

9.08 Gas

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We are here not much concerned with the large scale commercial production of gas, but with the history of gas generation in individual, domestic and even portable plants, which was a widespread phenomenon in the nineteenth century, and also, to a limited extent, with gas appliances.

a. pioneers

The first users of gas were commercial, motivated by the novelty and advertising value of display lighting. J T Wilson, of Upper Pitt Street, Sydney, lit his shop, house and entrance with gas in 1826, and two years later gaslight was installed by a Sydney chemist, McNaughton, and a shopkeeper, Thomas Wood.¹ This was by no means early, for the pioneering phase of the gas industry was past, and between 1815 and 1823 numerous public gas companies had been established in Britain.² In 1835 the engineers Bourne & White built a gas plant to light Wilson's Wharf on Cockle Bay [Darling Harbour].³ In the country one of earliest uses must have been at the homestead 'Fernhill', Mulgoa, which was lit by gas in 1842.⁴ We do not know what sort of gas plant was used there, but in Van Diemens Land, Robert Russell of the Hobart Town Foundery and Smithery, advertised 'Gas apparatus, for making and burning Gas, made from coal, and oil, from drawings by an eminent engineer.'⁵ It is unclear whether Russell really manufactured the apparatus, as is implied, or simply imported it, but the engineering involved is straightforward, and local manufacture cannot be ruled out.

The first large commercial producer was the Australian Gas-Light Company of Sydney, formed in 1836 and incorporated in the following year.⁶ Its apparatus was imported through the agency of the London consulting engineers Bryan & Howden,

¹ Rosemary Broomham, *First Light* (Sydney 1987), pp 3-14.

² Samuel Hughes, *A Treatise on Gas-Works, &c* (London 1853), p 17.

³ J D Keating, *The Lumbent Flame* (Melbourne 1974), pp 3-14.

⁴ G N Griffiths, *Some Houses and People of New South Wales* (Sydney 1949), p 59.

⁵ 'Hobart Town Foundery and Smithery', advertising flier, Allport Library, Hobart, reproduced in Brian Turner, *Australia's Iron Lace* (Sydney 1985) p 37.

⁶ Broomham, *First Light*, p 10.

and James Bryan accompanied the consignment out to Sydney to supervise the installation.⁷ When the system was finally opened on 26 May 1841 forty-nine subscribers were connected already,⁸ and the number grew fairly steadily from that point on. In 1849, the Melbourne confectioner George Overton succeeded in making gas on a scale sufficient to light his whole premises in Swanston Street, as well as a fine lamp in front of the door. His retort and gas holder had been constructed by the Fitzroy blacksmith George South,⁹ and Overton, South and others now became prominent in the group which finally established the Melbourne Gas and Coke Company.¹⁰ This company's supply was inaugurated on New Year's Day 1856, and others followed in Hobart in March 1857, Adelaide in 1863, Launceston in 1860,¹¹ and Brisbane in 1865, when the house of the engineer, Robert Fleming, was the first to be lit.¹² By that time works were also operating in the Melbourne suburb of Collingwood, in a number of Victorian country towns, and in Launceston. Perth had gas laid on only in 1884, which was long after many country towns in the eastern colonies.

Until those dates the story elsewhere was much as in Sydney - that of individual shopkeepers installing plants as much for publicity as for functional reasons. In about 1845 William Paterson, a watchmaker in Collins Street, Melbourne, put up a small gasometer at the back of his shop, and with some difficulty managed to get into operation a revolving light consisting of five gas burners. He displayed this in his shop window for about three weeks, but gas was leaking into the shop, and as he was about to retire from business he discontinued the light rather than repairing the system.¹³ In the same year George South is said to have put on the market airtight containers filled with gas, but to have met with little success. There appears to be no foundation, however, for the persistent story that South was marketing gas for domestic use in individual metal containers as early as 1844 or 1846,¹⁴ though it may well derive in part from some contemporary reference to a portable gas manufacturing apparatus. It is true, however, that portable gas containers were in existence: in the 1790s William Murdoch had transported gas in both bladders and tinned iron containers,¹⁵ and in 1819 a British patent was taken out by David Gordon for a copper vessel of one cubic foot [0.028 m³] volume, into which thirty cubic feet [8.5 m³] of gas were compressed. This led to the foundation of the London Portable Gas Company (which ultimately failed).¹⁶

⁷ Broomham, *First Light*, pp 20-21.

⁸ Broomham, *First Light*, p 10, contrary to Michael Cannon, *Life in the Cities* (West Melbourne 1975), pp 100-101, who says there were nearly two hundred subscribers.

⁹ *Metropolitan Gas Company Jubilee*, unpaginated.

¹⁰ *Argus*, 31 July 1849, p 2. For some account of the foundation of the company, see Miles Lewis, 'Tradition and Innovation in Victorian Building' (3 vols, PhD, University of Melbourne 1972), II, pp 462-4.

¹¹ Keating, *The Lambent Flame*, pp 57, 59, 62.

¹² Donald Watson & Judith McKay, *Queensland Architects of the 19th Century* (Brisbane 1994), p 68.

¹³ *Argus*, 2 August 1849, p 4.

¹⁴ *Collingwood Centenary 1855-1955* (Melbourne 1955), p 36; Robin Boyd, *Australia's Home* (Melbourne 1952), p 233; P C H Hunt, 'History of Gas Supply in Victoria', *Proceedings of the Victoria Centenary Gas Congress* (Melbourne 1934), p 4.

¹⁵ Hughes, *Treatise on Gas-Works*, p 10.

¹⁶ Hughes, *Treatise on Gas-Works*, p 19; Keating, *The Lambent Flame*, p 31.

b. portable gas plants

It is impossible to determine what sort of apparatus was used by Paterson and others, but there was now a range of choice. The ever careful Samuel Vaughan, who emigrated in 1853, noted in his journal that a domestic gas apparatus could be obtained from Messrs Cordon and Smith of Nottingham, inventors and patentees.¹⁷ In 1854 the *Hobart Town Courier* reported that a Mr Moore of the New Market, Hobart, had lit his premises with gas, using apparatus of a type invented by 'an ingenious English mechanic'. This used kitchen grease and fat to produce a gas which burnt with a brilliant white flame, and was very small, with a gasometer of fifty cubic feet (1.4 m³) which could supply one burner for twenty-four hours.¹⁸ In about 1853 a fully portable apparatus for making gas from resins and other hydrocarbons was patented by Stratton & Brother of Philadelphia.¹⁹

Though there is no evidence that the Philadelphia apparatus reached Australia, one that did was the 'portable olefiant gas manufacturing apparatus' of the Maryland Gas Company, Baltimore. A Victorian patent on the manufacture of gas from fats and oils was taken out in the name of J T Sanders, but the agent for the company appears to have been J R Ricards senior, of Fisher, Ricards & Co, Melbourne, who in 1858 set up a demonstration apparatus at the top of Lonsdale Street, operating on resin oil.²⁰ Another apparatus of the same sort was in use at Bendigo, possibly at the Shamrock Hotel, which had been lit by gas as early as 1855.²¹ Ricards used with the apparatus a special burner cap which he had patented (probably that invented by von Bunsen in 1855), which increased 'the photic power of the gas fully one hundred per cent' or reduced consumption by one half. 'The result', it was said 'is obvious and unmistakable. The cause is unknown.'²²

In 1862 the English firm of J T B Porter & Co, of Lincoln, was advertising in the *Australian Builders' Price-Book* their²³

UNIVERSAL COAL GAS APPARATUS, requiring no brickwork, and is sent away from the Works complete, with Iron Tank for Gasholder. Packed and delivered, with instructions, free on board at London, Hull, or Liverpool, £52.

