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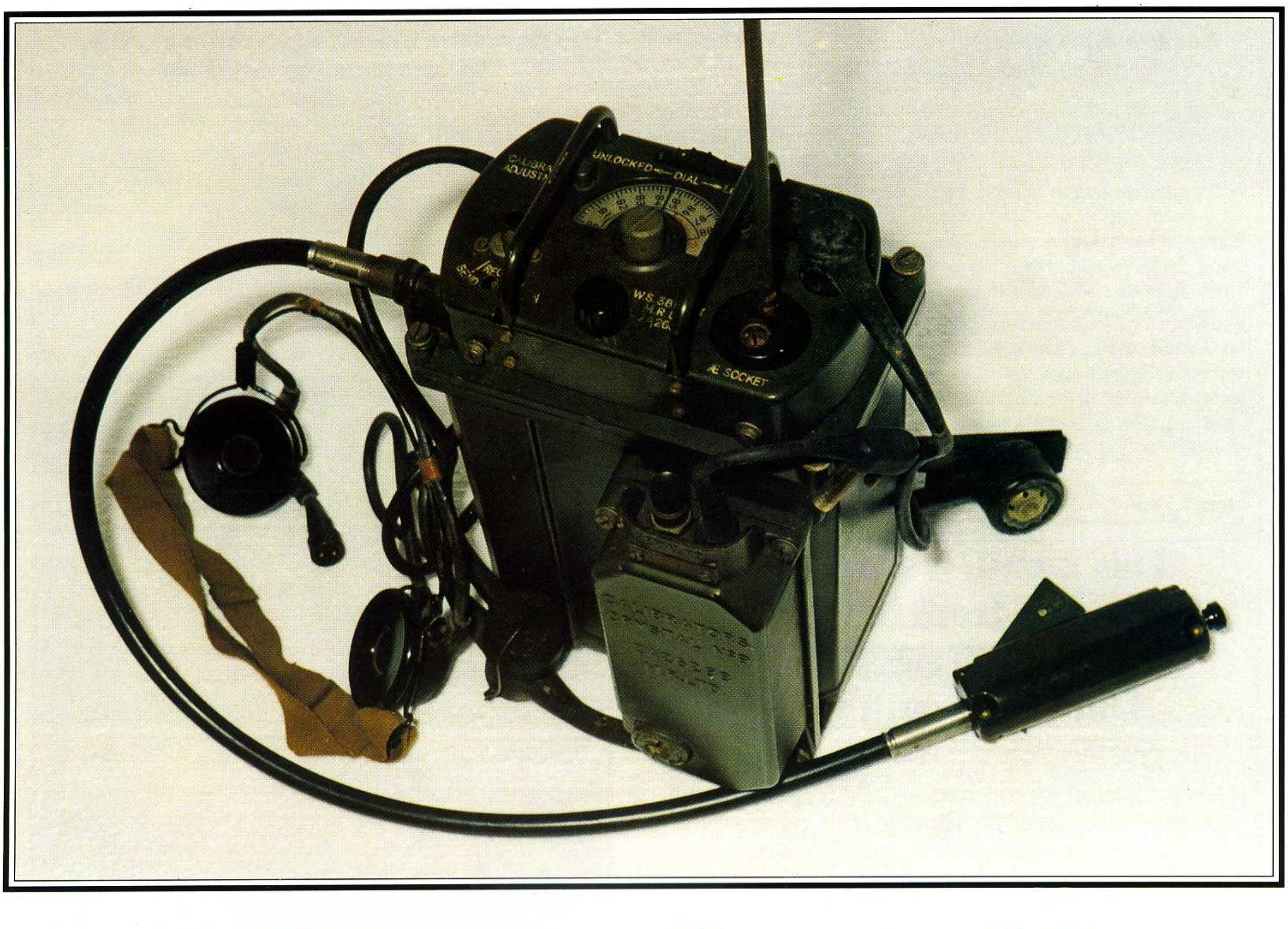
RADIO BYGONES

No. 6 – June/July 1990

Wireless Set No. 38 – Part 1



Radio and TV Interference Work in the 1950s

Coast Radio Stations – The First Sixty Years

A Visit to the Dulwich Vintage Wireless Museum

Reputed to be the first mains set with an integral loudspeaker, the 'H - I' was made for operation from 200V DC in around 1926 – 27 by the Swedish Aga Company, now more famous for its solid-fuel cooking stoves

The Gecophone Model BC2001 2-valve set (1922) sitting on its matching 2-stage LF amplifier Model BC2580. The mahogany case was designed to resemble a 'smoker's cabinet', and the set became known by that name

MUSEUM PIECES

This month featuring items from the Vintage Wireless Museum, Dulwich, South London

This combined TV/all-wave radio/gramophone, manufactured in 1938 by RGD (Radio Gramophone Developments), was once the property of John Paul Getty Senior, and was donated to the museum by John Paul Getty II. The set cost £223 when new

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Editor
Geoff Arnold
I.Eng FIEIE G3GSR

Administration
Barbara Arnold

Editorial, Subscription and Advertisement Offices
Radio Bygones
8A Corfe View Road
Corfe Mullen
Wimborne
Dorset BH21 3LZ
England

Telephone:
Broadstone (0202) 658474

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With this issue we arrive at the end of the first year of *Radio Bygones*, and I hope that you have enjoyed reading each issue as much as all the various authors and I have enjoyed producing it. I have tried to live up to the promise of including something about each use and aspect of radio – air, amateur, broadcasting, domestic, maritime, military, mobile, recording, telegraphy, and so on – plus collections and museums, personalities and general reminiscences, and I think that we have just about achieved that aim. There are lots more fascinating articles and features in the filing cabinet awaiting publication, so I hope that you will find plenty to interest you over the next year, too.

