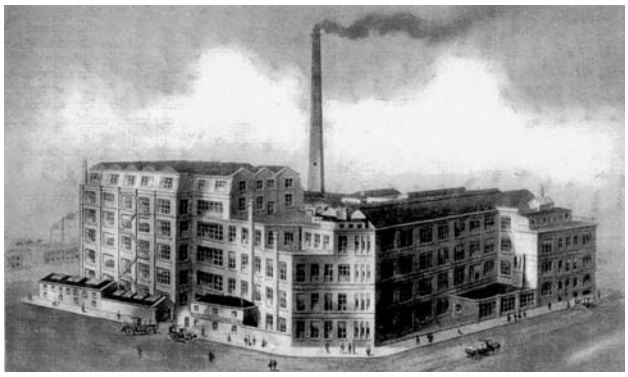
GEC and the Telephone

Bob Estreich and Alan Gall



Peel-Connor factory at Salford (c1902)

'Well-informed people know it is impossible to transmit the voice over wires. Even if it were, it would be of no practical value.' (Boston Post, 1865)

The announcement of the telephone's invention by Alexander Graham Bell in 1876 brought forth amazement, delight, and from some, ridicule; while the journal of the Society of Telegraph Engineers was both enthusiastic and cautious:

'… one cannot but be struck at the extreme simplicity of both instruments, [the telephone's transmitter and receiver] so simple indeed that if it were not for the high authority of Sir William Thomson one might be pardoned at entertaining some doubts of their capability of producing such marvellous results.'

Whatever doubts the general public had were soon dispelled. Hot on the heels of invention came commercial exploitation and in Britain the mushrooming empire of the General Electric Company began to embrace the new technology. Keen to make its mark on this industry, as it was in all aspects of applied electrical science, GEC forged ahead to become a major contender in the installation of telephone exchanges. How ironic that the ultimate fate of GEC (renamed Marconi plc) after years of diversification, was to wager its fortune on the telecommunication business – and lose it all.

THE BEGINNINGS

As early as 1861 Johann Philipp Reis demonstrated his invention called the Telephon. It was based on a transmitter where the signal was interrupted rapidly into a series of pulses ('make and break') which could be reconstituted into sound in a receiver. It only worked intermittently and at low levels of sound. Later tests showed that it could have been the first successful telephone, but only with a step-up transformer to boost the signal and keep the circuit open at all times, and with a better receiver. When it worked successfully it was operating as what was afterwards called a 'loose contact' transmitter, rather than a 'make or break'. A Judge in the United States later ruled that it would never have been a workable telephone as invented. On the other hand, there were those who felt that Reis had not received the recognition he deserved. Professor Silvanus P. Thompson stated: 'Nothing shall ever cause me to detract from the merit of this discovery by Bell; only he was not the first…' William Preece, later Sir William, wrote in his 1889 book The Telephone: 'Reis's instrument can and did reproduce articulate speech before Bell ever thought of his telephone' but added '…it is one thing to make a great discovery, and quite another thing to make it commercially useful.'

And so Alexander Graham Bell succeeded where Reis failed. He patented his first telephone in 1876, eventually developing a workable version using a voice-actuated iron diaphragm moving in a magnetic field to generate a signal. His telephone had its weaknesses – it made a reasonable receiver, but it was a poor transmitter. Transmission distance was measured in hundreds of yards. This could be improved with higher voltages, but these caused their own problems. Once Bell proved it could be done, the sudden revival of interest led to a huge number of successful refinements in a very short time. Many of these were invented in parallel in Britain, Europe and the United States. Because of the money to be made in the new industry, most of these inventions were designed to work around the Bell patent.

In 1877 Emile Berliner applied for a patent on a metal-to-metal or metal-to-carbon loose-contact transmitter somewhat like that of Reis, but he also designed an induction coil to wire across it to lift the output signal and maintain the circuit when the contacts were separated by strong voice signals. It worked well, but the American Bell company, who bought the rights to it, delayed the patent for years. They hoped to delay it long enough to get it issued when Bell's patent expired, giving them another 17 years monopoly over the telephone. Bell had meanwhile bought the rights to the Blake transmitter (due to Francis Blake), another loose-contact type. Berliner added an induction coil to this and made other improvements, and the resulting transmitter was put into production for Bell.

