A History of Clarke and Smith – The mighty pygmy in electronics

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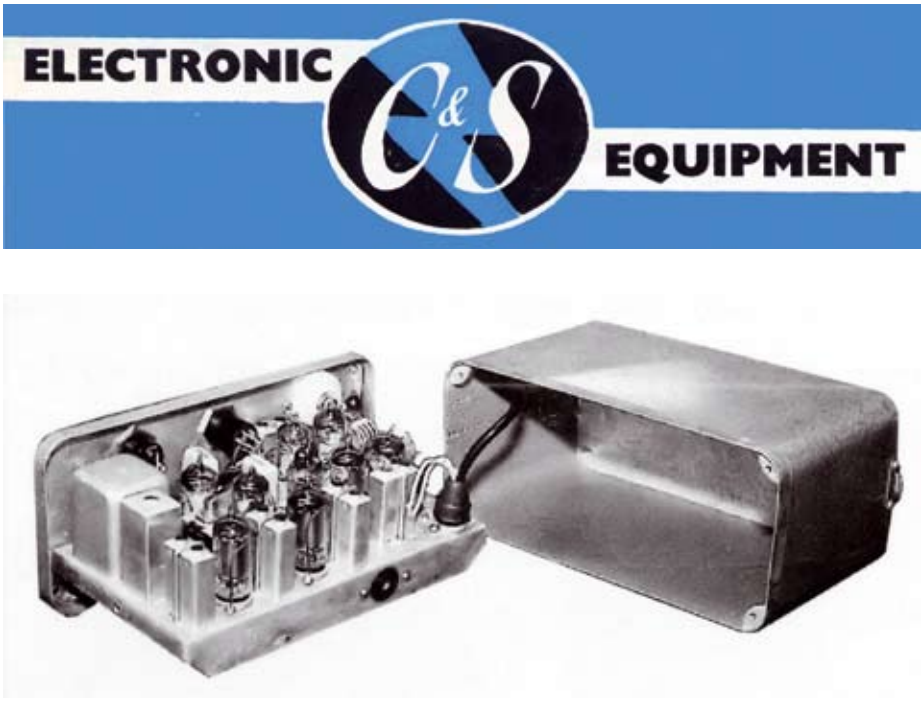
"If we ever get out of this alive, let's start up a business together" Those were the immortal words spoken by Major John Frank Edward Clarke to Warrant Officer Alec Smith in one of the darkest years of the Second World War, 1942, when virtually all of continental Europe was under Nazi Domination.

Clarke, 23, having joined the Territorial Army in 1939, was a young subaltern in The Royal Electrical and Mechanical Engineers (REME) would reach the rank of Major the following year and also the officer in charge of the command workshops. By 1945, he held the substantive rank of Lieutenant Colonel when commanding No 3 Battalion REME. It was here that he was to strike up what would be a lifelong friendship with Alec Smith.



A marvel of post war miniaturisation, the Clarke and Smith design of portable two way radio supplied to the Metropolitan Police in the late 1940s. The battery supplies are located in the lower compartment.

Frank Clarke's background before the war had been in electronics and had at an early age displayed his talents by building a crystal set housed inside a matchbox. He spent much of his teenage years studying electronics and wireless communications.

Before the beginning of the hostilities, and at the age of just 20, Clarke had set up a small electrical company dealing mainly in audio equipment. This had to be abandoned when he was called up for military service. Regrettably, with the passage of time the detail of these early business ventures has been lost. It would be fair to say however that this acumen for business along with the leadership and the management of operations during the war would prove to be a valuable asset with the setting up of a new company in the post war Britain of the 1940s and the subsequent industry competition that went with it. Frank Clarke would subsequently become a well known and respected figure in the industry and was often referred to as the "Major" in general conversation, by staff and those he did business with. You had to be on very good terms to be able to call him Frank, and few people it would seem would get that privilege.

Whilst Clarke's background is fairly well recorded, that of Alec Smith is sadly lacking. All that is known about Smith is his posting with REME, his management of the radio and communication workshops and his early association and friendship with Clarke born from their love of all things electrical and electronic. As is often the case the engineer, and in this instance a highly gifted one, gets consigned to the backroom. It is however recorded that Smith had advanced "hands on" ability and his skills would appear in many of the company's early products. Anecdotally it has been suggested to the author that Smith was at his happiest smoking a pipe and winding transformers in a corner of the workshop or sketching out a new circuit. Smith however was instrumental in developing many of the firm's designs and many of these will be found in the early products subsequently marketed by the firm. It was the early designs produced by Alec Smith that would see the new firm quickly prosper and initially supply an educational market with an almost insatiable appetite for audio equipment of the highest quality.

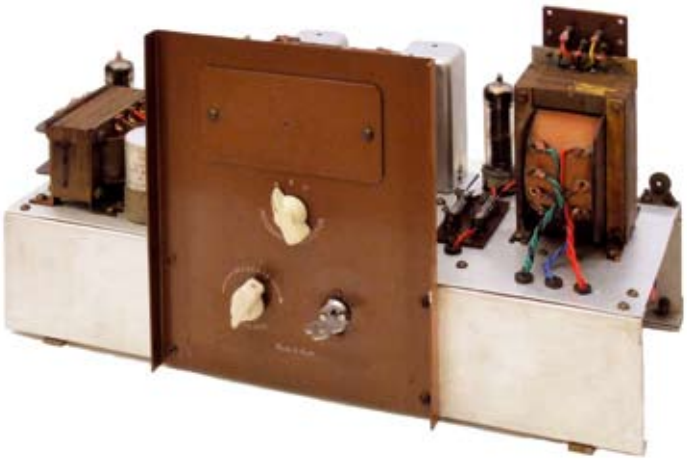
Wallington, the formative years

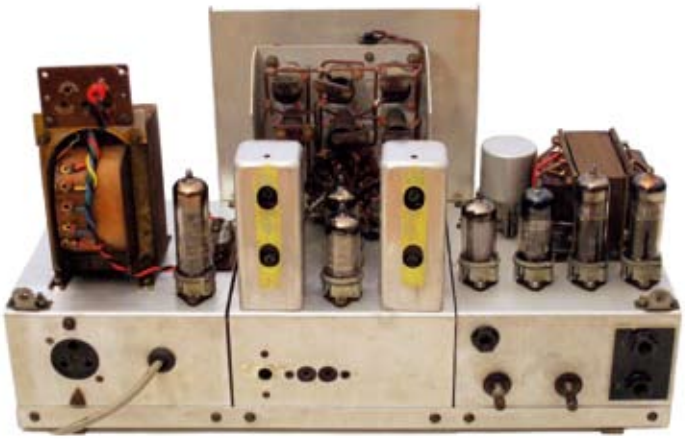
They did get out alive, and together, and started up Clarke and Smith in 1946 with just £100 of capital. The first premises comprised a simple corrugated tin hut on land located on the Melbourne Road in Wallington Surrey. It would be here that the company was subsequently incorporated on 4th June 1947 as Clarke and Smith Manufacturing Co Ltd. The location was allegedly chosen because it was equidistant between the partners' homes. As we shall see in the history of the firm, they were to become a force to be reckoned with, spanning many areas of engineering and electronics. They would also buy out or control many concerns, including some well known in recording and

Hi-Fi, a subject to which we shall return in detail later. In fact at the firm's height, there would be very few areas of electronics and light engineering in which it had not been involved in some form or another.

With insufficient capital to start manufacturing, the fledgling firm started out by repairing sets on a contract basis supplied by some of the local wireless concerns. Their first employee was Clarke's first wife, Olga who worked part time, as the firm's secretary. Business flourished for a little while, but once the major wireless manufacturers returned to the production of new sets, the repair work started to tail off. As a result of this Clarke and Smith, for a brief period, started to manufacture high quality radiograms. These were destined for a few of the well known department stores of the period. The venture was in essence killed off by the doubling of purchase tax on luxury goods without warning. As for these Clarke and Smith produced radiograms, no examples appear to have survived nor have any early sales or technical information.

By 1948 with production at a near standstill, and by then with 12 employees to support, the firm had little alternative but to seek out other work. 1948 was also the year that the BBC made it known that they were the approving authority for schools broadcasting equipment, and on hearing this Clarke and Smith began telephoning all the local councils in the South East. They struck lucky, as from these phone calls they found out that Kent County Council was about to seek tenders for such equipment. The two partners visited the council to obtain the details of the specifications and were subsequently invited to participate in a three day competitive demonstration at the Maidstone Technical College. Unbelievable as it may sound; they had just two weeks in which to design and produce from scratch the four pieces of equipment the tender called for. These were a radio receiver amplifier, record player, classroom loudspeaker and an auditorium loudspeaker enclosure. With such little time in which to act, the firm had to hastily recruit additional staff, with a local joinery firm engaged to





Above: The model 12 talking book gramophone first designed and produced by Clarke and Smith in 1950. The unit featured the novel method of housing the pickup in the lid, simplifying the replay process for the visually impaired. Initially the player was introduced with the original talking book standard of 24rpm. Later versions of the machine also accommodated the 16 rpm speed.

Top right: The SB4 AM only Receiver amplifier designed for portability between classrooms and capable of driving two loudspeakers. The stations are of the preset type. This particular example probably dates for the early 1950s and features a Bulgin key operated on/off switch to prevent tampering.

Centre right and right: The chassis of the SB4 showing the neat and modular layout of the set, a feature that would be retained on many of the later designs. The valve line up is typical of a period superhet with the B8A range of valves being employed these being EZ40, ECH42, EF41, EBC41, ECC40 and two EL41s. A 4 Watt output is claimed from the set. A gram socket is located on the rear along with the bass and treble controls.

The 88-10 AM receiver amplifier dating from the very early 1950s and featuring the standard Mullard range of octal valves available at the time. This set has an abundance of EBC33s, three of which are strapped as triodes. As there appears to be no technical advantage it has to be assumed that these valves were obtained at such a low price that it worked out cheaper to produce like this. Provision is made for gram and for feeding into further amplifiers. The output pair are EL33s. Note the use of a moving coil meter to indicate signal strength. The set still has its previous owner's badge declaring it Equipment Number 4, Surrey County Council. The cabinet is made of solid oak. The similarly designed later series were manufactured from oak–faced ply.

