A. Charles King: a unique contribution to anaesthesia

D J Wilkinson MB FFARCS *Department of Anaesthesia, St Bartholomew's Hospital, London EC1*

Keywords: history; anaesthetic apparatus; King, A Charles

Based on presentation to Section of Anaesthetics, 3 February 1984

Anaesthetic apparatus manufactured today is still largely styled on original designs from the early 1930s and 1940s. It was in those decades that anaesthesia was rapidly expanding in technological terms and this expansion was facilitated by the skills of the various anaesthetic instrument manufacturers of that time. The doyen of these was Arthur Charles King (Figure 1) who provided in his various premises not only the facilities needed by the rapidly developing specialty but a unique atmosphere which fostered enthusiastic research into improvement in the manufacturing and design of apparatus.

King was born on 15 March 1888 at 1 Upper Park Street (renamed Bewdley Street in 1934) in Islington, London N1. His father, a postal sorter, sent him to the local primary school in Canonbury Road for his early years but moved him at the age of 10 to a private school, Owens, near the Angel, Islington. He was a good but not brilliant scholar, his school reports placing him in the upper middle half of his various forms.

He left school at the age of 14 on 26 March 1902 and became apprenticed to a local engineering firm. His first commercial work involved the filing of ratchets on a handbrake of a barouche – an early horse-drawn carriage. The skills he developed in engineering at this early time in his life were to lay the foundation on which his future company was based.

His apprenticeship completed, and lacking the money to enter medical school as he wanted, King joined a medical supply company as a salesman. He spent his days selling medicine bottles and dressings to local doctors and this regular employment permitted his marriage on 29 April 1914 to Mary Head.

The outbreak of the First World War meant a severe disruption to King's life. He had joined a territorial unit as an apprentice and this unit, the First London Rifle Brigade, a City of London Territorial Unit, was immediately called up and fought in each major battle on the French Front from 1914 to 1918. King was wounded three times and required surgical intervention in France on at least one occasion, prior to convalescing back in England. It is interesting to speculate whether this early exposure to field anaesthesia, where the young engineer may have glimpsed an early water-sight flowmeter and ether vaporizer before the rubber mask descended on his face, might have kindled his interest in anaesthesia. Many of the great anaesthetists of that age were active in France at that time, including Boyle, Gwathmey and Marshall.

He returned from the continent at the end of the war to find his old job no longer existing and, with the added responsibility of a young son born in 1916 to consider, he set up his own business selling basic medical necessities to the circle of local doctors and hospitals he had developed contacts with prior to 1914. This business slowly expanded, partly run from an office in his new home, Stanley House, 63 Ronald Road in Islington. King felt the need to be nearer the private nursing homes and medical premises of Harley Street and, having borrowed £100 from an uncle, he purchased the lease of 34 Devonshire Street and opened a shop. This shop sold all general medical supplies, instrument cabinets, sterilizers, operating tables, and had a special interest initially in ear, nose and throat apparatus.

Figure 1. Arthur Charles King

In the early 1920s, as King was slowly establishing this new business, he was visited by Dr F P de Caux, an anaesthetist from the North Middlesex Hospital. de Caux had recently visited America and returned with a McKesson demand flow nitrous oxide–oxygen apparatus. He encouraged King to obtain further machines from abroad and these proved to be very popular. King obtained the British franchise to sell this apparatus and was soon selling as many as he could import. de Caux, like all anaesthetists of that era, was not content to use the apparatus as sold and wished to modify its design. After discussions with King a modified version – the de Caux-McKesson dental apparatus – came on the market manufactured and sold by King (Figure 2).

0141-0768/87/080510-05/$02.00/0

Figure 2. de Caux-McKesson dental apparatus

This was the start of King's specialization in anaesthetic apparatus. With the introduction of a service to provide anaesthetists with nitrous oxide and oxygen cylinders and his rapidly widening anaesthetic repertoire, it was natural that more and more anaesthetists would visit his very convenient premises to replenish their empty cylinders and see the latest equipment. Under these circumstances it was inevitable that he would soon meet Dr Ivan Magill. They were to become good friends, a friendship based on a mutual admiration of the other's skills. This unique partnership, which started at this particular time and lasted more than 40 years, changed the specialty of anaesthesia dramatically.