While there was still a degree of novelty in the idea of a gas plant designed to serve a single mansion or other small-scale user, but it does not appear that there was otherwise anything very distinctive about Porter's 'Portable Gas-Work' except that the retorts could be filled and discharged more easily than the norm. Another portable

¹⁷ Journal of Samuel Vaughan, La Trobe Collection, State Library of Victoria.

¹⁸ *Hobart Town Courier*, quoted *Argus*, 22 May 1854, p 5; 12 June 1854, p 5.

¹⁹ John Timbs [ed], *The Year Book of Facts in Science and Art* (London 1854), pp 98-9.

²⁰ Charles Mayes, 'Essay on the Manufactures more immediately required for the Economical Development of the Resources of the Colony', in *Victorian Government Prize Essays 1860* (Melbourne 1861), pp 305-6; *Australian Builder*, 5 March 1859, p 65, & 12 March 1859, p 75, quoting the *Age*.

²¹ George Mackay, *Annals of Bendigo 1851-1867* (Bendigo [Victoria], no date), p 32.

²² *Australian Builder*, 29 January 1859, p 32; 12 March 1859, p 75, quoting the *Age*.

²³ C B Mayes, *The Australian Builders' Price-Book* (Melbourne 1862), p xi.

gas apparatus was marketed by Carbines & Hammond of Southwark.²⁴ A 'gas apparatus' - presumably a generating plant - was reported in a house in Fitzroy, Melbourne, in 1864, and in 1866 J G Knight was able to show at the Intercolonial Exhibition a portable gasworks for country districts and private dwellings, which, though it was imported, was of his own invention.²⁵ In 1879 the 'Alpha' gas making machines of H L Muller, London and Birmingham, were displayed at Sydney,²⁶ but how they fared in the Australian market is not known. In South Australia J A Holden advertised in 1882 as (*inter alia*) a specialist in gas making machines.²⁷

c. alternative fuels

The British patent taken out by John Taylor in 1815 envisaged the manufacture of gas from materials other than coal, including oils, fats, bitumen and resins. Liverpool, Bristol, Hull and other cities attempted to adopt oil gas, but in each case were forced to abandon it in favour of coal.²⁸ In 1819 Professor Daniell attempted to make gas from resin, but it too proved to be uncompetitive.²⁹ R S Nichols, passing through Hawaii en route for Australia in about 1852, learned that a British patent had recently been taken out for the manufacture of gas from the oil of banana plants.³⁰ In 1855 the immigrant civil engineer Godfrey William Praagst reached Victoria, and was almost immediately taken with possibility of making gas from gum leaves. He was so successful that in 1856 the *Kyneton Herald* was able to report that the Karlsruhe Hotel had been lit by gas which 'being made from gum leaves contains no sulphurous properties, and is in consequence perfectly free from the deleterious effects so generally complained of in the case of coal gas'.³¹ The apparatus had cost £250, and provided enough gas for fifty burners from one cartload of gum leaves per week.³²

Praagst may not have been able to afford a patent, but the new *Victorian Patent Act* was passed in 1857, and he obtained one towards the end of the year.³³ The preamble suggests that it was concerned as much with the manufacture of eucalyptus oil as it was with gas, and this was not a new idea. The South Australian Register commented that a sample of eucalyptus oil had been prepared in Melbourne some time previously and, moreover, at about the same time that Praagst made his gas the Hobart Town Gas Company had combined gum leaves with coal to produce gas more economically.³⁴

²⁴ E S Eyland, Francis Lightbody & R S Burn, *Working Drawings & Designs Architecture and Building* (Edinburgh, no date [[c 1863]], 'Warming, Ventilation, and Artificial Lighting', p 23; R S Burn, *Modern Building and Architecture* (London, no date [c 1870]), pp 99-100.

²⁵ Intercolonial Exhibition, Melbourne, 1866-7, *Official Record*, p 46.

²⁶ Sydney International Exhibition 1879, *Official Catalogue of the British Section* (London 1879), p 235.

²⁷ D A Cumming & G C Moxham, *They Built South Australia: Engineers, Technicians, Manufacturers, Contractors and their Work* (Adelaide 1986), p 101.

²⁸ Hughes, *Treatise on Gas-Works*, pp 17-18.

²⁹ Hughes, *Treatise on Gas-Works*, pp 18-19.

³⁰ R S Nichols, 'Travels (1840-1852)' (typescript copy of the original ms of c 1852, SLV), p 66.

³¹ *Kyneton Herald*, quoted *Argus*, 20 December 1856.

³² *Argus*, 28 May 1858.

³³ C B Mayes, 'Essay on the Manufactures more immediately required for the Economical Development of the Resources of the Colony', in *Victorian Government Prize Essays 1860* (Melbourne 1861), p 307.

³⁴ Mayes, 'Essay on Manufactures', p 308.

Now a Kyneton Gas Company was formed, and the town was eucalyptically lit in 1858,³⁵ but it was later revealed that Praagst had surreptitiously been adding cannel coal to the gum leaves and finally, as the leaves became more difficult to obtain, had turned to coal entirely.³⁶ Nevertheless, at the 1861 Exhibition he showed - perhaps not the most rivetting of the attractions on display - 'The Residue from Wood, Leaves &c. obtained in manufacture of Vegetable Gas'.³⁷

In Adelaide an anonymous newspaper correspondent in 1869 (possibly Edmund Wright) suggested generating gas from petroleum waste or 'gasoline', as the municipal councils had found gas lighting beyond their means. By 1875 McLean Brothers Bros & Rigg of Melbourne were making a gas apparatus used petroleum spirit,³⁸ and this plant, or something like it, must have been used at 'Purrumbete' in Victoria, where in 1884 cases of 'gasoline' were being ordered for the gas lighting plant, 'which has been giving plenty of trouble'.³⁹

By 1875 there was a substantial range of gas-making plants available, a number of which used shale oil [kerosene]. One produced by L C Andresen of Melbourne used New South Wales shale oil and was said to produce a brilliant white light.⁴⁰ The fuel used for Edward O'Keefe's 'patent gas machine' was not specified,⁴¹ but was in fact also kerosene. In 1888-9, similarly, T Quinnins of the Patent Gas Co showed apparatus for making pure gas from kerosene at the Centennial Exhibition.⁴² O'Keefe had bought up an English patent for an apparatus suitable for public buildings, but it was used at the mansion 'Rupertswood', Sunbury, Victoria, of 1874-6, apparently for the first time for a private house.⁴³ Here a gasometer was installed below ground level, and kerosene was converted to gas at a cost of about twelve shillings a thousand feet [290 m³]. Pipes connected the gasometer to another pit containing a large fan, which drove the gas into pipes to supply the house. The whole apparatus was encased in brick and cement, and was reached from ground level by means of hatches 'like the hatches on the deck of a ship'.⁴⁴ The gas plant at 'Dhurringile', Victoria, must have followed soon after. Nothing is known of it in detail, but the house was built in 1878, and in a painting by William Tibbits, apparently at the time of construction, a small gas holder is shown to one side, with a building which is probably a retort house, and a smoking chimney.⁴⁵

³⁵ *Argus*, 19 April 1858, quoting the *Kyneton Observer*; 20 May 1858, quoting the *Kyneton Chronicle*; and 28 May 1858.

³⁶ Mayes, 'Essay on Manufactures', p 307.

³⁷ Victorian Exhibition 1861, *Catalogue with Prefatory Essays* (Melbourne 1861), p 197.

³⁸ Victorian Exhibition 1875, *Official Catalogue*, p 146.

³⁹ W G Manifold, *The Wished-For-Land* (Camperdown [Victoria] 1986), p 210.

⁴⁰ Victorian Intercolonial Exhibition, Melbourne, 1875, *Official Catalogue of Exhibits* (Melbourne 1875), p 145.