From 1877 to the early 1880s Thomas Edison invented a number of transmitter types, but his most successful was one using carbon powder. The American Speaking Telephone Company, owned by the Western Union Telegraph Company, put this into production in opposition to Bell. Legal action followed. In the end, Western Union capitulated and handed over the Edison patent to American Bell, who did nothing with it as they already had the Blake in production.

In the early 1870s Professor David Edward Hughes in Britain designed a 'microphone' using loose contact carbon pencils. He published details in 1878. He never patented the idea, but his notebooks showed that he had developed it some years earlier, based on Reis's work. His carbon pencil microphone became the basis for many practical European transmitters that worked around the Bell patents, such as those by Gower, Crossley and Ader. A thriving telephone construction industry developed in many countries.

In 1878 Henry Hunnings in Britain patented an improved Edison transmitter, which used carbon granules instead of powder. This gave stronger transmission and reduced packing of the carbon in the bottom of the transmitter, a well-known problem that reduced the transmission level. He sold the patent to the United Telephone Company (later the National Telephone Company) who held the Bell patents for Britain. It attracted little interest in the U.S. but the

Bell Telephone Manufacturing Company in Antwerp used the principle to produce a capsule transmitter that could be fitted to a handset.

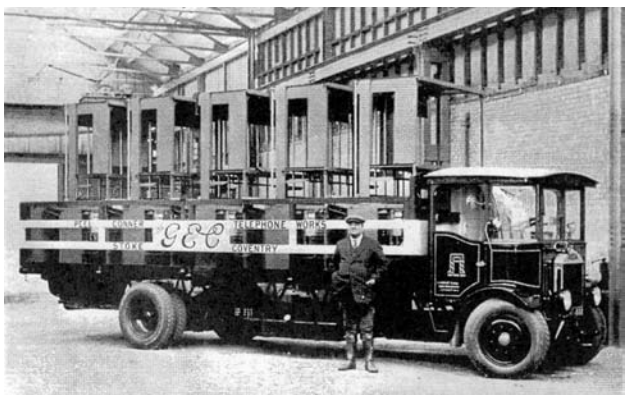
By the 1890s the telephone was accepted technology, if still a little crude, and the industry was thriving. The Bell patents expired during the 1890s and most manufacturers settled on telephones based on a Bell-type electromagnetic receiver and a Hunnings-type carbon granule transmitter. The telephones were still being built for magneto exchanges, where a generator in the phone was used to signal the exchange or other subscribers. A new system called Central Battery was starting to appear, but most development at this time was aimed at larger magneto telephone exchanges and cheaper, more reliable telephone instruments. The parameters of telephone construction had been fairly well sorted out, and precision in manufacture was increasingly important for optimum performance.

THE HISTORY OF GEC

Not so long ago, the name of the General Electric Company would have needed little introduction since its goods pervaded most areas of industrial and domestic life. The early slogan of 'Everything Electrical' was certainly no idle boast. Products ranging from light bulbs to kitchen cookers, batteries to power station generators and, of course, telephones, once poured from GEC factories around the country. Rapid expansion began at the turn of the century on the back of lucrative lamp sales, and by the 1930s the company had established 24 works with a total floor area of well over ten million square feet. More was to come under the vigorous leadership of Arnold Weinstock when, in 1967, GEC forced a merger with Associated Electrical Industries, itself encompassing Metropolitan-Vickers, British Thompson Houston, Edison Swan, Siemens Brothers, Hotpoint and W.T.Henley's Telegraph Works Company. The next year English Electric followed suit, although more amicably, bringing its retinue of acquisitions: Willans & Robinson, Elliott Brothers, The Marconi Company, The Vulcan Foundry, and Dick Kerr.