Magill was working with Rowbottom at Sidcup using intratracheal insufflation anaesthesia. King manufactured a whole series of apparatus to facilitate this method of anaesthesia. They joined forces to develop Magill's laryngoscope, originally sold as an intubating spatula, and utilized to facilitate the placement of the insufflation catheters. As Magill moved on from insufflation anaesthesia to endotracheal anaesthesia, it was natural that King would be involved in the development of the famous tubes and connectors. Magill by this stage was introducing new designs in anaesthetic apparatus at a prodigious rate and King kept pace with their manufacture and sales. Reducing valves, endotracheal tubes, forceps, connectors, laryngoscopes and anaesthetic machines all appeared in rapid succession and their sales were enhanced by the distribution of pamphlets by King (Figure 3).

These pamphlets were highly informative addenda to his main catalogue and provided simple instructions for the use and maintenance of the apparatus in question. As King became busier and busier, he slowly increased his workforce, selecting very carefully amongst highly-trained engineers to complement his own skills. The business premises in Devonshire Street were also the scene of much of the manufacturing processes that occurred, but more and more work began to be subcontracted out to small instrument manufacturers in the Islington and Clerkenwell area.

King became an authority on oxygen tents, another American invention, and he would hire these out on a daily basis to hospitals who had need of them. These devices sometimes had dramatic successes and his name started to appear in the national press[1], which undoubtedly enhanced his business prospects.

At this time he met Dr Victor Goldman, who was to remain a close lifetime friend. Once again, King helped with the final design and manufacture of the