⁴¹ Victorian Exhibition 1875, *Official Catalogue*, p 147.

⁴² Centennial International Exhibition, Melbourne, 1888-1889, *Official Record* (Melbourne 1891), p 630.

⁴³ Michael Clarke, *Clarke of Rupertswood 1831-1897* (Melbourne 1995), p 96, also p 113. The *Weekly Times* of 4 March 1876, p 2, which is cited by Clarke, mentions the gas but does not name O'Keefe.

⁴⁴ *Kyneton Guardian*, 30 August 1876, quoted in John Foster, *Victorian Picturesque* (Melbourne 1989), p 45.

⁴⁵ Deutscher-Menzies, *Australian and International Fine Art Auction* (Melbourne 2002), p 231.

In 1883 and 1886 Marshall's portable gas works, suitable for country mansions, hotels &c, was listed in Mayes's price book, and it was fuelled with tallow, as in Moore's earlier apparatus. Seven lbs of tallow would make 100 cubic feet of gas [that is, 1 kg of tallow produced 0.9 m³ of gas], and gasholders were available in sizes from 60 to 1500 cubic feet [1.7 to 42.5 m³].⁴⁶ Alternatives to coal were also considered for the public gasworks, and around 1850 a company was bruted in Sydney which would compete with Australian Gas Light, using resin, oil, tallow or tar as fuel. It was claimed that the product would burn brighter than coal gas, cost less, and be free of the suffocating smell caused by coal gas in unventilated rooms. The company did not, in the end, take off.⁴⁷

Water gas was a fuel produced by forcing steam over incandescent carbon and, when carburetted, could be used as an illuminant. A local patent application was made in 1889 for 'improved apparatus for producing carburetted water gas', in the names of James Peter Franki of Sydney, with Brady S Richardson, R W P Richardson, and Richard T Wilson, all of Scottsdale, Pennsylvania.⁴⁸ The gas was to achieve no prominence in Australia, and the patent was probably the extension of an American one.

Australia did not have the natural gas industry of the United States, where by 1887 it was already planned to pipe gas from the Pennsylvania area to Chicago and neighbouring cities.⁴⁹ However, in 1888 Joseph Loghlan discovered natural gas at Narrabeen. Up to this time it was only in America that natural gas had been used to any effect, and as local chemists assessed the local gas as being identical to the American, great hopes were held for its future.⁵⁰ These were not to eventuate, and natural gas did not become significant in Australia until the latter part of the twentieth century.

d. gaslight

It is impossible here to give a comprehensive account of the introduction of gas appliances across Australia. The oldest surviving gas light fittings are those installed in the Great Hall of Sydney University in 1859, each light of which comprises a cluster of five single fishtail jets.⁵¹ Early consumers could obtain gas light fittings in 'plain, mediaeval, gothic or fancy' style,⁵² and by 1861 John Danks and Co of Melbourne were manufacturing gas fittings locally.⁵³ By 1866 Samuel Sitch, of the Melbourne suburb of Richmond, was manufacturing gaslight reflectors of his own invention, which he showed at the Victorian Exhibition.⁵⁴ Andrew Dempster of

⁴⁶ Charles Mayes, *The Australian Builders' Price-Book* (4th ed, Melbourne 1883), p 107; Charles Mayes, *The Australian Builders' Price-Book* (5th ed, Melbourne 1886), p 122.

⁴⁷ Broomham, *First Light*, pp 39-40.

⁴⁸ *Australasian Builder & Contractor's News*, 1 March 1889, p 263.

⁴⁹ *Australasian Builder & Contractor's News*, 10 September 1887, p 295, quoting the *Universal Register*.

⁵⁰ *Australasian Builder & Contractor's News*, 1 December 1888, p 499.

⁵¹ Keating, *The Lambent Flame*, p 76.

⁵² C B Mayes, *The Victorian Contractors' and Builders' Price-Book* (Melbourne 1859), p F.

⁵³ Victorian Exhibition 1861, *Catalogue*, p 212.

⁵⁴ Intercolonial Exhibition, Melbourne, 1866-7, *Official Record* (Melbourne 1867), p 31.

Russell Street, Melbourne, displayed a four light patent long reflector suitable for shop windows, and an eight light patent octagon reflector suitable for public buildings. The latter had been used to light the Great Hall of the exhibition.⁵⁵

The technical details of gas lighting are almost entirely of overseas derivation and warrant only limited attention here. The fishtail burner (successor of the rat-tail and the bats-wing, all named for the shape of the flame), was standard by the time gas was introduced in Australia, and remained so until the advent of the incandescent burner.⁵⁶ The bunsen principle, of mixing the gas with air before burning, was only gradually adopted for gas lighting, though it was universally applied in gas stoves.⁵⁷ It then appears to have been during the later 1860s that it was realised that allowing too much air to mix with the gas reduced the heat and the luminosity, as a result of which various design improvements were made to control the mixture. The other factor in controlling burning was the glass protective chimney, tulip-shaped in the case of an Argand burner, and spherical for a bat-wing or fishtail one.⁵⁸

The problem of gas lights was that the combustion products would stain the ceiling, and that the water vapour produced would condense on it, and cause dust to stick there. On the other hand, if proper ventilation was provided, not only could the steam and gases be removed, but the ventilation of the room would be improved as stale air was sucked out with them. Dr David Boswell Reid, the great ventilating pioneer, was concerned about the 'soporific character' of gaslit rooms, but his solution rather missed the point. He devised a gas light fitting which projected a considerable way down from the ceiling, meaning that it did nothing to disturb the layer of warm spent air in the upper part of the room. There was a tube immediately above the burner to remove the combustion products. Outside this a second annular tube contained air to cool it, and this air itself rose as it became heated. Outside this tube again was another tube creating a further thin annulus in which air was brought down to the base of the second tube. This meant that the cooling air was drawn down from the ceiling space, and eventually sent back to it, and that it did nothing for the ventilation of the room.⁵⁹ This is surprising, as Reid elsewhere enunciated clearly the principle of using a heated lamp to improve the removal of air,⁶⁰ but it arises from his principle of 'exclusive lighting', in which the light has no interaction with the atmosphere of the room. He was however prepared to categorise as 'practically exclusive' a system in which the light was supplied with air from within the room.⁶¹ Reid's fitting, which he installed in the House of Commons, Westminster, flared out at the top and he thought of it as 'Gothic'.⁶²

In a sophisticated lighting installation the volume of gas flow, and hence the intensity of the light, could be adjusted by means of regulators set in the wall, and examples of this survive at the old E S & A Bank headquarters in Collins Street, Melbourne.

⁵⁵ Intercolonial Exhibition, *Official Record*, p 23.

⁵⁶ Keating, *The Luminous Flame*, pp 31-2.

⁵⁷ John Black, *Gas Fitting* (London 1886), p 44.

⁵⁸ Broomham, *First Light*, p 501.

⁵⁹ D B Reid, *Illustrations of the Theory and Practice of Ventilation, with Remarks on Warming, Exclusive Lighting, and the Communication of Sound* (London 1844), pp 30-31.

⁶⁰ Reid, *Theory and Practice of Ventilation*, p 130.

⁶¹ Reid, *Theory and Practice of Ventilation*, p 257.

⁶² Reid, *Theory and Practice of Ventilation*, pp 302-3.

