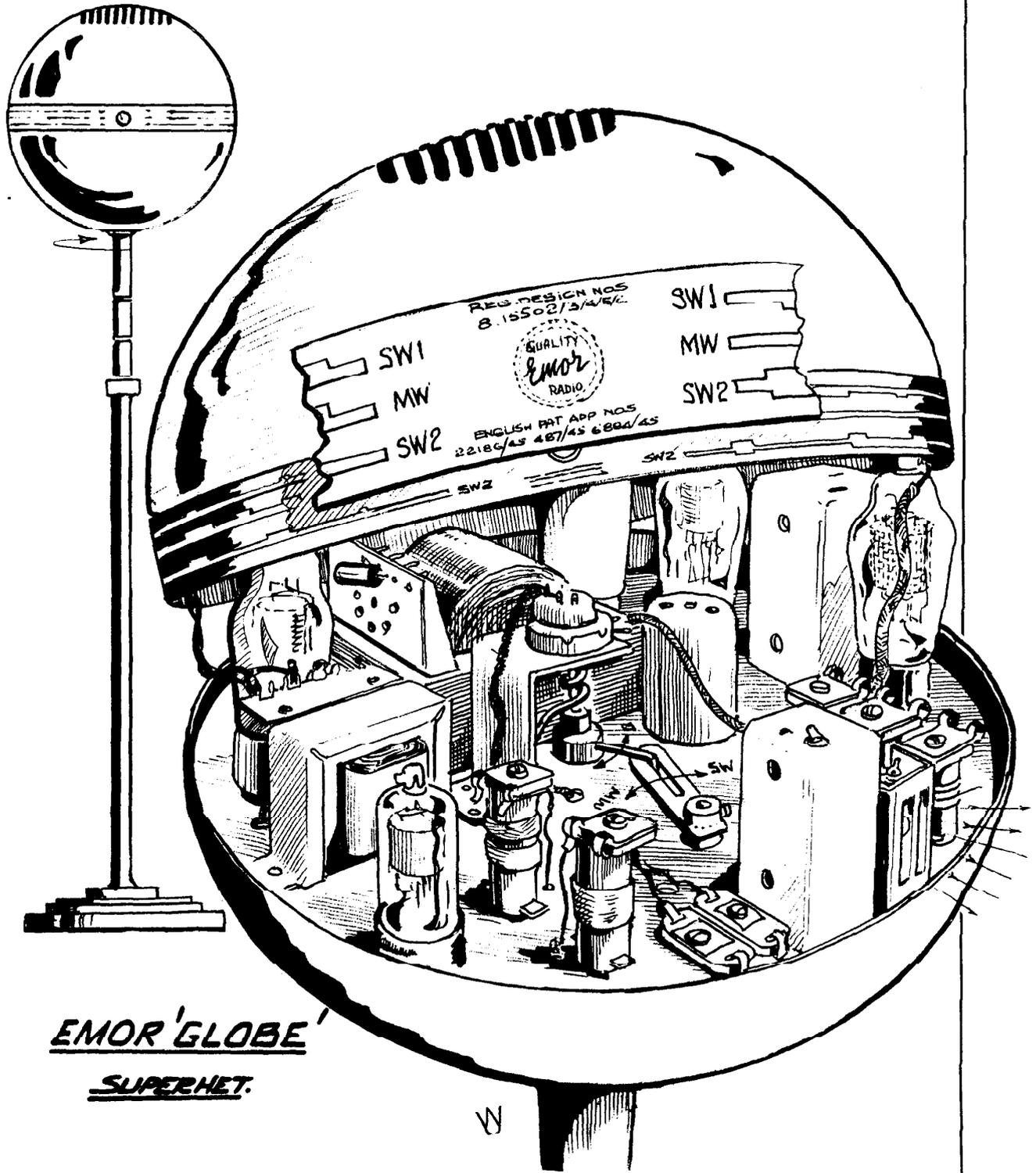


BULLETIN OF THE BRITISH

# VINTAGE WIRELESS

SOCIETY



**EMOR 'GLOBE'**  
**SUPERHET.**

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**BULLETIN OF THE BRITISH  
VINTAGE WIRELESS SOCIETY**

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Editorial and advertisement enquiries should be made to the Editor, Robert Hawes, 63, Manor Road, Tottenham, London N17 0JH. Tel: (01) 808 2838. Editorial Assistant: Pat Leggatt.

**BRITISH VINTAGE WIRELESS  
SOCIETY**

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# VINTAGE WIRELESS MUSEUM



The Vintage Wireless Museum, headquarters address for the British Vintage Wireless Society is at 23 Rosendale Road, West Dulwich, London SE21 8DS. Telephone: (01) 670 3667. The Curator is Gerald Wells, whom visitors should telephone before visiting the museum.

## 2MT Writtle

### *The Birth of British Broadcasting*

*"Stay for one fleeting moment,  
Tuned to the last degree,  
CQ! the concerts ending,  
Ending for 2MT."*

by Tim Wander

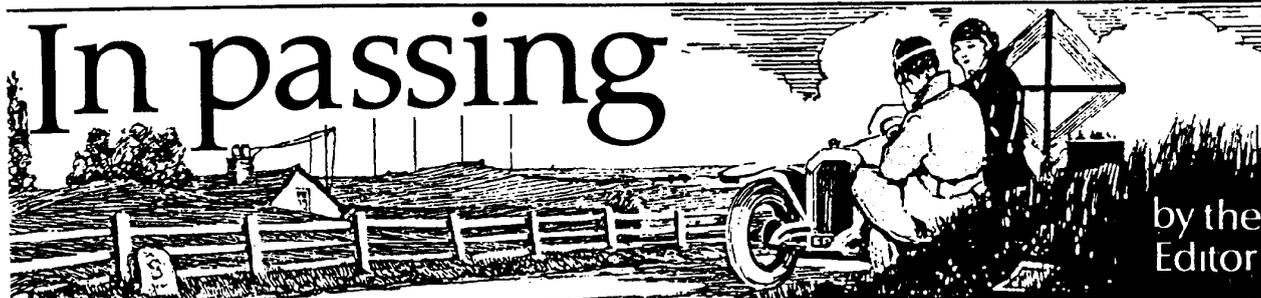
Tim Wander's new book charts the struggle to achieve a broadcasting service in this country - from the Chelmsford station MZX with the famous broadcast of Dame Nellie Melba in Chelmsford, through Writtle's sparkling success to the birth of the BBC. The book also includes separate appendices on Chelmsford and 2LO transmitters, Dutch station PGGG, telephony pioneers Grindell Matthews, Reginald Fessenden and David Hughes, and draws on much previously unpublished archive material.

Often a one-man show, radio station 2MT at Writtle established an individuality all its own which will ever remain a pleasant memory to its broadcast audience. Its burlesque entertainments, its parodies of grand opera, its peculiar announcements, the light-hearted spirit which pervaded the whole proceedings and the sheer joie de vivre that bubbled across the aether were not only a first but truly unique in the history of broadcasting.

The book is now available, (arrived at Easter) priced £12.95. However until Harpenden the offer of £11.00 + £1.00 postage and packing (£2.50 USA/Europe) still stands via the Writtle forms from the last journal. The book is a limited hardback edition, has 200 pages and contains 60 B/W photographs (many previously unpublished).

Each copy will be signed and numbered by the author. Please send orders, with remittances payable to Capella publications, to 44 Homefield Way, Earle Colne, Essex, CO6 2SP, Tel: (07875) 2674.

**2MT Writtle :- The Birth of British Broadcasting**



Correspondence for the Society's Bulletin should be addressed to The Editor, Robert Hawes, 63 Manor Road, Tottenham, London, N17 0JH. Telephone: (01) 808 2838.

### Harpenden meeting

Members are reminded that subscriptions became due on April 1st this year, irrespective of individual original dates of joining, and that only fully-paid up people will be eligible to attend our major meeting at Harpenden on 26th June. If you have overlooked your subscription, you are therefore urged to send it off with your application form for Harpenden tickets.

As usual, the meeting will be 'ticket only' and these must be obtained in advance. Meetings are for members only and there will be no 'admission at the door'. Arrangements will be the same as usual and details will be sent out with tickets. In addition to the usual 'swapmeet', there will be displays in the ante-room and members wishing to show interesting items are asked to contact the Organiser beforehand. Refreshments will be available: breakfast at about 10am, lunch starting at about 12 noon and tea well into the afternoon. Members are requested not to arrive too much in advance of the official opening time of 10am, although stallholders will be allowed in a little early to set up. Members are also reminded that trading must not take place outside the hall. The purpose of the meeting is to allow members to swap and trade between themselves: it is not intended for purely commercial activities, although our trader members are, of course, welcome to attend.

### Garden party

The annual BVWS Garden Party is again being held under the auspices of Gerald Wells' Vintage Wireless Museum at Dulwich, and will be on 25th June, the Saturday before the Harpenden meeting. This too is a members-only event and tickets must be obtained in advance, using the form sent out with this Bulletin. Attractions at the party, which re-creates the typical English garden-party of the 'thirties, include a buffet lunch, competitions, 'genuine Low-Fi' music

from 78rpm records reproduced through 'steam' valve equipment, 405-television presentations on vintage receivers and conducted tours round the museum and workshops. Members are not discouraged from turning up in fancy dress to match the period.

### Proposed BBC changes

Some members are concerned that proposed changes to the pattern of radio broadcasting in this country will mean that satisfactory medium and long wave transmissions will no longer be available for reception on vintage receivers. Although plans for the future are not entirely settled, BVWS Chairman Pat Leggatt asked the BBC to give us a statement of how they see things developing and this is what they say:

The Home Secretary said that the BBC would have to give up its Radio 1 and Radio 3 medium wave networks to National Commercial Radio stations: he did not indicate a time scale for these changes.