The BBC commenced its first broadcast for schools on the 4th April 1924. The broadcast was presented by Sir Walford Davies, the corporation's first director of BBC radio choral broadcasts. Davies was already a well known composer arranger and choirmaster, but it was in radio that Davies made his great mark on the nation until his unexpected death in 1941.

Right: A rare example of a Clarke and Smith Television receiver in use in a classroom environment, the picture dates from 1960. The receiver featured is thought to be the problematic SBDV2/A which, when first introduced in the mid 1950s, featured the then largest CRT available on the market.

produce suitable cabinets. The prototypes were in fact only tested on the morning of the demonstration, so tight was the deadline. Unfortunately no details survive of these very first items but it is highly probable that the later schools equipment was based on these early, and what would become almost instantly recognisable, designs in later years.

Nevertheless, despite the near impossible deadline, the Clarke and Smith equipment was tested against three other well known competitors and accepted by KCC. They were also subsequently approved by the BBC Schools Broadcasting Council. The firm was offered a five year contract subject to an inspection of its premises at Wallington.

This posed an immediate problem for Clarke and Smith; with little resources in place and based in a tin hut, would the Council want to do business with a firm that had such a short history in manufacturing the type and quality of equipment that was demanded in the tender? To pre-empt what could be a disaster, Clarke cleverly came up with an agreement whereby Clarke and Smith should be engaged on a trial basis for a three month period, delivering the required equipment to the value of £2,000 all to specification. The trial period was successful and over the coming years, some 300 authorities were subsequently approached, with Clarke and Smith eventually becoming one of the biggest suppliers of electronic equipment in the UK to schools, colleges and local authorities only finally relinquishing their grip on this lucrative market in the 1970s.

Schools Broadcasting

The origins of the BBC broadcasts to schools can be traced back to April 1924 when Sir Walford Davis gave the first educational broadcast, which paved the way for regular schools transmissions. A number of firms supplied suitable receiving equipment and amplifiers to satisfy the demands placed by the educational sector. These include Sound Sales, Burndept and later, Goodsell, Trix, Ambassador and Coomber and Son, a firm that started life in the early 1900s and is still active in the educational markets today. Clarke and Smith were by no means the first in this field. What was to set them apart from the rest was the rugged but straightforward, reliable designs of equipment that would have to endure rough handling in the school classroom and be easily operated by non–technical personnel.

An example of this ruggedness is one that was recounted by Clarke in connection with a visit to Shrewsbury Council in the very early days. Access to the audio visual aids office was by a narrow spiral staircase. Clarke slipped and dropped the wireless taken along for a demonstration shattering one of the output valves. To the amazement of both parties, the set still worked with apparently little loss of efficiency. The council officials were so impressed that an order for 12 sets was duly placed. Back at the factory, the

Top: The original factory complex at Wallington taken during the 1960s the later additions are also believed to have been added at this time.

Above: The first company premises consisted of a slightly run down tin hut. In the back ground the new purpose built factory can be seen rising from the foundations. The firm would eventually own much of the property on the surrounding land.

Top, right: Alec Smith and Major Clarke putting the finishing touches to the purpose built factory block that they had designed from scratch. A fifth floor was later added to the existing building due to the rapid expansion of the business.

Right: The three tradesmen who built the entire Melbourne Road factory block. Peter Bushnell, bricklayer, Peter Chucki, labourer and Thomas Russell who carried out the carpentry and structural work. They were all Clarke and Smith employees. It is not recorded how long they took to construct the factory.

set underwent a small modification resulting in fewer valves, a worthwhile cost saving and, little if any difference in performance. Of course, the simple explanation for this is probably the fact that only one of the push-pull output valves was broken in the mishap, with the other simply carrying on with a slight reduction in output, unknown of course to the official concerned.

In 1949, the Home Office communications branch, who at the time were responsible for specifying communications for the police and fire service, made it known that they were tendering for a portable “walkie talkie” unit. This came to the attention of Clarke and Smith through one C.O. Fletcher, the firm’s first salesman. Fletcher was a 70 year old retired businessman with a decidedly Victorian approach to selling but an excellent propagandist for Clarke and Smith, happily telling all and sundry about the outstanding talents of the two young gents who had started a business on a shoestring.

It is apparently recorded that on Fletcher’s first meeting with the then director of the Home Office communications branch, Commander Best, he swept into the room saying “I bring you the compliments of Major Clarke and Mr Smith” To which the commander replied, “Thank you very much. But who is Major Clarke and Mr Smith?” The sales pitch must have worked as the firm won the subsequent contract to supply the two way radio with evidently many hundreds eventually being manufactured. There is also anecdotal evidence to suggest they were still involved in this area of communications up to the late 1950s.

With so much work now rolling in, the company went through considerable expansion which appears to have got underway in the early 1950s with the original tin hut disappearing, being replaced by a four (later five) storey factory block, offices and a stores building. Clarke and Smith acquired much of the surrounding land in the process including property that was detached from the main site. One of these was a house which provided the accommodation for the service department located on the main road. The remarkable thing about the construction of the new factory is that it was built over a few short years almost entirely by the company itself under the direction of Major Clarke. The drawing office produced all the plans with the construction being undertaken by a team of just three men who were direct employees of the firm.

Such was the local interest generated in the construction work at the time that the local paper covered the story. This is how it was reported: “Near Wallington Railway Station is a large red-brick building. From the roof shoots a giant radio aerial. It is a familiar sight to the hundreds of people who travel daily along that line.

But how many people know the story of that building – which consists

Some of the faces behind the early success of the firm. (Left to right from top)
Major J.F.E Clarke, Chairman, Alec Smith, Head of Research, Mrs Olga Clarke the Major's first wife and part time secretary in the early days of the firm, later becoming a director. W.A. Boggia, managing director and chief executive who remained with the firm for many years. Donald Pettit, Clarke and Smiths first factory employee, seen here in a picture taken during the 1980s.

Far right: Above: Clarke and Smith produced this wireless operator training set, model STR/3 presumably for training military personnel during the 1950s. This would have been part of a larger array of equipment possibly including a tape tutor system that was centrally controlled. Note the circuit diagram stuck on the inside of the lid.

of nearly a quarter of a million bricks, all laid by only one pair of hands, those of bricklayer Percy Bushnell!

That in itself is remarkable, but woven round it is an even more remarkable story, which started with an idea during the war and is now a thriving industry in Wallington, employing hundreds of local people and with an annual turnover figure running well into six figures...

Much of the firm's success is their self-sufficiency. That is where Percy Bushnell comes in. He joined the staff in the early days and brick-by-brick has built the Melbourne Road factory, which has a floor space of many thousands of square feet and is four storeys high.

He was assisted by his labourer, Peter Chucki, a Pole, with Thomas Russell doing the carpentry and reinforced concrete structural work. It is to be hoped that in the future this team of three proud men, who now have good positions with the firm, will erect additional buildings in the same way. The work they have so far completed has been in addition to converting a stable for offices, which adjoin the Melbourne Road factory, and helping to build the cabinet making plant in Clyde Road."

Talking books

Another of the technologies that Clarke and Smith were involved in at the start of the 1950s was the development and production of the then gramophone based talking book. The method had been well established since the early 1930s as a means of providing recorded material to the visually impaired, when the RNIB had introduced a specially modified machine capable of replaying discs at a non standard industry speed of 24 rpm. The development of this system dates back to work carried out in the U.S during the 1920s. With the advent of broadcast radio and the first talkies of the late 1920s, engineers developed a disc capable of replaying at 33⅓ rpm to be able to time shift a radio programme for subsequent replay in a different time zone by another radio station.

These recordings were known as electrical transcriptions that could play continuously for 30 minutes. The discs were 16 inches diameter and made of aluminium or a semi flexible cellulose acetate compound. Similar in nature to the direct–to–disc recording systems (or acetates) as used later by the BBC, and remaining the method employed today. The Vitaphone Co in the US also introduced a similar system in 1926 which was operated alongside a film projector. The disc and speed were ideally suited as they were capable of running for the same length of time as a reel of film. The 33⅓ speed did not appear on the domestic markets as the LP until 1948 by which time considerable improvements had been made to the recording and replay processes.

One person who followed these early disc developments was a blind American by the name of Robert Irwin. In 1924 he was visited by John W Dyer a young man whose father Frank L Dyer, had just applied for several patents covering variations on existing recording methods. Principally these were turntable speeds slower than the current standard of 78rpm and much narrower groove pitch of the then current standard of 90 to 100 grooves to the inch.

Irwin immediately saw the potential of the Dyer patents which resulted in a letter to a friend in the spring of 1924 stating that there was "a scheme simmering in which I am tremendously interested for making phonograph records which will contain 15,000 words on the side of a 12 inch disc, which could be manufactured

The GP3 (3 Watt amplifier) and GP7 (7 Watt Amplifier) based record players were produced for a number of years also later to be known as the PGS Series and were fitted with a combination of decks such as the Lenco or those produced by Garrard and Collaro and with or without an internal loudspeaker. This equipment was advertised as being suitable for music and movement, country dancing and physical education. The amplifiers were also general purpose in nature and available in a self contained portable, metal cabinet, with the GP7 featuring a microphone input.

cheaply and played on an inexpensive playback machine. If we do not die too young, you and I may both live to see some revolutionary changes in books for the blind"

Later, the Dyer patents would be the subject of a court case which he subsequently lost on the grounds "that they were not original principles but merely a difference in the degree of existing processes".

The American Foundation for the Blind subsequently adopted the system in the early 1930s. The discs replayed at 24rpm and could hold 25 minutes worth of a recording per side (about 4,500 words). In the UK the RNIB had been experimenting it would appear, completely separately as early as 1920 but did not adopt the system that had originated in the US until the early 1930s. The first recordings in this format appeared in late 1935.

By the time Clarke and Smith had entered the market, the talking book service had been long established with a relatively reliable system of reasonable audio quality that could hold a complete novel on ten double sided 12 inch discs. Frank Clarke's interest in this medium stemmed from the fact that his grandmother was blind and also through a friendship with Lord Fraser, a blind member of parliament and head of St Dunstan's, an organisation first set up in 1915 to help blind ex servicemen and women. Clarke was acutely aware of the difficulties experienced by the visually impaired and contact was made with the RNIB (a relationship that would subsequently play a large part of the business for many years and be very lucrative for Clarke and Smith in the process) resulting in an improved record player (the first in fact) that could be used by a blind person completely unaided.