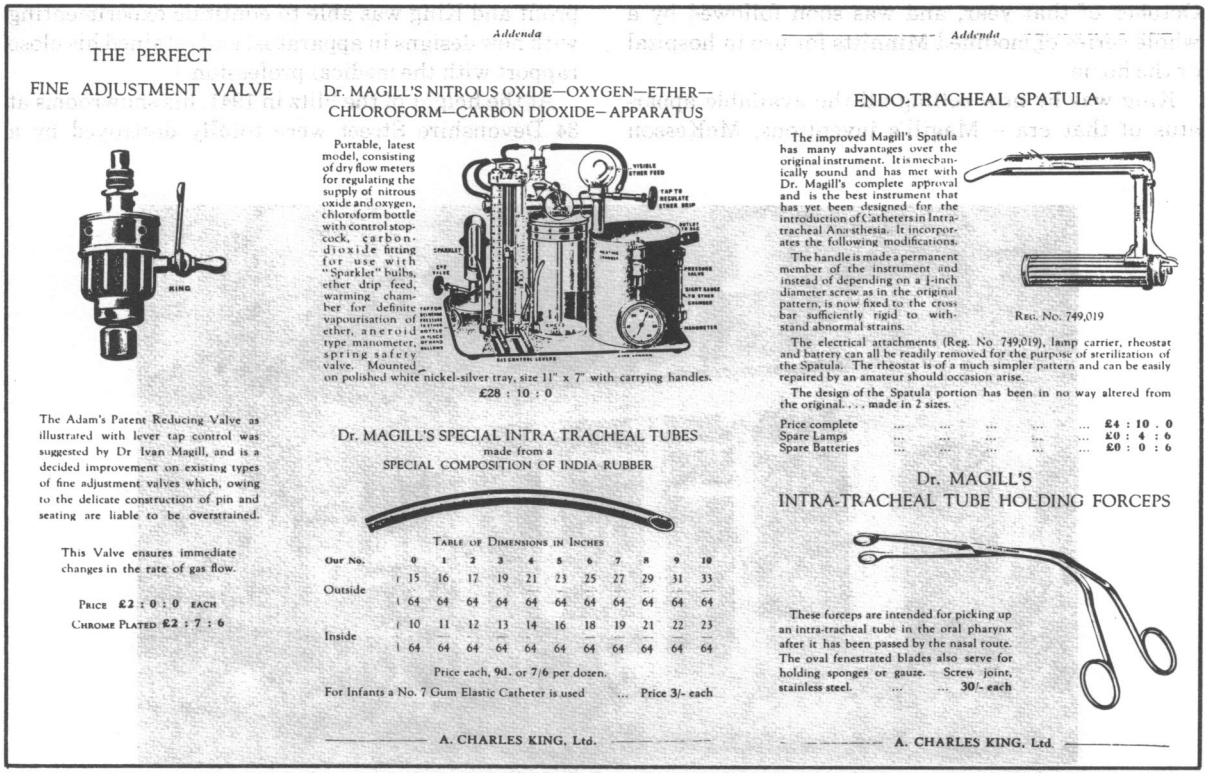

Figure 3. A Charles King pamphlet

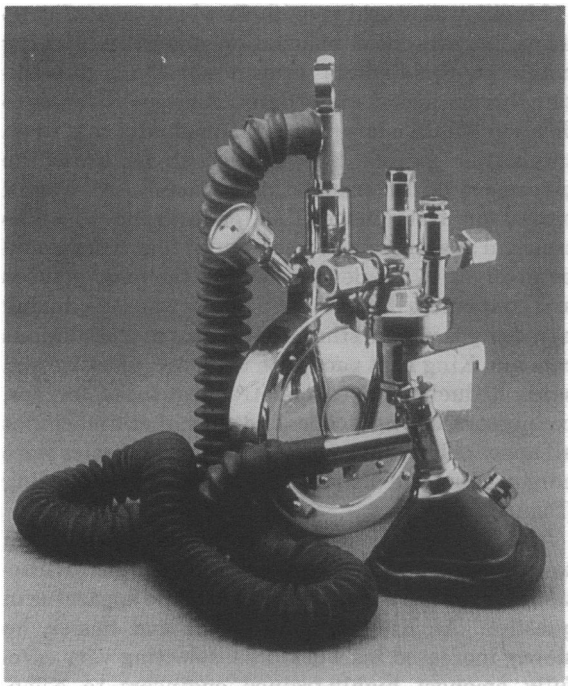

Figure 4. Original Minnitt's apparatus

many innovations that Goldman introduced into anaesthetic practice.

In October 1932, Robert Minnitt was invited by the Liverpool Maternity Hospital to investigate the possibility of a nitrous oxide apparatus for use by trained but unsupervised midwives to provide obstetric analgesia. He was a close friend of Charles King and he came to London in July of 1933 to discuss the matter with him. It is not surprising that following their discussions at 34 Devonshire Street, the first apparatus they developed was a modified McKesson apparatus, as the rooms in which they sat were filled with these demand flow machines. This first Minnitt gas–air analgesia apparatus (Figure 4) was used in October of that year, and was soon followed by a whole series of modified Minnitts for use in hospital or the home.

King was by now selling all the available apparatus of that era – Magill's inventions, McKesson and Forreger machines from America, Minnitt's apparatus, Shipway's apparatus as well as Boyle's machines and medical gases. He was also gathering around him a particularly talented group of workers who were all to contribute significantly to apparatus design in anaesthesia in the future. James Juby, an engineer, joined the company and became second in command to King, staying with the company for the rest of his working life. Henry Talley was a talented engineer who eventually left King and formed his own company, selling anaesthetic apparatus initially and finally specializing in ripple mattresses. Taffy Durrant was another great craftsman who worked with the company for many years before leaving to set up MIE. There was also one woman who was particularly adept at making the Magill endotracheal tubes. She was nicknamed 'Catheter Kate' and made the tubes from coils of rubber tubing bought from a rubber company in Euston Road, cutting the bevel with a pair of scissors and then smoothing the rough edges with an electric iron.

