *Leeds Mercury* (23 August 1905) commented that ‘it is perhaps well to emphasise how seldom what appears a simple invention is obtained without careful investigation and study.’
had to be made with great precision, as an accurately machined burner orifice was essential to achieve a good illumination flame. Bray designed his own manufacturing machinery and, starting from scratch, set up in business making gas burners. 31

**Figure 4: Street lamp design patented by George Bray**

The glass case of the street lamp was windproof, tapered downwards so as to avoid throwing a shadow on the ground in the immediate vicinity of the lamp post, and had reflectors in the top of the case to increase the illumination from the gas jet. Source: *The Gas World*, Jan 1 1887

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31 George Bray was not the inventor of the non-corrosive tip (Sugg and others used steatite rather than porcelain) but Bray was the first to produce a tip at a price which was affordable for the mass market.
Bray’s burners were independently tested and endorsed by Dibdin, who said that ‘The “Special” burners are made…to suit any pressure or quality of gas…they give a large well-shaped flame, are indestructible, not liable to get out of order and show, after years of steady use, the same standard conditions under test’.32

Bray continued to experiment and invent new designs for gas burners, lamps, and appliances, which he patented and manufactured for a growing market.33 The *Yorkshire Post* said his street lamp (Figure 4), first introduced in 1879, became ‘one of the commonest things in existence’.34 Bray’s chief customers were public bodies, railways, churches and pubs (see his advertisement, Figure 5). Charles Pawson, who started to work for George Bray as an office boy in 1888, said in his draft history of the company ‘many docks, sea walls and promenades were lighted by our lamps. A huge trade was done in the sale of…Bray patented Shadowless Street Lamps and many of them were so large that I would squeeze through the lamp door and stand up inside, they being nearly 6` in height.’35

Bray would have gained an insight into gas lighting in America, where he developed a substantial market for his products, when he employed an American called Mitchell as foreman of his tip-making room. Pawson says that Mitchell showed Bray an improved way to screw sockets, and that 4 tons a month of Bray’s High Pressure Special Union Jets were exported to America.36,37

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33 Tests carried out in Leeds in 1882 concluded that ‘Bray’s burners yielded the highest lighting power per foot of gas consumed for all the burners adapted for general purposes’. The tests included comparison with burners by Sugg, Bronner and Siemens: WYAS, WYL1207/52
34 *Yorkshire Post*, August 23, 1905. Bray claimed to manufacture 3/4ths of all gas burners in Britain (see his advertisement, p.70).
36 As early as 1839, there were some 297 gas companies in America, serving 4,857,000 people: Susan Messham, *Gas: An Energy Industry* (HMSO, London, 1976), p.13
37 Pawson notes that girls could screw sockets at the rate of 60/65 gross a day by hand in 1888: Pawson, *A Short History*, WYL1207/140, pp.2,9
This advertisement shows the spread of Bray’s customers for docks, railways and street lights in Britain and internationally, including India, Canada, Australia, Cape Colony, and several Foreign Countries. He claims that his lanterns are being extensively adopted throughout the United States and were found to be highly satisfactory in the 1881 Official Report of the United States Inspector of Gas. The advertisement also states that Bray’s lanterns have been adopted in place of a failed trial of electric light in Edinburgh, and successfully competed with electric light at a trial in York.
Bray took an innovative approach, not only to the design of burners, but also to marketing. Pawson recounts that until about 1890, Bray’s products were only advertised in the *Gas World* and *Journal of Gas Lighting*, and travelling salesmen were sent to visit gas company managers. Then Bray wrote a leaflet, on the front of which was printed ‘Your Gas Bill’ and inside was a sales pitch explaining that the Bray Special Adjustable Burner consumed a third less gas than the Regulator Union Jet, and gave better illumination. Millions of leaflets were printed and a copy delivered to every house in the United Kingdom. Pawson says that the campaign was a great success and subsequently Bray printed showcards, each copy carrying 2 doz Special Burners price 2d each; many thousands of the cards were sold and could be found in every plumber and ironmonger’s shop.

In contrast to George Bray’s background, William T. Sugg’s family had been involved in gas lighting from its outset. When William’s father died and he took on the family business, he was only 25. Prior to Bray patenting his porcelain tipped gas burners, Sugg had patented his own non-corrosive tip using steatite. He was interested in design and technology and spent a great deal of time experimenting with how gas burned and why. One of Sugg’s best known designs was his adaptation of Argand’s oil lamp to burn gas. Sugg used the same principle as Argand, with combustion air passing up the centre of a circular ring of flame, as well as around the outside, to give a controllable bright luminosity. The design was so successful that Sugg’s ‘London’ Argand burner was adopted as the standard gas burner for testing the quality of gas supplied by Metropolitan gas companies. Sugg’s designs were quality at a price – his Argand lamps sold at 2s 6d each compared to Bray’s simple batswing and fishtail burners, which sold for around 1d.

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38 WYAS, WYL1207/140, pp.6,7
39 WYAS, WYL1207/140, p.7
41 Many burners in common use produced significantly less light for the same gas consumption as Sugg’s standard burner; William Sugg & Co, History [accessed 28 April 2010]
to 3d each. Sugg’s Christiania flat flame burner (Figure 6) was a popular design and was praised by Charles Dickens [Jnr] in his *Dictionary of London, 1888*:

‘GAS BURNERS- The Argand and fishtail burners made by Sugg, of Westminster, and supplied by all respectable gasfitters, are unquestionably the best….For reception and bed rooms the opal Christiania shade or globe….gives the best and most agreeable result with the least consumption of gas."

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**Figure 6: Advertisement for William Sugg’s Christiania burner**


The advertisement shows how the Christiania burner could improve evening activity in a middle class home. Sugg claimed the white glass shades reflected a diffused light downwards, making it ‘agreeable and soft to the eye, and yet powerful near its work’ and that other common burners gave only half or even a quarter of the illumination of his ‘Christiania’ burner, while consuming more gas. Sugg’s burner maintained a steady light when the mains gas pressure fluctuated by including a governor, which was a self-regulating valve to maintain gas pressure at a steady level.

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42 Goodall, *The British Gas Appliance Industry*, p.124
Sugg’s street lamps were used in prestigious locations such as Parliament Square, Whitehall, and Ludgate Circus. In contrast to Bray’s approach to marketing, Sugg spent a lot on advertising and expanded his business with showrooms in the Grand Hotel Buildings, Charing Cross, London, and also in Paris. His book *The Domestic Uses of Coal Gas* gives advice on the type of burners and fittings for different rooms in a house and discusses problems such as the waste caused by bad burners and how to ventilate rooms effectively.

Both Sugg and Bray were fiercely protective of any attempt to copy their designs and each sued anyone whom they thought was guilty of infringing their patents. Court cases over patents were discussed in the correspondence columns and Editorials of the technical press and were, in effect, another way of advertising the latest gas light innovations. Bray and Sugg were engaged in a dispute over patents in the early 1880s. (This was a different dispute from Bray’s concerns about the Crystal Palace exhibition, but would have influenced his view of Sugg’s business). Bray believed that Sugg had infringed his patent for a lamp design, Sugg said he had not and sued Bray for defamation. The court proceedings dragged on over several years, and the eventual judgement in 1885, which was reported verbatim in the *JGL*, ruled that Bray had had reasonable grounds for believing that Sugg had infringed his patent, but that Sugg had not done so. No costs were awarded, but the judge said that ‘Each [party] appears to have thriven…and to have gained notoriety and custom for his wares’. It seems likely that Sugg overvalued the worth of his patents and his aggressive pursuit of defending them in

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44 Three original Sugg lamps, which have been refurbished and converted to electricity, can still be seen in Trafalgar Square: *William Sugg & Co, History* [accessed 28 April 2010]
45 *JGL*, March 5, 1907, p.595
46 William T. Sugg, *The Domestic Uses of Coal Gas: As applied to lighting, cooking and heating, ventilation; with suggestions to consumers of gas as to the best mode of fitting up houses and using gas to best advantage* (London, 1884, digitally reproduced at Milton Keynes, 4 May 2010)
47 *JGL*, May 19, 1885, p.915
the courts as well as getting into disputes with his own shareholders about the costs of his experiments and patents for new designs, resulted in financial difficulties for his Company in the last two decades on the 19th century.\textsuperscript{48}

Following the introduction of electric street lighting in Paris, Sugg wrote a paper on \textit{Lighting by Gas and Electricity}, concluding with the remark ‘Gas Lighting is a progressive science: and if electricity has been galvanised into renewed life…so have we gas engineers received the contre-coup of the shock.’\textsuperscript{49} Sugg presented a number of papers to the gas industry’s professional body, of which he was elected an Honorary Member in 1873. The next chapter discusses how and why the British Association of Gas Managers developed into The Gas Institute and set events in motion which produced a schism in its membership.

\textsuperscript{48} Sugg had a total of 24 patents still current in 1881 when his firm became a limited company. These patents were valued at £25,000 and represented 31\% of the total assets of the company. Dillon, \textit{Domestic Lighting in Britain}, pp.185, 203-4.

\textsuperscript{49} \textit{JGL}, March 5, 1907, p.596
4. Profession: a learned society

In response to changes and development in technical skills resulting from advances in science during the 19th century, a number of professional associations were established. The Institution of Civil Engineers was the first to be founded in 1818, reflecting the growth in civil engineering for railway construction; when railways began to need maintenance skills, the Institution of Mechanical Engineers followed in 1847. There were occasional lectures or discussions relevant to gas lighting at meetings of the Institution of Civil Engineers, and by the mid 19th century, technical gas journals began to be published. However, as gas lighting became increasingly popular, more and more gas undertakings were established across Britain, and gas manufacture and supply began to be regarded as a discrete industry. (The spread of gasworks is illustrated by the list of subscribers to the Crystal Palace Exhibition in Appendix 3.)

Production of coal gas required competent supervision of the operation of plant and equipment, but also required research, often involving trial and error, to improve the effectiveness of gasworks. Kaye defines a profession as being an occupation having certain characteristics and requiring its members to possess a skilled technique dependent on intellectual analysis. Gas engineering developed into a profession as the technical complexity of gasworks increased.

A group of gasworks managers and engineers, who wanted recognition of their specialist professional knowledge and social standing, met in Manchester in 1863, and

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50 By 1890, there were 10 national engineering institutions, and the total membership was about 15,000: Buchanan, The Engineers, p.20
51 The Institute of British Architects was founded in 1834 and the British Medical Association was formed in 1856: Barrington Kaye, The Development of the Architectural Profession in Britain, (London, 1960) p.13
52 The Gas Gazette and Monthly Adviser was first published in 1847, and the Journal of Gas Lighting was published from February, 1849
53 Kaye, The Development of the Architectural Profession pp.14,15
decided to establish The British Association of Gas Managers ‘for the encouragement and advancement of all matters connected with gas engineering, manufacture, and finance’.  

Some gas managers were engineers who had gained experience from working for several gas companies, but others were works supervisors, who could be technically isolated when working for a small private company or a municipal gas undertaking overseen by a Gas Committee of local Councillors. BAGM’s objectives were that ‘the gas industry …should make progress through the enlarged intelligence of its members, to be brought about by free exchange of opinion and experience’ and should not only communicate new knowledge, but also compare independent results.