The official history of GEC gives the birth of the enterprise as 1886 when Gustav Binswanger (later to change his name to Gustav Byng) employed a fellow German immigrant called Hugo Hirst. They had met because Hirst had been lodging at the house of Max Binswanger, Gustav's brother. The Binswangers' business operation, based in London, was more complex than the standard history suggests. They did not, as is often stated, set up initially to retail electrical goods but traded in the early 1880s as G.Binswanger & Company, offering a range of merchandise mainly associated with the mechanical engineering of steam generation. In fact, the range of products (asbestos packings, steam & boiler fittings, gauge glasses, lubricators and India Rubber goods) bore a remarkable similarity to those of a Manchester based engineer, inventor and iron merchant called

Delivery vehicle at the Peel-Connor Works, Coventry (c1920)



Charles Leigh Clarke. But the applications of electricity were gathering pace and before long Gustav Binswanger began the procurement and sale of electrical goods. In partnership with James Boyd, he formed the Electric Apparatus Company Ltd in 1884 to continue a business called the Electric Appliance Company that had already been run by Binswanger for a short time at Charing Cross. Separately, and operating from 29 Aldermanbury as G.Binswanger & Co. and The General Electric Apparatus Company, he imported or otherwise acquired electrical items, selling them on to the Electric Apparatus Co. with a 5% mark-up on cost. It was actually in 1884 that Hugo Hirst started working for Binswanger, as a Manager at the EAC. The venture did not make a profit and there was a disagreement between Binswanger and the other directors. On the 8th September 1886 Binswanger ceased to be a director of the EAC, taking Hirst with him, to continue with The General Electric Apparatus Company. The word 'Apparatus' was later dropped from the title and the General Electric Company then came into being. Hugo Hirst also started to emerge as the power behind GEC.

With a 'go-getter' like Hugo Hirst involved, it was not long before the fledgling GEC started making plans for large-scale manufacturing. Charles Leigh Clarke, previously mentioned and, incidentally, also an investor in the EAC, held a number of patents including one for a successful gas lighter. To exploit these inventions Clarke had helped set up the Patent Electric Gas Igniting Company Ltd at London which changed name to the Electric Portable Battery & Gas Igniting Company Ltd, and then moved to premises at Clegg's Court, off Chapel Street, Salford. Binswanger had business dealings with the EPBGIC, held some shares, and so when it went broke in 1887 he was well placed to take over the factory and associated patents with the help of a substantial loan from a finance company.

Although it was on the Salford side of the border with neighbouring Manchester, Binswanger & Hirst operated their factory under the name of the 'Manchester Electric Works Company'. The building stood between a sugar refinery and an engineering works on the banks of the River Irwell, accessed through the entrance to Clegg's Court. At the three-storey premises there was sufficient space to employ between three hundred and four hundred people. As large as this accommodation was, by the early 1890s it had become a little cramped. However, a move was forced upon the company after a fire swept through the place in 1895, leaving only the offices undamaged.

Not far from Clegg's Court stood the vacant six-storey Adelphi Mills on Silk Street. This was also near to the Irwell and overlooked Peel Park, a public amenity opened in 1846, named in honour of Robert Peel, founder of the Metropolitan Police Force. There is some evidence to suggest that GEC had acquired this property well before the fire, despite a colourful story later told by Hugo Hirst that the accommodation was found, moved into and operational all within four weeks of the destruction at Clegg's Court. Peel Works, as the Adelphi Mills was re-christened, remained GEC's main manufacturing site until large facilities at Birmingham and Coventry were established. As products were moved to new locations, so Peel Works concentrated more on telephone production. In 1905, the Meter Department was moved to a purpose-built factory nearby called Bow Street Works. A planning application of 1904 shows that the intended works could accommodate 140 men but no women. By 1910, when some members of the Salford Technical & Engineering Association organised an outing to Peel Works, the only reported non-telephone related activity there was a small section making stoves, kettles and other heating equipment.