The problem of lighting the gas in a centrally suspended fitting was overcome in two ways. One was the introduction of the telescope or 'water-slide' gasolier, which could be raised and lowered while the lights were burning. The gas was supplied through a pipe of telescopic sections with joints protected by a water seal, similar in principle to that of a gasholder.⁶³ It seems to have been in use in England by the 1840s,⁶⁴ and by the 1880s was seen as old fashioned, and liable to give problems when the inner telescopic tube became leaky and defective.⁶⁵

In the 1860s Ricketts & Hammond of London sold a 'ventilating globe light' which avoided the staining problem by enclosing the light in a globe, from which a tube rose right up into the ceiling. So far this is an example of Dr Reid's exclusive system, but at the same time a ceiling vent surrounded the top of the heated tube, and air from the room was drawn up through it.⁶⁶ By 1879 it was manufactured by Richardson Stall & Co.⁶⁷ There is no evidence of these lights in Australia, but the same principle was soon used in the very widely adopted 'sun burner'.

The 'sun burner' or 'sun light', or occasionally 'star light';⁶⁸ was a means of providing strong light in large public rooms. It consisted between twenty and a hundred burners beneath a reflector of between 600 and 1200 mm diameter. At the centre was a vertical tube to carry off the combustion products, and an outer tube which (by virtue of its heat) acted as an extract ventilator for the room. The idea of the double annulus formed part of a patent by James Braithwaite in 1847, but here the outer tube was not intended to suck stale air from the room but to heat fresh air for the room above. He provided above each burner 'a bell-mouthed pipe, into which the products of combustion enter and pass away ... around this pipe is fitted a larger pipe by which fresh air enters, and being heated by contact with it escapes into the room above.'⁶⁹ However Horatio Carter's patent of 1850 was directed at removing air from the room. The burner had a chimney leading from a pipe by means of which combustion products and hot air from the room were carried off, and 'This pipe may be surrounded by a second and larger pipe in such a manner that an annular space will be left between them, through which the air of the room will pass, being heated by the latter pipe.'⁷⁰

The very high temperatures in these fittings were at first the cause of numerous accidents. British improvements included Strode & Sons' 'mercurial regulator' to prevent downdraughts when the fitting was not in use; mica flaps in the tube, by T C Sorby; a self-acting valve and wind guard, by Billing & Co; and a device which stabilized the air temperature at about 47°.⁷¹

⁶³ Keating, *The Lumbent Flame*, p 93.

⁶⁴ Correspondence of 1847 referring to 'patent sliding gas lamp' is quoted in Charles Wood, *101 Rare Books: Catalogue 118* (Cambridge [Massachusetts] 2004), p 13.

⁶⁵ Black, *Gas Fitting*, p 41.

⁶⁶ F W Laxton, *Laxton's Builder's Price Book for 1863* (London 1863), advertisements, no page.

⁶⁷ William Eassie, *Healthy Houses* (New York [London] 1879), pp 179-180. CHECK THIS REF (a) for the name of the company, and (b) that it is in fact referring to the globe light.

⁶⁸ Black, *Gas Fitting*, p 73.

⁶⁹ Great Britain, patent no 11,546 to James Braithwaite, 28 January 1847.

⁷⁰ Great Britain, patent no 13,015 to Horatio Carter, 13 March 1850.

⁷¹ Wyatt Papworth [ed], *The Dictionary of Architecture* (London 1853-92), sv Sunlight or Sunburners.

The sun burner seems to have come into wide use in Australia from the later 1860s. In 1867 what were then referred to as 'sun light reflectors' were installed in the new Independent Church and the new Town Hall, Melbourne.⁷² The latter, at least, were made by Andrew Dempster, who also produced those for the Melbourne Exhibition of 1871.⁷³ At the Sydney Exhibition of 1870 J A Patterson of Pitt Street showed a 'twenty burner double sun-light reflector' and a slightly more expensive 'twenty-light double reflector', both said to be suitable for public buildings, churches and chapels.⁷⁴ Whether Patterson was actually the manufacturer is unclear. In 1873 six gas sunlights were installed in the arcaded loggia of 'Victoria House', the new Farmer & Co store in Pitt Street, Sydney.⁷⁵

In 1888 Dempster supplied two sun lights for the Lydiard Street Wesleyan Church at Ballarat. The larger of these measured 1.5 m across the reflector, with an external diameter of 1.95 m, and contained an inner circle of thirty-two large burners, and an outer one of eighteen burners, producing a thousand candlepower. The smaller one was over the gallery, and twenty burners in the inner and fourteen in the outer circle.⁷⁶ Another type, Webster's patent, was said to have given satisfaction in both Sydney and Melbourne, and was installed in the Macdonaldtown Council Chambers, Sydney, in 1889.⁷⁷ There are surviving burners in the ballroom of 'The Acacias' at Marryatville, Adelaide, which may date from Thomas English's extensions of 1879. At the Melbourne International Exhibition of 1880-1 the section XII jury tested - with apparent success - the improved burners and regulators for lamps made by W Sugg of London and Sugg's 200 and 400 candle lamps for lighting large areas.⁷⁸

A local invention, probably of little long-term consequence, was a burner patented in 1880 by Arthur Selby of Sydney, consisting of a brass chamber in which two Bray's No 1 burners were placed obliquely so that their flames converged. This had been tested at the Sydney Gas Works, and was said to use less gas while producing more light.⁷⁹ The next significant improvement was when Auer von Welsbach's incandescent gas mantle,⁸⁰ invented in 1885, was first installed locally in 1894 at the Colonial Bank, Melbourne, and eliminated the sputtering and flaring hitherto characteristic of gas lighting.⁸¹ The Welsbach light Co of Sydney was a prominent

⁷² Christopher Wood & Marc Askew, *St Michael's Church* (Melbourne 1992), pp 52, 54, ref *Argus*, 26 August 1867.

⁷³ Alexander Sutherland [ed], *Victoria and its Metropolis* (2 vols, Melbourne 1888), II, p 617.

⁷⁴ *The Industrial Progress of New South Wales* (Sydney 1871), pp 52-3.

⁷⁵ Peter Reynolds & Joy Hughes, 'Private Practice: Works 1869-1904', in Peter Reynolds, Lesley Muir & Joy Hughes [eds], *John Horbury Hunt: Radical Architect 1838-1904* (no place [Sydney] 2002), p 102

⁷⁶ *Australasian Builder & Contractor's News*, 10 December 1888, p 414.

⁷⁷ *Australasian Builder & Contractor's News*, 21 December 1889, p 603.

⁷⁸ Melbourne International Exhibition, 1880, *Official Catalogue of the Exhibits* (2 vols, Melbourne 1880), II, p 276; Melbourne International Exhibition, 1880-1881, *Official Record* (Melbourne 1882), p 86. at the Centennial Exhibition Sugg was to win a first order of merit: Centennial International Exhibition 1888-1889 (Melbourne 1890), p 893.

⁷⁹ *Australian Engineering and Building News*, 1 July 1880, p 16.

⁸⁰ For which see P Truchot, *L'Éclairage à Incandescence par le Gaz et les Liquides Gazéifiés* (Paris 1889), referred to in Elton Engineering Books, *Catalogue Number 16: Gas and Electricity for Light & Heat, &c* (London 2001), p 27.

⁸¹ *Metropolitan Gas Company Jubilee* unpaginated. For the Welsbach mantle see also C D Elliott, *Technics and Architecture* (Cambridge [Massachusetts] 1992), pp 244-5

distributor, was ultimately forced to trim its sails, and became a prominent dealer in electrical fittings.⁸²

Another development, reported in 1887, was the Wenham patent gas lamp, in which the gas was burnt downwards and the incoming air was heated before reaching the flame, resulting in an increased level of illumination.⁸³ This was the subject of some discussion in 1882 in connection with the proposed dining room of the Melbourne Club. Sir George Verdon referred to it as 'Denham's Patent' - 'the only form of lamp by means of which the bad effects of gas are reduced to a minimum':

This consists of a double tube leading to an argand burner enclosed in a large frosted glass globe supported from above. The inside tube carries the gas, the outer one which surrounds it takes off the heated air with all the detrimental products of combustion.