The first Honorary Secretary of BAGM, James Blackburn, said that he needed ‘the utmost tact and discretion…in those days when almost every gas manager…was a stranger to almost every other. It seemed as though a link were necessary…to connect together the different members of the profession.’

BAGM elected Thomas Hawksley, an architect and consulting civil engineer, who was the Vice-President of the Institution of Civil Engineers, as their first President, and based its constitution and rules on those of the Civil Engineers. Qualification for membership of BAGM had considerable flexibility as it was not concerned with establishing the technical competency of its members or with setting professional standards. Ordinary Members of the Association were engineers, managers, or secretaries of gasworks, but ‘gentlemen taking an interest in matters connected with gasworks’ could be admitted as Extra-ordinary Members, and ‘gentlemen who take a deep interest in

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54 Trans, TGI 1884, p.8
55 Braunholtz, The Institution of Gas Engineers, pp.11,15
56 When Blackburn was appointed Honorary Secretary in 1863 he was Manager of the gasworks at Droylsden. He was appointed Engineer to the Oriental Gas Company in Calcutta in 1868, and died in 1882: Trans TGI, 1882, pp.2,9
57 Hawksley (1807-1893) built both water works and a large number of gas works at locations including Nottingham, Derby, Cambridge, Sunderland, Folkestone, Oxford and Bombay: Braunholtz, The Institution of Gas Engineers, pp.13,14
matters connected with gas engineering’ could be admitted as Honorary Members.\textsuperscript{58}

These last two membership categories allowed the contribution of prominent traders to the gas industry to be recognised, and George Bray was elected an Extra-ordinary Member, and William Sugg an Honorary Member. From BAGM’s first annual meeting membership grew rapidly, and 20 years later the re-named Gas Institute had almost 900 members.\textsuperscript{59}

The format of the Association’s annual meetings became established as a Presidential address, presentation of papers, visits to gasworks, and sometimes lectures. A new President was elected each year from prominent gas industry figures and from 1867 annual meetings were held alternately in London and the provinces. Following the Institution of Civil Engineer’s precedent, BAGM summarised the papers delivered at its meetings and recorded its business in bound volumes of annual Transactions.

George Livesey, who was elected an Honorary Member at BAGM’s first annual meeting, said when he was elected President 10 years later, that the Association had ‘collected, by means of its papers and discussions, an amount of information and experience on gas engineering, manufacture and finance, of which few of us have any idea.’\textsuperscript{60} The annual visits arranged by the Association allowed its members ‘to inspect many of the largest and best conducted gasworks in the kingdom.’\textsuperscript{61} Livesey went on to say that he hoped that BAGM would eventually expand its activities to include ‘technical and research committees, education and training, scholarships, [and] co-operation with kindred bodies at home and overseas.’\textsuperscript{62}

\textsuperscript{58} Braunholtz, \textit{The Institution of Gas Engineers}, p.268
\textsuperscript{59} \textit{Trans TGI}, 1883, p.236
\textsuperscript{60} Braunholtz, \textit{The Institution of Gas Engineers}, p.20
\textsuperscript{61} Ibid., p.20
\textsuperscript{62} Ibid., p.21
Despite its substantial membership, BAGM was in financial difficulties in 1881 and was concerned that, as gas lighting had become more commonplace, public respect for the gas industry had declined. In his Presidential address that year, Charles Hunt said:

‘..”Gasmaking,” it was observed to me not long since, “is a very simple process.”

“It appears so,” was my reply, “until one begins to know something about it”.63

To enhance its public prestige, BAGM decided to change its name to The Gas Institute and at the same time to change its Rules in order to increase its subscription revenue. (A list of successive name changes of the gas industry’s professional body is given in Appendix 4).

Under the new Rules, membership of the Institute was to comprise Honorary Members and Members as before, ‘such Extra-Ordinary Members as have been elected prior to June 16, 1881’, and a new class of Associates, defined as ‘persons holding a responsible position in gas-works, or Pupils of Gas Engineers,’ and also, most importantly for this study, ‘persons whose pursuits constitute branches of gas engineering, or who are otherwise qualified to assist in promoting the objects of the Institute..’.64 Both George Bray, as an Extra-Ordinary Member, and William Sugg, as an Honorary Member, qualified for continuing membership.65 It is unlikely that Members of the Institute would have sanctioned such a broad definition of ‘Associates’ if they could have foreseen just how much trouble it was going to cause them in the near future.

The following year, it was reported at the AGM that the financial condition of the Institute was only sufficient to cover expenditure of bare necessity and income needed to be increased, but the Council reported their satisfaction at the unusually large accession of 42 Ordinary Members and 49 Associates that year following the alteration of the

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63 *Trans TGI* 1881, p.17
64 Honorary Members required the approval of two thirds of Members present to be elected: *Trans TGI* 1883, pp. 203-209
65 Bray had been elected an Extra-Ordinary Member in 1879.
The new Gas Institute had a successful first meeting, and awarded their prestigious Birmingham medal to George Livesey in recognition of his contribution to technical research. Livesey presented a paper on *The Principles of Gasholder Construction* and William Sugg presented a paper on *The Application of Gas to the Lighting of Open Spaces and Large Buildings*, in which he demonstrated that ‘gas is steadier and readier, and more useful for the purpose of lighting large interior and exterior spaces, than electricity.’  

The President, George Stevenson, who had clearly been impressed by the electrical exhibition at Crystal Palace the previous year, warned members that they needed to keep their gas prices down in order to compete with electricity. He suggested that this could be achieved by economy in the construction of gasworks, improved gas making processes, reduction in gas leaks, and diversification of business. He recognised that ‘There is a disinclination on the part of some managers, who have had an engineering education, to regard their work from a trade point of view’, but continued by saying that the way forward was to interest the public in the use of gas for cooking and heating through exhibitions, in order to increase gas consumption during daylight hours. The next chapter discusses why the Institute became involved in the International Electric and Gas Exhibition at Crystal Palace and what issues about the exhibition triggered the schism among the Institute’s members as a result of the very ‘disinclination’ that Stevenson warned about.

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66 *Trans TGI*, 1882, p.2  
67 The Birmingham Medal was founded in 1881 to encourage the extension of use of coal gas, and it was directed to be bestowed for originality in connection with the manufacture and application of gas: *Trans TGI* 1882, p.25  
68 *JGL*, March 5, 1907, p.596  
69 Although the price of gas was steadily reducing, it was at this time still expensive for cooking and heating compared to coal: Goodall, *The British Gas Appliance Industry*, p.76  
70 *Trans TGI*, 1882, p.15
5. Crystal Palace Exhibition: gas industry showcase and trade competition

London hosted a succession of international exhibitions in the 19th century to display the products and technical progress of its Empire, starting with the Great Exhibition of 1851, where displays included a gas chandelier, cooking range and hot-air stove.\(^71\) Using the railways, people travelled considerable distances to see the Exhibition at Crystal Palace, which attracted some 6 million visitors.\(^72\) Subsequently, exhibitions became an increasingly important way for traders to make the public aware of their products, both because of the accompanying press coverage and discussion, and because the award of medals could be used for company advertising, as illustrated in Figure 7.\(^73\)

Exhibitions could benefit gas undertakings by persuading customers to use more gas for lighting and appliances, but not all gas managers viewed exhibitions with enthusiasm and some declined to co-operate when traders offered to provide display stands, exhibits, and salesmen. However, some of the more commercially-minded gas undertakings in the north of England began to sponsor local exhibitions. When the South Shields Gas Company invited traders to demonstrate gas cookers and heaters, and awarded silver medals for the best appliances on show, they attracted some 30,000 visitors in a week.\(^74\) Other exhibitions followed, sponsored by both private gas companies and municipal gas undertakings, in towns including Birmingham, Bradford, Halifax, Wakefield, Rochdale and Newcastle.\(^75\)

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\(^{71}\) Goodall, *Burning to Serve*, p.80


\(^{73}\) The Paris Universal Exhibition of 1867 attracted exhibits from many countries, and included a display of gas lamps and cookers: Goodall, *Burning to Serve*, p.80

\(^{74}\) Goodall, *The British Gas Appliance Industry*, pp.85-6

\(^{75}\) Ibid., p.86
Figure 7: William Sugg & Co headed notepaper used in the 1880s

The figure illustrates some of William Sugg’s range of gas lamps and highlights the awards he had received.

Whilst the gas industry was beginning to appreciate the value of exhibitions, so also was the nascent electrical industry, which held an International Exhibition of Electrical Appliances at Crystal Palace in early 1882. The previous year at the Paris Electricity Exposition, Edison had shown his carbon filament lamp, claiming that ‘the light given out by the lamp resembles gaslight in colour and intensity, but differs from it in that it is absolutely even and steady.’ A French report compared electric light very favourably with gaslight: ‘Electric light leaves no combustion residues in the house…to pollute the air …[or] to damage paintings and fabrics…and does not give off

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uncomfortable and fatiguing warmth.\textsuperscript{77} During the electrical exhibition at Crystal Palace, The Gas Institute held an informal dinner and meeting to discuss how electricity might affect their industry, but gas sales were continuing to grow and many gas engineers were at first complacently dismissive of electric lighting, and only slowly realised that their industry needed to innovate in order to compete.\textsuperscript{78}

**Figure 8: Electric incandescent lamps possibly displayed at the Crystal Palace Exhibition**

Illustration from R. Hammond’s ‘The Electric Light in our Homes’ published c.1882, and an advertisement for Maxim lamps, c.1900 Source: Dillon, *Artificial Sunshine*, pp.164-5

By 1882 electric street lighting was being trialled by some local authorities, and it was proposed to hold an international exhibition at Crystal Palace where the gas industry, not only in Britain, but also from Europe and America, could show how they could compete with electricity, not only for lighting, but also for cooking and heating.\textsuperscript{79}

\textsuperscript{77} Schivelbusch, *Disenchanted Night*, p.60
\textsuperscript{78} *Trans TGI*, 1882, p.3
\textsuperscript{79} Electricity was first used to light the Avenue de l’Opera in Paris in 1878: *JGL*, March 5, 1907, p.596
The Institute was at first reluctant to become involved in working with traders to organise a display. The *JGL* in an unusually outspoken report said that:

‘the larger Metropolitan Gas Companies have not yet decided to help in the vindication of gas lighting at this exhibition. We prefer to state the case in this way rather than to say that the Companies positively decline to have anything to do with it. They may have mistaken the situation [the threat from electricity] until the present… we fully endorse our correspondent’s [William Sugg] vigorous expressions respecting the great damage to the gas interest that will result from a *fiasco* in this part of the enterprise. If electricians appeal to the public eye, so must gas engineers.’