THE FORMATION OF PEEL – CONNER TELEPHONE WORKS

A new chapter in the history of GEC's telephone business started sometime before 1908 with the arrival of American engineer Merritt Scott Conner. There can be no doubt that he was an important figure in subsequent developments. Peel Works became the Peel-Conner Telephone Works and in 1910 M.S.Conner held a sixth of the shares in the newly formed Peel-Conner Telephone Works Ltd, a subsidiary of GEC. In the same year, the meter department at Bow Street Works, at the rear of the main building, was incorporated as Salford Electrical Instruments Ltd. At GEC's annual meeting in July 1910, Gustav Byng reported with satisfaction on the installation of an exchange at Glasgow: '…one of the largest telephone exchanges in the kingdom, every particle, every screw, being made at our Salford Works.'

In spite of this boast, not everything from the Peel-Conner factory originated there.

Their early telephones often used parts imported from other manufacturers, and they then started gradually making their own parts to replace the imported ones. An example is the telephone shown from the 1912 catalogue. It is based on L M Ericsson's famous 'skeletal' model, the first handset phone to go into mass production. It proved very popular, so for some time GEC had been importing complete telephones and rebadging them. Under Conner, they replaced Ericsson's spoked gearwheel with a polished brass one of their own design. The ornate and expensive Ericsson handset was replaced with a simpler version using a Western Electric capsule transmitter that appears to have worked better on the British telephone system. The handset cradle was simplified and the pillar supporting the handset was shortened. The origins of the telephone were still obvious, but it was now a distinctly Peel-Conner version.

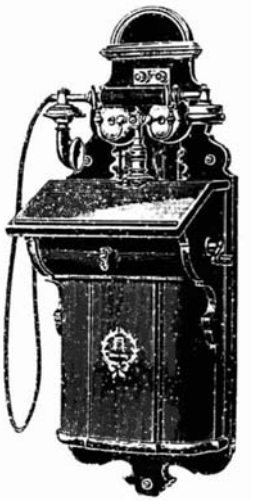
Model K88 based on an Ericsson "skeletal" phone, fitted with a GEC handset and cradle by Peel Conner.

GEC continued wholesaling the products of other specialised telephone producers in areas such as marine telephones and the coal mining industry, but it was their mainstream telephone production through Peel-Conner that now showed the greatest growth. Their growing reputation for quality led to many sales in Britain and overseas, with their first full 10,000-line telephone exchange being sold into Glasgow.

The first overseas sales were for 8,000 lines in six new exchanges in the Adelaide area of South Australia.

A typical early all metal "traction" phone for tramways and collieries, the Model K71

M.S.Conner set to work improving products and processes at the telephone works. A number of patents followed, some twenty applications being made between 1909 and the start of the First World War. Of course, when hostilities broke out it soon became apparent that industry in general had to vastly increase its production capacity and also its ability to respond to new requirements. Telephone production was vital to the war effort – but so were shells for the army's big guns. Apart from turning out trench telephones and trench microphones, Peel Works also developed a method of mass-producing shell casings. According to GEC publicity, the process allowed the production of 20,000 units per week when perfected. Another contribution came from the drawing board of M.S.Conner. Because of the wide use of German magnetos for internal combustion engines, there was naturally a shortage of these devices. Simms Motor Units Ltd, selling magnetos that were made to the design of Robert Bosch of Germany, was the main supplier of British manufactured units to the forces but, presumably, couldn't keep up with demand. Conner designed a suitable magneto, calling on his experience of magnetos for telephones, which fulfilled the requirements of reliability and functionality. The Government subsequently placed an order for 4500 of these. Merritt Conner visited Coventry where he observed that the expansion of the motorcar industry had resulted in a good supply of female workers. On his recommendation, a ten acre plot of land was bought at Stoke, Coventry for the construction of a magneto works to be run as another GEC subsidiary, The Conner Magneto & Ignition Ltd.