In the light of these Government proposals, the BBC is suggesting that it should concentrate its radio services on the VHF-FM networks. The possibility and implications of making the following changes are currently being investigated:-

- (1) Transmit Radios 1, 2 and 3 on VHF-FM only.
- (2) Use the present Radio 2 medium wave network (on 693 & 909kHz in most areas) for educational, sports and children's programmes.
- (3) At appropriate times, replace the normal Radio 4 programmes on long wave by Parliamentary Broadcasts, Party Conferences, State Occasions and other special events.

The Government proposals imply far-reaching changes in the structure of radio broadcasting; but medium and long wave broadcasts will nevertheless continue to be receivable throughout most of the country, although perhaps from different broadcasters than at present.

The Home Secretary, in a statement to Parliament on January 19th this year announced that legislation would be introduced later in the year to enable the development of new radio services. It is proposed that three new national commercial radio networks will be introduced, together with some hundreds of community radio stations. The frequencies for new stations will be released by phasing out the duplication of existing radio services across more than one waveband; and from additional VHF-FM spectrum which will be made available in 1990 and 1995.

### Japanese Museum

Ed Dinning of Newcastle, back from a trip to Japan, has sent me news of a wireless museum in Tokyo, founded in 1956 to mark the 30th anniversary of broadcasting in Japan.

The task of the museum is to gather and preserve old apparatus and data about broadcasting, and to present it in an easily understandable form to the public. In addition to vintage hardware, the Japanese wireless story is told with the aid of audio-visual displays. The catalogue describes how

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## In Passing (continued)

the Japanese Ministry of Communications laboratory succeeded in wireless telegraphy experiments at the end of 1897 and details the development of wireless in the country following the beginning of broadcasting in the United States. Ed Dinning notes that the equipment displays at the museum have an 'American bias' and that the collection is large but mostly held in reserve. They have a Baird Televisor 'imported from England in 1931 for study'.

An interesting area for enthusiasts in Tokyo is called Akihabara, a centre for consumer electronics, but having a vast number of small 'junk' parts stores. 'It is a real goldmine' comments Ed 'reminiscent of the Edgware Road and Tottenham Court road areas of London thirty years ago. Unfortunately, the airlines severely limit the amount you can bring back!'

### New Book

Marconi man Tim Wander has sent a copy of his newly-published book '2MT Writtle: The Birth of British Broadcasting'.

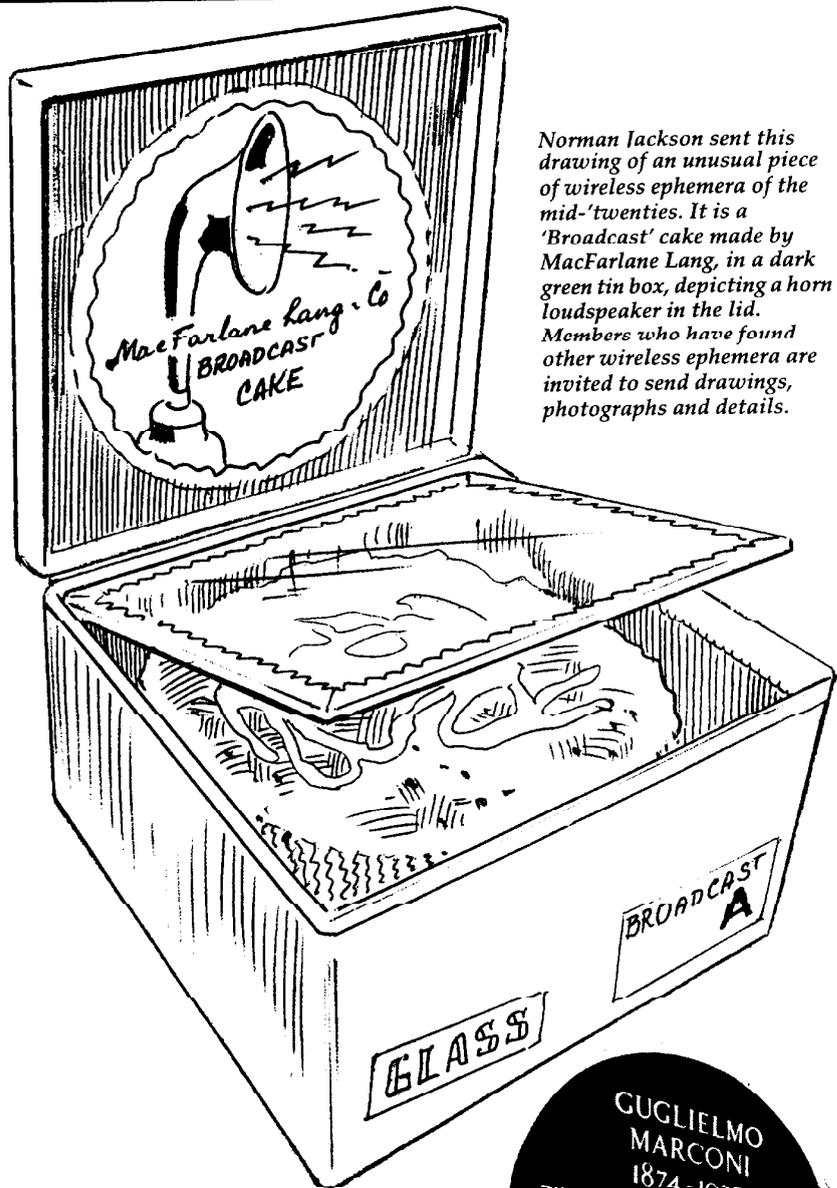
Attractive and well illustrated, it makes interesting reading and presents a lot of diligently researched information. The book is reviewed elsewhere in this issue, but I would like to mention that as well as telling the story of 'Two-Emma-Two', it has a fat bonus in the form of a useful appendix a third as long as the book itself and containing much factual information, from a list of 'further reading' to articles about the beginning of wireless and broadcasting history notes.

One of the most interesting tidbits in the section is a short account of one of the pioneers of broadcasting in Britain who might be described as relatively 'unsung': Grindall Matthews, inventor of all sorts of things from remote-controlled torpedoes to the system of 'sound tracks' for films.

Tim tells how Matthews did some broadcasting of his own just after the first world war. If you have not heard the story, I won't spoil it for you before you've had a chance to read it in the book. Suffice it to say that I think you'll find it fascinating.

### Can you help?

The Editor is researching various subjects with a view to producing Bulletin articles. Help in the way of information and photographs would



Norman Jackson sent this drawing of an unusual piece of wireless ephemera of the mid-'twenties. It is a 'Broadcast' cake made by MacFarlane Lang, in a dark green tin box, depicting a horn loudspeaker in the lid. Members who have found other wireless ephemera are invited to send drawings, photographs and details.

be welcome. The subjects to be covered are: early car radio, practical hints and tips, and versions of the DAC90 and 90a. In connection with a previously published article on the National Company electro-mechanical 'Dancing Man', the Editor is seeking details of a Victor 78rpm gramophone record, issued in about 1930 and numbered Victor 22228, possibly of ragtime music.

### Collections

The Editor is drawing up a list of wireless museums and small collections in the UK, Ireland and Europe and would appreciate receiving any information members may have on the subject.



### News from Chelmsford

Although a little late, members of the Society may be interested in a new plaque in memory of Guglielmo Marconi and recording Dame Nellie Melba's historic broadcast on June 15th 1920. It was unveiled by the Life President of the Marconi Company Sir Robert Telford on Thursday 23rd July 1987 at the front entrance of Marconi's New Street factory.

## The novel Emor Globe receiver

by Thomas Turland

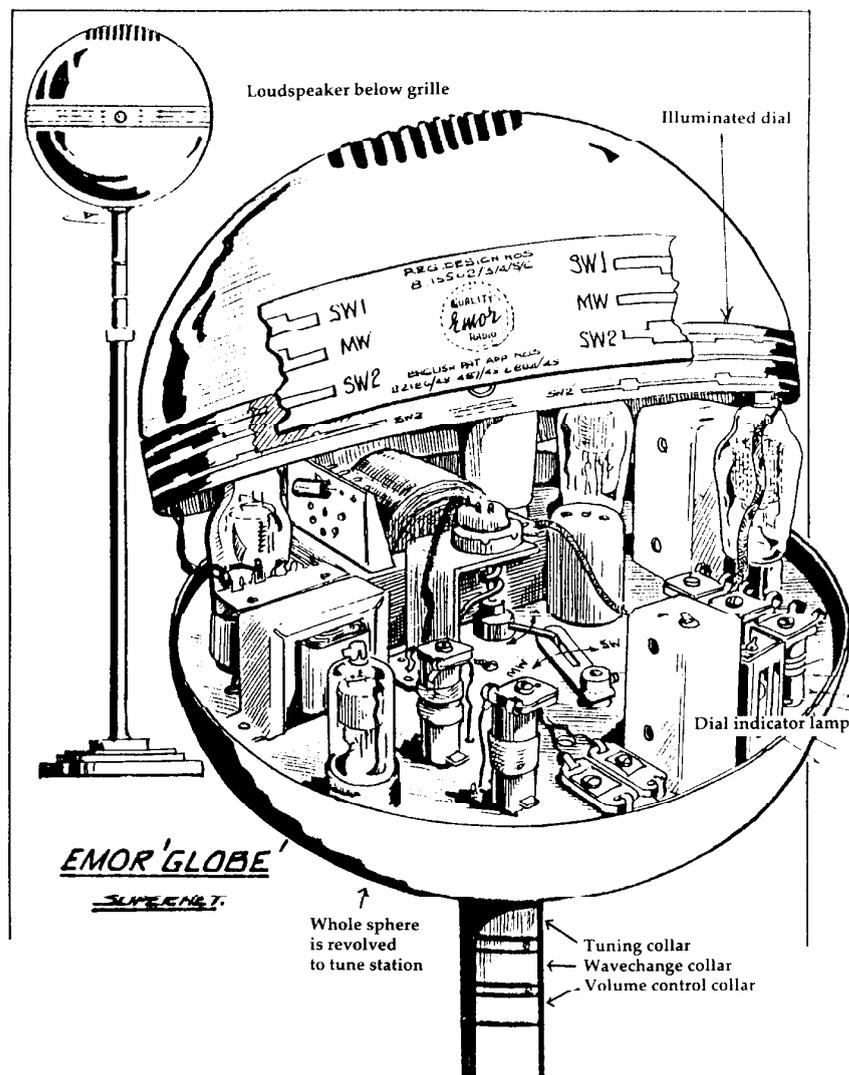
Series: 'The Classics'

This rather rare and quite unique domestic radio was manufactured by a small firm in Kilburn, north-west London, in the 1940s following the end of World War II. It consists of a 12in diameter circular cast aluminium pedestal supporting a tubular column upon which is mounted a terrestrial globe. This is 12½in diameter with the tuning scale forming the 'equator'. The controls take the form of flush sleeves at the top of the column, under the globe – more about this feature later.