Ultimately, pride in being ‘universally acknowledged as the executive authority of the industry we represent’ won the day. The Institute’s President, Robert Paterson said that when the Directors of Crystal Palace decided to hold the exhibition ‘it was natural that they should seek for the assistance and co-operation of those who were able to guide them; and ..appealed to your Council to aid them in the work of the gas section.’ The Institute set up a subcommittee comprising George Livesey (Chairman), Charles Gandon (Deputy Chairman) and Magnus Ohren to organise the gas section of the exhibition (see Appendix 1 for biographies). However, it was problems resulting from this subcommittee’s management of the gas exhibition arrangements that led to the dispute between the Institute and trader George Bray.

The Exhibition was originally planned to open in October 1882 and run until March 1883, and the Institute’s subcommittee set about fund raising for the gas section. Gas undertakings from across Britain donated a total of £5,594 14s 0d (a list of subscribers has been compiled as Appendix 3). The big London gas companies, the Chartered and South Metropolitan, each donated £500 and several local authority Gas

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80 *JGL* July 11, 1882, p.77
81 *Trans TGI* 1883, p.14
82 Ibid., p.14
Committees donated amounts ranging from £10 to £150. Small undertakings such as the Fleetwood Gas Company, who wished to be shown as subscribing, donated 1 guinea.

The subcommittee determined the layout of the exhibition stands in the south nave of Crystal Palace, choosing to place only a few selected gas stands in the nave and locating most stands in somewhat cramped conditions in the west aisle (Figure 9). This contrasted with the electrical section, where all the stands were grouped into the centre of the northern nave. Gas and electric sponsors were each asked to provide overhead lighting for sections of the Exhibition Hall, and William Sugg proposed a complete plan of gas lighting arrangements to the Institute’s subcommittee. (Sugg said that he was the only exhibitor to respond on time to the subcommittee’s invitation to submit lighting arrangements, but it is likely that he had prior notice since he and Magnus Ohren were both Founder Members of the same Masonic Lodge.)

Sugg said that the Institute “had been pleased to approve of this scheme, and had granted to the company the best position in the Palace for lighting, and also the best site for their stall.” (Figure 10 shows that Sugg’s lights were Section 21, and Bray’s were Section 22.)

The subcommittee’s inexperience in organising exhibitions was apparent when George Bray pointed out that the prescribed stand height of 8 feet was inadequate to demonstrate lighting and that similar stands elsewhere were all 12 feet tall. He had specially constructed his display for a central position at stand number 111 or 112, but was allocated an end position at 110. (Sugg’s stand was in prime position at 102, the orchestra end of the south nave).

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83 This was the Evening Star Lodge, No.1719. Its members were exclusively ‘directors, auditors, secretaries, engineers, managers of gasworks…or contractors for the supply of gas material’. Another mason described the Lodge as ‘a trade association of the most odious character’: JGL, March 5, 1907, p.596 and March 26, 1907, p.799 & Goodall, The British Gas Appliance Industry, p.144

84 This was reported at William Sugg & Co.’s Half-Yearly General Meeting: JGL, October 3, 1882, p.606

85 WYAS, WYL1207/12
Figure 9: Plan of stands at the Crystal Palace International Electric and Gas Exhibition, 1882-83
The red marker shows George Bray’s stand, the blue marker shows William Sugg’s stand
Source: WYAS, WYL1207/12
The great height of the Palace necessitated high power burners and the lighting plan was for burners of at least 600-candle power, placed 24 feet apart, and about 30 feet above the floor.

The lighting space by George Bray is marked in red, lighting space by William Sugg is marked in blue.

Sources: WYAS, WYL1207/12, and JGL Nov 21, 1882, p.918

The exhibition was originally planned to open in October 1882 but was twice postponed and was finally opened by the Mayor of London on 13 December 1882.\(^8^6\)

The Official Catalogue of the Exhibition lists the very substantial product ranges displayed by both Bray and Sugg (their catalogue entries and advertisements are shown in Appendix 5). Bray’s stand included his ‘Patent Flat Flame Burners, adapted for every

\(^8^6\) It was not until almost two months after the exhibition opened that the JGL reported ‘The gas section is practically complete with one or two omissions’: JGL, February 6, 1883, p.223
kind of street and interior lighting..’ and also ‘A display of improved Globes for various
kinds of fittings…and Bray’s Patent Flat flame Shadowless Lanterns….’.

Figure 11: Example of William Sugg & Co. display stand at a gas exhibition
(unknown location)

Source: Family Archives held by Chris Sugg

The display stand shows not only large ceiling-hung lamps and small table top lamps, but also Sugg’s range
of ovens, and a large lamp at top right clearly meant to hang outside a public house or restaurant.

Sugg’s stand included his Christiania burners, and his accompanying advertisements
proclaim the awards he had won for his exclusive products. Figure 11 shows a Sugg stand
at an unknown exhibition.

Since the Crystal Palace exhibition had initially been planned to run until the end
of March 1883, Bray had committed to remove his display to another exhibition in
Sheffield in early April. When the Institute’s subcommittee advised that the exhibition would be extended and judging for awards would not take place until April, Bray’s protests were ignored. He was not the only exhibitor to be obliged to clear his stand, as W. & B. Cowan were also committed to take their display to Sheffield.

The Gas Institute considered the Exhibition to have been a great success, and the *JGL* congratulated George Livesey on his directing of the gas section ‘he is a worker, and never allows his sanction and authority to go forth as a cover for work done by others.’

Robert Paterson, President of the Institute, saw the occasion as critical to the gas industry:

‘had we not been appealed to, and had not the gas authorities throughout the country generously responded to the application we made to them for the necessary funds, the gas section of the exhibition would have been a dismal failure. What this would have meant...when the advocates...of electric lighting were exuberant in the recollection of their success in the same building last year, is not difficult to conceive..... if this exhibition had preceded by a couple of years or so the electric exhibition of last year, ruinous launching of gas stock upon the market by timid owners [fearful that the gas sales market would collapse in favour of electricity] would not have taken place...’

Surprisingly, it was a year before the awards were announced. When William Sugg was distinguished by the award of no less than five silver medals, George Bray felt that, having incurred substantial costs to put on an extensive display, he had been unfairly treated both in being excluded from the awards process, and in the allocation of stand space, because ‘the practical control of the Gas Section was in the hands of the shareholders and partisans of a limited company [ie. William Sugg & Co].’

Bray was also excluded from the subcommittee’s post-exhibition Report, which comprised a series of articles about gas lighting and appliances. One article addressed the

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87 *JGL*, June 2, 1885, pp.999, 1007  
88 *Trans TGI* 1883, pp.14,15  
89 The judges were Robert Harris (President of the Institute of Gas Engineers), W. J. Russell (Institute Member) and Captain Douglas Galton, C.B (possibly an independent juror). *JGL*, April 8, 1884, p.614  
90 *GW*, March 19, 1887, p.360
illumination and quality of flat flame burners, but was based on very limited independent tests, using only burners manufactured by Sugg and by Winsor & Bronner.\textsuperscript{91}

The next chapter discusses why the exhibition was a catalyst for polarising issues of status and perception between professional and traders, and why this led to a schism in the gas industry and the formation of The Institution of Gas Engineers as a rival professional body to The Gas Institute.

\textsuperscript{91} The Report was published in a series of articles in \textit{JGL}, the gas burners article appearing in April 7, 1885, pp.620,621
6. Profession versus Trade: issues of status and perception

Despite the success of the Crystal Palace exhibition, many gas engineers and managers continued to professionally distance themselves from traders. The Institute’s refusal to listen to Bray’s concerns was symptomatic of the view of many gas engineers and managers that traders were at best to be tolerated as Associates, and at worst were a nuisance. Bray’s persistent efforts to have his complaint heard by the Institute polarised the profession’s perception of traders between those who recognised the benefits of working together to promote the gas industry as a whole, and those who maintained that a learned society had no place for commercial members.

Only three years after the Institute had revised its rules to include Associates, the JGL drew attention to the imperative need for change in respect of ‘the practice of cumbering the hall of [the annual] meeting and lobbies with articles intended to advertise the makers. Nobody wants to stumble, whenever he enters the meeting, over stoves such as can be seen at any dealer’s’\(^92\) Whilst making an exception for ‘novelties’ which the JGL thought might be well worth seeing, it recognised that ‘Nobody can prevent manufacturers from getting up shows and entertainments in the nearest available spot to the hall of meeting; but it is enough to admit themselves to the latter, without permitting the encroachment of their goods.’\(^93\) George Livesey remarked that when he attended a meeting of the Gas Institute ‘the principals in certain trading firms were there [in the lobby] buzzing about like a lot of bees’\(^94\)

A JGL editorial, said that admission to the Institute had been ‘thrown open too widely just at the time and place where there was most risk of invasion…the new class of Associates suddenly assumed bloated proportions…the privilege of admission …was

\(^{92}\) JGL, June 17 1884, p.1037  
\(^{93}\) Ibid., p.1037  
\(^{94}\) Trans TGI, 1901, pp.63-4
abused by men who had no moral right to avail themselves of it.  

This problem was not unique to The Gas Institute. A similar issue had arisen several years previously, when the Bristol Society of Architects allowed ‘persons engaged in pursuits appertaining to Building’ to become Associate members, but then reorganised in 1862 to exclude the builders.  

However, the issue for the gas industry was not clear cut. In a letter to *The Gas World*, George Bray drew attention to the inequity of professional gas engineers or managers, who were ‘patentees of, and traders in, apparatus sold to gasworks, and … directors and shareholders in limited companies engaged in similar businesses’, not only retaining their Member status but eligible to serve on the Council of the Institute, whereas other traders could only be admitted as Associates.  

Bray tried hard to get the Institute to investigate his complaint about the unfair arrangements for the Crystal Palace Exhibition. His approach to the subcommittee which had been responsible for the gas section of the Exhibition was to no avail.  

Consequently, he informed Thomas Newbigging who was President of the Institute, that he would appeal to members at the next AGM, but said ‘If you can show me how I can obtain justice in any other reasonable way than by bringing the matter before the annual meeting, I will adopt the course you suggest.’  

Forewarned of Bray’s intentions, the Council resolved that when Bray got up to speak, the President would rule him out of order.  

In his Presidential address at the start of the meeting, Newbigging referred to ‘Mr. Sugg and Mr. Bray, twin genii of the lamp – a trade doubtless, but mutual friends of the gas manufacturer, who esteems the work of both’. However, when Bray attempted to

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95 *JGL*, May 13 1884, p.817
96 Kaye, *The Development of the Architectural Profession*, p.90
97 *GW*, March 19, 1887, p.360
98 *GW*, April 2, 1887, p.423
99 *Trans TGI* 1888, p.26
100 Opinion of Institute Council members was apparently divided at this time since Bray thought that the resolution against him was only passed by 6 votes to 5. Charles Sellers said that the President himself was personally opposed to the ruling which he had orders to enforce: *GW*, April 2, 1887, pp.422, 423, and *JGL* June 9, 1885, p.1075
voice his complaint, ‘a band of members...drowned my voice by stamping, shouting and other forms of rowdyism’ such that ‘I failed to obtain even a hearing’.\textsuperscript{101}

It appears that some of the more moderate members of the Institute’s Council wanted to quietly close the matter since a letter from Bray published in \textit{Gas World} says that he had

‘had visits from a gentleman, acting as ambassador for some of the parties chiefly concerned in the malpractices of the Gas Institute Committee at the Crystal Palace Exhibition, with the view of inducing me to agree to private and personal arrangements, whereby the matters in dispute might be settled.’\textsuperscript{102}

As Bray’s friend Charles Sellers\textsuperscript{103} said in another letter published by \textit{GW}, ‘the gentlemen charged by Mr Bray with unfairness have always told the world that Mr Bray’s charges were baseless, and ridiculous, and beneath notice, and yet a strong attempt has lately been made to settle those charges privately. Why?’\textsuperscript{104} Sellers goes on to argue that if Bray’s charges were baseless, there was nothing to settle, and pointed out that the Institute had declined to submit the matter to a committee chosen half by one side and half by the other. Bray declined the settlement proposals, contending that his reputation had been injured and that he would not receive justice if his complaint was swept under the carpet.