In short it was a development of the ventilating globe light of the 1860s, and a revival of Boswell's exclusive principle. Each lamp had a separate flue - in the case of a sconce light, preferably built into the wall - to carry off the combustion products and the heated air.⁸⁴ In responding to Verdon, the club's architects, Terry & Oakden, professed to be already aware of the 'Benham' light.⁸⁵

There has been no report of the use of the 'Albo-Carbon' system in Australia, though it was sufficiently established in Britain for T & W Farmiloe to advertise a substantial range of light fittings for it. Albo Carbon was a solid material used in conjunction with the regular gas supply to deliver a more intense light, but could be shut off if a soft light was required. A generator, usually spherical or ovoid, was attached to each light fitting, and was filled with pieces (not powder) of the material. It appears that the gas was passed through this when in use.⁸⁶

In the 1880s electricity began to be used to ignite the gas in major installations. At the Sydney Town Hall the main gasolier, with its sixty jets, was ignited 'instantaneously' by this means.⁸⁷ Parliament House, Adelaide, had what must have been one of the most sophisticated gas lighting installations in Australia, and one of last of any substance. By the time the building was completed electric lighting had already been installed in Parliament House in Melbourne, and at Adelaide wiring was installed in anticipation of future conversion. In the meantime, electricity was used to ignite the gas. On the Clerk's table was a switch with a dial, which showed the number of jets in the chandeliers. By turning the switch as a number came opposite it, the corresponding circuit was closed between the Leclanche primary batteries in the basement and the burners, causing a momentary spark which ignited the gas. On

⁸² *Salon*, I, 1 (July-August 1912), advertisement p iii.

⁸³ *Australasian Builder & Contractor's News*, 25 June 1887, p 117.

⁸⁴ George Verdon, 'Notes on some details in the proposed addition to the house of the Melbourne Club', 23 September 1882, Melbourne Club archives, quoted in Allom Lovell & Associates Pty Ltd, *Melbourne Club 26 Collins Street Melbourne Conservation Management Plan* (Melbourne 1998), p 43.

⁸⁵ Terry & Oakden to the Building Committee, Melbourne Club, 27 September 1882, Melbourne Club archives, quoted in Allom Lovell, *Melbourne Club*, pp 41-2.

⁸⁶ T & W Farmiloe, *T. & W. Farmiloe's Miniature Catalogue* (London 1894), pp 615-628.

⁸⁷ Keating, *The Lumbent Flame*, p 95.

the same dial were buttons to call messengers and to ring the bells which summoned members back to the chamber.⁸⁸

The next system was the use of a pilot light at the fitting itself, and a pneumatic or other switch to control the gas supply from a distance.⁸⁹ The pneumatic switch was introduced in 1903, enabling gas lights to be turned on as simply as electric ones and prolonging the competitiveness of gas.⁹⁰

e. gas cookers and appliances

Eggs had been boiled using gas in 1739, meat cooked in 1824, and in 1834 a gas cooking stove was in use at the Etna Iron Works near Liverpool.⁹¹ Various types of gas cooking were described in Loudon's *Encyclopædia* of 1833 and 1846, but they cannot have been much used even in Britain at this time.⁹² Gas cooking was in a sense introduced to Australia in 1842 by a Sydney confectioner called Gill, who supplied drinks heated by gas.⁹³ By 1851 William Strode of London was able to exhibit both a gas cooking range and a gas boiler, and James Sharp of Southampton an 'apparatus for cooking by gas a dinner for one hundred persons'.⁹⁴

E C Wheelock of Melbourne was stocking gas stoves by 1858,⁹⁵ doubtless of the form which had been developed in the 1840s and 1850s, consisting of a sheet iron cylinder standing on four legs. At the base of the cylinder was a ring burner, above which a roast could be suspended, and the top of the cylinder formed the hot plate. In 1870 Thomas J Brown of Ballarat showed an 'assortment' of gas stoves at the Sydney Exhibition, ranging from a large cooking stove costing £6 down to an 'atmospheric-gas stove' at 5 s. 6 d. F R Robinson similarly displayed an 'atmospheric-gas cooking-stove'.⁹⁶ In 1872 Constable & Turner, retail agents of the Australian Gas Light Co, claimed to have sold 150 stoves for purposes such as room heating, laundry use, and cooking of various sorts, though the Gas Light Co's only records for the time show only 61 stoves of all types, in the hands of 52 consumers. None of these seem likely to have been fully developed cooking stoves, as it is reported that AGL imported one in 1873 at a cost of £4.14s.6d, and installed it in the company's Darling Harbour store, without eliciting much response from consumers. By 1878, however, the company had 156 cooking or heating stoves on its books.⁹⁷

Things were perhaps more advanced in Melbourne. In 1873 a shareholder of the Collingwood, Fitzroy and District Gas Company asked that the company 'make

⁸⁸ Susan Marsden et al, *Heritage of the City of Adelaide* (Adelaide 1990), p 248.

⁸⁹ Keating, *The Lament Flame*, p 93.

⁹⁰ Mandy Jean, *A Complete Guide to Lighting* (Milson's Point [NSW] 1991), p 15.

⁹¹ Great Exhibition of the Works of Industry of all Nations, 1851, *Official Descriptive and Illustrated Catalogue* (3 vols, London 1851), II, p 601.

⁹² J C Loudon, *An Encyclopaedia of Cottage, Farm and Villa Architecture* (London 1846 [1833]) § 1445, p 690; §2044, p 1023; §2380, p 1203.

⁹³ *Illustrated Australian News*, 12 May & 24 December 1879, cited by Michael Cannon, *Life in the Cities* (West Melbourne 1975), p 103.

⁹⁴ Great Exhibition, 1851, *Official Catalogue*, II, pp 645, 601.

⁹⁵ Victoria Industrial Society, *Catalogue of the Eighth Annual Exhibition* (Melbourne 1858), p 30.

⁹⁶ *The Industrial Progress of New South Wales* (Sydney 1871), pp 52-3.

⁹⁷ Broomham, *First Light*, p 69.

special arrangements, with a view to encouraging the use of gas for cooking and for other purposes besides lighting.⁹⁸ In 1874 James Ellis had a shop in the Eastern Arcade devoted to the promotion of 'a certain type of gas stove invented and manufactured in Melbourne',⁹⁹ though the identity of the inventor is unknown. There are rival claims as to who was the first Victorian manufacturer of gas cookers, made on behalf of F Wallis¹⁰⁰ and A R Walker, who were amongst the five exhibitors to show gas stoves at the 1875 exhibition.¹⁰¹ At the Melbourne International Exhibition of 1880-1 the jury for section XII attempted a comparative trial of gas burners, but Wallis Brothers and Jeans, both of Melbourne, withdrew. The remaining local maker, Walker, locked horns with Vieillard of Paris. The two performed identically, using the same amount of gas and taking the same cooking time. Jeans, despite his cowardice, was given a first award for his fine collection of gas stoves and grills, and gas iron heating stoves¹⁰²

In 1878 the Collingwood, Melbourne and South Melbourne companies were amalgamated to create the Metropolitan Gas Company, and in 1880 the Metropolitan established a department for hiring out stoves, the first of which is said to have been a Walkers No 2, priced at £6 [?per annum].¹⁰³ The Acme gas stove, registered in 1888, is also said to have been an early type stocked by the company.¹⁰⁴ By 1890 more than twelve thousand stoves were out on hire, but four years later the majority of these had been returned, symptomatic of the financial stringencies of the Depression.¹⁰⁵ In 1884 the AGL Co of Sydney bought cookers worth £3,000 from Wright & Company, as well as the whole stock of its agent F R Robinson.¹⁰⁶ Wright & Co's gas cookers and stoves were advertised by Neave & Co in 1886, under the 'Eureka' brand, though it is not clear whether they were a local product.¹⁰⁷ A number of the stoves were returned to AGL in 1886, apparently because servants, accustomed to limitless solid fuel, were leaving the burners alight continuously and running up massive bills.¹⁰⁸ It was only in 1889 that the Sydney company followed Melbourne in making these stoves available on time payment or on monthly rental.¹⁰⁹

⁹⁸ *The Metropolitan Gas Company Jubilee* (Melbourne 1928), unpaginated.