Patent applications were filed in late 1944 and early 1945 by one Mechal Rabinowicz, a man of Polish nationality residing in north-west London just a short distance from where these sets were to be made. The specifications were finally accepted in April 1949.

The main object of the invention was 'to eliminate the control knobs or buttons which are normally provided on the casing of a wireless receiver for the purpose of tuning the receiver to the required transmission.'

The patent refers to 'broadcast receiving apparatus of the kind having a casing member which is rotatable around a column and is operatively connected to the tuning means of the receiver, so as to enable the receiver to be tuned to the required wavelength by turning the said casing member.' The specification continued 'Owing to the comparatively small size of the casing which needs be provided, the column may form part of a floor stand without the arrangement being thereby rendered top-heavy.' Another advantage is mentioned in that with a receiver having a spherical casing, both sides of the inner platform (i.e. the flat chassis plate) can be utilised for supporting the receiver components, and the platform can be of circular shape, so that by arranging it near the middle of the casing the space available within the casing can be used to the maximum advantage. The patent also makes provision for the casing to be of any suitable shape, for instance prismatic, cylindrical or spherical. The cylindrical shape seems to have been intended for a television and it seems that only the globe went into production.



At least two models of the radio were made, both for A.C. only. The first was the 1946 export version – model AC100 – with two short-wave-bands and medium-wave (BC), available for operation on 110 volts or 200/240 volts. This was known by the manufacturer as the 'Indian' model. Perhaps it was thought slightly reminiscent of the religious edifices of that country, or was it destined solely for the sub-continent? Then, in 1947, came model AC200 for the home market, with the usual long, medium and short wave-bands. Another variation was provided with a stand having a telescopic action as well as fixed height. Further, a table model was available with dwarf stand. There was also a choice of finishes, the most popular of which appears to have been polished chromium plating. Bases appear to have been supplied in several colours.

Unfortunately it has not been possible to obtain very much information on the manufacturers. It would seem that the company records, along with those of many more small companies of this era, were destroyed about twenty years ago and only a few token examples remain in the Public Records Office at Kew. Local museum archives do not assist. One wonders from whence the name Emore originated. Could it be the first two letters (reversed) of the inventor's Christian name plus the others from his surname? The row of premises named Manor Terrace in Kilburn High Road where the firm occupied one unit consists of shops, restaurants, launderette and a public house at one end, all with three storey residential accommodation above. I assume that

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## The Classics 'Emor Globe' (continued)



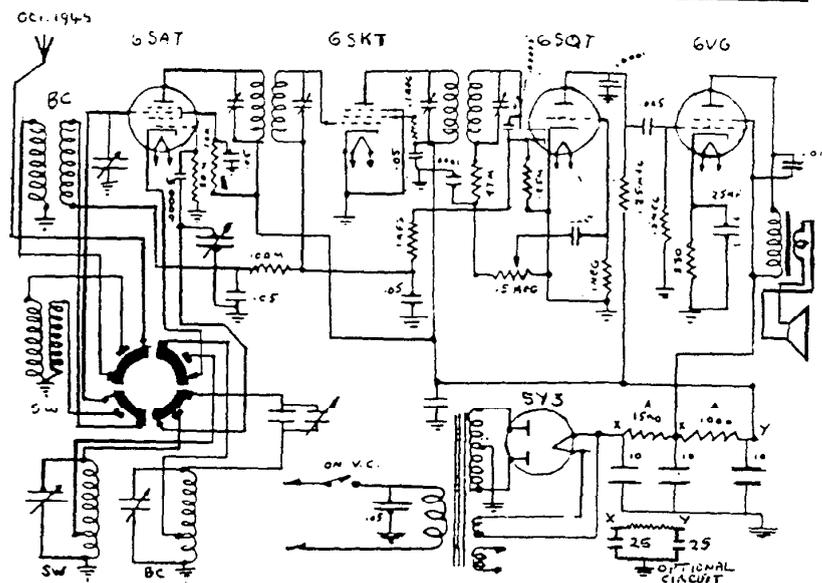
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the company's unit could have been used for assembly purposes on a limited scale, with perhaps some components being supplied by small engineering works in the vicinity. Conversely this address may have just been the registered office and perhaps the factory was situated elsewhere. Can anyone supplement this sparse information?

Now for some details of one version of this unusual radio.

It is a four valve plus rectifier superhet utilising octal based GT or G series. The sturdy flat steel chassis plate of 10½in diameter is firmly screwed to the top of a one-inch diameter tube by means of a heavy collar welded to the tube. The control sleeves slip over this tube which in turn, at the lower end, fits into the top of the static main support column. The loudspeaker, in this case a five-inch diameter Celestion, is mounted on brackets above the plate, facing upwards just under the top of the upper bowl which is provided with a grid and mesh. This, according to the sales brochure, 'enables the sound waves to be evenly distributed and thus reception can be heard clearly and distinctly by listeners in any part of the room.'

The two aluminium hemispheres have lips in which rest the circular dial. This is formed from a band of ¼in thick Perspex just over 1½in wide on which are silk-screen-printed the wavelengths and station names in three colours on a black background. Illumination is by a fixed bulb mounted on the chassis and lighting the appropriate part of the scale as the whole globe and dial are rotated. It uses a similar principle to that on some round Ekco models which is referred to as 'light beam and shadow indicator'; although of course in the latter case the lamp is mounted on the end of the rotating cursor. The mechanical engineering design aspect is rather ingenious as well as rugged. For instance it embodies several robust turned and milled steel components of a quality not usually found in domestic radios.



Various brass and aluminium brackets and plates give this radio a 'handmade' internal appearance – and some alterations to the original layout design during actual assembly seem evident.

The upper control sleeve is removably attached by a flange to the lower half bowl. Above this flange and inside the bowl is a groove for the drive cord to the ganged tuning condenser. The top half bowl rests on the lower half, separated by the tuning scale. The complete globe rotates for tuning. Both halves of the bowl may be easily detached and lifted off or lowered away for access to both sides of the chassis without the need to dismantle the tubular control links.

Inside the one-inch diameter tube already described there are two others, controlled by sleeves attached by short screws and operating through an arcuate slot in the one-inch tube. This slot or window is covered by the sleeves. Centrally mounted on a bracket on the chassis plate is the volume control and ganged on/off switch with the spindle facing downwards. This is connected to the inner of the two tubes, to the lower end of which is attached the lowest control sleeve. The intermediate tube operates the wave change switch by means of a lever just above the chassis plate and is connected at the lower end to the middle control sleeve. Just above this sleeve a narrow collar with stampings indicating the position of the wave change switch is fixed to the main support tube. On the model in my possession all these are of the same outside diameter as the main support column and thus give a very sleek and uncluttered appearance – as was the original objective.

The mains lead which for safety reasons must include an earth core and the aerial lead, also necessary because of the metal casing, are fed through the tubes emerging via a hole in the pedestal. They enter above the chassis plate through a small paxolin bush drilled with four holes and supported by the volume control spindle.

A final note of my personal experience of this radio is that the three holes in the cast aluminium pedestal through which the main column is gripped are tapped 1BA. By virtue of being drilled horizontally into the side of the shallow centre boss, just above the 12in diameter base plate, they are quite inaccessible to be able to tap to a larger size, say ¼inW. The set was acquired in a dismantled condition with many screws missing, including these. A search for this size of screw was made in vain. No problems were encountered in replacing various 4BA and 6BA screws and nuts but I am indebted to Mr Gerald Wells for helping me out of this particular predicament. Quite possibly forty years ago odd BA sizes were in common usage, but I still feel, perhaps rather cynically, that using this size rather than the more usual OBA, also the fact that a few 3BA threads were encountered elsewhere, that the manufacturer's policy was 'thou shalt not interfere with this equipment.'

I would like once again to extend my sincere thanks to Mr Wells for getting this radio back into working order: in fact he practically rebuilt it electronically after the rough life and many hands it had passed through.

## An early Glass-panel Receiver

by Tony Carr

At a recent Harpenden meeting some of you may have spotted a somewhat dilapidated glass-panel receiver which appeared to be creating quite a lot of interest, if only with comments like, 'What a pity.'