The improvement was so simple that you wonder why it was not thought of before. The record player that was subsequently designed and manufactured by the firm did away completely with the conventional pick up, housing it instead in the lid of the equipment, the idea being that as soon as the user closed the lid the record would be ready to play without any further intervention by the user.

The record player known as the Model 12, using a modified Garrard deck would see use right up to the end of the 1950s when the first proprietary magnetic tape cartridge would appear, rendering the gramophone disc obsolete. Later versions of the Model 12 could in fact replay both 16 and 24 rpm discs, to take advantage of the then alternative commercially produced talking book records issued by VOX.

With the emergence of practical magnetic recording after the war and the subsequent appearance of the magnetic tape recorder in the UK in the latter half of the 1940s, the RNIB started looking at the possibilities of using the medium for the talking book service. By 1960 several articles and editorials had appeared in one form or another, most notably in Wireless World and The Tape Recorder Magazine. The development time appears to have been a long one with the RNIB claiming that they had developed the system after several years of research. It is not entirely clear therefore exactly how much involvement Clarke and Smith actually had in the research and development side of things, as they appear to have made not dissimilar claims. The fact remains however that the talking book tape cartridge was a truly revolutionary development at a time when multi track, magnetic tape was still considered a bit of a novelty. The development work appears to have been carried out under the direction of Alec Smith

Far left: A small selection from the range of loudspeaker enclosures available to schools and various institutions during the 1950s and 1960s.
Centre: MK1 Talking Book: The first magnetic tape based talking book produced for the RNIB from around 1960. The development period appears to have spanned nearly ten years.
Top right: The fairly complex internal mechanism of the talking book magazine, using a stacked spool arrangement and ½ inch magnetic tape.
Far right: Major Clarke, Freddie Bellis and Alec Smith seen here examining the MK1 talking book player by this time in production form.

with one of the firm's engineers, Freddie Bellis, also being involved in the project.

The cartridge had a number of salient features; these were the ability to contain up to 18 tracks recorded across a ½ inch magnetic tape and the cartridge could contain up to 20 hours worth of recording, considerably more than the disc based system. The deck did not replay at a conventional tape speed, which was non–linear. This was dictated by the driving spindle on the deck, rotating at a constant 15rpm. As the tape played out, it's diameter in relation to the take up spool increased and with it the tape speed. As the replay process is the reverse of the recording conditions, the pitch remained constant.

In fact this method was ideal for speech recordings and was employed on some of the early Grundig Stenorette dictation machines of the 1950s. The weight of the new cartridge was 6lb and earned the nickname of "talking bulk" in some circles. Nevertheless by late 1960, the first recordings started to be issued in this new format with the disc version gradually being phased out. Clarke and Smith, as the sole manufacturer, made thousands of these along with the special deck and tape cartridge, not just for the home market but for export as well. The tape cartridge housed the complete mechanism, track change linkages, replay heads and tape spools which were stacked on top of one another within the housing. Interestingly the firm gets no mention at all in any of the technical press apart from being referred to as the "major manufacturer" involved in the production of these, even though it is obvious from some of the accompanying pictures that it was.

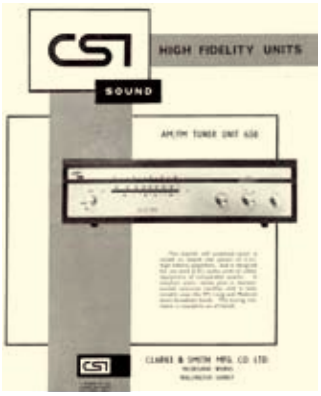
The early duplication processes were somewhat complex. The master recording was dubbed at high speed from a standard ¼ inch tape on to 12 copies of the talking book media at a time. With other attendant complications such as the instruction announcements, the 18 tracks were initially dubbed over one at a time. The resulting recorded tape was then wound into the cartridge and sealed. Although this process may appear very time consuming today, this was state of the art technology back in the early 1960s. Tape also gave the producers relative freedom over the number of copies required at a given time and this could be varied to suit the demand; the new medium could also be reused and saved on costs. A typical production onto disc could have taken up to 18 months to reach the listener from inception to completion: with tape it was reduced to the same number of days.

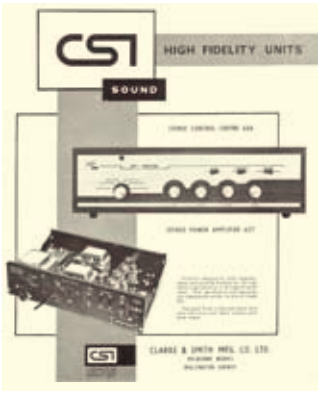
The educational market

From the 1950s onwards, Clarke and Smith also designed and produced a large range of equipment for the wider educational market; some of these were almost certainly based upon the original Kent County Council equipment of the late 1940s. The earliest of these ranges comprised the portable SB4 classroom AM receiver amplifier consisting of a three position pre-set station selector and a push–pull output comprising a pair of EL41s' to give a 4 watt output, capable of driving two classroom loudspeakers. A larger receiver designated the 88/10 was fully tuneable across the AM band along with a provision for a microphone or gram input and using a pair of EL33s' in a push pull arrangement designed to work with a larger number of speakers of the type installed across a medium sized school. On the early installations the equipment was generally terminated in each classroom or hall, a special Belling Lee, 3 pin socket, with the speaker fitted with an appropriate matching plug. The equipment was housed in a solid oak cabinet with the metalwork finished in a smooth gold paint. Many of the early receivers featured a lockable front flap or a key operated on/off switch to stop any interference equipment by inquisitive fingers.

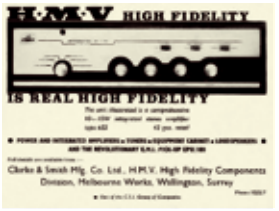
The cabinet and cosmetic finishes would change very little, although the later equipment adopted oak veneered ply cabinets to cut down on cost. Subsequent developments also saw the receivers designed with much larger outputs, and the introduction of the VHF waveband on certain models, from the mid 1950s onwards. Apart from that little was changed electronically until the adoption of transistor based equipment from the early 1960s when the solid oak cabinets eventually gave way to cheaper timbers and plastics. The later valve based range was developed into the 88/12 (EL84s) the 88/20 (parallel push-pull EL84s) and the 88/25 (EL34s). In the FM

Above: The STR 4 tape recorder from 1959 featuring the Ferrograph Wearite Series 4 deck was a good performer in terms of facilities and overall quality. This equipment was also made available to the general public.



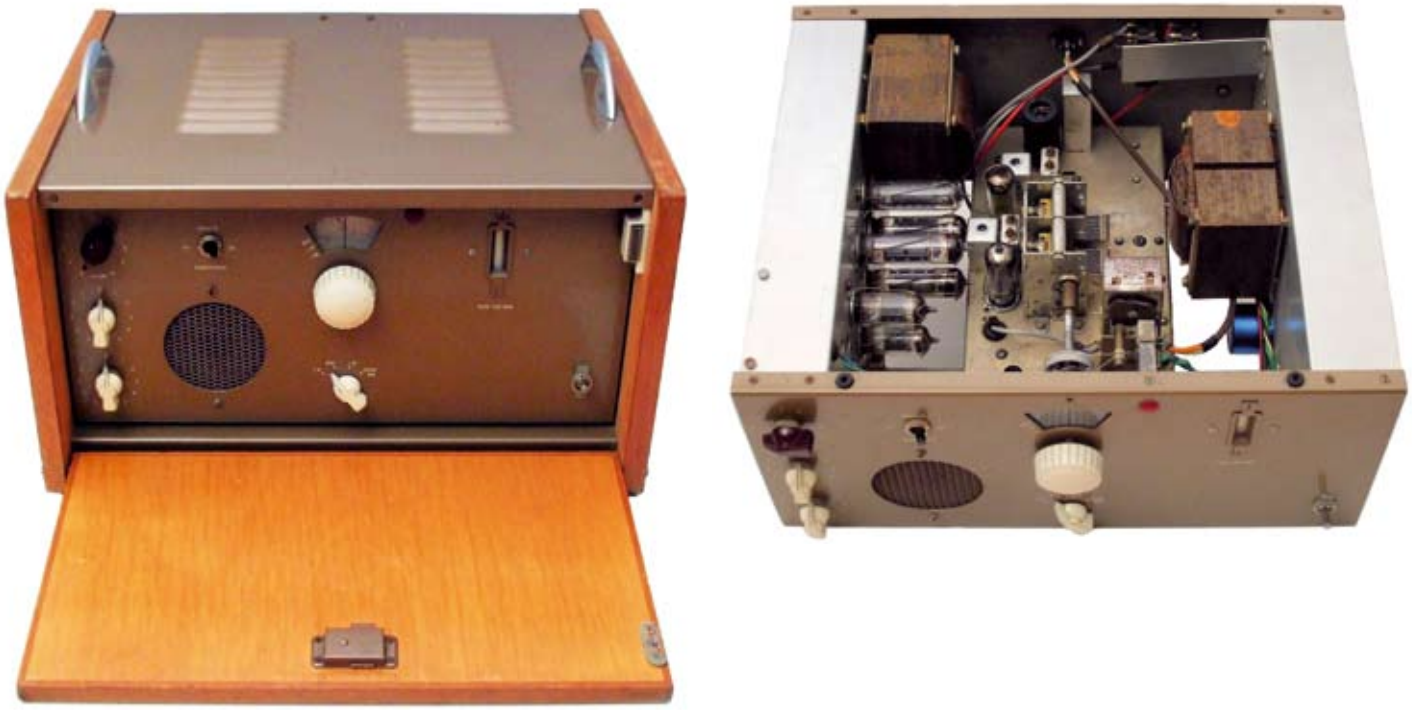


Above and below: Clarke and Smith manufactured a number of high quality hi-fi amplifiers from 1959 produced under Scientific Technical Development Ltd a division of the firm headed by Alec Smith. These were also produced until the early 1960s for EMI and also appeared with the HMV badge. With Major Clarke's departure from the EMI board this arrangement lapsed. The firm did for a short period produce cut down versions of these products such as the CS1 655 series of amplifiers and tuners.



Below: Major Clarke is seen here with Herbert Weisberg President of the American company who imported the Clarke and Smith/EMI Hi-fi products, seen here alongside one of the firms loudspeaker enclosures. The picture is thought to date from around 1959.