⁹⁹ *Argus*, 12 January 1874, quoted in Keating, *The Lambent Flame*, p 110.

¹⁰⁰ Terence Lane & Jessie Serle, *Australians at Home* (Melbourne 1990), p 387, cite Wallis's biographical details in *Victoria and its Metropolis*, pp 621-2, but the idea that the 'cooking apparatus' shown by Wallis in 1866-7 was gas-fired is far-fetched, given that nothing is said of this novelty.

¹⁰¹ Cooking stoves: Hodgson & Co of Collingwood, S E Jeans of St Kilda (Patent Reflector Gas Cooking Stove), A R Walker of La Trobe Street. Other unspecified gas stoves: Hodgson & Co, S E Jeans; Parker & Co; and F Wallis & Sons of Collingwood: Victorian Intercolonial Exhibition, 1875, *Official Catalogue of Exhibits* (Melbourne 1875), pp 146-7: Jeans was notable for producing 'Jeans's cheerful gas stoves, for heating offices or bedrooms'.

¹⁰² Melbourne Exhibition 1880-1881, *Official Record*, p 85.

¹⁰³ *Metropolitan Gas Company Jubilee*, op cit.

¹⁰⁴ Illustrated in H H Paynting & Malcolm Grant, *Victoria Illustrated 1834-1984* (Melbourne 1984), p 361.

¹⁰⁵ Keating, *The Lambent Flame*, p 110.

¹⁰⁶ Broomham, *First Light*, p 76.

¹⁰⁷ Charles Mayes, *The Australian Builders' Price-Book* (5th ed, Melbourne 1886), advertisements p xxviii.

¹⁰⁸ Broomham, *First Light*, p 76.

¹⁰⁹ Broomham, *First Light*, p 88.

In 1889 Neaves were still selling 'J. Wright and Co.'s Enameled [*sic*] Gas-stoves, with asbestos lining', as well as 'Doulton's Portable Radiating Gas Stove' with what was described as a patent asbestos arch designed to throw the heat out into the room.¹¹⁰ In Tasmania Green & Brown of Launceston were in 1888 marketing their patent 'Shamrock' gas kitchener, though there is little reason to suppose that it was a local development.¹¹¹ At the Centennial Exhibition of 1888-9 numerous Victorians showed gas fires, heaters, stoves and other appliances.¹¹²

In the 1880s there were positive developments in the design of locally made gas stoves, reflecting what was already occurring in Britain.¹¹³ In 1880 Walker Bros introduced the first gas stove with burners of the Bunsen type,¹¹⁴ presumably the 'Walker's Patent Gas-Cooking Stove' for which a patent was issued in November 1880.¹¹⁵ By 1884 Douglas & Sons of Melbourne advertised stoves with automatic switches for the burners, turning on when a pot was placed on top, and off when it was lifted.¹¹⁶ A stove being made in 1887 by Galliers & Klaerr was of essentially the form that became standard in the twentieth century.¹¹⁷ The other Melbourne manufacturers were Walker Brothers; Jeans, Holt & Moore; and F Wallis & Sons, and their stoves were made of sheet iron until about 1905, when cast iron superseded it.¹¹⁸ Wallis's cooker was a patent design in which the burner was placed above the joint rather than below it, with a metal plate over it to reflect the heat down.¹¹⁹

As early as 1884 a sub-committee of the Melbourne Club had recommended that the new club kitchen have a gas cooking range in addition to a coal-burning range and an open roaster.¹²⁰ The first large gas kitchen was installed in the Australian Club in 1913,¹²¹ and later in the year there was a major gas installation in the kitchen of the new Commercial Travellers Club in Flinders Street,¹²² soon to be followed by other commercial and institutional users. In 1890 a Melbourne house was designed with specifically named 'gas stove recess' in the kitchen.¹²³ In 1929 Metters released their 'Early Kooka' one level range, with the oven raised to bench height next to the hotplate burners,¹²⁴ and this was to become something of an Australian icon.

¹¹⁰ *Australasian Builder & Contractor's News*, 6 April 1889, p 334.

¹¹¹ Centennial Exhibition, *Official Record*, p 570.

¹¹² Centennial Exhibition, *Official Record*, pp 629-630.

¹¹³ Hunt, 'History of Gas Supply in Victoria', *Proceedings of the Victoria Centenary Gas Congress* (Melbourne 1934), pp 13-14.

¹¹⁴ *Melbourne Bulletin*, 28 March 1884, reproduced in Michael Cannon, *Life in the Cities* (West Melbourne 1975), p 103.

¹¹⁵ *Australian Engineering and Building Journal*, 1 December 1880, p 110.

¹¹⁶ *Melbourne Bulletin*, 28 March 1884, cited by Cannon, *Life in the Cities*, p 104.

¹¹⁷ Illustrated by Phyllis Murphy, 'The Colonial Kitchen' in Robert Irving [ed], *The History and Design of the Australian House* (Melbourne 1985), p 244.

¹¹⁸ *The Metropolitan Gas Company Jubilee* (Melbourne 1928), unpaginated.

¹¹⁹ Victorian Intercolonial Exhibition, Melbourne, 1875, *Official Catalogue of Exhibits* (Melbourne 1875), advertiser p 35.

¹²⁰ Keating, *The Lambent Flame*, p 112.

¹²¹ *The Metropolitan Gas Company Jubilee* (Melbourne 1928), unpaginated.

¹²² Keating, *The Lambent Flame*, p 112.

¹²³ Hyndman & Bates, 'Specification, &c, Villa Residence Tank +c / Camberwell / Arthur J Fuller Esq / Normanby Chambers Chancery Lane' (Melbourne 1890), p 2.

¹²⁴ Broomham, *First Light*, p 124.

John S Riddell of Melbourne showed a gas bath at the 1875 Exhibition, which was said to be a new invention,¹²⁵ but nothing further is heard of it. Gas bath heaters were shown at the 1880 exhibition by Walkers of Melbourne and Jeans of St Kilda, and found to be of equal merit,¹²⁶ and by 1884 Douglas & Sons also advertised instantaneous gas water heaters.¹²⁷ However, they sold at the rate of only two or three a year from 1887. The 'Dairymaid' milk boiler was imported by the Metropolitan Gas Company from some unspecified date, and became the prototype for subsequent gas laundry coppers.¹²⁸

The first gas fires were of the ball fuel, iron fret and asbestos fibre types, and were imported from England in 1886, but sold at the rate of only three or four a year.¹²⁹ In 1890 J W Jaffray & Co of Sydney were advertising imported 'Leeds Patent Floor Warming Gas Stoves', as giving no smell and being ornamental and cheap.¹³⁰ It is unclear whether these are connected with Lewis Leeds, the American heating and ventilating expert.