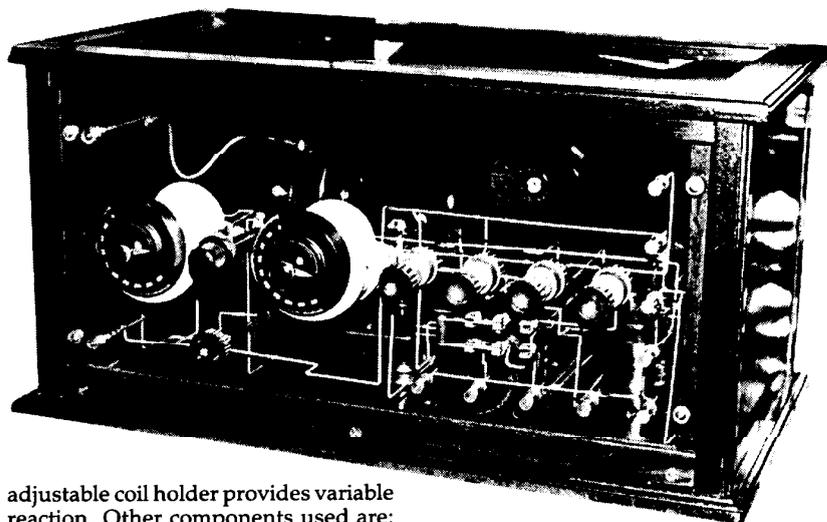
It lay on the floor under a stall and after one of my many tours around the hall, each time stopping to take a further look at this rather sorry-looking, but interesting radio with its smashed glass making the 'works' look like the inside of a bottle bank. Being a person who enjoys a challenge I made an offer for the set and after some haggling, reached a price acceptable to both parties.

That evening, after the long trek home to Stoke-on-Trent, I took a close look at it. What at first had appeared to be a well-constructed unit of the home-brew type was now looking more and more like a professionally built job.

The cabinet is constructed from solid mahogany using dovetail joints and elegantly moulded edges to the base and hinged lift-up top. The top itself consists of a rebated frame with mitred corners into which a plate glass window is fitted. The cut edges of the glass have been painted black to stop edge reflection. The interior and exterior woodwork have been French polished.

The base-board is also of solid mahogany with vertical support brackets on to which the front panel is fastened. All electrical components are screwed direct to this board or fastened to the glass front where thin leather washers are used to avoid damaging the glass.

Electrically the receiver is standard in design with IIF-DET-LF-LF four valve configuration, the number of valves being selectable from three to four giving one LF stage for phones or two LF stages to drive a speaker. Interstage coupling uses 'Eureka' concert grand and baby grand transformers (first introduced in 1924) without grid bias. The tuned HF and detector (with reaction) stages utilise the one pin and one socket type plug-in coils and an



adjustable coil holder provides variable reaction. Other components used are: adjustable grid leak resistance, two variable  $0.0005\mu\text{T}$  capacitors with fine tune single moving plate controls, one each for aerial and H.F. anode tuning, filament reostats of the compression type, (sold under the trade name 'Microstat') provide adjustment for each valve. 'Edison Bell' fixed capacitors being used in the detector and L.F. stages. The components are connected together with hard drawn tinned  $\frac{1}{16}$  inch square section copper wire, with neatly formed right angle bends and a combination of both clamped and soldered connections.

**Restoration:** The only part which required any serious rebuilding was the glass front panel. I rejected the idea of clear plastic: the only cure was to fit a completely new piece of  $\frac{1}{4}$  inch thick plate-glass. This sounds relatively simple until one considered the 29 holes of various sizes which would have to be drilled.

After several phone calls to local glass suppliers, I managed to find one who was prepared to take on this delicate task. Having obtained the undrilled glass and marked out the relative hole positions, the glass was returned for drilling. After two weeks it was returned completed, along with the question 'Do you mind telling us what is it for, as we have never before drilled so many holes in such a small piece of glass.'

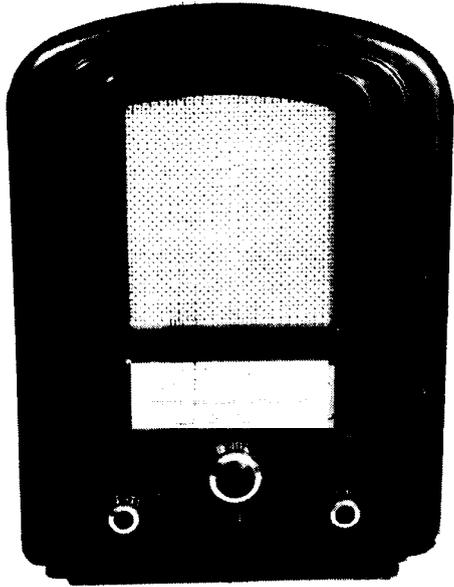
The next stage was to refit the various components to the panel and complete

the restoration. But to my dismay, the larger holes proved to be under-size and the only solution was to grind out the holes using a small coarse-grit, shaft-mounted wheel, mounted in a hand brace.

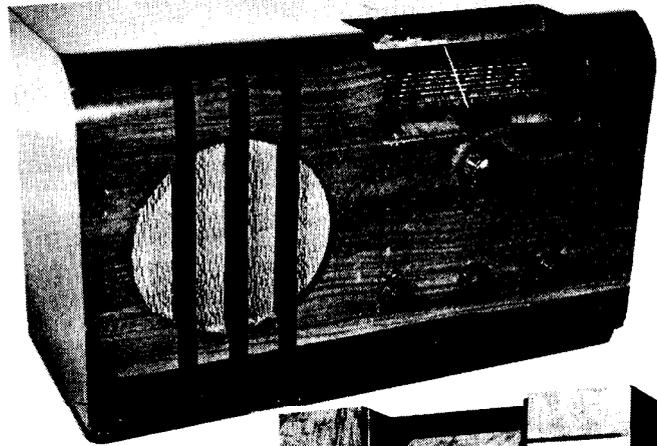
I re-lettered the front panel using the rub-on type of transfers which I painted with French polish to seal them. The original markings were soak-and-slide-on transfers which seem to be unobtainable these days. Next, the front panel and base board were fastened together and all components fitted in their respective positions. The last stage was to connect the sections of wiring via the component clamping nuts or soldered joints. The receiver was now ready for testing. A set of valves and coils were fitted and all necessary external connections made. Headphones in position, I switched on, and burbling and squealing noises appeared in the phones and after some knob-twiddling Radio 1 came in loud and clear!

The receiver appears to have been made around 1924, but for what purpose? I would be pleased to hear from anyone prepared to speculate on this. A copy of an advertisement for the 'Eureka' transformer dated March 1924 shows that this was first available in February 1924, also from the same magazine is a plug-in coil selection chart which may prove useful to fellow members.

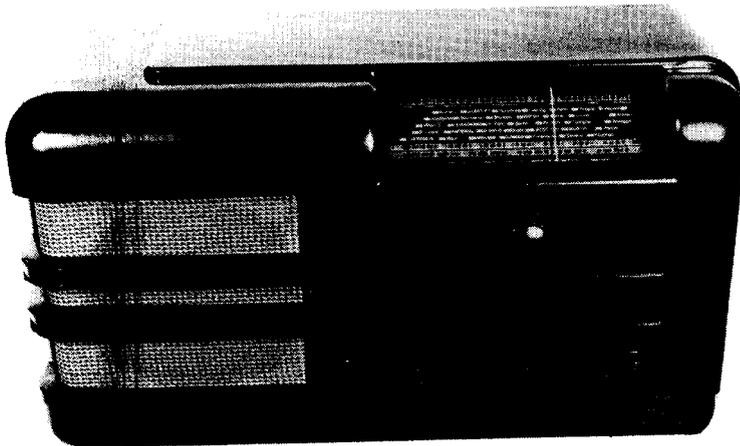
Wave length	Stations to be received	Aerial circuit	Anode circuit	Reaction
300-500	British Broadcasting and Shipping	35, 50	50, 75	75
600	Shipping .. ..	50, 75	100, 150	100
800-1,000	Aircraft .. ..	75, 100	150, 200	150
1,050	Hague .. ..	75, 100	150, 200	150
1,785	Radiola (Paris) ..	100, 150	250, 300	200
2,600	Eiffel Tower ..	200, 250	300, 400	200



1936 'Parva' battery set



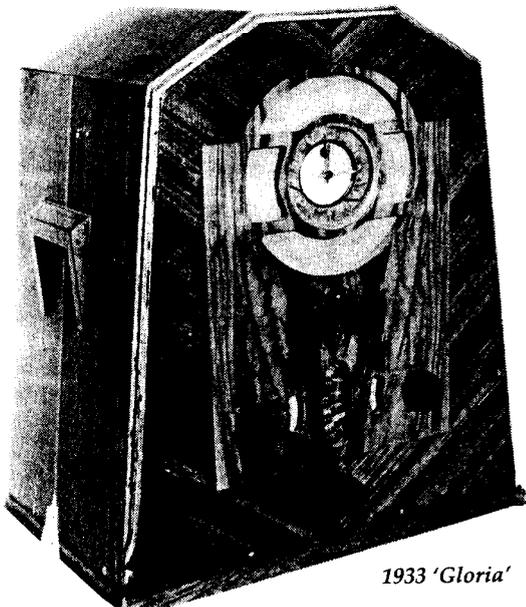
1940-41 'Model 241'