Below: An advert from 1963 for the then recently acquired Associated Electrical Maintenance division that Major Clarke had secured from EMI as part of the buyback deal. The picture suggests that it was quite a sizable operation although it was reportedly a loss making division of EMI at the time of the acquisition. It was to eventually disappear in the early 1970s.



The later 88-20 AM/FM receiver amplifier. This example dates from the mid 1960s and followed the well established cabinet tradition with the drop down lockable flap. This example features EL84s in a parallel push pull arrangement and a semiconductor based FM tuner. Various versions of the 88 series were produced over the years, the second generation AM only equipment for example, and originally featured B8A valves throughout with parallel push pull EL41s and a neon tuning indicator. EM34s or EM84s will also be found as the tuning indicator in some models. The earliest of the 88 series FM models featured a valve based "bought in" tuner utilising an ECC85 which was prone to periodic drifting.

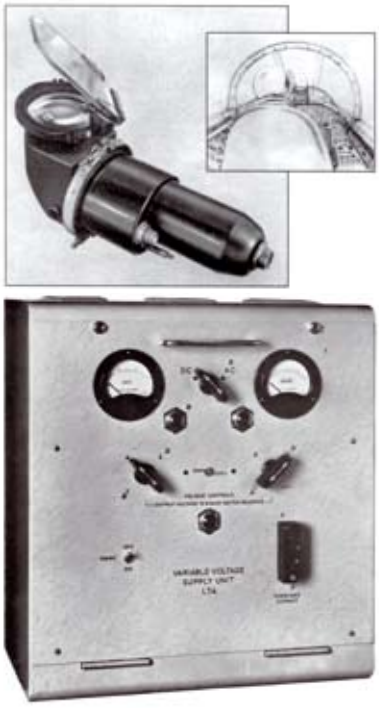
models, the tuner section featured a valve module fitted with an ECC85, which was prone to drifting; this was later modified to a Mullard LP1179 transistorised tuner module fed from the valve heater supply via a silicon diode. The 88 series was apparently still in production in the early 1970s.

Another model known as the SB/FM series was introduced in three different versions each denoting the power output respectively. These were the SB/FM7, 12 and 25; the latter used a pair of EL34s and was capable of feeding up to twelve loudspeakers. The stations were of the preset type giving the user a three position selector for the Light, Third or Home services. Clarke and Smith also designed a special negative feedback arrangement in the tuners of these amplifiers to give a claimed "low radio frequency circuit distortion". The author has not however been able to establish what benefits this may have yielded in a noisy classroom. A mixer amplifier of similar appearance to the 88 series and known as the MX20 was also produced along with various small amplifier designs known as the GP3 with a single ended EL84 and the GP7 containing Push-pull ECL86s. The chassis of these were so designed to either be supplied in a self contained portable cabinet, or as is more commonly found, fitted into the various record player models available at the same time.
The internal construction of all the designs was to a very high standard and allowed easy servicing with in many cases the removal of just two screws needed before the whole receiver or amplifier could be slid out. The neatness and attention to detail is one of the things that stands out in all of these designs. Depending on the vintage, various forms of tuning indication were used including a moving coil meter, neon lamp or a miniature "magic eye" valve. Generous smoothing was employed and in some cases more than one rectifier valve may be found on the power supply chassis of the larger receivers. The amplifiers and receivers were in most cases designed to feed multi speaker configurations and were fitted with multi tapped, transformers. The American 70v line standard was adopted on safety grounds along with provision for low impedance working of 3 or 15 ohm selected by a rotary switch on the back of the equipment. The circuitry on this equipment was generally conventional and followed the design trends and valve ranges available to manufacturers at the time. The only let down was the use of sheet aluminium for the chassis which was prone to buckling under the weight of the anvariably large transformers used in some of the designs.

The supply contract to certain Northern authorities does however appear to have differed slightly. Some of these early classroom receivers supplied to the North were floor standing consoles fabricated entirely from steel and finished in a light grey. The amplifier was housed in the bottom of the console with the speaker in almost baffle fashion, and not dissimilar to the floor standing wireless consoles produced by Murphy. Why these differed so much in appearance could just be down to the individual contract requirements. The firm had operated a general policy of "you specify it and we'll make it," so this could well be how this came about. A large range of suitable loudspeaker enclosures were developed and produced over a number of years to suit almost every situation and these varied from the wedge shaped floor or wall mounted cabinets through to the wall mounted column designs for auditoriums. These were generally finished in oak or beech with a heavy duty weaved cloth or an expanded metal grille depending on the model. At the firm's peak, Clarke and Smith could justifiably claim that it had equipment in one form or another in every school across the country, manufacturing some 600 items in 25 categories with 60 types of loudspeaker alone.

With the arrival of the comprehensive school in the early 1960s, Clarke and Smith carried out many of the installations in schools located in London and the South East, and at one point had a team of two engineers solely engaged on the installation and fitting out work. Contractors carried out the main cabling throughout the various buildings with the firm's engineers dealing with the final termination to the purpose made rack mounted amplifiers and ancillary equipment. These high powered systems not only provided radio signals to an array of loudspeakers fitted in each of the classrooms and corridors, (in some cases the speaker and associated controls was an integral part of the blackboard), but also class change signals, fire alarm tones, master clock pulse generation, and public address facilities, with a microphone quite often housed in the headmaster's office.

From around 1955, the firm also produced its first magnetic tape recorder the GTR5 which used the early Truvox Mk3 deck. This was superseded by the CTR1 using the Collaro transcriptor and a larger output featuring ECL82's in a push pull arrangement and a separate bias erase oscillator and the STR4 introduced in 1959 using the Ferrograph



The head up display was one of the firm's success stories in the early 1960s. Seen here in the picture are Air Marshall Morris, Chief of Staff (seated in front of the unit) behind him left to right are Freddie Bellis, Major Clarke and Alec Smith. The two men to the far left are unknown but may have been connected with Specto. Above, left: Clarke and Smith produced a small range of laboratory grade equipment and accessories for schools during the 1950s and 1960s, The LT 4 variable low voltage supply unit seen here, supplied 2 to 24 Volts AC or DC in 2 Volt steps with a maximum current rating of 24 Amps, fully stabilised.

Wearite deck Series 4. The latter two were made available to the general public.

Television for schools and colleges

By 1957, Clarke and Smith had produced their first schools television receiver, the 405 Line SB/DV2A using 21, 23 and 27 inch picture tubes, to be ready for the first schools broadcasts radiated by ITV in that year. These sets used some of the largest cathode ray tubes available at the time, and were typically housed in a large oak cabinet with double doors set high, upon a special metal framed trolley. The manufacturer of the larger 27 inch tubes, RCA, made available a sample, which did the rounds within the manufacturing industry, passing through the hands of Clarke and Smith, Pye, Ultra and other television manufacturers of the period. This large tube had in fact been available in the US since late 1952 for luxury consoles. Evidently, Clarke and Smith had just two months of the summer of that year to get their first batch of receivers designed and produced around this tube, and installed in time for the start of the new academic year.

The development work was undertaken at such a pace that the design of line output transformer was overlooked, resulting in severely overrun components. By the Christmas of that year, most of the sets had suffered with burnt out LOPTs resulting in a Clarke and Smith engineer being hastily dispatched around the Kent area to upgrade the faulty component and make any necessary modifications. Such practices would be unheard of today. The later Clarke and Smith schools televisions appear to have fared better and at least two further ranges were produced in the early 1960s, with the last of these incorporating a dual standard (405/625 line) chassis. These models were known as the 733 which incorporated a 27inch tube and the 734 in which was fitted a 23 inch tube. To meet the safety requirements demanded in a schools environment, the designs featured a fully isolated chassis and a double wound mains transformer. The audio output stages of these sets were also larger and in one design, fed a loudspeaker that was actually fitted on top of the television set in a baffle arrangement.

For schools within the London area the Inner London Education Authority was planning the introduction of a cabled system which would eventually serve some 900 schools and colleges across the various boroughs. The project was first implemented in 1965 and was in full operation by the late 1960s. The first transmissions were from an old school in Laycock Street in Islington, London with the service later being transferred to purpose built studios in Battersea, London. The system was distributed by the GPO on special co-axial cable installed for the purpose and resulted in a vast array of cabling under the streets of the capital. The service which included the BBC and ITV programmes along with the ILEAs' higher educational channels originating from Battersea and remotely injected from other colleges was distributed at 625 Line VHF in the region of 40-140 MHz. The sets subsequently supplied for the system were specially modified Decca television receivers not entirely dissimilar to the Clarke and Smith manufactured ones.

Whether or not Clarke and Smith were ever invited to tender to supply sets to run on this system is unclear, as their sets were only designed to run on a conventional "off air" signal. Once the ILEA system was underway, any already installed in schools within the London area were probably consigned to the store cupboard as a standby. Suffice to say, it would appear that production of schools television receivers was probably wound down by the late 1960s, with the supply of these by then only to educational authorities outside the London area.

Apparently when Clarke and Smith sold off the land at the front of the site in the late 1980s to the Japanese multinational Canon for their new UK headquarters as a fundraising exercise, a house full of old schools television spares came to light, apparently long forgotten. Needless to say these probably all went into the skip. Due to the rarity of these televisions, none have turned up to allow further examination of the construction or circuitry.

EMI and High Fidelity

By the late 1950s Clarke and Smith had formed a subsidiary named STD Ltd (Scientific and Technical Developments) headed by Alec Smith which, despite the name, appears initially only to have dealt with the range of Hi-Fi the firm would subsequently produce for Electrical and Musical Industries (EMI) at Hayes in Middlesex. Evidently Clarke and Smith came to the attention of Sir Joseph Lockwood, the then chairman at EMI. Clarke was invited to join the board of EMI as a non executive director with a view to rationalise the operations of their sales and services companies. EMI bought a 49 percent stake in Clarke and Smith to cement the bond, this being effected in late 1959. This co-operation also saw the introduction of the acclaimed Hi-Fi products under the Emisonic and Stereoscope range and also

Above: The Specto 171 tape recorder was introduced in 1960 and was one of a handful of machines to appear on the market that would feature the ill fated Garrard tape magazine deck. Specto had already manufactured a small number of other tape recorder models and also produced a fairly short lived range of HI-Fi amplifiers also under the Spectone badge. Specto became part of the Clarke and Smith group in the late 1950s and was already in the business of producing 16mm cine projectors for education and industry. Here are two examples, The Specto Motion (top, right), designed for special applications including slow and stop motion and the Specto Sound (above, right), a fully featured projector featuring optical and magnetic sound replay. These were latterly badged CSI. (Clarke and Smith Industries)

included HMV badged models. The range was to include high quality amplifiers and loudspeaker enclosures and by late 1959, several products had been introduced on the market under the EMI brands. It would appear that most of these were destined for the American markets making them a sought after collectable in the UK due to their rarity. 1959 also proved notable in that Clarke was appointed chairman of the recently formed BREMA Audio group initially made up of Clarke and Smith, Lowther, BTH, Dynatron and several other well known high end audio manufacturers.