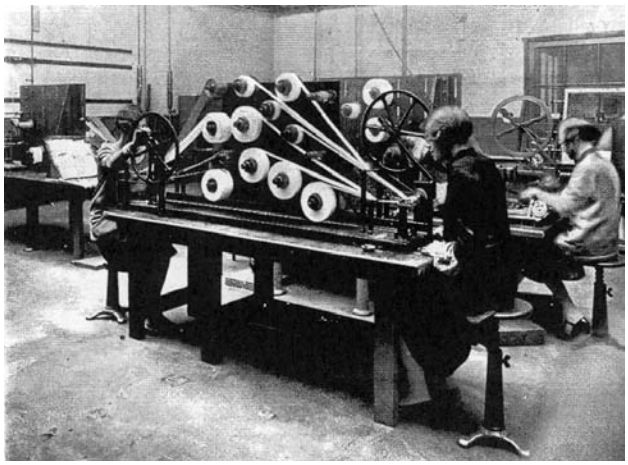
Ericsson magneto wall phone, fitted with GEC handset and cradle, GEC Model K8060

The 129,000 square feet at Peel Works was proving insufficient even before the start of the war. To help relieve the situation, cabinet making had been moved to another site, halfway along Adelphi Street, next to the Adelphi Iron Works of Sir James Farmer & Sons Ltd. But once established at Coventry, GEC acquired a further 136 acres at the same location on which to build a new telephone factory. Construction began in 1920 and production moved there in 1921. The Peel Works was now handed over to Salford Electrical Instruments Ltd, the erstwhile GEC meter department that had occupied a small 2-storey building since 1905. Merritt Conner was rewarded for his efforts by a directorship on the main GEC board. He held this position until a fall-out with fellow directors resulted in his departure back to the USA. The Coventry plant continued to be known as the Peel Conner Telephone Works until about 1930 when it changed name to GEC Telephone Works.

K8385, standard British Post Office candlestick

All the magneto business was sold to Simms Motor Units Ltd after Merritt Conner's departure, and the facilities turned over to radio production. Even though Stoke works continued to expand by the

addition of numerous extensions, production needs outstripped even these provisions. Eventually, GEC acquired another four sites in Coventry: Helen Street Works, Spon Street Works, Ford Street Works and Queen Victoria Road Works. The combined workforce in Coventry grew to about 10,000 in the early 1950s. At this time, GEC calculated some annual raw material consumption figures for telephone, radio and television production: 2000 ounces of platinum for electrical contacts, 2500 tons of ferrous metals, 1000 tons of non-ferrous metals, 63000 lbs of wool (said to be enough to make 12600 blankets), 44800 lbs of and 17 tons of electroplated zinc. The report also included the fact that 'Enough gas is used to make seven cups of tea for the whole population of the United Kingdom.'



Winding condensers, Peel Conner factory at Coventry 1920s

Despite their successes, GEC missed one critical invention – automatic switching of calls. When the British Post Office decided to automate its telephone network after the First World War, they selected the step-by-step system marketed in Britain by British Insulated and Helsby Cables Ltd. Peel-Conner was relegated to producing parts and phones for the BPO system based on telephones designed by Western Electric. As one of Britain's leading manufacturers their share of the contracts was significant, but telephones were no longer a major part of GEC's total output. Production turned to the relays, selectors and switchgear needed for the exchanges. They also began production of dials for the new telephones.

With the introduction of Bakelite moulding in the 1920s, high-pressure presses and Bakelite compounding equipment were installed at the new Coventry factory. Bakelite mouldings were used in so many electrical products that it made sense to put the presses where their output could be fed directly into the production lines. Bakelite telephones became one of GEC's major production lines. In 1921 the Peel-Conner company, now mainly a component producer, was absorbed back into the parent company and its telephone production was rebadged as GEC

THE BAKELITE YEARS

The quality of the GEC telephones remained as high as ever, and they continued as a source of export income for decades to come. In Australia, for instance, the GEC 400-series Bakelite telephones were still being imported in the 1960s before finally being replaced with a locally designed instrument.