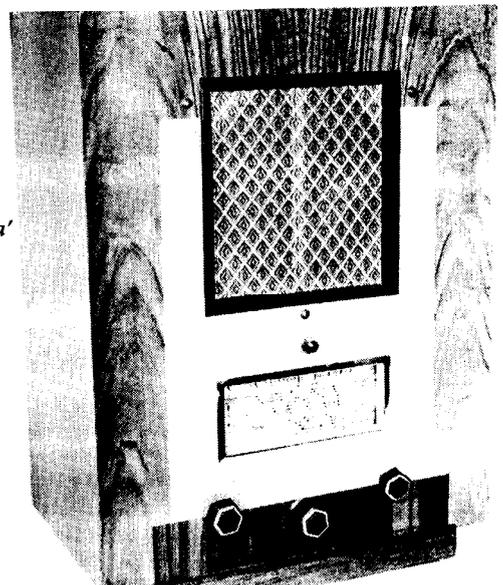
1939 'Model 139'



1935-36 'Arcadia Console'



1933 'Gloria'



1934-35 'Lancastria'

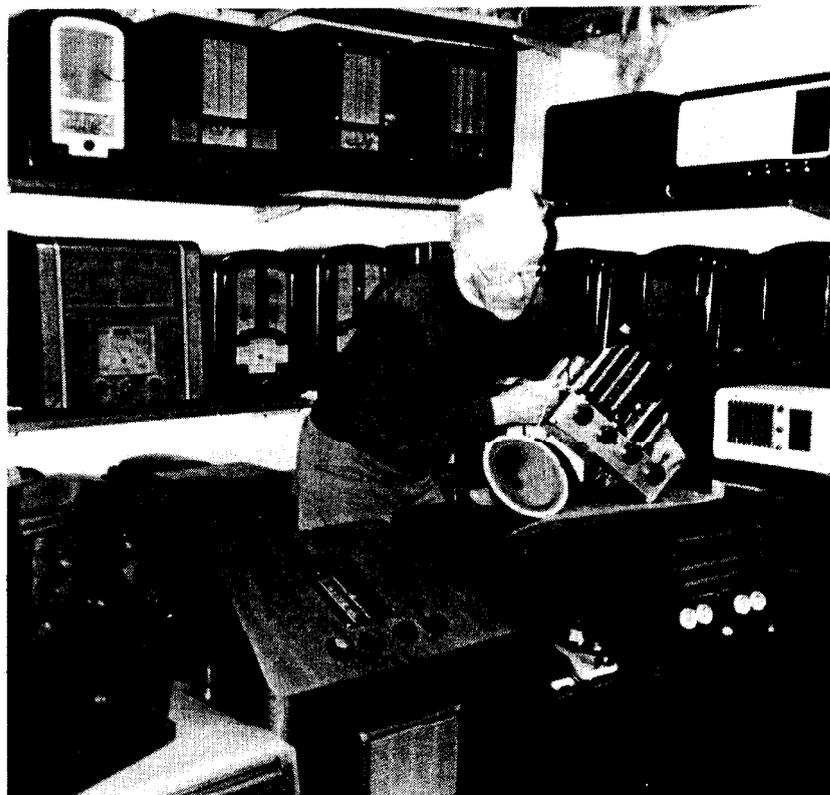
## A Ferranti Collection

by Jim Forster

My interest in wireless goes back to the early thirties but I did not begin the present collection until about 1974. The previous ten years or so had been spent researching the history of sound recording and assembling a reasonable collection of phonographs, gramophones and other associated items.

Unfortunately, the cost of expanding the collection further was escalating at such a rate that it became increasingly difficult to find the necessary finance. As this was very frustrating, I decided to look around for something else just as interesting but less expensive. In choosing wireless I was fully aware that the time might not be far off when I could well be confronted with exactly the same problem. In order to minimise the effects of such an eventuality, I decided to limit my objective. Briefly, this was to specialise on one manufacturer, who, in my opinion, had made a significant contribution to the development of domestic radio receivers. Ferranti was chosen for a number of reasons but it is not my intention to bore you with all the details, suffice to say some were personal, others not so.

In 1956 a major policy decision was taken to cease the manufacture of all domestic consumer products. Although experimental receivers using transistors were being designed and tested at that time, they never reached the production stage. The radio department was closed and its interests vested in a new subsidiary company Ferranti Radio and Television Ltd. The shares were sold to E. K. Cole Ltd who then manufactured radio and TV sets bearing the Ferranti marque at their Southend Works. Eventually E. K. Cole disappeared as an independent company and the marketing of sets using the Ferranti name ceased about 1970. 1956 therefore, really marks the end of a chapter in the Company's history because the EKCO sets, excellent though they were, are not really 'genuine Ferranti.' It also provides a convenient ending to the period covered by the collection. Ideally, one would like to have an example of each product made between 1924 and 1956 but space limitations preclude this because quite a number of bulky radiograms would have to be included.



*Jim Forster with part of the collection. Sets referred to in the text are: the 1935-36 'Nova' extreme left on top shelf; the 1937 '837' arch-top set just behind Jim; the 1929 'Type 31' bottom left; and the 1945 '145' centre shelf right.*

Photo: by Jonathan Hill.

The present collection comprises some 200 or so items, of which about 100 are receivers. Some are partly or fully restored, the rest awaiting similar treatment. Each year is represented but there are still many gaps to be filled. At the present time most of the collection is in Bangor at my home but there are some items on display at the Company's Archives in Moston.

Assembling the collection has been great fun, bringing me into contact with numerous people, many of whom are members of the BVWS. Ferranti Ltd have taken a keen interest and given considerable encouragement. I am very grateful to all those who have contributed in one way or another to a fascinating project.

One of the 'Lancastria' series employed a reflex circuit, this being an attempt to compete in sensitivity with the well-known EKCO AD65. The Company was also instrumental, along with other manufacturers, principally E. K. Cole Ltd, in pioneering the use of moulded bakelite cabinets, Ferranti's first being that used for the 1935/36 two waveband 'Nova'. 1937 saw the advent of the '837', an all wave, three valve plus rectifier, AC mains superhet housed in a bakelite cabinet. This model was a bold attempt to mass

produce a receiver at the relatively low price of eight guineas. Its main feature was the absence of any screening cans around the rf. oscillator and if. coils. It is said that its introduction at such a low figure caused consternation amongst some of the other manufacturers. International octal-based valves and press button tuning were incorporated in some of the 1938 sets but only a relatively small number were made.

By 1939 the pace of development was slowing down and only three new models appeared, namely '139', '239' and '539', the latter being their first all dry battery superhet using the 1.4v octal based valves. A few sets, '241' and '341' were sole in 1940/41 but they were really 1939 chassis put into new cabinets.

The chassis used in the first post war receiver, the '145', released in September 1945, was based on the 1939 design, the same being true for the following year's model, the '146'. Both these sets used bakelite cabinets, the latter being a long rectangular design in black (or brown) and cream, the former an upright brown cabinet very similar in appearance to the 1936/37 all wave 'Nova'. The '546' and its immediate

• continued on next page

## Collections 'Ferranti Collection' (continued)

• continued from previous page

successor the '547' were the first serious attempt at miniaturisation. Both were AC/DC sets and employed octal based, universal GT type valves. From 1947 onwards, in common with many other manufacturers, relatively few new technological advances took place until the new VHF-FM service was opened in the early 'fifties. Certainly greater emphasis was placed on miniaturisation, use of transformerless techniques and R-C smoothing. The first set incorporating FM, the '045' came out in 1954. The chassis, basically a modified 1952/53 design had a 'bought in' Mullard FM tuner unit added to the front end. The '045' was superseded in 1955 by the '255', an entirely new design. Unfortunately, it was destined to become one of the last range of models manufactured by Ferranti at Moston.

The collection covers the period 1924 to 1956, ie the period in which the parent company manufactured components and complete receivers, firstly at Hollinwood and later at Moston. The Radio Department as it was known, closed in 1956, but more about this will be said later.

Dr S. Z. de Ferranti and his assistant Albert Hall began experimenting with wireless in the early twenties. The first commercial product resulting from their work, ie the AF2 intervalve transformer, appeared in 1924 and was followed by a range of components such as capacitors, resistors, transformers (intervalve, mains and output,) trickle chargers, 'anode feed' units which incorporated the principle of decoupling and complete HT power supplies. The first moving iron horn loudspeaker arrived in 1927 and in 1929 came the M1 permanent magnet loudspeaker, a superb piece of engineering. A number of kit sets were marketed in the late twenties, followed in 1929 by the first completely manufactured AC mains receiver (type 31). This was a three valve plus rectifier TRF set housed in a handsome wood cabinet. It did not have an internal loudspeaker but had provision for driving both high and low impedance types.

The Company's contribution to the rapid progress taking place in those early years was not confined to hardware. 'The Way to True Radio Reproduction' appeared in October 1926, a booklet giving advice to designers and amateur constructors. Written by Albert Hall it was revised on three subsequent occasions under the titles 'True Radio Reproduction' (September 1928) and 'The True Road to Radio' (June 1931 and July 1933).

Dr Ferranti died in 1930 and was succeeded as Managing Director by his son Vincent, who fortunately maintained the Company's interest in wireless. Albert Hall was mainly responsible for the research and development work from 1930 to 1932 when he was joined by Dr N. H. Searby and later by M. K. Taylor and others. During this period four ac. mains sets were produced, Models 21 and 22 (simple two stage receivers), Model 32 (with or without internal speaker, an updated version of type 31) and the first superhet, the 'A1', which apart from the rectifier used screened grid and triode valves throughout. At the same time a valve department was opened and from then on, until the outbreak of WW2, virtually every component, including valves, used in the Company's sets was made entirely within the works. The practice of marketing kit sets also continued until about 1935.

From 1933 to 1937 a series of superhet and TRF sets was marketed using the names 'Lancastria', 'Arcadia', 'Gloria', 'Una', 'Nova', 'Parva' and 'Magna', their circuit complexity increasing as time progressed. Novel devices, (some people prefer the term 'gimmicks') such as moving iron tuning indicator, high note uplift transformer, magnascopic tuning and variable selectivity were incorporated in some models.