More correspondence published in \textit{GW} illustrates how the split among professional members of the Institute was opening up. W. Carr, an Institute Council member wrote that, regarding the merits of the dispute between Bray and the Institute, ‘I know very little, and care less’\textsuperscript{105} Sellers berates this view, writing that:

\textsuperscript{101} \textit{GW}, March 19, 1887, p.360
\textsuperscript{102} Ibid., p.360
\textsuperscript{103} Charles Sellers supported and defended Bray throughout the dispute. (See Appendix 1 for biography)
\textsuperscript{104} \textit{GW}, April 2, 1887, p.422
\textsuperscript{105} Ibid., p.422 (Carr was Manager of the gasworks at Halifax, Yorkshire)
Personally I was always under the impression that the main object of the members of the Gas Institute was for mutual protection and benefit, but if….when a member makes a complaint other members have the right to bully him, and treat his complaint with the most heartless indifference, then the sooner each member looks out for himself the better.”*106

Sellers continued by alleging that although originally admitting that Bray had not been rightly treated by the Institute, Carr was now ‘sick of the business’ and had done a volte-face saying he (Carr) now has the ‘utmost confidence in the men whose integrity Mr. Bray has impugned.”*107

The next step by the Institute’s Council was to change their rules to redefine qualifications for Associates, provide for members to be expelled, and increase subscription costs. George Livesey was the key Council member responsible for drafting the amendments. It was agreed that the former class of Associates would be divided into Associate Members and Associates. This was an attempt to distinguish between junior employees or pupils of Gas Undertakings (Associate Members) and a broad definition of Associates as ‘persons who, by reason of their professional knowledge or experience, are qualified to assist in promoting the objects of the Institute.”*108 The name change was in essence a way of emphasising the lower status of traders (Associates) compared to all other classes of Member.

As can be seen from Table 1, the influx of Associates had increased membership until 1883, when it stagnated. The Institute at this stage clearly wanted to keep the membership subscription revenue from traders because, as the JGL pointed out, the average annual cost of each member had been calculated at 15s 7d, which was unsustainable when fees were levied at 10s 6d.*109 To rectify this, fees were doubled to a

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*106 GW, April 2, 1887, p.422
*107 Ibid., p.422
*108 Trans TGI 1885, p.222, 227
*109 JGL May 20 1884, p.861
uniform subscription of a guinea for all classes of members except Associate Members who were to pay the reduced amount of 15s.

Table 1: Membership of the Gas Institute between 1881 and 1901

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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate</td>
<td>49</td>
<td>126</td>
<td>124</td>
<td>135</td>
<td>78</td>
<td>65</td>
<td>56</td>
<td>54</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>724</td>
<td>796</td>
<td>885</td>
<td>873</td>
<td>875</td>
<td>702</td>
<td>604</td>
<td>682</td>
<td>683</td>
<td>688</td>
</tr>
</tbody>
</table>

Source: Compiled from Transactions of The Gas Institute

A further change in the Rules said:

‘The Council may refuse to receive the subscription of any person who shall, in their opinion, have been guilty of such conduct as shall have rendered him unfit to continue to belong to the Institute….giving due notice to the person concerned, who shall have the right to be heard; and if two-thirds of the members present [at an AGM] so determine, his name shall be erased from the roll of the Institute...’

George Bray took advantage of the right to be heard to get his letters of complaint read out to Institute members at the next AGM. The Council still maintained that they were ‘totally incompetent to inquire into the charges you have made against the gentlemen

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110 Trans TGI 1885, p.225 (Almost 20 years earlier, the Institution of Civil Engineers had sought legal opinion on whether it could expel a member for misconduct and had been advised that it could do so, but not ‘at the arbitrary will of the Council or a majority of the members’: Buchanan, The Engineers, p.73)
referred to in your former letter.\textsuperscript{111} After further disruption, the President invoked the new rule to recommend that Bray be expelled from the Institute and members present voted in favour.

Bray still valued his membership of the Institute and challenged his expulsion in the High Court, which found in his favour on a technicality. This was the crunch point. The Institute were obliged to reinstate Bray and pay his costs for challenging his expulsion, and shortly afterwards most of the leading members of the Institute, including George Livesey, resigned in protest.\textsuperscript{112} For once, the Journal and Gas World were united in criticising the Council’s ineptitude in handling Bray’s complaint.

The gas engineers and managers who resigned from the Institute set about establishing The Incorporated Institution of Gas Engineers as a rival national professional body from which traders were explicitly excluded. Its founding principle was that ‘only men actively engaged in the management of gasworks or professionally in their construction were proper men to form an association representing the gas industry.’\textsuperscript{113} Having induced more members to defect from the Institute, the Institution had 70 members at its first annual meeting in 1891.\textsuperscript{114} George Trewby, the Institution’s President, boasted that their members were of a superior character to those of the Institute representing ‘a capital expenditure of gas undertakings of upwards of £23million’ – essentially an organisation of the largest gas undertakings.\textsuperscript{115} In defining a professional divide from the Institute, Trewby was echoing the Institution of Civil Engineers many years earlier when Thomas Telford said in his Presidential address that ‘talents and respectability are preferable to numbers, and that from too easy and promiscuous admission, unavoidable, and not infrequently incurable, inconveniences perplex most

\textsuperscript{111} Trans TGI 1888, p.27
\textsuperscript{112} Braunholtz, The Institution of Gas Engineers, pp.37,38
\textsuperscript{113} Trans TIGE 1901, p.60-61
\textsuperscript{114} Trans TIGE 1890, p.10
\textsuperscript{115} Trans TIGE 1891, p.17
societies."\textsuperscript{116} It was perhaps due to a wish to avoid comparison with the Institute that no annual membership lists were published in the \textit{Transactions} of the Institution, and in some years, not even the total number of members was reported.

The Institute suffered an immediate fall in numbers in 1890 as can be seen in Table 1, but succeeded in keeping the majority of its members including industry leaders such as Thomas Newbigging. In his Presidential address that year, George Garnett said that there had been an attempt to show that the split had caused ‘the men of “brains”’ to defect to the Institution.\textsuperscript{117} However, the Institute’s membership rebounded to stabilise by the late 1890s at around 680, of which about 12\% comprised Associate and Extra-Ordinary Members, and professional engineers and managers co-existed peacefully with traders.

Both Institute and Institution were national bodies and both continued to publish and discuss technical papers at their annual meetings. Both remained concerned with the social status of their members rather than with setting standards for professional competency. A significant number of professionals were members of both the Institute and the Institution.

\textsuperscript{116} Buchanan, \textit{The Engineers}, p.63
\textsuperscript{117} \textit{Trans TGI} 1890, pp.8,9
7. Collaboration: profession and trade working together

The Institute and Institution continued their rivalry to represent the national gas industry for 10 years. It was not until 1900 that the rift was healed and negotiations began to unite the two organisations. This chapter discusses how the vexed question of trader membership was resolved to allow a new Incorporated Institution of Gas Engineers to be formed as the single voice of the gas industry; how the drive to increase gas sales led to professionals and traders working together to install pre-payment meters and rented gas cookers; and how gas lighting was able to compete more effectively with electricity following the invention of the incandescent gas mantle.

George Livesey had a ‘can do’ attitude and Mills says that his personality was such that he could walk into a meeting and say ‘Look this is how it is’ and with a clarity of message could change the agenda, and change how people think.\textsuperscript{118} This is certainly what happened when Livesey, accompanied by George Bray and Charles Sellers, unexpectedly walked into the annual meeting of the Institute in 1900. They were greeted with loud applause, invited to occupy seats on the platform and were each requested to address the meeting.\textsuperscript{119} Livesey said

‘how pleased he was to find himself once more, in company with Mr Bray and Mr Sellers, among his old friends.....It was a great satisfaction to both Mr Bray and himself to be present. The past was gone and they had to look to the future…No doubt there were difficulties in the way of union; but if men were sincerely desirous of it, he had no fear but that it would be brought about.’\textsuperscript{120}

Bray said that

‘as far as there ever was any fundamental difference of opinion between him and the Institute [about the organisation of the Crystal Palace Exhibition] it was now, at all events settled. For

\textsuperscript{118} Mary Mills, \textit{The Ghost in the Dome} [http://gihs.gold.ac.uk/ghost.html, accessed 5 May 2010]
\textsuperscript{119} Braunholtz, \textit{The Institution of Gas Engineers}, p.50
\textsuperscript{120} Ibid., p.51
many years, though Mr. Livesey might not have known it, he had regarded him with growing
admiration…” ¹²¹

Charles Sellers, who had been the friend of both Livesey and Bray said that
‘he had had a little to do with bringing Mr. Livesey and Mr. Bray together and in effecting an
amicable settlement of the differences which existed between them. He felt he should succeed,
because he always associated generosity with bravery; and the two men who had just spoken were
both brave and conscientious.’ ¹²²

These remarks were received with hearty approbation, and a Joint Committee of both the
Institute and Institution was subsequently appointed to negotiate the terms of
amalgamation. As can be seen from Table 2, almost a third of the ordinary members of
the Institution were also members of the Institute. When the two bodies united in 1903,
membership of the Institute was almost three times that of the Institution.

<table>
<thead>
<tr>
<th>Class of Membership</th>
<th>Belonged to both old Societies</th>
<th>Old Institute</th>
<th>Old Institution</th>
<th>New Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honorary Members</td>
<td>-</td>
<td>18</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Members</td>
<td>62</td>
<td>520</td>
<td>188</td>
<td>577</td>
</tr>
<tr>
<td>Extraordinary Members</td>
<td>-</td>
<td>28</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Associate Members</td>
<td>5</td>
<td>60</td>
<td>-</td>
<td>78</td>
</tr>
<tr>
<td>Associates</td>
<td>-</td>
<td>46</td>
<td>38</td>
<td>-</td>
</tr>
<tr>
<td>Students</td>
<td>-</td>
<td>-</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>67</strong></td>
<td><strong>672</strong></td>
<td><strong>239</strong></td>
<td><strong>684</strong></td>
</tr>
</tbody>
</table>

Source: *Trans TIGE* (united) 1903, p.12

¹²¹ Braunholtz, *The Institution of Gas Engineers*, p.51
¹²² Ibid., p.51
The sticking point for agreement was a proposed rule which said that ‘No person shall be qualified to be or remain a member of the Institution who shall be actively engaged in…the management or business…of any trading company, firm or concern doing business with gas undertakings…’ George Livesey spoke in support of excluding traders from the new body, arguing that the Institution’s members, being actively engaged in the management or construction of gasworks, were responsible for buying and selling of all articles used by their gas undertakings, and therefore must be above suspicion in their relations with traders. However he suggested that traders, such as Past Presidents who had since started up their own businesses in gas making equipment or ‘who had rendered service to the industry’ such as William Sugg, should receive an honorary distinction.