In the early twentieth century the gas heater containing a fireproof back and ceramic 'radiants' of various forms, which were heated by the gas flame, became common in domestic use. The Parkinson Gas Stove Co of Sydney made a range of these. They argued, in 1934, that their 'Convex' radiant was a great improvement, for with some radiators 'one might scorch if in the direct line of the fire, while leaving the confines of the narrow beam he would appreciate the meaning of "absolute Zero"'. Strangely, however, the Convex had a concave face, the effect of which would be to focus the heat more rather than less. However to be on the safe side the company also offered the 'Cosie', which did in fact have a concave face, as well as a number of models of the more usual straight-faced type. More interestingly, for large spaces like halls, they offered the 'Indusa' heater, in which no radiant elements were visible. It presented a vertical metal panel, which must have radiated heat, with a series of horizontal slots at the top, suggesting that its operation also depended upon the release of heated air, or in other words convection.¹³¹ It was at about this time that true radiant panel heaters appeared in Australia, one of the first uses being in the Shell Building, Melbourne, of 1932-3. The appliance presented as a plain black panel, which would be an efficient radiator, and this was heated from behind by gas jets. It was manufactured by the oldest British stove maker, Sidney Flavel & Co of Leamington.¹³²

f. acetylene

In rural areas small domestic plants after the turn of the century were generally of the carbide or acetylene type, followed shortly by air gas. Following researches by

¹²⁵ Victorian Intercolonial Exhibition, 1875, *Official Catalogue of Exhibits* (Melbourne 1875), p 147.

¹²⁶ Melbourne Exhibition 1880-1881, *Official Record*, p 85.

¹²⁷ *Melbourne Bulletin*, 28 March 1884, cited by Cannon, *Life in the Cities*, p 104.

¹²⁸ *The Metropolitan Gas Company Jubilee* (Melbourne 1928), unpaginated.

¹²⁹ *The Metropolitan Gas Company Jubilee* (Melbourne 1928), unpaginated.

¹³⁰ *Australasian Builder & Contractor's News*, 4 January 1890, advertisements, no page.

¹³¹ Parkinson Stove Co. (Aust.) Ltd., *Catalogue of Parkinson Gas Fires* (Sydney, no date [c 1934]), *passim*.

¹³² *Architectural Review*, LXXIV, 443 (October 1933), p xxiv.

Moissac in Paris, T C Wilson of New York had succeeded in 1892 in fusing powdered coal and lime in an electric furnace, to produce carbide. Within the next decade or so the manufacture of carbide was established on a commercial basis in Scotland, Switzerland, Germany, Sweden and the United States. Acetylene gas was produced by dropping controlled amounts of water onto the solid carbide, and for lighting purposes it was burnt in flat-flame burners.¹³³ When J M L Macdonald built his new homestead at Wallabdah, New South Wales, in 1898, he is said to have included an acetylene gas plant,¹³⁴ though this seems remarkably early. In 1900-1 acetylene was used to light 'Ettrick' homestead near Camperdown, Victoria.¹³⁵

By 1900 the Acetylene Gas Co of Australia Ltd, in Sydney, supplied portable generators and burners, and carbide at fourpence a pound [0.4 k]. In 1907 acetylene generators of unspecified make were advertised by G E Crane & Sons of Sydney,¹³⁶ and in 1908 Mayes's Australian Builders Price Book was already listing 'acetylene gas combination generator and purifier plants' for country residences,¹³⁷ while Tyree Ltd of Sydney claimed that they were the pioneers of acetylene gas lighting, and had several thousand plants at work throughout the Commonwealth.¹³⁸ In 1909 Lasseters of Sydney were marketing the Andreas Auto Acetylene Gas Producer.¹³⁹

There were plenty of rivals, such as the 'Kilgour' carbide feed acetylene generator of the Sun Acetylene Company, South Melbourne,¹⁴⁰ and the 'Colt' leader carbide feed acetylene generator, advertised by the Acetylene Company of Melbourne,¹⁴¹ though of United States origin.¹⁴² Colt's automatic acetylene generators were used by the Sydney Harbor Trust to fuel their leading lights, and could operate for sixty days continuously 'without much attention'. The Trust's marker buoys were supplied by the international Marine Signal Company, and came with an inbuilt acetylene system which could service the light for six to nine months without attention.¹⁴³ In 1910 Alex Gunn & Sons Ltd of Collins Street, Melbourne, advertised as limelight and acetylene gas manufacturers.¹⁴⁴ By 1911 Robert C Swan & Co of Sydney were advertising that they undertook, coal, acetylene and air installations,¹⁴⁵ and in 1914 Brandt Bros were selling their patent 'B.B.' automatic acetylene gas generator, as well

¹³³ J M Somerville, 'Gas-Producing Apparatus for the Illumination of Country Houses', in G L Sutcliffe [ed], *Modern House Construction* (new ed, 6 vols, London 1909), V, pp 314-319.

¹³⁴ G N Griffiths, *Some Southern Homes of N.S.W.* (Sydney 1954), p 58.

¹³⁵ Robert Haddon, 'Australian Planning and Construction', in G A T Middleton, *Modern Buildings* (6 vols, London, no date [c 1910]), V, p 149.

¹³⁶ Walter Jeffries, *The Australian Building Estimator* (Sydney 1907), advertisements, no page.

¹³⁷ C E Mayes, *The Australian Builders & Contractors' Price Book* (7th ed, Sydney 1908), p 236.

¹³⁸ Mayes, *Australian Builders & Contractors' Price Book* (7th ed, 1908), advertisements, p xiii. Cranes also advertise, on p ii.

¹³⁹ Jean, *Lighting*, p 16.

¹⁴⁰ Robert Haddon, *Australian Architecture* (Melbourne, no date [1908]), advertisement, p xlvi; also *Cazaly's Contract Reporter*, XXIV, 25 (23 June 1908), p 93.

¹⁴¹ Haddon, *Australian Architecture*, p vi.

¹⁴² *'Sweet's' Indexed Catalogue of Building Construction* (New York 1906), p 597.

¹⁴³ H D Walsh, 'Gateways to Prosperity', *Building*, 12 December 1911, p 43.

¹⁴⁴ *Sixth Australian Exhibition Souvenir Catalogue* (Melbourne 1910), p 19.

¹⁴⁵ *Building*, 12 December 1911, p 21. See also *Salon*, I, 1 (July-August 1912), advertisement p viii.

as the patent 'Atmoslite' safety air gas machine.¹⁴⁶ In South Australia the 'Mozart' acetylene gas generator was marketed by A W G Pitt.¹⁴⁷

g. air gas

Air gas is air carburetted with petrol, and it was found suitable for incandescent burners and mantles, stoves, fires and grillers. Its first known Australian appearance is at 'Martindale Hall', South Australia, in about 1878-80. For this house an 'atmospheric gas engine' was supplied by J Edmundson & Co of Westminster, together with sixty lights, ninety-seven Argand burners, twenty-five bat-wing burners, and 160 gallons [800 litres] of 'gasoline'.¹⁴⁸ By 1909 the Non-Explosive Gas Company Limited of Westminster was making an apparatus sufficient to supply forty lights, which was quite compact, although it incorporated its own small gasholder.¹⁴⁹ By 1911 air gas installations were being offered by Robert Swan of Sydney,¹⁵⁰ and in 1914 Mayes was able to refer not only to the 'Atmoslite' machine sold by Brandts, but to the 'Premier' (Elliott, McLean & Co), the 'Simpetrol' (James Hardie & Co), the 'Ideal', the 'Sunlight, and 'many others'.¹⁵¹¹⁵² By the 1920s Parker's Air Gas Company had a Gothic headquarters in Melbourne.¹⁵³

At 'Greenmount' homestead near Mackay, in Queensland, A A Cook was approached in 1915 by one Thoms, the local agent for Quirk's Air Gas Machine, and agreed to have one installed. By October Mansfield, the company's fitter, offered to give an exhibition of lights, of which Cook commented 'were not impressed + think acetylene better'. Another fitter, Foley, altered the plant in April 1916, after which Cook recorded with satisfaction 'we had tea by gaslight.' The gas house and the poles to carry the weight are still at the homestead, which is operated as a museum by the Mackay Historical Society, but the machine itself has long gone.¹⁵⁴ A Quirk machine was also installed at 'The Meadows', Toongi (near Dubbo), New South Wales.¹⁵⁵ In 1927 Mayes indicated that air gas machines were supplied by John Danks & Son Pty Ltd of Melbourne, and the Sydney firms of William Adams & Co, Malleys Ltd, Noyes Bros and Swans.