For all his skills as an engineer and inventor, King was unfortunately no businessman. He would happily give out equipment on credit, and sent out bills sometimes only once a year. This resulted in frequent cash-flow problems and King turned to Coxeter, who manufactured many pieces of anaesthetic apparatus, including Boyle's machines, for financial aid. This financial aid became more and more extensive and led to the formation, in 1926, of A C King Ltd, a company in which King himself was a minority stockholder, the majority of shares being held by Coxeter. This, however, in no way interfered with the running of King's shop, which continued exactly as before (Figure 5).

In 1939, the British Oxygen Company bought out Coxeters, and A C King Ltd came under the new management too, but King was again left to run his anaesthetic division of the company much as he pleased, a situation which suited him well. British Oxygen made no severe demands on his making of a profit and King was able to continue experimenting with new designs in apparatus, and retained his close rapport with the medical profession.

At the height of the blitz in 1941, his showrooms at 34 Devonshire Street were totally destroyed by a

Figure 5. The premises of A Charles King Ltd at 34 Devonshire Street

landmine. His business carried on unchanged from two parked cars in the street, while a telephone service was provided by the Genito-Urinary Company that had premises on the street corner. Within a week, a grocer's shop opposite became vacant and King moved across the road to open a new shop at 27 Devonshire Street.

This showroom was to become famous worldwide – described by Waters as a 'Mecca for anaesthetists worldwide'[2]. In it he provided not just an opportunity for anaesthetists to look at the latest in apparatus but many other facilities besides. King had always been an avid reader and collected a large number of anaesthetic textbooks, both historical and current, which were available for use by any visiting doctor. He would eagerly browse through secondhand bookshops and frequently found items of anaesthetic interest. On one occasion in 1937/38 in Paris, he discovered an original edition of John Snow's *On chloroform*, which he purchased for two francs!

His interest in apparatus was not limited to new inventions and he was ideally placed to build up his extensive collection of equipment, from the earliest days of the specialty right up to the present, by being able to exchange new apparatus for old. This collection is unique and contains a tremendous wealth of material for the enthusiast to see. He was able to manufacture facsimile pieces of those items he was unable to collect and these were usually, but not always, usable pieces of anaesthetic apparatus. This collection was frequently used for teaching purposes and his demonstrations of anaesthetic apparatus prior to the examinations were mandatory for all anaesthetists in training. To augment these teaching sessions, King also had a series of films and lantern slides that were available for hire and which illustrated the various aspects of anaesthetic practice of that era.

His premises became a regular meeting place for anaesthetists. They would call in to have their cylinders refilled and stay to talk to friends or to discuss with King or one of his skilled engineers some modification to a piece of equipment. Drawings could be made on the spot and the working apparatus would follow with remarkable rapidity from the basement workshops. King was always willing to make a special item for any particular anaesthetist, whether it was commercially viable or not.

Outside his work, King had a wide variety of interests. He had moved to Highgate and now lived in Cromwell Avenue. He had a keen appreciation of local history in particular and London in general, and wrote a superbly detailed paper on Highgate Village which described the houses and previous inhabitants[3]. He was an enthusiastic member of the Highgate Literary and Scientific Institution, acted as its treasurer for 12 years and then, as his health declined in later life, became one of its Vice Presidents. He was interested in sketching and enjoyed amateur dramatics. During the Second World War he joined the Home Guard and was an enthusiastic officer in that force (Figure 6).

Despite this broad spectrum of outside interests, King was essentially most happy when working. As he grew older he was able to delegate more and more routine work to his colleagues, and he therefore had more time for writing. He published a book on anaesthetic equipment[4] and wrote several papers on the development of anaesthetic apparatus[5,6]. He was an