Some years earlier, the JGL had tried to take a balanced approach, saying that

‘We are not of those who would condemn the recognition of what is called the “trading element”.

The gas industry is not a purely scientific or scholastic pursuit. A man does not cease to be an engineer when he makes articles for sale, instead of selling his time and skill…At the same time, the Institute is not a trade society and must not be patronised as such.’

It was agreed that the Institution should compliment those who had ‘rendered distinguished service to the progression of gas engineering, or have specially promoted the interests of the gas industry’ by electing them as Honorary Members. With the exclusion of most traders, the new united Institution had just 12 more members than the former Institute (see Table 2), but by the time of its first annual meeting, an additional 48

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123 Trans TIGE 1900, p.17
124 In the late 1880s, there were scandals about ‘commission’ payments by traders to secure contracts from gas undertakings, notably in Salford in 1887 in relation to coal supplies. A Public Bodies Corrupt Practices Act was passed in 1889, which made bribery a criminal offence, but only for municipal undertakings: Goodall, Burning to Serve, p.115
125 For example, John West, the Institute’s President for 1893–4, had been Chief Engineer of Manchester Corporation Gas Department but left to establish West’s Gas Improvement Company Ltd: Braunholtz, The Institution of Gas Engineers, p.285
126 JGL, May 13 1884, p.817
127 Trans TIGE 1902, p.28
applications for membership had been accepted (bringing the total membership to 732).  

When the first meeting of the united Institution of Gas Engineers was held in 1903, there were just five nominations for election to Honorary Member, including George Livesey and George Bray. Livesey gave credit to Bray and said

‘But for Mr. Bray, this union could not possibly have taken place; and they were very much indebted to him for the great magnanimity he displayed when he said to the old Institute that he was willing to retire if he were an obstacle to union. …. Mr Bray was a hard hitter, and he said hard things; but he was an honest man and he never made use of the Institute to further his personal objects.’

Livesey was quick to pursue the new opportunities for professionals and traders to work together which were opened up at this time by the invention of the penny-in-the-slot meter. As a result of cheaper coal prices and increased revenue from sales of residual products, gas undertakings had been able to steadily reduce the prices they charged customers. However, gas lighting was still beyond the means of working class homes. The ability to pre-pay little and often with pennies opened up a new mass market for gas sales once gas pipework had been installed.

Livesey developed a scheme at the South Metropolitan Gas Company, whereby the company paid the capital outlay to install a pre-payment meter and gas lighting in a customer’s home. Recognising that a significant increase in gas sales could be achieved, and gas usage spread throughout the day, if customers were encouraged to use gas for cooking, the South Metropolitan offered gas cookers on a rental basis. The customer paid a surcharge on the gas price charged through the pre-payment meter to reimburse the gas

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128 Following their exclusion from the new Institution, traders formed their own organization in 1905 - the Society of British Gas Interests.
129 Trans TIGE (united) 1903, p.25
company for their initial costs.\textsuperscript{130} Livesey contracted to buy meters and fittings from William Sugg, who had a showroom in the South Metropolitan Company office.\textsuperscript{131} A series of cooking demonstrations was arranged and just twenty demonstrations in 1888 resulted in orders for 859 stoves.\textsuperscript{132} The huge success of the scheme is illustrated by Livesey’s comment in 1897 that ‘a single collection from these machines [pre-payment meters] has yielded 10 tons in weight of copper’ and that ‘there has been at times an actual dearth of copper money in South London’.\textsuperscript{133}

Similar meter pre-payment schemes became enormously successful throughout Britain. Figure 12 shows just how dramatically the popularity of gas cooking increased gas sales in Manchester, shifting the peak gas supply period from the evening to midday by 1936. The scheme necessarily meant that gas supply companies became very big customers of the traders who manufactured the pre-payment meters and who also designed and sold the light fittings and gas cookers.\textsuperscript{134} Since gas companies generally rented out cheap cookers at less than cost, no retail market in appliances developed, and traders were constrained to produce the cheap, robust models which gas companies chose to bulk order for their hire market.

\begin{flushleft}
\textsuperscript{130}Gas cookers had been provided on hire from 1882 by Leicester Corporation Gas Department, who rented out 2000 stoves to customers within 2 years. Liverpool was first to use penny-in-the-slot meters, but it was not until pre-payment meter and hire schemes were introduced across London by the South Metropolitan and shortly afterwards by the Chartered Company, that such schemes became commonplace across the country. By mid 1894, the South Metropolitan had supplied some 15,000 pre-payment meters: Goodall, \textit{Burning to Serve}, pp.93, 103  \\
\textsuperscript{131}Sugg did not compete successfully in the gas cooker market as he used a different, less effective, burner principle from other manufacturers.  \\
\textsuperscript{132}Goodall, \textit{The British Gas Appliance Industry}, p.88  \\
\textsuperscript{133}Otter, \textit{The Victorian Eye}, p.148  \\
\textsuperscript{134}Appliances such as domestic ovens, gas fires, gas rings and water heaters were made by Bray and Sugg and also made by firms such as Cannon, Parkinson and Cowan: Goodall, \textit{The British Gas Appliance Industry}, p.11
\end{flushleft}
Lighting gave high levels of demand for gas sales during only a third of each day, whereas the combined lighting and cooking demand meant high gas sales for over 2/3rds of each day.

It was the traders who enabled the gas industry to successfully compete with electricity by introducing incandescent gas mantles, which greatly improved both street and domestic gas lighting by giving several times more light than a flat flame burner with less gas consumption. The profession was initially very sceptical about the effectiveness of incandescent mantles, but by the mid-1890s traders were able to demonstrate that the mantles, which could be screwed on to existing gas fittings, were giving 18 candlepower illumination per cu.ft of gas, compared to just 2 candlepower from a simple flat flame burner. In addition to making domestic lighting brighter and being more efficient of gas usage, the mantles solved the problem of gas lighting making rooms hot and stuffy. Incandescent mantles also meant that gas street lighting could

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135 After his first mantle was shown to be very fragile, Welsbach continued to experiment and patented an improved mantle and impregnating fluid in 1892: Goodall, *Burning to Serve*, pp.127-8
provide cheaper and better illumination than that available from electric lamps and for large areas such as railway stations, incandescent burners could give as good illumination as electric arc lamps (see figure 14).\footnote{By the end of 1896, the Welsbach Incandescent Gas Light Company, which was based in Westminster and had a licence to manufacture mantles under the Welsbach patent, was producing 30,000 mantles a day. The price of the mantles fell from £s3d in 1895 to 7½d in 1900: Reg. Brown, ‘Seeing the light – the great leap forward’, in \textit{The Historic Gas Times}, Issue 56 (2008)}

George Livesey was again in the lead in working with traders to exploit the mantles. He offered to convert all the street lamps in the South Metropolitan Company’s area from flat flame to incandescent burners at the Company’s expense. Because the mantles were more efficient and provided a brighter light with less gas consumption, the Company would continue to charge their customers at the same rate as previously until their costs were recouped, and then reduce the customer’s bill to reflect actual gas used with the new mantles. Within a year, almost \(2/3\)rd of the 21,000 street lamps in the South Metropolitan’s supply area had been converted.\footnote{Goodall, \textit{Burning to Serve}, pp.134-5}

George Bray’s company, managed by his sons after his death, became one of the largest manufacturers of incandescent burners, which were displayed at showrooms opened in central London in 1905.\footnote{Bray & Co.Ltd sold 2 million incandescent burners a year: WYAS, WYL1207/140, p.11} The \textit{JGL} reported that

‘A visit is interesting as it shows how considerably the firm have entered into the incandescent business...the firm, we learn, are turning out more flat-flame burners than ever …The firm’s ordinary incandescent burner, with its gas and air adjusters, and beautifully constructed head, has won much favour…Of fittings, globes and shades, there are samples of choice design [see Figure 13]; and in fact, a careful examination of them will bear out the firm’s claim that cheapness, good material and high efficiency are companionable merits.’\footnote{\textit{JGL}, December 5, 1905, p.701}

By the turn of the century, it was the traders who were promoting the gas industry through marketing of incandescent gas lights and cooking and heating appliances. The idea of linking the prepayment meter to installation of gas pipe work for lighting and the

\footnotesize
\begin{itemize}
  \item \footnotesize 136 By the end of 1896, the Welsbach Incandescent Gas Light Company, which was based in Westminster and had a licence to manufacture mantles under the Welsbach patent, was producing 30,000 mantles a day. The price of the mantles fell from £s3d in 1895 to 7½d in 1900: Reg. Brown, ‘Seeing the light – the great leap forward’, in \textit{The Historic Gas Times}, Issue 56 (2008)
  \item \footnotesize 137 Goodall, \textit{Burning to Serve}, pp.134-5
  \item \footnotesize 138 Bray & Co.Ltd sold 2 million incandescent burners a year: WYAS, WYL1207/140, p.11
  \item \footnotesize 139 \textit{JGL}, December 5, 1905, p.701
\end{itemize}
This shows how George Bray & Co Ltd developed their domestic lamp designs. Illustration from their 1912 catalogue.

Source: Gledhill, *Gas Lighting* (Shire Publications, Aylesbury), p.23

The lamp has three mantles and is typical of railway stations in the early 20th century

Source: Gledhill, *Gas Lighting*, p.32

rental of gas cookers, was a turning point in the perception of gas engineers and managers that they needed to involve themselves in the appliance trade and could not continue to stand on their professional dignity. The Incorporated Institution of Gas Engineers renewed its focus as a professional ‘learned society’, but made provision to recognise outstanding traders as Honorary Members, with George Bray being one of the first to be elected.
8. Conclusion

The 1880s, when electricity was beginning to emerge as a competitive energy source to gas, were a period of tension between the more commercially-minded engineers and managers who recognised the benefits of working with traders to develop the market for gas sales, and other engineers who saw themselves as professionals, above and apart from involvement in trade. For the traders, there was increased competition to manufacture and market new designs of gas lamps and also to diversify into gas appliances. It was a combination of the attitude of superiority among professional engineers, and aggressive competition between traders, that caused a major schism in the gas industry’s professional body.

When the British Association of Gas Managers was first founded, its membership grew very rapidly; the presentation of technical papers and visits to gasworks at its annual meetings enabled members to share expertise and keep pace with new developments in gas engineering and manufacture. Recognition was given to outstanding traders by electing them as Honorary Members or Extra-Ordinary Members. However, by the early 1880s membership numbers had stalled. BAGM was in financial difficulties and attempted to raise its profile by changing its name to The Gas Institute and to increase its revenue from membership subscriptions by amending its Rules to admit traders as Associates. This strategy had unanticipated results when not only did membership applications from traders begin to outnumber those from engineers, but some traders used the Institute’s annual meetings as an opportunity to importune gas engineers and managers for business.