The British Post Office standardised on a pyramid-shaped Bakelite telephone, the Tele 162. This had a separate bell set which could be bolted onto the base of the phone or located elsewhere in the house. It was a little clumsy and it was soon redesigned into the Tele 232, a similar looking telephone that overcame some of the 162's problems. GEC's engineers felt that there were still improvements to be made and they designed a telephone they christened the Gecophone. It was more rounded than the angular 232, but featured a one-piece case which included the bell set. It was eventually produced in Black, Chinese Red, Jade Green, Ivory and an attractive mottled 'walnut' finish. The colours were made possible by using a new moulding compound, Urea Formaldehyde, which had a slightly translucent appearance.

Gecophone in black bakelite

Unfortunately the Gecophone was not adopted by the British Post Office or any other large purchasers. It found a market niche on Private Automatic Exchanges sold by the Reliance Telephone Company and with some of the smaller telephone administrations, but was never as successful as it could have been. GEC continued production of the 232 in parallel with the Gecophone.

A weak point in the BPO's 162 and 232 was the 'antler' assembly that held the handset in place at the top of the phone. The antlers were fragile and broke fairly easily under hard treatment. The BPO did not develop a wall equivalent of the 232, preferring to mount a desk phone on a decorative steel wall stand instead. GEC produced a wall equivalent of their Gecophone, called the Muraphone (from the Latin 'mur' for wall). It was a rather shapely design built with rugged use in mind. Again, it was not adopted by the BPO but found a market position in the rental market. It was also used in large numbers by the various railway companies on their own networks, and enjoyed useful export sales.

Muraphone

The British Post Office developed their own phone, the 300 series; the familiar black Bakelite telephone used in thousands between the wars. GEC produced many of these telephones, but once again their engineers felt they could do better. They produced their 1000 series based fairly heavily on an L M Ericsson design. Technically it was similar to the 300, although simpler to build, and its case was softer and more rounded and its handset grip was oval in cross-section rather than the 300's triangular shape. Once again, the BPO stayed with its own design. After World War 2 the Australian Post Office adopted the telephone for their 400 series, but in the end kept the angular 300 case and added the new handset.

POST SECOND WORLD WAR

GEC moved successfully from Bakelite phones through the succession of plastic styles that followed World War 2. Telephone production moved to Aycliffe, Co. Durham in 1963. The BPO 706 telephone once again gave GEC engineers major contracts, and a chance to improve on the design. In 1966 they produced

a simpler, more angular version which they called the Sonic 70. Although it had some useful innovations, it was a complete failure in sales. This was effectively GEC's last major product in the telephone area.

Sonic 70 plastic phone.

Advert for BPO 700 Series

Around this time the British electrical industry was going through a series of mergers and rationalisations. GEC's intention was to become large enough to compete against overseas competition, and under new Managing Director Arnold Weinstock this was succeeding. Through the mergers, GEC also found itself the owners of other non-traditional companies such as those involved in shipbuilding and defence.

On Weinstock's retirement in 1996 the company seems to have lost direction. Under the guise of 'focusing on core business strengths', a popular management tool of the time, many of GEC's profitable fringe companies were sold off. It registered a change of name to the Marconi Corporation plc on 2nd March 2000 and concentrated on communications, the Internet and electronics. Then, in a major setback, the company failed to get even a minor share of a huge British Telecom network upgrade contract. Share prices fell and the company was only rescued by bank and shareholder support.

The Internet bubble burst in 2000, and by 2001 the new company's shares had dropped to an all-time low. On Tuesday, October 25, 2005, the company announced that it had sold its business and its name to L M Ericssons.

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MISCELLANEOUS

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ACKNOWLEGEMENTS

For proof reading thanks to Ken (KB) Taylor.

For information on Peel-Conner at Coventry we are indebted to Bob Freshwater.

Thanks also to Tim Ashworth of the local history library at Peel Park, Salford.

Linley Wilson in Australia kindly provided catalogues.

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