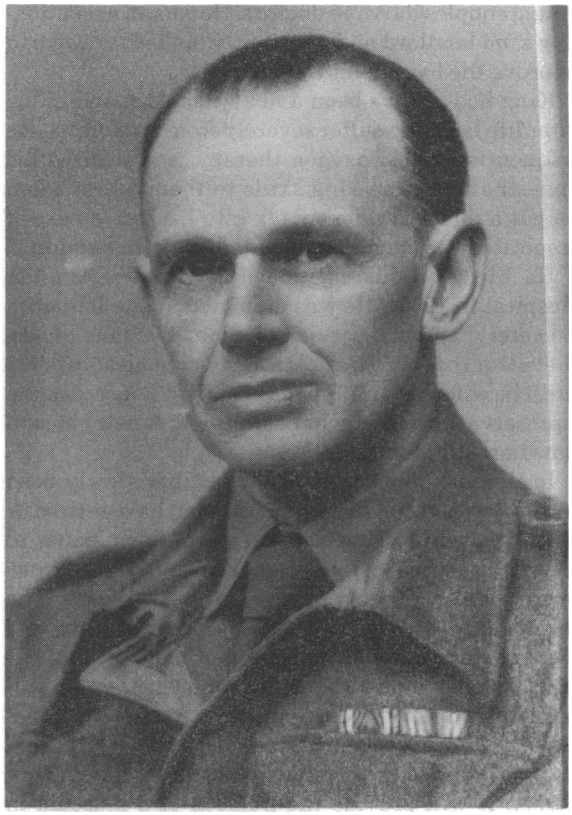

Figure 6. A Charles King in the uniform of the Home Guard during the Second World War

enthusiastic member of the British Institute of Surgical Technicians and spent much time attending meetings to propagate the work of this body.

He was now a highly respected man amongst anaesthetists, particularly in the United Kingdom, and in January 1949 was awarded the rare honour of being made an Honorary Fellow of the Section of Anaesthetics of the Royal Society of Medicine. He was already an honorary member of many regional anaesthetic societies including the Yorkshire, Glasgow, West Scotland, Liverpool and South-West Regional Societies.

In the late 1940s he undertook a world tour sponsored by the British Oxygen Company, in which he travelled throughout Europe, Africa and Australasia lecturing on anaesthesia and anaesthetic apparatus. He was given honorary membership of the Australian, New Zealand, Transvaal and Cape Province Anaesthetic Societies during this tour, in which he covered some 50 000 miles – quite an achievement at the age of 62. He obviously enjoyed the trip and kept a detailed diary of the day-to-day events and the people he met. In 1953, after a further tour of North America, he reached his 65th birthday and was informed by BOC that he had to retire. This, King found very difficult. The Charles King Company was taken over by his great friend, James Juby, and King was retained as a consultant. He continued to drop into his showrooms and always returned to lecture on anaesthetic history when asked, but gradually began to spend more and more time at his new home in Wood Lane, Highgate. He was a keen gardener, but found his enforced retirement very frustrating as he still felt fit and able to contribute to anaesthesia.

His great desire to help other people, which was so fundamental to his whole life, found further outlet at his new home when he let the top part of his house to a

young couple who were doctors. He was an exceptionally kind landlord and constantly looked for ways to improve the lives of his tenants.

King had always been a heavy smoker, and in his later life began to suffer severely from bronchitis. He frequently needed oxygen therapy, and utilized his anaesthetic engineering skills to their fullest when he put a piped oxygen supply into his car in case of respiratory problems whilst out driving in London.

He died, on his birthday, at the Whittington Hospital in 1966[2]. He was cremated at the Islington Cemetery, and at a service attended by many anaesthetists a rose tree was planted to commemorate his life. His wife died in 1974 and their last house, despite a preservation order, was demolished. A new block of flats now stands on the site.

In the last 20 years King's name has slowly been forgotten, as those who knew him well have retired or died themselves. There are no statues or plaques to record his contributions to anaesthesia. We do, however, have some tangible signs of his presence. The Association of Anaesthetists of Great Britain and Ireland was given his collection of historical anaesthetic apparatus in 1953, and this museum, which still bears his name, was housed until recently at the Royal College of Surgeons, having been originally held and maintained at the showrooms in 27 Devonshire Street. It will provide the nucleus of a museum in the basement of the Association's new premises at 9 Bedford Square in London.