The attitude of professionals towards traders began to harden after the Institute had been persuaded to organise the gas section of an international exhibition at Crystal

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140 William Sugg was elected an Honorary Member in 1873, and George Bray was elected as an Extra-Ordinary Member in 1879: Trans TGI 1883, pp.213, 231
Palace. Trader George Bray tried to complain about the way that the subcommittee which was responsible for the Institute’s management of gas industry representation at the exhibition, had allocated stands and arranged the judging for awards. From the available evidence, Bray was justified in his complaint, but the subcommittee members, George Livesey, Charles Gandon and Magnus Ohren, who were all friends of Bray’s rival trader William Sugg, refused to acknowledge that there could be any question to answer about their organisation of the exhibition.

Bray was a man of strong principles and doggedly determined to achieve recognition that he had been unfairly treated, remaining steadfast for many years in withstanding bullying and harassment by members of the Gas Institute, and vilification in the *Gas Journal*. It was the Institute’s inept attempt to expel Bray for being a nuisance that far from resolving the issue, led to the Institute losing its status as the single national focus for the gas industry. When a High Court hearing obliged the Institute to reinstate Bray, the perceptions of professionals towards traders became polarised. Many senior members resigned from the Institute to form the Institution of Gas Engineers, taking the view that their national professional body should be restricted to engineers and managers, and that all traders should be expressly excluded. The Institute by contrast retained its Associate membership class for traders. A letter by Charles Hunt said:

‘It cannot be too clearly understood that the rock upon which The Gas Institute split is the question of the exclusion or otherwise of the trading element.’

Apart from this issue of traders, there was no significant difference between the constitutions of The Gas Institute and the Institution of Gas Engineers, and for the next 13 years both held annual meetings, both published technical papers and both sought to represent the national gas industry. The two professional bodies eventually agreed a set of rules which allowed them to unite, but some perceptions die hard. At the first meeting of

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141 Brauhnoltz, *The Institution of Gas Engineers*, p.43
the new United Incorporated Institution of Gas Engineers, a member tried unsuccessfully
to block George Bray from being elected an Honorary Member. George Livesey
confirmed that Bray’s issue was settled, saying ‘he was very glad indeed that Mr. Bray’s
name was associated with his own in the Honorary Membership – in fact, it would have
taken off the greater part of the pleasure if it had not been.’ Bray and Livesey were both
independent, strong-minded individuals with a ‘can do’ attitude, who managed successful
businesses with a clear code of ethics at a time when payment of ‘commission’ for gas
contracts was common. Both had a keen sense of their own capabilities and status – Bray
as an inventor and manufacturer of burners and appliances, Livesey as a professional
engineer and manager.

Recognition of professional status through the establishment of industry bodies
was one of the significant social changes of the 19th century. James Helps, President of
the Institution of Gas Engineers in 1900, highlighted the progress that the gas industry
had made towards professionalism, saying:

‘in the earlier days of gas manufacture, managers of works were men who held their position by
the possession of strong natural intelligence and undoubted energy, but who, through no fault of
their own, were hardly possessed of that early training which fitted them for acting in any other
capacity than that of manager.’

Helps went on to say that, although there were many gas managers who had contributed
to progress in the industry, they had relied on consulting engineers for technical
assistance. Britain led the way in gas engineering expertise and more experienced gas
engineers found they were in demand to give advice about gasworks all over the world,
including Thomas Hawksley in Bombay, Thomas Newbigging in Brazil, Charles Gandon
in Smyrna for the Ottoman Gas Company, and Henry Woodall in Melbourne, Australia.

In 1899, the Institute elected Frederick Marshall as its President, a British engineer who

\[142\] Trans TIGE 1900, p.32
was working for the Danish Gas Company, where he rebuilt several of their gasworks. The professionalism of the united Institution was respected internationally, and at it’s 1907 annual meeting, held in Dublin, it welcomed visitors from France, Germany, Denmark and Japan, as well as two visitors from the United States who presented technical papers.\footnote{JGL, June 25, 1907, p.893}

George Livesey was the outstanding gas engineer and manager of his generation. His education had been essentially practical, through apprenticeship to his father, but by the time of his death, the value of scientific theory had been accepted as integral to engineering competency.\footnote{King’s College, London, set up a separate Faculty of Engineering in 1896, followed by University College and Imperial College: Buchanan, The Engineers, p.172} Professional bodies, such as the Institution of Civil Engineers, were reflecting the desirability of university education in their qualifications for membership. The Institution of Gas Engineers endowed the Livesey Professorship of Coal Gas and Fuel Industries, to direct teaching and research for the gas industry at Leeds University, as a memorial to Livesey’s contribution to the gas industry (see Appendix 6 for discussion of why Leeds was chosen rather than a London college).\footnote{There were other precedents for endowing a specialised subject appointment at a University. In 1884, a Chair in Naval Architecture at Glasgow University was endowed by The Institution of Naval Architects, soon followed by similar developments at Newcastle and Liverpool: Buchanan, The Engineers, p.95} George Bray had been a Life Governor and regular donor to the Yorkshire College of Science, and had supported its development to become established as Leeds University. Trade and profession came together when Bray’s son, John William Bray, was nominated to be a University representative on the Advisory Committee which was set up to administer the Livesey Professorship.\footnote{Letter of July 18, 1910 from The University, Leeds, to the Institution of Gas Engineers (Private archive of Mary Mills)}

Over the following years the Institution was increasingly recognised as the authoritative voice of the gas industry, promoting advances in research, technology, and
the training and qualification of gas engineers. The grant of a Royal Charter in 1929 enabled the Institution’s members to style themselves with the title *Chartered Gas Engineer*. Changes in the Institution’s by-laws associated with the Royal Charter meant that a technically qualified person involved in trade could be admitted to the same classes of membership as engineers and managers of gas undertakings.\(^\text{147}\)

By the 1920s, the tungsten filament electric light bulb had been developed and electricity, now sold at an affordable price, was seen as a modern and labour-saving competitor compared to gas which was smelly and hazardous. When the national grid became operational, electricity superseded gas lighting and the future for both gas companies and traders was in the use of gas for cooking and heating.\(^\text{148}\)

The Livesey Professorship continued during the 20\(^{th}\) century as also did Leeds University’s links to George Bray & Co. In the 1960s, the research carried out under the aegis of the Livesey Professorship included a study of the effect on gas burners of the change from coal gas to natural gas; this study was initiated by George Bray & Co., who provided a fellowship for the research, and it was considered to be of national importance since coal gas was about to be superseded by natural gas produced from the North Sea.\(^\text{149}\)

Today, the professional body is known as the Institution of Gas Engineers and Managers and continues to publish technical papers. It sets industry standards for professional competence, and although membership is not a requirement for employment, the Institution’s 11 grades of membership, ranging from Student Member to Fellow, provide recognition of a spectrum of technical expertise relevant to both engineers and traders. 

Katrina Hide 13 September 2010

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\(^\text{147}\) Institution of Gas Engineers and Managers, [www.igem.org.uk/company/history.asp](http://www.igem.org.uk/company/history.asp) accessed 31/05/2010

\(^\text{148}\) In 1880, lighting represented well over 90% of gas sales, but had fallen to only around 10% by 1939: Goodall, *Burning to Serve*, p.64

\(^\text{149}\) *The Houldsworth School of Applied Science: The Fuel Department after 60 years* (The Institution of Gas Engineers, 1966)
Appendix 1

Brief career sketches of professionals and traders

involved in this episode of the gas lighting industry:

Sir George Thomas Livesey, 1834-1908

George Livesey was following a family tradition in becoming a gas engineer. His great uncle Thomas was one of the initial shareholders of the first gas company, the Chartered Gas Light and Coke Company. Thomas became so concerned about poor operating practices at the Company’s gasworks that he took on a leading role in re-organising the way the Company managed its business. Thomas junior, George’s father, joined the Chartered Company as an apprentice to great uncle Thomas, and having developed his technical capabilities, moved to an appointment as manager at the South Metropolitan Gas Company’s gasworks.150

George started working with his father at the South Metropolitan at age 14, and remained with the company for 60 years, becoming Assistant Manager at the age of 23, and progressing to the position of Engineer & Secretary, before retiring to become a Director and later Chairman of the company. George Livesey was responsible for the South Metropolitan expanding to become the second largest gas undertaking in the country in volume of output.151 He was President of The British Association of Gas Managers in 1874, and in 1882 was the first recipient of The Gas Institute’s prestigious Birmingham medal for research, awarded ‘for originality in connection with the manufacture and

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150 Thomas was a notably successful manager, improving the efficiency of the gasworks and introducing workmen’s benefits such as a contributory sick fund: Goodall, ‘Livesey, Sir George Thomas (1834-1908)’ Oxford Dictionary of National Biography[accessed 6 May 2010]

151 Between 1862 when George was appointed Engineer, and his death in 1908, the gas output of the South Metropolitan Company rose from 350 million to 12,520 million cubic feet per year: Ibid.
application of gas, such qualification to be interpreted in its widest possible sense’.

Livesey was a generous philanthropist and was knighted in 1902.

Sources: Mary Mills, A Biography of George Livesey (Southwark Local History library, Pamphlets 920/Liv, 2001); Mary Mills, The Ghost in the Dome [http://gihs.gold.ac.uk/ghost.html, accessed 5 May 2010]; Braunholtz, The Institution of Gas Engineers. p.321

Magnus Ohren, 1821-1907

Magnus Ohren started his career by becoming articled aged 16 to the Engineer-in-Chief of the British Gas Company’s Ratcliffe gasworks. After spending a period in Hamburg to assist in establishing gas lighting for the city, Ohren became Superintendent of the Commercial Gas Company. In 1855, he was appointed Manager and then later was Secretary of the Crystal Palace Gas Company, a position he held until 1893. Ohren was a founder member of the British Association of Gas Managers. He resigned from The Gas Institute in 1890 and became one of the auditors of the rival Institution of Gas Engineers. When he retired in 1893, George Livesey was one of the supporters of a proposal that company shareholders should pay Ohren a pension.

Source: JGL, March 26, 1907, p.799

Charles Gandon, 1837-1902

Charles Gandon began his career by assisting in construction of gas works in Germany. He moved to Smyrna, where he was Engineer & Manager, of the Ottoman Gas Company. After a period as Engineer & Manager of gasworks in Bombay, Gandon returned to England as Engineer & Manager of the Crystal Palace Gas Company, a position he held for over 20 years. He was President of The Gas Institute in 1888.

Source: Braunholtz, The Institution of Gas Engineers, pp.282-3
**Charles Sellers, d.1902**

Charles Sellers was Secretary and Manager of the York United Gasworks Company. He was elected a member of the British Association of Gas Managers in 1874 and was a Council member of The Gas Institute in 1883-84. No other biographical information about him has been found.