From 'Wireless World' June 1917:

### Wireless in the Courts

In the early days of the war when wireless enthusiasts were new to the working of regulations concerning apparatus established under the Defence of the Realm Act, a certain number of police court cases occurred, of which typical examples will be found in past issues of The Wireless World. Such cases have practically ceased to exist, but on May 7th last an electrical apprentice named Reginald George Harrison Cole, employed in Portsmouth Dockyard, was charged at Portsmouth Police court, under the Defence of the Realm Act, with being in possession of a wireless telegraphic apparatus, without the permission of the Postmaster General. A detective who visited the prisoner's residence at Southsea is stated to have found, attached to a 15 foot clothes pole, three fine wires similar to those used as aerials in wireless telegraphy, whilst in Cole's bedroom it is alleged that he discovered a table on which was a machine attached to aerials, and in working order. The account which has reached us states that the accused maintained he could only receive messages, and was remanded for further inquiry. The young man has since been committed for trial.

## Looking back

Roger Snelling looks back at reports in the wireless press of the early days.

From: 'Wireless World' September 16th 1922:

### Landlords and Wireless Aerials

From notes which have recently appeared in the daily press it is apparent that, in some instances, the attitude of landlords towards the erection of aerials on buildings will not be an encouraging one.

A reasonable attitude for a landlord to adopt would be to obtain an undertaking that any damage resulting from the erection of an aerial would be made good by the tenant. Beyond that it is difficult to see any reason for landlords to interfere.

For those unfortunate amateurs who may be domiciled in a building owned by the London County Council, it appears that the method of erecting the aerial and many other details must first receive the approval of the council, whilst among other formalities a deposit of £1 must be left with the council as security against damage.

From 'Wireless World' "Current Topics". 27th June, 1928:

### He needn't feel lonely

An American statistician has been computing how many telephones in Europe can be communicated with from the US by means of the Transatlantic telephony system. His list is as follows:

Great Britain, 1,630,000; Germany, 646,000 (3 cities); Belgium, 97,000 (2 cities); and Holland, 109,000 (3 cities). An American subscriber can also talk to 45,000 people in Mexico, 75,000 in Cuba, 850,000 in Canada, not to mention 18,365,000 in his own country.

From 'Wireless World' January 6th, 1926:

### Those loud loud-speakers

Guildford tradesmen who have resorted to the wily charms of the loud-speaker to entice prospective customers will probably have to direct their energy into other channels in the near future.

The Guildford Town Council has asked the Home Secretary whether he will confirm a bye-law regarding the use of wireless loud-speakers outside business premises for advertisement purposes.

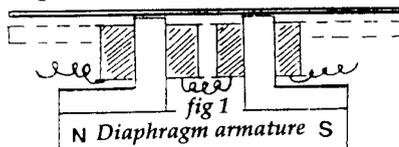
# Headphones

Probably, most vintage wireless enthusiasts pay little attention to earphones. Certainly, anyone trying any listening-in on crystal sets will have discovered that their quality varies, mostly due to deterioration over the years, but in the heyday of headphone reception manufacturers often made extravagant claims for their products. How good were they really? Here, in the first instalment of a two-part series, **Desmond Thackeray** looks at some of the designs. What he says about headphones applies equally to most horn loudspeakers, which were really just 'glorified' earphones.

## Part I – The Hardware

by Desmond Thackeray

### 1. The Diaphragm Armature Design: (Figure 1)



In search of oddball designs of headphones, it occurred to me that here was an interesting speciality looking for a collector.

Indeed, just to collect a good example of each of the well known makes of standard design would demand all the dedication available. Since headphones, headbands and phone cords seem to get scratched, soiled and frayed to an amazing extent. My interest being only technical, I was grateful to a ham friend who dug three unwanted pairs from the bowels of his garden shed, since at least one of the 'receivers' in each set seemed to be in sound electroacoustic condition. Together with other usable headphones loaned by kind-hearted BVWS members, I now have the basis for some comparative measurements on used telephone receivers, though the wide variety of winding impedances will make interpretation a less certain exercise.

One result is bound to emerge, namely that certain headphones appear more 'sensitive' than others, a conclusion which must have been reached time and again by BVWS members in search of the best pair to use with a cherished crystal set. And it is not always the well-known brand that delivers the goods in the shape of a strongly audible signal; sometimes 'Brand X' of unknown origin heads its class, and for no very obvious reason.



Device for 'transmitting sound by light waves' by Bell and Tainter 1881.

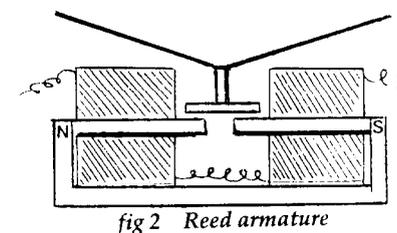
In truth, getting an optimum design from traditional construction of the short-magnet bipolar watch-case style of telephone receiver was probably little influenced by the theory of Poincaré and Kennelly, but the result of much empirical 'cut and try' activity and probably a measure of luck as well. In the process, diaphragms eventually stabilised at about 10 'thous' thickness in a suitable grade of silicon-iron, and magnets got somewhat shorter and stronger.

That wasn't quite the end of the line, however, since the standard design (typified by a latish Brown's 'F', say) still had no obvious means of applying some mechanical damping to the diaphragm. This doesn't matter at all for listening to Morse; indeed a strong resonance at some high audio frequency may be an advantage. But for telephony, a peaky audio spectrum leads to low intelligibility.

So, to flatten the response acoustically, the traditional headphone design was modified about 1937 by filling in the space immediately behind the diaphragm. This can be seen in the

British 2P receivers of the angular-styled GPO 300-series telephone instruments and in headphones using type 4035B receivers (is this an ST&C number?), as well as in the HA1 receiver insert made by Western Electric for American telephones.

### 2. The Reed Armature Design:



That does however appear to be the ultimate improvement, for in all other features there are compromises between the electrical, magnetic,

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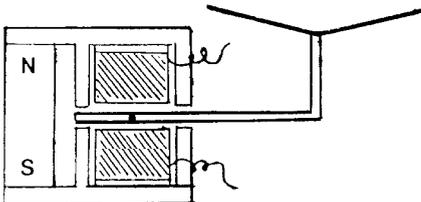
## Research 'Headphones' (continued)

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mechanical and acoustical requirements which hamper the efficiency and fidelity of this sort of telephone receiver. An early attempt to separate the functions of magnetic armature and acoustic diaphragm resulted in the S. G. Brown vibrating-reed receiver, in which the armature is a tiny metal 'reed' clamped at one end, with a coupling transmitting the motion mechanically to a light aluminium diaphragm supported by a thin parchment ring (Figure 2). The magnetic air-gap is adjusted by means of a knurled knob on the back of the case. Two steps in the right direction, certainly; but the reed still has to be substantial enough to sustain the pull of the permanent magnet, and the lack of symmetry invites losses of magnetic flux

### 3. The Balanced and Rocking Armature Designs:

fig 3 Balanced armature

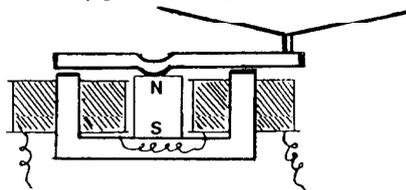


However it is no big step in design from there to arrange a symmetrical 4-pole system in which the armature sits halfway between magnetic poles (Figure 3), at which point it should experience no pull at all from the magnet alone. The signal current then causes it to 'rock' about this balance point in a symmetrical fashion. Probably the most famous of these rocking or balanced-armature headphones were those made by Nathaniel Baldwin of Salt Lake City which he (and wives no doubt) put together in his kitchen for the US Navy, ten at a time. Type C seems to have been the Navy 'standard' and McMahon's 'Vintage Radio' depicts type C with both fibre and mica diaphragms. More familiar to UK readers will undoubtedly be the military surplus headphones DLR N5 ITBA 5S. An informant tells me that his mother assembled these during World War 2 in a small Siemens Bros. factory in Blackheath. That 'LR' means 'low resistance' (60 ohms total in the pair I have) and 'BA' means 'balanced armature' is fairly certain. Does

anybody know what the 'IT' represents? 'T' for 'telephone', perhaps. Both these, and the S. G. Brown 'S.G.B. C.L.R.' which is of conventional bipolar diaphragm-armature pattern, come equipped with a crude and awkward headband consisting of a piece of stiff wire and a webbing band.

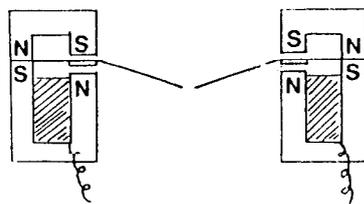
Ultimately, somebody must have realised that the four-pole balanced system could be sliced through conceptually to give two-pole systems (Figure 4). Easier to make and assemble as it turned out; which is vital to reliability and cost when the projected manufacture will be of a million or more for public use. The S. T. & C. design appears as the 4T in the handset of the 700 series telephone, the last of the non-electronic GPO telephones to be widely issued. Its small relation, the 3T, is to be found in some headsets and also in the S. T. & C. 'Deltaphone' and the GPO's 'Trimphones'. Both sizes of sealed capsule are small enough to fit if one wishes into the shells of older headphones/headsets; and they give a much smoother frequency response than one would suspect from telephone experience, where it is the response of the carbon microphone that so badly mars sound quality.

fig 4 Rocking armature



An alternative to these balanced armature receivers appeared in the Western Electric type U capsule (and also in a similar design by Siemens AG), Fig. 5, where the armature is a ring of magnetic alloy around the periphery of the diaphragm, thus eliminating the need for any coupling component between the two. The U3, a sealed unit as is the British 4T, is however larger and heavier than the 4T and was not envisaged for use in handsets, and also has a hole in the diaphragm to roll off the bass.

fig 5 Ring armature



The balanced armature receiver can also be used as a microphone where electronic amplification is available, though of course superior results are generally obtained from moving coil (electrodynamic) and capacitor (electrostatic) microphones such as the 'electret'. I say 'generally' because a badly made transducer of any type can be disastrous to the sound quality and sensitivity, quite noticeable when such a low-grade capsule finds its way into so called 'Hi-Fi' stereo headphones or a smart-looking operators' headset. It is perhaps a tribute to the quality of rocking-armature receivers that the British Telecom 'Viscount' telephone instrument was designed to use them as both receivers and transmitters in the handsets (as well as in the tone caller), though the use of identical items here clearly made avoidance of 'howl around' a problem. One wonders how Ericsson fared with their handset containing two identical moving-coil capsules.