His extensive collection of books was given partly to the Royal Society of Medicine Library and partly to that of the Royal College of Surgeons and is still therefore available. His name can be found, even today, engraved on many pieces of anaesthetic apparatus which are still in use, in itself an indication of the quality of the equipment that he produced.

King served the newly emerging specialty of anaesthesia with a unique blend of enthusiasm and skill which set the standard for future manufacturers to follow. His contribution to that specialty was immense and his name should not be forgotten.

Addendum: The new museum at the Association of Anaesthetists was officially opened on 9 July 1987.

Acknowledgments: I would like to thank the following for their considerable assistance in the collection of information for this paper: Mr John King, Mrs Elaine King, Mrs Hilary Riches, Mrs Margaret Smalley, Mrs Peggy Bole, Mrs Joyce Rogers, Mr James Juby, Sir Ivan Magill, Professor Donald Jenkinson, and Mr Hamilton-Hynes. I would also like to thank the Department of Medical Illustration at St Bartholomew's Hospital for the photographs.

References

1 Anonymous. Baby saved by oxygen tent. *The Daily Mirror* 1934 October 27
2 A. Charles King. Obituary. *Anaesthesia* 1967;**21**:439–40.
3 King AC. Highgate and its past. *Journal of the London Society* 1954;**325**:55–7
4 King AC. *The principles of gaseous anaesthetic apparatus*. London: Bailliere Tindall and Cox, 1941
5 King AC. The history and development of anaesthetic apparatus. *Br Med J* 1946;ii:136–53
6 Galley AH, King AC. Modifications of the Clover's ether inhaler. *Anaesthesia* 1948;**3**:147–53

(Accepted 21 July 1986)

Some recent books

Biology and development

Angiogenesis: the Growth of the Vascular System. O Hudlická & K R Tyler (pp 221, £25) ISBN 0-12-3601-304, London: Academic Press 1986

Development as an Evolutionary Process. (MBL Lectures in Biology, Vol 8) R A Raff & E C Raff (pp 332, £39) ISBN 0-8451-2207-X, New York: Alan Liss 1987

Genetic Aspects of Developmental Pathology. E F Gilbert & J M Opitz, eds (pp 482, £84) ISBN 0-8451-1063-2, New York: Alan Liss 1987

Immune Regulation by Characterized Polypeptides (UCLA Symposia on Molecular and Cellular Biology, New Series Vol 41). G Goldstein *et al.* eds (pp 768, £81) IBSN 0-8451-2640-7, New York: Alan Liss 1987

Positive Strand RNA Viruses (UCLA Symposia on Molecular and Cellular Biology, New Series, Vol 54). M A Brinton & R R Rueckert, eds (pp 605, £61) ISBN 0-8451-2653-9, New York: Alan Liss 1987

Primate Conservation in the Tropical Rain Forest (Monographs in Primatology, Vol 9). C W Marsh & R A Mittermeier, eds (pp 365, £61) ISBN 0-8451-3408-6, New York: Alan Liss 1987

The Vertebrate Neuromuscular Junction (Neurology & Neurobiology, Vol 23). M M Salpeter, ed. (pp 454, £65) ISBN 0-8451-2725-X, New York: Alan Liss 1987

Transcriptional Control Mechanisms (UCLA Symposia on Molecular and Cellular Biology, New Series, Vol 52) D Granner *et al.* eds (pp 516, £50) ISBN 0-8451-2651-2, New York: Alan Liss 1987

Haematology

Haematology (Colour Aids). D Linch & A P Yates (pp 124, £5.95) ISBN 0-443-02842-7, Edinburgh; Churchill Livingstone 1986

Separation of Human Blood and Bone Marrow Cells. F M K Ali (pp 231, £17.75) ISBN 0-7238-0698-6, Bristol: Wright 1986

Transfusion Medicine: Recent Technological Advances (Progress in Clinical and Biological Research, Vol 211) (pp 357, £40) ISBN 0-8451-5061-8, New York: Alan Liss 1986