Sources: Braunholtz, *The Institution of Gas Engineers*, p.52, and *Trans TGI* 1883, p.226

**Thomas Newbigging, 1833-1914**

Thomas Newbigging started his career as an engineering apprentice in Blackburn, and after progressing to become Secretary & Manager of the Rossendale Union Gas Company, he went to Brazil as Engineer & Manager for the Pernambuco Gasworks. Returning to England in 1875, he set up a consulting business in Manchester and his professional activities took him all over the world. Newbigging was one of the leading authorities on gas engineering and he first published *The Gas Manager’s Handbook* in 1870, in which he laid down guidelines on how a gas supply undertaking should be managed. His *Handbook* was so popular it ran to at least 8 editions. Newbigging was one of the founding members of the British Association of Gas Managers and was President of The Gas Institute in 1885. He was awarded a Doctor of Science degree by the University of Leeds in 1912.

Source: Braunholtz, *The Institution of Gas Engineers*, pp.31, 280

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152 Braunholtz, *The Institution of Gas Engineers*, pp.31, 281
George Bray, 1841-1905

George Bray started work, aged 12, with a printer and bookseller, who encouraged him to educate himself by attending night classes at his local Mechanics Institute. Having learned the basics of chemistry, physics and metallurgy, Bray went to work for a Leeds company which manufactured textile machinery and machine tools, where he became proficient in working with brass and drilling the ultra-fine holes needed for carding machines. He developed an interest in ceramics and after much methodical study and experiment with different clays and glazes, invented a brass, flat flame gas burner with a porcelain tip, which would not corrode, thus curing the flickering light problem. Bray took out his first patent for a gas burner at the age of 24. He used his experience at the textile machine tool company to make his own machinery for manufacturing burners in order to keep his production process unique to his business, which he developed into an enterprise employing 700 workers by the time of his death. Bray handed over the management of his business to his sons, John and Arthur, in about 1900 and converted it into a Limited Liability Company in 1903. Bray took a philanthropic interest in facilities for working men in Leeds, founding the Leeds Athletic Club, and setting up soup kitchens during the long severe winter of 1895.

153 Mechanics Institutes were originally founded to provide a scientific education for the working class - see Appendix 6
William Thomas Sugg, 1832-1907

William Thomas Sugg’s family were involved in the gas lighting business from its outset. Thomas Sugg, an ironmonger who worked with tin and sheet metal, is thought to have manufactured and installed pipes for Frederick Winsor’s first demonstration of gas street lighting in Pall Mall, London. Thomas’s son, William, went to work for a meter maker and then set up his own business in Westminster as:

“William Sugg & Co., Brass and Iron Founders, Gas Engineers and Fitters, Makers of Improved Gas Meters, Manufacturers of every description of plain and ornamental bronze, brass and iron work for OIL or GAS….154

William’s son, William Thomas, worked for Thomas Livesey at the South Metropolitan Gas Company, where he learned about gas supply and appliances, and he took over his family’s business at age 25 years when his father died. William T. Sugg was elected an Honorary Member of the British Association of Gas Managers in 1873 (despite being a trader rather than a gas supply manager), giving papers at annual meetings and authoring a book on The Domestic Uses of Coal Gas.155. He spent a lot on advertising and expanded his business with showrooms in the Grand Hotel Buildings, Charing Cross, London, and also in Paris. To raise more capital for development, he converted his business into a Limited Company in June 1881 but at a time when investors

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155 William T. Sugg, The Domestic Uses of Coal Gas: As applied to lighting, cooking and heating, ventilation; with suggestions to consumers of gas as to the best mode of fitting up houses and using gas to best advantage (London, 1884)
were concerned about the challenge of electricity to gas lighting, the flotation was substantially under-subscribed.\footnote{156} William Sugg’s company suffered from a loss of commercial direction during the late 1880s. Its gas cooker design did not compete successfully with those of other manufacturers, and a number of its patents were never put into manufacture.\footnote{157} Sugg’s company got into financial difficulties, and no dividends were paid between 1888 and 1896.\footnote{158} It was not until the firm was re-organised after Sugg’s death and refocused on its core business of gas lighting, that it recovered its reputation and profits.

Sources: William Sugg & Co, History [accessed 28 April 2010] and JGL, March 5, 1907, p.595

\footnote{156} Of the Offer of 40,000 shares, only 6,571 shares were taken up: Dillon, \textit{Domestic Lighting in Britain}, p.196

\footnote{157} Sugg’s wife, Marie Jenny Sugg wrote a cookery book which also described gas appliances and how to use them: Goodall, \textit{The British Gas Appliance Industry}, p.87

\footnote{158} Dillon, \textit{Domestic Lighting in Britain}, p.202
Appendix 2

Syllabuses for examinations by the City and Guilds of London Institute in Gas Engineering and Gas Supply June, 1907

[APPENDIX]

The following are the syllabuses for the examinations by the City and Guilds of London Institute in "Gas Engineering" and "Gas Supply" referred to in the preceding report.

GAS ENGINEERING.

The examination will include questions founded on such subjects as the following:

Mandatory Grade.
1. The construction and setting of retorts for the destructive distillation of coal, and the furnaces or producers for heating them.
2. The methods of charging and discharging producers, and the machine and other coals employed; the fittings of the retort-bench, including the hydraulic means for dry-day cleaning.
3. The effects of modifications of carbonizing temperature upon the quantity and quality of gas yielded by the coal.
4. The description of apparatus for the manufacture of water gas (unconsolidated or carbonized), and the practical working of the plant.
5. The principles and methods of gas condensation, with description of apparatus employed.
6. The exhauster—its construction, its use or object, and the means by which it is actuated and controlled.
7. The methods of removing the gaseous impurities present in the gas after condensation, together with the apparatus and materials employed. Chemical reactions involved.
8. The various instruments used in gas-works for ascertaining and recording pressure and exhaust, and their practical employment and significance.
9. The usual methods and apparatus employed for testing coal gas, water gas, producer gas, waste gas, &c., including the usual tests for illuminating power, calorific value, specific gravity, and purity of the gas supplied to the public, and those for ascertaining the value of the bye-products.
10. The simpler physical and chemical principles involved in the ordinary processes of gas manufacture and the formation of the bye-products, the laying of mains and services. The necessary methods for securing an adequate supply of gas throughout the area of a district. The methods and instruments employed at the works for the due control of the pressure in the street mains. The fusing up of premises for the supply of gas for light, heat, and power. The construction, testing, and fitting of gas-meters. The influence of temperature and pressure on the volume of gas.
11. The construction of various types of gas-burners. The simpler physical and chemical principles involved in the combustion of gas. The economy and efficiency of incandescent lighting as contrasted with luminous flames. High-pressure lighting.

Honours Grade.
In the Honours examination more difficult questions will be set in the subjects named in the syllabus of the Ordinary Grade, and, in addition, a knowledge will be required of—
1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes.
2. The effects of temperature upon the production of residuals.
3. Chemical composition and physical properties of coal gas, and the influence of each component upon the illuminating power and calorific value of the gas.
4. The principles of combustion, and their application to the working of retort-furnaces.
5. The more advanced physical and chemical principles involved in the processes of destructive distillation of coal, and in the condensation and purification of the resulting gas.
6. The methods of complete gas analysis, including those for ascertaining the amount of impurities in the crude gas. Method of testing oil to be used in the manufacture of carbonet water gas.
10. The construction of gas-works plant generally.
11. The management of the various portions of the plant in order to obtain the best efficiency of the apparatus, with due regard to economy in working.
12. The method of dealing with such emergencies as are of more common occurrence in gas-works through breakdown of machinery or other failure of plant.
15. The construction, working, and efficiency of the gas-engine.
17. Structural capacity. Working costs.
18. Such important recent developments of the gas industry as have been fully described in the Technical Press.

[Here follows the list of works of reference.]

GAS SUPPLY.

The examination will include questions founded on such subjects as the following—

Ordinary Grade.
2. Gas-Meters. Principles and construction of gas-meters, including slot and stop mechanism. Repairing, testing, and setting of meters.
3. Plumbing. Properties and composition of various alloys, such as brass, gas-tube, &c., used for valves, cocks, gas-fittings, &c. Fitters, their composition, preparation, and uses. Methods of cleaning.
10. Tools and Appliances. A full knowledge must be obtained of all the tools and appliances necessary for repair and extensions from the work's governors to the point of combustion.

Honours Grade.
In the Honours examinations more difficult questions will be set in the subjects named in the syllabus of the Ordinary Grade, and, in addition, a knowledge will be required of—
2. Interior Fittings. Specifications. Principles and construction of various types of burners and plant for intensified lighting. Lighting of churches, factories, and other large buildings. Theory and practice of ventilation by gas. Lighting for special purposes, such as billiard tables, &c. Switch lighting.
7. Gas in competition for light, heat, and power, and the chief legal obligations affecting gas supply.
8. Such important recent developments in any of the foregoing subjects as have been fully described in the Technical Press.

The examination in both grades will be held on Saturday, May 12, 2.30—6.30 p.m. The fee for the examination in either grade is one shilling and sixpence.

[Here follows the list of works of reference.]

Source: JGL June 4, 1907, p.650
### Appendix 3: Subscribers to The Gas Institute’s fund for the Crystal Palace Exhibition

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Source: Compiled from *JGL* issues between 22 August and 12 December 1882

It appears that one or more subscribers may be omitted from the names published in the *JGL* since the total amount reported as having been raised is slightly more than the sum of the donations.

In 1882 The Gas Institute had 650 Ordinary Members (see Table 1, p.40), and the list of 146 subscribers to the Institute’s fund for the Crystal Palace Exhibition gives an indication of their geographic spread. The largest London gas companies, the South Metropolitan and the Chartered each contributed £500, principal regional companies such as the Edinburgh and Dublin gas companies contributed £100, and small private companies such as the Arundel and Broadstairs gas companies contributed 2 guineas. Municipal authorities also contributed varying amounts ranging from £150 given by the Corporation of Nottingham Gas Department, to £5 given by the Staffordshire Corporation Gas Committee.

The funds were used to pay for installation and gas consumption of lighting in the South Nave, using lamps borrowed from traders. The *JGL* reported that the lighting was planned for brilliancy of effect rather than economy. The funds also paid for the extended process of judging for awards (see p.34). Exhibitors paid all the costs of their stands.

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159 *JGL* November 21, 1882, p.905
Appendix 4

Progressive name changes for the gas industry professional body

1863-1881  The British Association of Gas Managers

(this was the first national body to represent the gas industry, although the Scottish Association of Gas Managers was established in 1862)

1881-1890  The Gas Institute

1890-1902  The Incorporated Gas Institute

1890-1902  The Incorporated Institution of Gas Engineers

(both the Institute and Institution applied to the Board of Trade for Incorporation in order to limit the liability of their members to the amount of 1 year’s subscription, and to enable them as corporate bodies to sue and be sued.)