### Two Moving-Coil 'Classics':

The moving-coil headphones of World War Two were intended to provide radio-telephone quality that was an improvement on what could be obtained from available electromagnetic types with fixed coils; and they seem to have met this vital need for intelligible communication with adequate speech bandwidth and lower distortion. The British inserts, alleged to have been made by S. G. Brown to fit into flying helmets, etc., are however relatively heavy for their size; while Western Electric in the USA chose to make very small featherweight capsules with a nicely engineered headband. The type number ANB-H-1 is to be interpreted as 'Army Navy British' apparently.

Though my hardware story stops here, history did not stop in 1945 ('more's the pity' did I hear some cynic say?). So, somebody writing in the next century about headphones will for sure be including those of the decades 1945 to 1985. What intrigues me is the thought of my Sennheiser HD400\* 'phones being eagerly sought at Harpenden by collectors offering much deflated £100 coins in say the year 2038, along with other items of current hobby hardware.

\* A discount 'offer' in Boots

Part Two of Desmond Thackeray's report will appear in the next Bulletin.

## Books



Photos: The Marconi Co. Ltd.

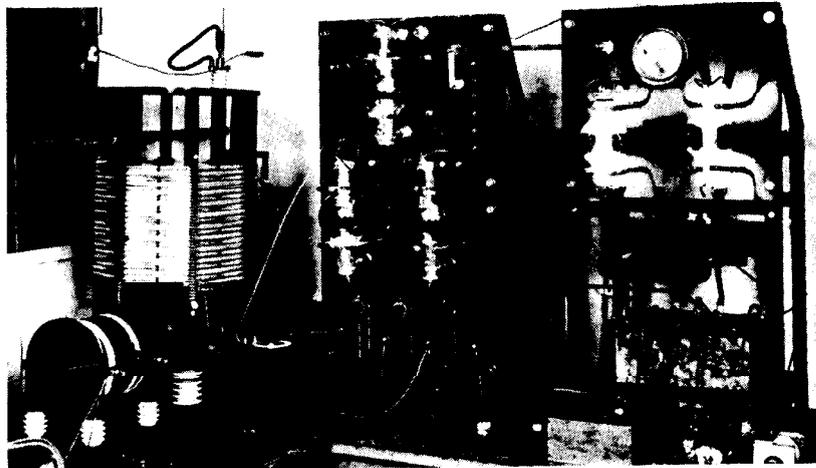
## Book review

*'2MT Writtle: The Birth of British Broadcasting'* by Tim Wander, 200pp with 60 photographs. Obtainable from the author in a signed and numbered edition at £12.95 plus £1 post and packing (£2.50 USA and Europe), cheques payable to Capella Publications, 44 Holmfield Way, Earls Colne, Essex, CO6 2SP.

In a world now dominated by megalithic broadcasting organisations and megabuck media personalities and advertising, Tim Wander's book serves as a timely reminder of how it all started – warts and all.

There is something peculiarly British about the whole story. Blinkered officialdom, made to look ridiculous by a bunch of enthusiastic engineers who clearly saw the future of radio as bringing laughter, music and news to every home rather than the preserve of military and commercial interests.

The story of 2 EMMA TOC, Writtle is above all, a human story, and Tim has wisely separated the technical aspects of radio from the story of those 'long low people in that long low hut' so that we can enter the anarchic world of the carthed goat, omnivorous stove and sheer dedicated hard work that kept Writtle on the air in spite of 'blushing' valves and 'blasting' singers.



Despite the endless battles with 'Head Office' over irksome details like the return of packing cases and other 'borrowed' items, it wasn't all horseplay.

'PP' Eckersley welded a creative team together, and their long hours of dedicated hardwork at the sharp end of airborne communications technology helped to create the airborne equipment that proved vital in the Battle of Britain and throughout the War.

Tim has put together a book that should satisfy everyone – not just the historian, vintage wireless enthusiast

and the technologist. And by including a historical perspective on radio telephony, he has brought the largely unknown activities of several important pioneers into the limelight.

Although I am familiar with Grindell Matthews' work, I knew little about Fessenden, and nothing about Nathan B. Stubblefield! I found the photograph of Fessenden's ill-fated mast at Machrihanish particularly impressive and the book contains many other superb illustrations to mark it as an original and entertaining story of the start of broadcasting in Britain. – Tony Hopwood

## Book Reviews

### Book review

*'The Radio and TV Collector's Guide Book' (first volume) by Guy Biraud, translated by Richard Foster. Large format, printed on art paper, 256 pp including many hundreds of illustrations on coloured backgrounds and descriptions in both French and English. Published by Edition Biraud, 1, Place du Puits-Lavaud, 85200 Fontenay-le-Compte, France, from whom an order form can be obtained on sending a self-addressed envelope together with an International reply-paid coupon.*

**Guy Biraud, the respected French vintage wireless enthusiast, who has already published an excellent book on conservation and restoration, has just published another beautifully-produced book, based on a unique concept which is much to be applauded.**

The first volume of a remarkably enterprising project contains more than 1,000 illustrations and is a sort of 'wireless directory' covering the period from about 1800 to just after the first world war. But to view this sumptuous volume as simply a 'coffee-table book' full of pictures would be to considerably understate its purpose.

In his introduction, Guy states his purpose as simply 'to be useful to the enthusiastic collector' in publishing the fruits of his twenty years of research and gathering of documents, but behind that humble statement is an admirable philosophy of conservation.

He is concerned with searching out, checking and preserving important material, both as printed data and in the form of equipment, preserving it and then presenting information gained in a convenient form. His research goes back to original sources rather than picking up material 'second hand' and repeating it. He eschews the 'standard' way of producing a collectors' reference book, which is to photograph objects in collections and merely to catalogue them. Instead, he has sought out illustrations from original catalogues and other documents. The advantages of such a philosophy clearly outweigh the disadvantages, as he demonstrates in the book. The special advantage is that original illustrations are likely to be much more authentic than recently discovered objects which may have undergone modifications due to the replacement of parts over the years or to over-restoration.

Possible disadvantages are that early illustrations are not always as good as modern photographs and that 'production models' of pieces of apparatus are not invariably the same as depicted in contemporary publicity material. (One must admit that there is scarcely any evidence of the first objection in the book, for the excellence of the printing and the technique of putting illustrations on a tinted background actually enhances their clarity. In the case of my second objection, I confess that I have insufficient knowledge of the French equipment depicted to substantiate my suggestion.)

Guy has also sensibly decided not to

of radio or succumb to a 'great men of history' approach to the subject, for these areas have already been well covered. He has set out to create a kind of wireless collectors' 'Bible': an ambitious undertaking of which this is the first volume. A second is already in preparation, to be followed by supplements which will make it a living encyclopaedia on the subject.

In this first volume, fascinating etchings and early photographs depict the quaint apparatuses of the period before 1918 which are given the title 'La prehistoire', followed by a necessarily larger section covering the period from after the first world war to just after the second and entitled 'La T.S.F. devient radio'.

The chronological structure of the work enables the reader not only to trace the general development of wireless but also to trace the specific evolution of the products of various manufacturers.

As one would expect, the equipment illustrated is mainly of European origin, with a bias towards French manufacturers, but important British makers are represented, such as Burndept, AJS and even Bush (the ubiquitous DAC 90). Among the curiosities shown is a Grafton china crystal-set having a curiously small coil (a rare 'export' model?), crystal sets built in walnut shells and tortoise shells, and valve-sets built into grandfather clocks and table-lamps.

This first volume is a splendid compendium and we eagerly await the second: to feature everything from valves and television tubes, meters and microphones, to wireless toys and humorous picture postcards. — **Robert Hawes.**

### Book review

*Waveforms - A History of Early Oscillography by V. J. Phillips, Adam Hilger, 1987, 259 pp, 211 illustrations, Price £35.*

**For modern engineers and scientists the oscilloscope is probably the most indispensable electrical instrument. How else could you trace those fast moving electrical impulses as they are split up, recombined, reshaped, inverted and delayed in different parts of almost any electronic instrument? The oscilloscope not only allows one to see and photograph the shapes of these pulses over a very wide band-width, it is also designed to measure their voltage and time characteristics against built-in calibration.**

Dr Vivian Phillips tells us that the waveforms measured so easily and accurately with the modern instrument have been the subject of scientific investigation for well over a century. Possibly as early as 1827, but certainly with the work of Prof. Joseph Henry in 1842, there was experimental evidence to suggest that discharges from a Leyden Jar were oscillatory even though there was no means available to observe the waveform. Sir Charles Wheatstone had written a paper in 1834 on the use of a rotating mirror device which he used to observe vibrating bodies and electric sparks. But it was not until 1861 that Dr Bernhard Feddersen used the

Wheatstone mirror method to make an instrument capable of observing the electrical oscillations suggested by Henry. Early investigators encountered numerous difficulties in their attempts to observe and measure waveform characteristics of alternating voltages, whether at the high frequency of oscillatory spark discharges or at the much lower power frequencies. The great variety of instruments produced, or merely proposed, show that ingenuity was not lacking.