The models produced by Clarke and Smith included the STD 300 and 400 series which comprised a high quality stereo amplifier and control unit of different power outputs ranging from 2.5 though to 10 Watts per channel. A higher powered mono amplifier was also produced capable of delivering a power output of 25 watts. Whilst most of these amplifiers received good reviews in the press, the most unusual design would be that of the Stereoscope 555 first launched at the 1959 Radio Show. This equipment was unusual in that it featured a miniature 1CP1 cathode ray tube as a visual indicator for calibration of the amplifier. This was achieved by operating an appropriate switch, whereby the CRT would then provide an accurate visual measurement of channel balance, monitoring of the output level and the overall frequency response. Clearly the unit contained a number of salient features that were instantly appealing to the American market. Typical of the organisation, the same tube found its way into a simple oscilloscope supplied as part of a range made for Griffin and George, a well established schools laboratory equipment supplier. Clarke and Smith claimed many thousands of the Hi-Fi units along with the Hi-Fi speakers and integrated stereo systems were sold in the U.S. It is not entirely clear who actually developed the range but Clarke and Smith were producing them at the Wallington factory from the late 1950s through to the early 1960s when they were finally discontinued. Clarke and Smith also produced other models under the HMV marque. In April 1964 the firm announced to the trade that it was discontinuing the range of equipment bearing the HMV trademark but instead would be producing a range of equipment under the CSI Sound marque. The range produced comprised the Model 655 stereo integrated amplifier, priced at 42 Gns, the model 656 stereo control centre, at 26Gns, the model 657 stereo power amplifier and the Model 658 AM/FM tuner units priced at 24Gns and £31. 11.7 respectively. A number of EMI accessories such as EPU100 pickup and various loudspeaker enclosures were also available through Clarke and Smith. The Hi-fi range does not appear to have been particularly long lived and eventually disappeared from the catalogues during the mid 1960s. It does not appear that any transistor based models were developed or produced and the later CSI Sound equipment was the last in the range to be marketed. The STD name reappeared in the 1990's as a vehicle for an abortive attempt at producing a range of "whole house" remote control electronics targeted at the paraplegic and quadriplegic markets.

One other development that Clarke was involved in was as a co-patentee of the HMV Voice master reel to reel deck. The deck could also double up as a record player when fitted with an optional arm, although all the examples seen have this facility omitted. The specification for this was published in January 1963. The deck however first appeared in 1961 and was another one of those novel but unsuccessful ideas that were only taken up by one or two manufacturers including the one model produced under the HMV marque as the 'Voicemaster'. It remains unclear as to whether this was produced at Wallington or Hayes as no further manufacturing information has come to light.

The association with EMI also saw Clarke attain the position of chief executive of the HMV record label which was at the time employing around 3000 people and losing some £2,000,000 a year. Anxious to remain independent, Clarke offered to take on the position without remuneration and within two years the loss–making division was breaking even and making a good recovery. Lockwood was impressed with this turnaround of

Above: The 634 tape recorder first produced in early 1963 was a first for Clarke and Smith in that it was the first all British semi professional tape recorder to feature semiconductors throughout. A choice of tape decks was also available at the time of order. Such was the demand for these at the time, the factory struggled to keep up with the orders.
Below: The SBFM series was issued in three models this example features a pair of EL34s as the output pair and capable of delivering 25 Watts into an array of up to twelve loudspeakers. This was the largest in the range of semi transportable amplifier tuners. The FM stations are switch tuned with a limited range of adjustment via trimmers behind a concealed flap.

the ailing division and offered Clarke the position of deputy chairman. Clarke evidently declined the offer having seen the politics and bureaucracy associated with such a large organisation and resigned the position of chief executive returning to Clarke and Smith. By the mid 1960s, he had bought back the original 49 percent share from EMI at a reported premium price but also gained two of the ailing service companies that had been making losses. These were Associated Electrical Maintenance Ltd who were based in Hanworth Middlesex and the EMI office equipment division that had marketed the Emidicta magnetic floppy disc dictation equipment during the 1950s. These businesses became very profitable under Clarke and Smith. The experiences at EMI were not forgotten and during the late 1950s and through to the 1970s expansion was largely by acquisition. The subsidiaries were run in many cases autonomously. At one point it was said that if you did too much business with Clarke, you ran the risk of being bought out. At the company's height during the 1960s, it controlled some 17 different companies across a wide range of specialist sectors and employed in the region of 1600 staff, 450 of these were based at the Wallington factory against 250 in 1958 when there was just the one company. The estimated turnover annually was in the region of £100,000,000 at today's values. All of the subsidiaries were capable of, and did supply large contracts. As one example, the dental hospital and students' accommodation block at the Royal London Hospital, Whitechapel London, first opened in 1960, was supplied with public address and loudspeaker equipment throughout the various new buildings that were housed on the site.

In addition to the schools, Hi-Fi separates and RNIB sectors they were also manufacturing laboratory equipment including bench power supplies, cine and projector equipment, optical lenses, stock control systems, time control equipment, architectural wrought iron work, die casting, tool mould making, transmitter receivers and a host of other activities. At one point Clarke and Smith also had offices at Fenwick House in Holborn, London; this dealt with the office dictation equipment side of the business and was also described at one

Left: The RP2-5A high quality record player featuring the Garrard 301 turntable and designed for drama workshops and dance studios. This example probably dates from the early 1960s.
Right, top and bottom: The 718 MX20 high quality 20 Watt, mixer amplifier and manufactured in a similar style to the "88" series of receiver amplifiers. The equipment featured ECC83 double triodes throughout along with four EL84s in a parallel push pull arrangement. The unit featured two balanced line inputs along with a third high impedance input for gram. Provision to feed either a line source array or low impedance loudspeakers was provided along with high impedance, low level outlet for feeding further equipment such as a tape recorder.

point as being the group's headquarters. These offices appear to have survived into the early 1970s before they were finally closed and moved back to Wallington.

The "Head up" display

In 1960, the Ministry of Aviation commissioned Clarke and Smith through another of their subsidiary companies, and only recently formed, Specto Avionics, which manufactured highly specialised instrumentation such as flight recorders, deci-microsecond chronometers, printed circuit logic boards and central and early warning systems. This was to develop an advanced head-up display for high speed, low flying aircraft in association with the Royal Aircraft Establishment at Farnborough. The unit was to be known as The "Spectocom". The Ministry required this equipment for the Harrier "Jump Jet". In addition The United States Bureau of Weapons ordered samples for further trials and on their successful completion later adopted it as a primary instrument for all military aircraft. Not surprisingly, the American interest resulted in a US company allegedly reverse engineering the Specto Avionics prototype, losing the valuable US military market, as the US Military would have wanted to keep control of the technology in US hands.

The system was not a new one, having originally been developed by Rank Cintel for the RAE. Specto however, had introduced completely new transistorised circuitry allowing a considerable reduction in the size of the equipment, an important feature where space between the aircraft instrument panel and windscreen was of prime consideration. In addition to this equipment, Rank Cintel commissioned Specto to develop the optical units that were a vital part of the existing system.

The Ministry offered a contract with a value of £1.6 Million for one fully operational prototype. However, they would not validate it unless Clarke and Smith gained a bankers guarantee for technological performance, or amalgamated Specto with one of the large British companies already in the field. No bank would give such a guarantee of the kind demanded by the Ministry so the whole of the capital of Specto Avionics was sold to Smiths Industries with Clarke installed as deputy chairman. Specto Ltd of Windsor, a manufacturer of stop motion analysis recorders, film projectors, as well as tape recorders and overhead projectors and another of the Clarke and Smith subsidiaries, was not affected by the sale and remained in the group.

Into the transistor era

In 1963 Clarke and Smith had introduced their first all transistor based reel to reel tape recorder, the 634. In fact it was an industry first, as up until that point most of the semi professional category of recorders in which this machine fell, were still all valve based. One or two of the rivals had introduced hybrid circuitry, generally confined to pre-amplifier sections of the equipment concerned and the Simon SP5 tape recorder of the same period comes to mind in that respect. The 634 had three heads, comprehensive mixing and monitoring facilities and a 10 watt power output for low impedance or for 70V line working. Although primarily designed for schools this was also available to the general public and was priced at 103Gns. Evidently such was the demand placed on the factory for these that at one point there was a waiting list for them, due to the favourable reviews received in journals such as The Tape Recorder. Whilst this machine was a very good performer and could achieve an above average frequency response due to the use of Bogen magnetic heads, this was spoilt by the relatively high level of amplifier noise due to the early transistors employed. This generally manifested itself as an obtrusive background hiss. This was more noticeable in home settings than in a large hall where the noise would probably go unnoticed. Some school

Above: The compact all transistor 747 receiver amplifier from the mid 1960s was probably the last to be housed in the stout oak cabinet that became the trade mark of the earlier Clarke and Smith products. Many of these saw use in ILEA controlled schools and colleges throughout the London area. The unit is a fraction of the size of the earlier equipment and packs quite a punch in terms of facilities. The output is rated at 10 Watts, with provision for microphone, gram tape etc taken to P.O type sockets housed on the right of the unit. The VHF tuner is switch tuned for the reception of Light, Home and Third with user adjustment behind a concealed flap on the main control panel. The receiver actually has a conventional tuner covering 88-108 MHz which is only accessible when the receiver is completely removed from the cabinet, with a narrow band of VHF frequencies being adjustable in conjunction with the switch tuning. The loudspeaker output is on 100V line only with no provision for driving low impedance only speakers.