1903-1928  The Incorporated Institution of Gas Engineers

( the new united organisation, somewhat confusingly, kept the same name as the previous Institution)

1929-1963  The Chartered Institution of Gas Engineers

2001  The Institution of Gas Engineers and Managers
Appendix 5

Exhibit listings and advertisements from the Official Catalogue of the International Electric and Gas Exhibition, 1882-83

Front cover of George Bray’s copy of the Official Catalogue of the International Electric and Gas Exhibition, 1882-83, Source: WYAS, WYL1207/12

The catalogue includes a plan identifying the location of each exhibitor’s stand, and also a plan showing which companies provided the lighting for different parts of the exhibition space. The plans are reproduced on pages 31 and 32.
Catalogue entry for George Bray & Co., Gas Lighting Engineers listing his gas burner exhibits

Source: WYAS, WYL1207/12

The catalogue shows the comprehensive range of burners that George Bray took to the exhibition. There are different types of burners, including Flat Flame Burners, Bray’s ‘Special’ Slit Union Burners, Bray’s ‘Market’ Burners and Bray’s ‘Adjustable’ Burners. The burners are shown with and without screws, for holders; of both the ‘Regulator’ and ‘Non-Regulator’ variety; in a range of sizes from 2 to 9 and some large burners in sizes 19 and 20 only. By contrast, F. Brown listed below Bray, simply states that he is exhibiting ‘Various forms of Air and Gas Ring and Block Burners’.
Catalogue entry for George Bray & Co., Gas Lighting Engineers, listing Accessory exhibits

The list shows that Bray was exhibiting his Flat Flame Shadowless Lantern (illustrated on p.14) in white and coloured glass, for lighting streets, public buildings, railway stations, docks etc as well as globes and chandeliers. The *JGL* reported ‘several striking specimens of street and other lanterns’ among Bray’s exhibits including ‘a pillar with three globular lanterns fitted with 80-candle lights’: *JGL* Feb 6, 1883, p.222

Source: WYAS, WYL 1207/12
The advertisement on the left claims that ‘About THREE-FOURTHS of the Burners used for Lighting Purposes in the United Kingdom are of Bray’s manufacture’ and that ‘A collection of nearly 200 different kinds and sizes of BRAY’S PATENT FLAT FLAME “ENAMEL” BURNERS may be seen at our stand in this exhibition’.
The listing refers to William Sugg’s showrooms in Westminster and Charing Cross London, and also in Paris. His burner exhibits include Table-top Burners, Argand Lanterns for streets, promenades, bridges, railway stations etc, and Christiania burners with shades ‘hand-painted in great variety, for every form of interior lighting’ and a selection of Chandeliers (see Christiania advertisement p.18). The JGL reported that all Sugg’s lanterns ‘are beautiful in design, most of them being on Indian models, and surpassing in grace…anything of the kind previously seen’ (JGL, Dec 19, 1882, p.1078)
Advertisements for William Sugg & Co., Limited in the Exhibition Catalogue

Only Gold Medal for Gas Burners.
PARIS EXHIBITION, 1878.

WILLIAM SUGG’S PATENT
“London” Argand Burners.
Fitted with a great variety of Shades and Screens, and with Self-Acting Governor, which prevent waste and fuming. The Crystal Chimneys are double-annulated and of best quality.
“The best Burner ever constructed.”—Gas Engineer Referee.

WILLIAM SUGG’S PATENT
“Christiania” Flat-flame Burner.
Fitted with Self-Acting Governor, which maintains constant rate of consumption under varying pressures.

The left hand advertisement proclaims that Sugg received the only gold medal award for gas burners at the “PARIS EXHIBITION, 1878.”

The right hand advertisement states that Sugg was awarded two silver medals at Melbourne in 1881, and also awarded silver medals at Eastbourne and Stockport. The illustration on p.27 shows how Sugg used these awards as a form of advertising on his company headed notepaper.

Source: WYAS, WYL1207/12

The advertisements give prominence to the awards that William Sugg has won. The left hand advertisement proclaims that Sugg received the only gold medal award for gas burners at the ’PARIS EXHIBITION, 1878’. The right hand advertisement states that Sugg was awarded two silver medals at Melbourne in 1881, and also awarded silver medals at Eastbourne and Stockport. The illustration on p.27 shows how Sugg used these awards as a form of advertising on his company headed notepaper.
Appendix 6

Development from Mechanics Institute to University of Leeds

It may be questioned why the Institution of Gas Engineers, which was a London-based organisation, chose the University of Leeds rather than one of the London Colleges to endow a professorship in the name of George Livesey, who had lived all his life in London. This Appendix gives a brief summary of how the University of Leeds became a centre for gas industry research from its beginnings as a Mechanics Institute, and how George Bray came to be involved.

Leeds Mechanics Institute, 1868 (now a Museum)

Source: J. F. C. Harrison, Learning and Living 1790-1960, Figure10

Mechanics Institutes were initially established to give working class men with little or no formal education, an understanding of the theory of science and technology. (It was considered that practical aspects of trade were best learned in workshops.) The
first Mechanics Institute was established in Edinburgh in 1821, followed by Glasgow and London in 1823, after which the movement spread with astonishing speed. In less than 3 years, every large town and many small ones had its Institute. The Leeds Institute was founded in 1824 to provide opportunities for the study of various branches of science which were of practical application to the trades and occupations of artisans in the town, primarily in mechanical or chemical operations. Larger Institutes such as Leeds displayed models of machines and had chemistry laboratories, and this was where George Bray first saw a demonstration of gas lighting. The classes and lectures, which were given in the evenings, included the higher branches of mathematics, mechanical drawing, and the principles of mechanics and chemistry.

By the 1830s, classes were being attended by middle rather than working class people, and the scope of lectures was broadened to include a variety of popular literary, historical and statistical subjects. Cardwell argues that one of the reasons for this change was that Institutes were unable to provide any sort of diploma that could be recognised in consideration of promotion by employers, and being self-supportive had to cater for public tastes. In Yorkshire the Mechanics Institutes formed a Union to pool resources for books and lectures, including courses in mechanics, chemistry, economics and statistics. It was hoped to achieve general recognition from employers by awarding a diploma of merit.

By mid-century, the Yorkshire Union was the largest educational organisation in the country, embracing over 100 Institutes with a membership of nearly 20,000 individuals. It was the first large-scale attempt to systematically teach the ‘pure’ and

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163 Ibid., pp.73-4
applied sciences and an impressive new Mechanics Institute building was opened in Leeds in 1868.

From a national perspective, Britain’s showing at the Paris Exhibition of 1867 was widely agreed to have been poor, prompting concern about technical education, and in 1874 the Yorkshire College of Science was founded to provide a level of technical education comparable with that in France. Ten years later, the Yorkshire College combined with Owens College, Manchester and University College, Liverpool to become part of a federal north of England university, but Leeds was granted its own Royal Charter to form a University in 1904. George Bray had been a financial supporter and Life Governor of the Yorkshire College and he donated to the Foundation Fund for the University, serving as a member of its Court. One of the departments established by the new University of Leeds was Applied Chemistry (Fuel and Metallurgy), headed by William A. Bone, F.R.S., which had a particular focus on the manufacture and use of coal gas.

This development in Leeds was noted with interest by the Institution of Gas Engineers, which was at that time establishing a Special Purposes Fund to enable research investigations to be carried out ‘on some subject connected with the chemistry of gases, and combustion.’ The Institution decided to use their Fund to provide a Fellowship for research in Gaseous Fuel under Professor W. A. Bone at the University of Leeds. After the death of George Livesey in 1908, the Institution invited contributions to a Memorial Fund for him, and in 1910 when this fund reached £10,500, it was used to endow the Livesey Professorship of Coal Gas and Fuel Industries at the University of Leeds.

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164 Sanderson, *Education, Economic Change and Society in England, 1780-1870*, p.35
165 University of Leeds – Heritage [http://www.leeds.ac.uk/info/20014/about/21/heritage, accessed 31 May 2010]
166 Braunholtz, *The Institution of Gas Engineers*, p.79
167 Ibid., p.197
Leeds. To administer the Professorship, the Council of the University established an Advisory Committee, which was to comprise no more than 25 members including the Pro-Chancellor, the Vice-Chancellor, not less than 10 nominees from the Institution of Gas Engineers, 4 nominees by the Society of British Gas Interests, and the remaining nominees by the University. In recognition of the work already done by Professor Bone, he was appointed the first Livesey Professor. John William Bray, George’s son was a University nominee to serve on the Advisory Committee, George himself having died 5 years earlier.

The Livesey Professorship continued into the 20th century (see page 55), but there has been no response to inquiries as to whether it still exists today.

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168 Braunholtz, The Institution of Gas Engineers, p.84
169 Copy of Deed Poll founding and endowing the Livesey Professor of Coal Gas and Fuel Industries in the University of Leeds, dated 1 Nov 1910 (Mary Mills archive)
Bibliography

Research for this dissertation focused on 4 main topics: the history of the gas lighting industry; archival material relating to George Bray and William Sugg; the development of the gas industry professional body; and general contextual material.

The West Yorkshire Archive Service holds an extensive, well-catalogued archive for George Bray, which formed the cornerstone for this study. The William Sugg & Co website provided a useful history of William Sugg, which was supplemented with material from the family archives of Chris Sugg and Maureen Dillon’s Ph.D. thesis on Domestic Lighting in Britain.

The starting point for information about the gas industry professional body was The Institution of Gas Engineers by Braunholtz; much additional material was sourced directly from the Transactions of both The Gas Institute and The Institution of Gas Engineers, and also from extensive reading of the Journal of Gas Lighting, which reported very fully on proceedings of both bodies, including their Presidential addresses and technical papers. Some editions of The Gas World were accessed from the British Library collection at Colindale but their photocopying charges are prohibitive, and the Science Museum’s collection, held at Wroughton, is almost entirely 20th century.\textsuperscript{170}

The main primary source for gas supply undertakings was Newbigging’s Handbook which provided many useful insights into the industry; the range of secondary sources accessed included The Engineers by Buchanan, Lighting the Town by Wilson, Burning to Serve by Goodall, and The History of the Gas Light and Coke Company by Everard.

\textsuperscript{170} The JGL had close links with The Gas Institute, which it supported throughout the Bray dispute: JGL’s founder and first Editor, Thomas Barlow, was also the Institute’s first Vice-President in 1864. In the 1880’s the JGL was edited by Walter King, a friend of Magnus Ohren and William Sugg, who were all members of the same Masonic Lodge. It has not been possible to verify the claim of both Currer-Briggs and Pawson that George Bray financed The Gas & Water Review (which later changed its name to The Gas World, printed by J. Allan & Sons, London) as a new weekly trade journal to support his case. Efforts were made to access GW to obtain a different viewpoint from that of JGL.
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Copy of Deed Poll founding and endowing the Livesey Professorship of Coal Gas & Fuel industries in the University of Leeds, Ref. 476


Letter from Alan Williams, Leeds University, to Mary Mills confirming that the Livesey Professorship still exists, 7 January, 1980, Ref. 751

**Family archives of Chris Sugg** (Great Grandson of William Thomas Sugg)

*One Hundred Years of the House of Sugg, Westminster* (centenary booklet)

Photograph of a William Sugg & Co display stand at a gas exhibition (unknown location)
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