In this most important book, the author tells the fascinating story of all the ingenious devices that were used to observe waveforms before the oscilloscope. He describes manual and automatic wave-form plotting; moving coil, bi-filar and moving-iron oscillographs; the Einthoven string galvanometer and the rheotome. Purely accoustical methods are covered in some detail as they played an important part in waveform observations, and those which used diaphragms were easily adapted to electrical measurements. The oscilloscope itself is briefly dealt with at the end of the book in a section on cathode rays and the early devices that grew out of Prof. Ferdinand Braun's cathode ray tube of 1897. Like all new inventions, this one did not immediately replace the older instruments, some of which have continued in one form or another up to the present time.

The story, as Dr Phillips reveals, is by no means confined to electrical science. The instruments described use vibrating membranes, mercury jets, sensitive flames, Helmholtz resonators, rotating mirrors, stroboscopes, polarising prisms, phonographs and chemically sensitive papers, as well as a host of electrical phenomena. This well researched book certainly shows how versatile inventors can be.

It is difficult to fault the author in any way. His presentation is clear. Copious original references are listed at the end of each chapter. The hundreds of contemporary illustrations are clearly printed, well placed against the text and each carries a reference to its origin. The book is comprehensive with no major omissions. There is a detailed index but, in a work which contains so much information about scientists and inventors, a separation of name and subject might have been helpful. Many of the names referred to are given a short but very useful biographical note somewhere in the text and I found this extremely informative and sometimes positively illuminating.

My criticisms are few and the two I will mention relate to organisation rather than the facts themselves. The all important index, though generally well detailed, has a few curious omissions. For example, after reading the book I wanted to refer again to the excellent account of the polarised light ideas in chapter six. The key word, polarisation, was not to be found separately indexed. Some other key words were difficult to locate. I wondered if Lissajous' figures might have played some small part in oscillograph history. The index suggested not. I now know they are mentioned at least five times in the text.

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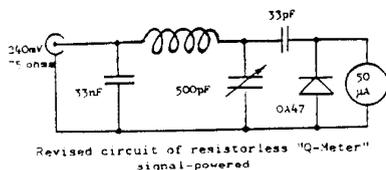
## Letters

### Vintage 'Q' meter

From: Desmond Thackeray

As I've always been keen on making measurements on vintage components (which are not always what they might be after 60 years) I was pleased to see Ted Beddoes' article on his 'Vintage Q Meter' in Bulletin 12:3.

Ted rightly mentions the problems of resistive losses, which this design has in R1, R2 and the resistor chain, restricting the performance. It is of course in good company there, since the problem is shared by other signal-powered devices including the familiar crystal set. While one can't do a great deal about the aerial-earth losses that are the bane of crystal set reception, one feels intuitively that one ought to be able to eliminate actual components like resistors. One route is the use of inductive signal injection, that has been used in commercial VHF Q-meters. However it is difficult to see as visually acceptable a single turn of copper strip wrapped round the honeycomb coil in Ted's realisation of the instrument; or two such strips if one intends inductive coupling to the 'voltmeter'. A second, swinging coil on the other hand might be visually acceptable, but would require a second variable condenser for tuning. So I think we are thrown back on the third possibility, capacitive coupling. This is engagingly simple in concept, as can be seen from the circuit diagram, though the coupling capacitors will need to be chosen to suit the oscillator and meter available. Eighty years ago, a similar function was performed by a decimeter; does any member possess one? An afterthought: the oscillator voltage may be monitored by means of the same diode and meter, or by a second diode and meter if available.



### Ekco coloured sets

From Frank Brittain

May I add my comments to Tom Going's article on Ekco coloured cabinet sets in the last Bulletin.

Ekco's first moulded cabinets of c1931/2 were supplied in plain, rather dark green. I am not certain about the model numbers but they could have been 312 or 313. If I remember correctly, one set was supplied with a separate

loudspeaker which could be fitted on top. About 1932/3 model RS2, described curiously as a 'console' and having a built-in cone-speaker, was marketed in a green mottled cabinet. This was followed by the M23, a similar set (SG3) but fitted with a moving-coil speaker and again in a green cabinet. The RS2, M23 and SH25 may have been supplied in brown but I do not remember them.

I must emphasise that all this is from memory and I could be wrong. One thing I am certain about is the reaction of the moulding manufacturers in Britain, who were so incensed by Ekco importing manufacturing plant from Germany that they took space in the trade press advertising the fact that they could produce anything that was needed. Incidentally, the word 'plastic/s' was not used in those days. Can anyone say when the term was first introduced?

*(Editor's note: These sets are all commonly seen nowadays in a dark 'walnut' brown. I have never seen a dark green mottled one although I do know of just one example of an AD65 in light green imitation marble. The only dark green Ekco radio product commonly seen today is a small table-microphone intended for 'home' use.)*

### Round microphone

From: Paul Anderson

A recent article in the Bulletin about the Round-Sykes microphone aroused in me the thought that somewhere in my archives I have reference to the use of chewing-gum for the coil suspension (vaseline was usually specified). So far, all I can come up with is a report in the 1926 Pitmans Radio Year Book, containing a report of the use of butter, which has a melting-point even lower than vaseline, so I assume the weather must have been very cold! Anyway, here's what the report said:

'The Aldershot Searchlight Tattoo broadcast was carried out successfully, although, owing to a chapter of accidents, it was not executed according to plan. On the way down from London, the van containing the gear was delayed through a mishap and did not arrive at Aldershot until the first part of the performance was over. In the ordinary course it would, therefore, have been possible to broadcast only the second part at 11.30pm. Fortunately, however, the engineer in charge, who was already on the scene, happened to have left at Aldershot apparatus used three days earlier, during a rehearsal. This apparatus consisted of an amplifier with a microphone over two years old - the very first of its type made, with batteries half run down and no spare valves. There was not even a pair of telephones with which to listen to the music, nor a

portable telephone set with which to maintain communication with London. The local post office engineers came to the rescue with a pair of head telephones and a portable set such as the telephone maintenance men use for tapping the lines. By using an overcoat rolled up on which to rest the microphone, and butter instead of the usual vaseline to fix the microphone coil on the microphone, and connecting up with odd pieces of wire, the apparatus was hastily lashed together and got into position in the arena. The head telephones, which were hurriedly fetched by a boy scout from Aldershot town, three miles away, were not received until after the first item had been transmitted, so that the only check that the engineers had that the apparatus was functioning properly was by telephoning to Savoy Hill and enquiring whether the music was being received satisfactorily. As regards the placing of the microphones, when the proper apparatus finally turned up, a second microphone was brought into service and carried on along with the antiquated instrument, which had survived the first part of the programme satisfactorily. These microphones were run out into the arena at the end of long lead covered cables, which had to be placed in position and hauled back as opportunity occurred in the pauses between the evolutions of the troops.'

### 'Book Reviews' (continued)

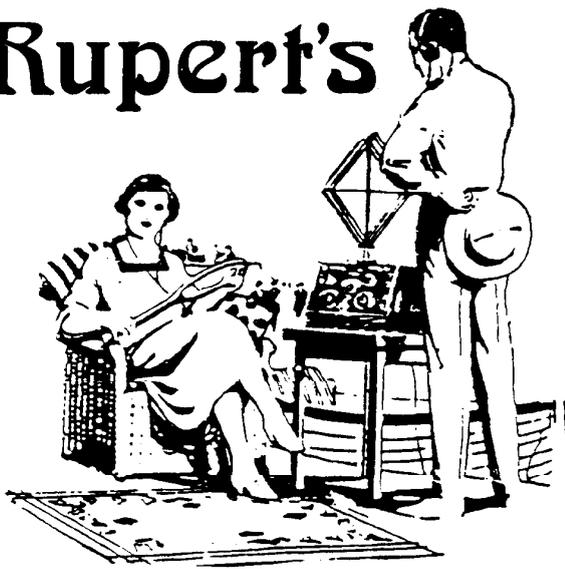
Book Review: 'Waveforms'  
continued from page 52

There are inconsistencies in name forms. A complete name and title (e.g. Prof. Joseph Henry) is only sometimes given on first introduction. Sir Charles Wheatstone only gets a 'Wheatstone' when he is first mentioned. The index is more consistent with most names correctly appearing as surname followed by simple initials. but Crookes gets 'Prof.' with no initials, Campbell gets 'Sir' with one initial, French priests get 'Abbé' with no initials, Brackett gets 'Mr' with no initials and poor old Sir William Crookes simply gets 'Crookes'. A book which is such a mine of information would have looked better with this point tidied up a little. It is a very common fault.

The author is a Senior Lecturer in the Electrical Engineering Department at University College, Swansea. His interest in the history of electrical technology is well known and 'Waveforms - A History of Early Oscillography' makes an ideal companion to his previous book 'Early Radio Wave Detectors' which appeared in 1980 and has now become a well-established classic.

I have no hesitation whatsoever in recommending this book. Wireless historians and collectors of scientific instruments will find it a stimulating work and a necessary reference source. - A.R.C.

# Rupert's



RUPERT'S, the Vintage Wireless Specialist, 151, Northfield Avenue, Ealing, London, W.13.

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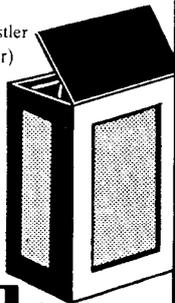
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