Right: The 835 portable AM/FM receiver amplifier was first issued during the mid 1960s and appeared in various configurations until its demise in the mid 1970s. The early sets were well specified, with a ten inch loudspeaker, and a 1 watt output sufficient for the average sized classroom. The tone controls and various outlets housed on the rear of the equipment. The early models' Achilles heel was the use of the infamous Mullard IF module which featured the unreliable AF series of transistors.

teachers also found the machine irritating and complicated to use when compared with the earlier offerings such as the STR4. The machine was issued either with a Wearite or Truvox deck depending on requirements at the time of order. The early recorders were finished in the Clarke and Smith smooth gold finish although more commonly, in the light green/grey normally associated with the Ferrograph Wearite deck of the period.

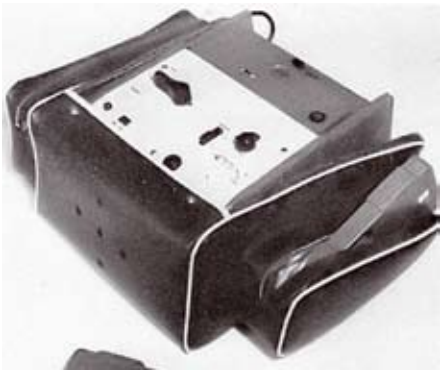
This would be the final semi professional reel to reel recorder produced other than one or two language laboratory machines produced around the same time and based around the Magnavox 363 tape deck.

The Tapete system

Clarke and Smith also took the opportunity to introduce a new type of tape cassette, known as the "Tapete" originally launched at the 1965 Olympia show. Clarke and Smith had seen the further potential possible after the introduction the original talking book cartridge of the late 1950s but lacked a patent on the design and therefore any degree of control. This was to change with the new design of cassette and the associated replay deck which would see a considerable reduction in size, weight and the introduction of transistorised based circuitry. Interestingly they choose to engage Laszlo Nameyni-Katz to carry out the design work on the cassette and a patent covering the complete specification was finally issued in 1968. Nameyni-Katz was well placed to carry out this work, having been instrumental in setting up The Epsylon Research and Development Co back in 1950. Epsylon will not be a name familiar to many readers but they were an early entrant in mulitrack magnetic recorders and several of these were marketed to broadcast, industry and the military during the 1950s and 1960s. They also undertook work on early computer tape drives. Nameyni Katz had many patents to his name as a result of this and was a prolific inventor in these areas of technology. This single move would ultimately see the RNIB locked into a deal that they would be unable to get out of for many years for, in addition to this development, Clarke had secured an international standard as well which would eventually be adopted around the cassette.

The Tapete cassette was a considerable improvement over the original system in a number of ways. It weighed considerably less, at just 6 ½ ounces, was a fraction of the size compared with the original and was capable of accommodating six tracks with a recording time of up to 13 hours. The housing being made out of a rigid plastic, was durable and a special mechanism was incorporated to stop tape spillage. The new format started to see widespread use in 1967 and a special adaptor was produced for users who had one of the old format based machines as an interim measure. Unlike the non linear way the original Mark 1 talking book player replayed the cartridges, the new cassette was based on conventional capstan drive, and due to its careful design, produced good wow and flutter figures.

The duplicating process comprised a one inch tape master each containing six speech and two index tracks. The speech tracks were recorded in alternate directions by a combination of turning over the tape and switching tracks on the master deck tape heads. These were one inch 4/8 interlaced format. ie: they were at eight track pitch but had four physical pole pieces. Originally, the recording was done direct to a one inch master tape in the studio. Later they reverted to using a ¼ inch master then transferring these to the duplication copies on one inch tape. The duplicators were built by Clarke and Smith incorporating modified Leevers Rich decks, later these were changed to Studer A80 transports. At one point, part of the Major's house was converted into a recording studio for producing master recordings for the format. Not all organisations had access to this type of technology and some of the overseas concerns resorted to banks of modified recordable Tapete based machines,



The later talking book cassette cartridge known as the "Tapete" was first introduced in 1965 with a 13 hour playing time using standard ¼ inch tape, and would remain the Clarke and Smith proprietary format for the talking book service until the demise of the firm in the late 1990s. Various versions were produced including a recordable unit for dictation purposes and language laboratory use.

requiring a controller, a conventional ¼ inch based master replay machine, and a lot of manual dexterity in the process.

By 1969 a number of variants of the Tapete system had appeared with the basic mechanism having been modified by Freddie Bellis, these were for educational purposes and language laboratories. An office dictation version was also made available. The modified systems comprised of a twin speed deck running at the industry standard 1.78 and 3.75 ips. Frequency response was a claimed 7 kHz and 12 kHz respectively. It would also appear that the possibility of a Hi-Fi version of the Tapete was also researched, and initial discussions were held with RCA, who were showing prototypes of what would become the "8 Track" format of the late 60's, about them adopting the format; nothing it appears, was to come of this and, with the gaining popularity of the Philips Compact Cassette at that time, (had it been introduced as such) it would have probably amounted to a marketing disaster. The Tapete system remained the standard for talking books until the late 1990s when the system went over to "Daisy" and we will look at this and the final demise of Clarke and Smith later on in the history of the company.

Jumping back a little to the mid 1960s and the era that Clarke and Smith were at their height, an article on the firm appeared in Electronics Weekly, penned by David McIlwian the Commercial Editor at the time. He was very enthusiastic about the company and this is what he said in his column about Clarke and Smith.

"The total floor area of CSI's factories amounts to about a quarter of a million square feet. In addition, the local cinema at Wallington was recently gutted and reconstructed internally with two additional floors to secure further badly-needed space. A substantial extension of factory accommodation is planned and approved on a new adjacent site at Wallington...

So far as research and development are concerned, the company claim to spend far more than many companies of comparable size in the industry. A subsidiary company, Scientific & Technical Developments Ltd was set up under the leadership of Alec Smith to co-ordinate the group's research and development programme.

CSI, as a matter of general policy, do not manufacture on a speculative basis. They ask potential customers what they want-'you specify it and we'll make it.'

The management believe that in conducting any business the two vital extremes are research and development and marketing, in that order. First you have to formulate the product; finally you have to sell it. But what goes on in between-the planning-production processes and budgetary and cost control-have an important bearing on profitability and must be handled by specialists.

Britain undersells herself in overseas markets, Major Clarke believes. He says: 'The future of the British electronics industry depends very much on efforts made overseas. We in the United Kingdom have so much to sell. Original thinking in the past, such as radar, penicillin, jet engines, hovercraft have not always been successfully exploited. We too frequently leave our inventions for others to manufacture because the government is not always able to give enough financial support to home-grown ideas...'

CSI are a manufacturing enterprise in the full sense of the word. They buy in very little from outside. They do their own metal work, make their own cabinets and manufacture a wide range of components, from transformers and discriminator coils to tape cassettes for talking books, from optical lenses to components for compasses, from projectors to measuring instruments.

Although this calls for high initial capital investment, it reduces overheads on short product runs (the company tend to manufacture in terms of 500 to 5,000 rather than 20,000 or more of a particular item).

Once the original cost of the capital equipment has been written off, 'in-house' component manufacture proves to be much cheaper than subcontracting, with a consequent improvement in profit margins.

One can't help feeling that the success of CSI is Major Clarke himself–a man of persuasive charm and courtesy but nevertheless single-minded. To use an American expression he is a 'T-shaped' man, combining vertical depth of experience (in time) with horizontal breadth of experience (in space). And on the evidence, CSI would seem to be very much of a T-shaped organisation."

The property slump

By the end of the decade, the Clarke and Smith group were in a healthy position and in 1970, were approached by Sime Darby a Singaporean subsidiary of R.G Shaw a publicly quoted company based in London. They were interested in one of Clarke and Smiths subsidiary companies, W.F Stanley, makers of scientific instruments and who were in terminal decline at the time of the original acquisition in 1965. W F Stanley had a subsidiary in Singapore, Motion Smith, who were ship chandlers. The R G Shaw group were interested in buying into Clarke and Smith and W.F Stanley, after seeing the recovery and profitability restored by Clarke. A key figure in the negotiations was Sir Charles Miles the deputy chairman of the Charter Bank. The deal struck was that R.G Shaw would take over Motion Smith and buy a third interest in Clarke and Smith, with Sir Charles also joining the Clarke and Smith board.

To avoid the possibility of a future reverse takeover, Sir Charles proposed that Major Clarke should have a seat on the board of R.G Shaw, in return for taking the financial control of Clarke and Smith. However before the proposals could be finalised Sir Charles died suddenly. RG Shaw unexpectedly saw a downward turn and was taken over by its subsidiary in Singapore, thus transferring the Clarke and Smith shares to the Singapore Company, Sime Darby, who by this time were only interested in property and finance in the UK.

As we have seen, Clarke and Smith had acquired substantial property in and around their Wallington factory. The new chairman of the takeover persuaded Clarke to sell these properties to a proposed new company 40 percent owned by Clarke and Smith and 60 percent owned by Sime Darby/R.G Shaw. It was on this basis that a new office complex for Sime Darby would be built at Wallington, with Clarke securing additional finance from the banks, greatly enlarging the existing property holdings.

Unfortunately for Clarke, although the board minutes refer to the agreement, it was never formalised through solicitors. Before the subject of a formal agreement could be reached, the chairman of Sime Darby in Singapore was arrested and charged over a number of irregularities involving business affairs conducted in the Far East and Canada. This threw the company into turmoil and most of the existing Sime Darby directors were either removed or had resigned. Clarke was put in a serious predicament because he had to approach the new board and ask for approval for a scheme previously put before a board that had now been by–and–large discredited.

With the prospect of a property slump in the UK at the same time, the new Sime Darby board decided not to honour the previous agreements. Clarke and Smith were immediately placed in a serious financial predicament with huge sums of money owed to the banks for property they could not now sell because of the slump. With large interest payments to make, cash flow became a problem. Sime Darby offered Clarke and Smith the option of a loan or the outright purchase of the Stanley Group. Clarke evidently chose the latter but the subsequent funds paid off very little of the debt.