According to the English technological historian Brian Bowers, the mixture was dangerous if the proportion of petrol was between 2% and 5%, for which reason

¹⁴⁶ C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1914), advertisement p 23.

¹⁴⁷ Anonymous undated typescript, 'Albert William George Pitt'.

¹⁴⁸ Elizabeth Warburton, *Martindale Hall* (Adelaide 1979), p 142.

¹⁴⁹ G L Sutcliffe [ed], *Modern House Construction* (new ed, 6 vols, London 1909), V, pp 321-2.

¹⁵⁰ *Building*, 12 December 1911, p 21.

¹⁵¹ C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1914), p 291. See also Brandt's advertisement, p 23.

¹⁵² C E Mayes, *The Australian Builders & Contractors' Price Book* (9th ed, Sydney 1927), p 367: Mayes refers to the advertisements of these companies in his volume, but none of these makes any specific reference to air gas plants.

¹⁵³ Isaac Selby, *The Old Pioneers' Memorial History of Melbourne* (Melbourne 1923), p 240.

¹⁵⁴ Mrs B Clark of the Mackay Historical Society, letter of 24 July 1991, including extracts from Cook's diary.

¹⁵⁵ Information from Barbara Hickson, 2002.

some of the commercial systems used a weaker and others a stronger concentration. As Bowers describes it:¹⁵⁶

A typical vaporizer had a rotating drum, driven by a falling weight, which dipped into a container of petrol. as the drum turned, it picked up droplets of fuel which mixed with a stream of air. If gas were not being drawn off, the pressure would rise and operate a brake on the mechanism until more gas was required.

h. liquid fuel

Another system, which in a sense succeeds air gas, involves reticulating the liquid fuel itself. The earliest documented type is the 'Gloria' lighting system, made by the Gloria Light Co of Chicago, which established a Melbourne company with offices in Post Office Place,¹⁵⁷ then later in Little Bourke Street.¹⁵⁸ John M Black of 'Ayrdale', near Candelo, New South Wales, recorded in his journal that a Mr Cohen of Gloria Light arrived on 26 October 1915 to install the system, and left the next day. The result was 'a brilliant light rather too strong' in the kitchen, dining room and schoolroom. There survives at the property both the pressure cylinder from this installation and some of the tubing still in situ. This tubing has an outside diameter of about 3 mm, or less than insulated wiring, which meant that it could be led up corners and across ceilings without being at all obtrusive.

Mr Field Roberts remembers the system in operation at Ayrdale, and his wife Topsy [née Styles] remembers it at the Styles family's 'Malmarni' in the same area. The tank contained 'Shellite' fuel, and was pumped to a pressure of 30 psi [207 kPa], which would be maintained for some time, but require boosting about once during an evening: this would be done by anyone who passed the tank and noticed that the pressure had fallen below 15 psi. The lamp was in an open bottomed shade hanging from the ceiling with the mantle within reach. To light at the end of the pipe had first to be heated up sufficiently to vaporise the fuel. This was done using a wire about 6 mm in diameter and 300 mm long, which had a grey substance on one end. This end was dipped in methylated spirits and lit, then hooked over the pipe. At the end of the pipe was a two headed arm with a chain on it, and when it was warm enough the arm was pulled slowly down and the lamp lit up. To turn it off the arm was pulled the other way. The mantle became very brittle, but it lasted typically for three or four months, and gave a bright yellow to rosy pink light. At Ayrdale the system seems to have had a limited life, but the dining room light at least continued in use for some time.¹⁵⁹

¹⁵⁶ *New Scientist*, 12 September 1998, [np], quoting from the [then] forthcoming Brian Bowers, *Lengthening the Day*.

¹⁵⁷ J S Gawler [ed], *The Architects' and Builders' Index (Victorian Edition)* (Melbourne 1928), p 34.

¹⁵⁸ Gloria Light Co of Australasia, 354 Little Bourke St: Sands & McDougall, *Melbourne Directory*, 1935, p 1956.

¹⁵⁹ For this information I am much indebted to Mr & Mrs Charles and Carol Mueller of Ayrdale, who showed me the remains of the installation, and subsequently sent me photographs of the cylinder, extracts from Black's journal, and a note of the recollections of Mr and Mrs Roberts.

The Gloria system was common elsewhere. Mr Bruce Rigby remembers it at Cracow station in western Queensland, where it had been installed before 1938, and it was particularly susceptible to the assaults of moths known to the family as 'mantle bashers'. The family had to fend these off, particularly during World War II, when mantles were hard to obtain.¹⁶⁰ Mr Neil Clerehan remembers the system being installed at his parents' hotel at Sassafra, Victoria, in 1926.¹⁶¹ In 1936 a Gloria system was installed in the main rooms of the homestead at Churchill Island, Victoria.¹⁶² At Kyneton, Victoria, 'Kyneton Lodge' at 29 Donnithorne Street has pneumatic switches of the sort used in gas installations, and fine tubing connected to them suggests that they were for the Gloria or a similar system.

Another product, which seems to have been similar to the Gloria, was the "'Wizard" hollow wire lighting and cooking system', details of which were published by Mayes in 1927:

Benzine or petrol vapour is conducted from a "Compressor" through a fine copper tube or wire to the different positions of house required, using special burners and mantles, and cost from £50 to £60 upwards to instal; upkeep, 2/- per week average, 20 light machine. The cost of installation is extremely low and the upkeep much less than electricity, coal, gas, acetylene or kerosene.

It was claimed to be suitable for cooking stoves or gas rings, and to have been made in Australia and designed for local climatic conditions,¹⁶³ but it was in fact manufactured in England. The company had an office or agency in Flinders Lane, Melbourne.¹⁶⁴ A Wizard cylinder and other equipment survive at 'The Hermitage', Barnawartha, Victoria.¹⁶⁵ The cylinder is branded:

WIZARD LIGHTING SYSTEM
187A FLINDERS LANE
MELBOURNE

Light fittings in a house at 9 Fletcher Street, Essendon, Victoria, are reportedly branded:

SOLE LICENSEES FOR
AUSTRALASIA
THE W.L.CO OF A. LTD

—————
PATENT
MADE IN ENGLAND

The Muellers believe that they still have the instruction booklet for the Gloria system, but have yet to locate it.

¹⁶⁰ Information from Mr Bruce Rigby, Yarram Gully, Charleville, Queensland, 1993.

¹⁶¹ Information from Mr Neil Clerehan, Melbourne, 1993.

¹⁶² Michael Taylor, *Conservation Analysis Churchill Island Homestead* (Cranbourne [Victoria] 1987), p 17.

¹⁶³ Mayes, *Builders & Contractors' Price Book* (9th ed, 1927), p 367.

¹⁶⁴ Gawler, *Architects' and Builders' Index*, p 34.

¹⁶⁵ Inspected 1998, having been kindly brought to my attention by Deborah Kemp.

There are two symbols, one the letter W in a circle with eight lines radiating from it, and the other a crescent moon bearing the words 'TRADE MARK', within the curve a heart-shaped object, and the whole surrounded by a ring of radiating wavy lines.¹⁶⁶ Like the Gloria system and others, it must have been rapidly superseded by the domestic electric generators when these became viable in the 1920s.

¹⁶⁶ National Trust, Victoria, file no 1996.