Luckily for Clarke the firm's bankers remained loyal but from 1975 to 1984 every penny of profit went towards repaying the interest on the loans made on behalf of Sime Darby. It was during this period that Clarke and Smith made many of its subsidiaries dormant and these probably included A.E.M. Although the records from this time are very patchy, it would appear that any remaining profitable production was transferred to the Melbourne Road, Wallington Site, allowing the disposal of much of the rest of the property portfolio to help reduce the loans. This retained the

Above: How the duplication process was handled in Australia during the 1970s. A Ferrograph Series seven recorder provides the master source with an intermediate controller and recordable Tapete machines. This operation required a fair amount of manual dexterity on the part of the operators overseeing the process. Each machine had to be loaded manually although some of the remaining process does appear to be semi automatic. It is thought that the tape was duplicated across in real time.

Left: This image shows the two versions of the Clarke and Smith talking book tape magazines against a standard compact cassette to illustrate the comparative size of the products.

The Braille link was first conceived by Major Clarke during a visit to New Zealand in 1971, it was to take a further two years before work was started on the development and at one point there were reportedly eight engineers working on the project. The National Research Development Corporation provided funding to the tune of £75,000 but pulled out after a couple of years. It has also been suggested that Clarke's interest waned and the project was handed to Freddie Bellis. The machine did not appear on the market until 1982 and at a cost of £5000.00 put it out of the reach of most people

The 1068 radio cassette was launched by Clarke and Smith in the summer of 1974 and received favourable reviews. It joined the gradually reducing range of equipment still being manufactured for schools such as the 1047 record player and 1048 VHF portable radio receiver.

Above: Final Clarke & Smith Products: The radio cassette and TV Sound receiver were some of the very last products to be assembled at Wallington. Much of the internal electronics were brought in from the Far East and were fraught with quality control issues.

asset base of its largest properties which prevented the companys' insolvency.

In the late 1970s a court action was brought against Sime Darby for a breach of contract to the tune of £3 Million by Clarke. The deputy judge hearing the case, Sir Douglas Frank QC, dismissed Sime Darby reluctantly, adding

"There must be judgement for the defendants, he said, notwithstanding that their Board had behaved in its corporate capacity in a way in which it would not, he felt sure, dream of behaving in their private affairs".

The judge also said, "I am forced to the conclusion, reluctantly, that the parties did no more than agree to agree, and at no time reached agreement on matters fundamental to the proposed contract so as to constitute a binding contract".

During these troubled times Clarke formed a new company, East Cheap Finance Ltd, subsequently selling the patent rights of the Tapete technology to this new concern. The idea was that should the group collapse, he would still have control of the very lucrative talking book rights and be in the position to continue the manufacture of the Tapete and associated equipment.

Vortexion

Throughout the financial crisis and the resultant closures of some of the subsidiaries, Clarke still managed to keep an eye open for a bargain, acquiring at least one further well established firm, that being Vortexion Ltd of Wimbledon. The firm was a notable manufacturer of high quality public address amplifiers, mixers and later tape recorders having been formed in October 1936 by two brothers, Sidney and Edward Brown. Vortexion was born out of a small shop trading under the name of Brown and Salter, who had been a supplier of components, later specialising in transformers. Nothing further is

known about Mr Salter who does not appear to have featured in the later history of the firm or in the formation of Vortexion Ltd.

The firm originally traded from 182 The Broadway, Wimbledon and expanded a little further along the road into premises at 257-263 The Broadway. With the unexpected death of Edward Brown in the February of 1942, Sidney's wife Dorothy assumed the position of a director, with the husband and wife team being the driving force behind the firm for many years. Although never a large concern, at their peak in the 1950s, Vortexion products sold in relatively large numbers as evidenced by the survival rate of some of this equipment today. By 1937 their first portable amplifier was introduced under the Vortexion brand name, capable of operating from the mains, or off a 12V battery, drawing some 6 amps. The CP20 could deliver a 15W output, and received a favourable review in the October 1st issue of Wireless World of that year.

By the outbreak of war the CP20 had been joined by an amplifier chassis featuring a pair of 6L6s in the output stage. Vortexion claimed that many hundreds of these were in use by the ARP and government. The claimed output from this amplifier was 50W. Post war they produced a recording amplifier type AD47 for disc recording purposes and interestingly a Magnetophon recording and replay amplifier in the summer of 1947 specifically to drive the German originated magnetic tape recorder deck of the same name. This development makes them an early, if not indirect entrant into the tape recording field as the UK did not see magnetic recording commercially introduced until a little later with the professional EMI BTR1. The domestic markets would have to wait until 1948/9 before the emergence of a complete home tape recorder such as those produced by Ferrograph and the Thermionic Products "Soundmirror". Vortexion did not produce their own self contained recorder for these markets until early 1953 a subject which will be returned to shortly. In early 1949, the firm announced a stereophonic amplifier using as the output valve in each channel, a single PX4. Unfortunately, nothing further is known about this development although the equipment continued to be advertised in one form or another throughout the early 1950s. Much of the post war design work was carried out by George Ferriman who joined Vortexion in January 1946 after being demobbed. Ferriman remained with the company until shortly before the Clarke and Smith buyout.

Probably though the best known of the Vortexion range which appeared around this time was the "Wimbledon" also later known as the "Super Fifty". This used as the power output, a pair of 807 beam tetrodes in class AB2; at first glance these may appear to be a slightly unconventional choice of valve as they were more often found in the RF or driver stages of transmitters and examples will be found in the No19 set and various amateur radio transmitters of the period. Vortexion got them to work well enough in the amplifier and the 807 based model was produced for a number of years until the change to EL34s in the early 1960s. The decision to use the 807s was probably down to the large numbers of these that appeared on the surplus markets in the immediate post war years and the fact that they were renowned for their robust construction, ideal in fact for the punishment they probably received in the process. The "Wimbledon" was a substantial piece of electronic engineering fitted with high quality transformers, on a substantial chassis designed and produced by Vortexion themselves. The reputation for reliability was supported by a number of popular features, such as a wide range of output tappings on the output transformer, and the reputed ability to drive a 30 ohm microphone input with a hundred meters of twisted unscreened cable without interference, due to use of balanced line working.

Throughout the 1950s and early 1960s the amplifier equipment was joined by a small range of high quality mixers. Some of these were produced with 3 or even 5 identical channels for low impedance microphones of the balanced line type while others allowed for the mixing of a gram input and microphones. Another type, marketed as the 3/PPM and first introduced in the very early 1950s, featured a peak programme meter for accurately monitoring the resulting signals. Much of this equipment was designed for professional applications with the basic design behind these remaining virtually unchanged for a number of years. Vortexion eventually entered the tape recorder market in 1953 with their first "A" model, followed by the WVA and WVB series. The design changed very little until the final model, the stereo CBL6 of 1967 which was considered

VORTEXION 15W

Type CP20 AC and 12-VOLT DC AMPLIFIER

THIS small Portable Amplifier, operating either from AC mains or 12-volt battery was tested by "THE WIRELESS WORLD," October 1st, 1937, and has proved so popular that at Customers' demand it remains unaltered except that the output has been increased to 17.2 watts and the battery consumption lowered to 6 amperes. Read what "The Wireless World" said :—

"During tests an output of 14.7 watts was obtained without any trace of distortion so that the rating of 15 watts is quite justified. The measured response shows an upper limit of 18,000 c/s and a lower of 30 c/s. Its performance is exceptionally good. Another outstanding feature is its exceptionally low hum level when AC operated even without an earth connection. In order to obtain the maximum undistorted output, an input to the microphone jack of 0.037 volt was required. The two independent volume controls enable one to adjust the gain of the amplifier for the same power output from both sources, as well as superimpose one on the other, or fade out one and bring the other up to full volume. The secondary of the output transformer is tapped for loudspeakers or line impedances of 4, 7.5 and 15 ohms."

AC and 12-volt CHASSIS with valves, etc. £12 12 0

Or in Rexine Case with Collaro Motor, Piezo P.U. and Mike Transformer..... £17 17 0

AC only CHASSIS with valves, etc. £8 18 6

Or in Rexine Case with Collaro Motor, Piezo P.U. and Mike Transformer..... £14 0 0

Gauze Case for either chassis 12/6 extra.

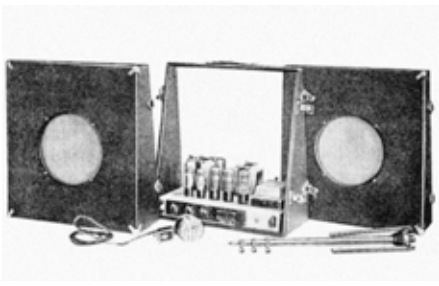
SEND NOW FOR FULL DETAILS.

Vortexion Ltd., 182, The Broadway, Wimbledon, S.W.19. 'Phone: LIBerty 2814.

Top: The Vortexion 50/70 transistorised amplifier as available in 1970.

Above: The famous Wimbledon Super 50 this early example dates from an advert that first appeared in 1946 and remained little changed for a number of years.

Left: The CP20 15W AC Mains & battery amplifier as advertised in 1939 and remaining in the companies catalogues for a number of years. The early versions featured an American range of valves which included a pair of 6B5 double triode valves.



Top: Vortexion specialised in a range of high quality professional mixers. The Type 3-PPM first appeared in 1950 and was still being advertised as being available as late as 1970.

Above: The Vortexion self contained dance band portable P.A. system available during the 1940s.

Left: When Vortexion entered the semi professional recording market they had already gained some experience with the design and manufacture of amplifiers for magnetic tape and direct to disc recording. A rare example of an early WVA tape recorder outfit pictured here on the left, first appeared in early 1953 and features the Series 2 Wearite deck, although it was also briefly offered with the Truvox deck as an option. Vortexion continued their range of recorders based on this design until the demise of the Wearite deck in 1968. A new model that briefly appeared featuring the Ferrograph Series 7 deck, and known as the CBL7T can be seen above

by some to be the finest stereo reel to reel tape recorder ever produced in the UK. All of the machines used the Ferrograph Wearite tape transport making Vortexion one of the largest users of the deck with Clarke and Smith a very close second. With the demise of the Wearite deck in early 1968, Vortexion briefly marketed the CBL7/T. This was designed around the ill fated Ferrograph Series 7 deck launched later that year. The new range was abruptly withdrawn after a considerable investment in the development of the new recorder, with the subsequent marketing yielding few sales. The late 1960s also saw Vortexion make the move into transistors and one of the first of the designs to appear was the CP50, a 50watt amplifier. This was still being advertised under the CSI banner as late as 1979. Vortexion do not appear to have attempted to produce any Hi-Fi amplifiers choosing it would seem, to remain in the more specialised markets of sound reinforcement.

With the death of Sidney Brown in early 1972, the firm was subsequently sold to Clarke and Smith by Brown's widow who evidently did very well out of the deal, also securing a company pension from Clarke and Smith. The changes in ownership were finalised in February 1973. Dorothy Brown also remained a director on the board of Vortexion well into the late 1970s, anecdotally Clarke was once heard to bemoan years later that she made more from Vortexion each year than he did! The new subsidiary remained largely autonomous until the January of 1974 when the entire production was moved to Wallington, although adverts appearing in the trade press were still showing the old Wimbledon address as late as July 1975. The original Vortexion factory on the Broadway, Wimbledon was finally disposed of in early 1976. The amplifier range continued to be made alongside the Clarke and Smith schools equipment, with development work and production already in progress on the CSI Vortexion System 2000 and an early announcement in the Wireless World of July 1975 proclaimed that the new amplifier "combined the aesthetics of design in the domestic field with the near flexibility of a modular system". This range was joined in the summer of 1979 by the VTN30 a 3 channel 30w amplifier, and later the VTN5a, an early induction loop amplifier. The final designs introduced were the Series 3000 during the 1980s with the final development appearing as the Series 4000; these were to include induction loop amplifiers such as the model 469, and a return to the battery powered amplifier in the 455 50 watt mixer amplifier that harked back to the CP50. By the early 1990s, the Vortexion range was generally starved of resources with some of the last company accounts from the middle of the decade showing the division as being completely dormant. With the demise of Clarke and Smith the brand name was sold off to Hagger Electronics of Letchworth, Hertfordshire who discontinued all but the induction loop amplifier range. This legendary brand name still survives today (just) in this specialised market.

The 1970s also saw the loss of Alec Smith who died unexpectedly in late 1972 at the age of 66. The loss to Frank Clarke of a close friend and long time business partner was incalculable. As we have seen, Smith's development and design work was the lynch pin of much of the early success of the firm in the many areas of the electronics engineering it had been engaged in and later as the head of research of the STD division, this role would be given to Freddie Bellis. He assumed the position in early 1973, a post he subsequently retained until 1985.

Braille Link

There was however one development in the doom and gloom of this period that was the brainchild of Clarke. This was Braille link, a system of soft Braille, and was the first invention ever in this field. The idea was conceived after a visit to the New Zealand Foundation for the blind. Work was started on the device in 1973. He later went to the National Research Development Corporation for financial help; they provided £75,000 but pulled out of the project after a couple of years. Evidently Clarke also lost interest in it and put the braille link design work in the hands of Freddie Bellis. Its subsequent development enabled a blind person to interface with a computer. The design concept was eventually adopted and is still in use today. Briefly, when the equipment is interfaced to a computer, it turns its output into a stream of brialle characters that are created by a matrix of tiny pins in solenoids that create the Braille characters that are read by the user just as though they were printed on a page, and this can be done at high speed. The Post Office Prestel service also adopted it making their text based service available to the blind.

The first machine was sold in 1980 and by 1996 Clarke and Smith had sold 60 with a dozen of these sold to the US. The cost at the time was over £5,000 each with a development cost over ten years of some £500,000. Although the development was innovative it came at a time when the computer industry was still in its infancy. For that reason the system would never make any money for the firm, until computer systems such as the IBM PC and its compatibles first appeared in 1984 making the technology more practical and affordable. Nevertheless, in 1982, Frank Clarke won a Recognition of Achievement award for the work carried out on the Braille link invention. Freddie Bellis it appears received nothing for his efforts.

The New Scientist contributor, Peter Marsh wrote a lengthy piece in an early 1982 edition of the periodical and this extract typifies Clarke's outlook at the time.

Clarke is sanguine about the outcome of his work. He is by no means a struggling inventor; his company makes money from its other activities... he has a chauffeur driven car and wears expensive suits. But he confesses that if it had not been for his successes in these other areas of business, so giving him the money to pour into his pet project, the

Braille device would never have seen the light of day. Even though the gadget is a success, Clarke does not expect much in the way of financial reward. “This is why the leaders in technology will not consider the world of the disabled – there’s no money in it”.

Throughout the 1970s and into the 1980s the Schools ranges were still in production although investment in these products was now in terminal decline having been switched to other areas of the business, allowing the likes of Coomber to step in and take a fair chunk of the educational market. A court tape recording system was developed for Saudi Arabia that was marginally successful, along with a staff training system based on the Tapete for Lloyds Bank, and using modified equipment originally developed for the RNIB.

The group whilst considerably reduced in size due to the troubled 1970s still managed to hold on to one or two of the subsidiaries and even to acquire others. The number of trading companies had been dramatically reduced from 17 to just 5, the others held as dormant companies largely for tax advantages or future expansion. Some of these reductions included building and maintenance firms such as Siggs and Chapman. Those that remained included H.A. Gaydon which specialised in laboratory equipment for paper, packaging food and textile markets. The most notable product was the film gauge for cast blown film products, accurate to 0.1 micron. They also produced a one off special gold plated carousel tie rack for HRH The Duke of Edinburgh after he had complained about the difficulties of keeping a large collection of ties under control. Transtech Transformers, which was founded in 1977, joined Clarke and Smith in 1991 after being rescued from the hands of the receivers, Bletchley Engineering, a specialist manufacturer of precision die castings and the supplier of the die cast chassis for the final Tapete model the TB2000. The final company in the group was Oxford Welding Equipment a long established firm originally founded in 1936 and acquired by Clarke and Smith in 1991. The firm produced the Oxford AC/DC sets and a 180A petrol driven set. Whilst some of these acquisitions were a success such as Transtech, others were not, with Oxford Welding turning into a financial disaster reportedly costing a million pounds in the process.

Wireless for the Blind

It is a common misconception that Clarke and Smith always made wireless for the blind, in fact many other firms had at one point supplied sets bearing the ‘British Wireless for the Blind’ name. The more recent of these included Roberts Radio who had also supplied the TV sound only portable receiver, the TVS1. Clarke and Smith did not really enter the BWFB market until the early 1990s when they produced a TV sound tuner in a compact toaster style format. This was followed by an innovative radio cassette recorder. Frank Clarke only got the deal by supplying the equipment to the BWFB at very close to the actual cost of producing them, expecting to be able to sell the rest of the production run at a profit. The ploy did work after a fashion, but the problems of incorporating a mass produced tuner module from the Far East in relatively small orders of 5000 or so made it difficult for the firm to iron out the quality control issues that became apparent. The same issue plagued the similarly sourced cassette mechanism of the companion “toaster” cassette player. With this and the combination of the Wallington produced amplifier, control electronics and case and despite picking up awards, the BWFB radio cassette was never really profitable. A further abortive attempt to re-enter the schools market was also made with the appearance of an overly specified and similarly priced music centre that also featured the same problematic tuner as the BWFB series. Another unsuccessful attempt was the schools versions of the toaster cassette player, adapted for use with multiple headphones for language lessons. Other opportunities were also lost due to long development times resulting in the loss of contracts.

Clarke and Smith had become heavily reliant on the Tapete talking book contract with the RNIB and had been so since the 1970s. The format was now of considerable age and the RNIB had been looking at various alternatives for some time. Work had commenced as far back as 1982 just before the Compact Disc was launched. In 1984 in close collaboration with Philips, the first 12 hour audio CD was produced. Later work was done in collaboration with Nimbus and Rediffusion to develop a RNIB format. The audio parts of CD-I were tried out but this later shifted to ADPCM and MPEG. The RNIB were nervous about the investment which came in at around £20 Million plus. Once international agreement had been ratified the final phase of the development was with Labyrinten Data, Plextor and IFLA which resulted in the RNIB adopting the Digital Accessible Information System or “Daisy” digital talking book technology and this remains the standard in use today.

Clarke and Smith knew that they were unlikely to get a look in with the new format on the basis of “once bitten twice shy” and it is a matter for speculation as to how early they got wind of the fact. It was also in the late 1980s that the RNIB commissioned another company to reverse engineer the housings and manufacture the Tapete cassette. The move was designed to make the RNIB less reliant on Clarke and Smith and in doing so took a large element of the contract away from them. Estimates had put the talking book contract profit at some £500,000 per year and certainly more than enough to hide the problems elsewhere in the group. Orders came down from Frank Clarke to make the players unreliable with anything but the genuine CSI 778 cassette housings in use. This proved impossible to do without also affecting the replay and reliability of the genuine cassettes themselves. One of the CSI engineers at the time was heard to remark “It’s exactly what we would have done, had they asked us”.

In January 1997, Major Frank Clarke died unexpectedly at the age of 77, this and the final loss of the RNIB contract shortly after was the final combination of unfortunate events that would see the closure and winding up of the company by Mrs Frances Clarke, the Major’s 2nd wife. In fact the company was subsequently listed at Cork Gully, Hill House in Bournemouth but was finally wound up on 15th February 2004.

The final account available from 1997 showed losses of over £86,000 on the year. The staff levels had dropped to just 49; compare this to the hundreds employed during the 1950s and 1960s. As we have seen, Vortexion ended up with Hagger Electronics with the only other survivor, Transtec Transformers surviving the closure. The thin film gauge, developed by H.A Gaydon was bought by Ron Hannah, a former sales manager of the group, from the receivers and it is still marketed by Hanatek Ltd of Worthing, Sussex.

The story of Clarke and Smith is in some ways quite remarkable and mirrors much of Britain’s light industry and what we used to be good at. It would be fair to say that the fact that the firm managed to keep afloat until the late 1990s is no mean feat when one considers the market pressures and the tremendous resources needed for development with the constant threat of undercutting from overseas concerns who have the financial muscle and cheap labour to make just about anything you want in quantity. The impact the talking book had on tens of thousands of people worldwide cannot be under estimated and is very much a credit to Major Frank Clarke and his close friend and business partner, Alec Smith for helping to shape and develop the technology during the 1950s and 1960s.

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Images: All images are of examples of Clarke and Smith equipment from the author’s collection except The Model 12 Gramophone and the RP2-5A record player. I would like to thank Jim Mc Lauchlan and Ross Muir of the Museum of Communication, in Burntisland, Fife for helping to arrange for these to be photographed.