Our circulation continues to grow steadily, though more slowly than we would like, but at a time of high interest rates we know that our UK readers, particularly, are having to watch the pennies carefully. It is not a good time, therefore, to have to announce increased cover price and subscription rates for the coming year. Unfortunately, over the past twelve months we have had to bear rising costs in every aspect of producing the magazine – paper, printing, postage and so on – and we simply cannot afford to go on absorbing those increased costs ourselves.

The cover price of *Radio Bygones* will rise to £2.40 commencing with the next issue, and you will see details of the new subscription rates on page 11 of this issue. These come into effect for orders and renewals received after 31 July 1990, so if you get your subscription or renewal in promptly you can pay at the old rate of £12.00 for the UK, £13.00 overseas by surface mail or £16.00 airmail to the Middle East and North Africa, £18.00 to SE Asia, Central and Southern Africa, Central and South America, the USA and Canada, or £19.00 to Australia, New Zealand, the Far East and Pacific Regions.

At the back of this issue, you will find a comprehensive index of what has been in the past year of RB, and I hope you'll find that helpful. If some item listed there takes your fancy, but you don't have a copy of that issue, don't panic! At present we have stocks of all past issues, and can supply these for £2.40 each to UK addresses or £2.60 each by surface mail overseas (those prices go up on 1 August, I'm afraid – see page 11).

Finally, I would like to thank all those readers, magazines, clubs and societies throughout the world who have passed on the word about *Radio Bygones*. For a new publication in a special interest field like this, it isn't easy to get your existence known about through conventional publicity and advertising channels. We still need more readers, so if you have friends or acquaintances who are interested in vintage radio, tell them what a marvellous magazine *Radio Bygones* is! That way, you will help to ensure its continued development. Thank you!

Geoff Arnold

In This Issue

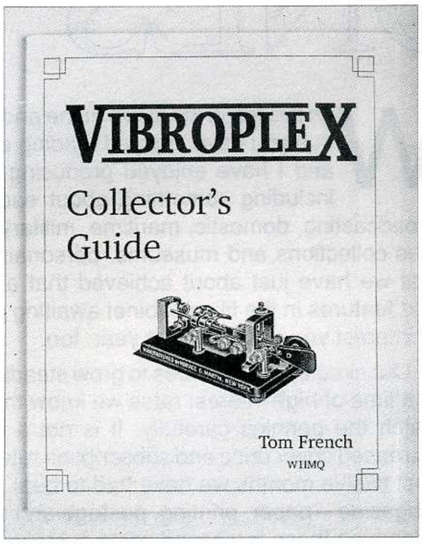
News & Events

New Book

Among Morse code enthusiasts, the name Vibroplex is virtually synonymous with 'bug', the semi-automatic key with the vibrating contact arm which sends a string of dots automatically, though there have been other bug-key manufacturers over the years – I have a Japanese one made in the early 1950s.

Whether you view such keys as a blessing or an abomination depends very much on your own operating expertise, as well as that of the 'chap at the far end'! Learning to handle a bug key properly is quite an art, but in the hands of an expert they can be a joy to listen to. Certainly they have eased the task of many professionals handling great volumes of traffic by landline and radio, since their invention some hundred years ago.

To the uninitiated, a bug is a bug is a bug, but in fact there have been many design variations and improvements over the years. Collectors avidly seek out the more unusual, the more desirable models. Various articles on Vibroplex keys have appeared in magazines over the years, but now a new book from the USA brings together a vast quantity of information, including guidance on identifying, dating and adjusting them and copies of the original patents.

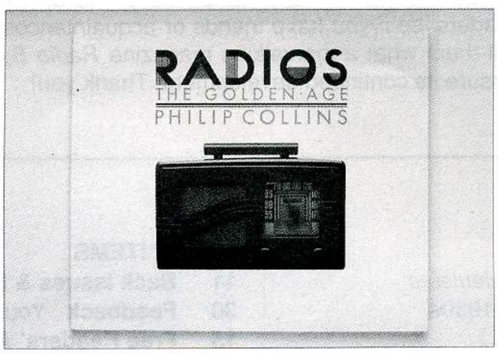


The *Vibroplex Collector's Guide* by Tom French W1IMQ is in paperback, 88 pages, size 11 x 8½in, and is available by post from the publishers, **Artifax Books, PO Box 88, Maynard, MA 01754, USA**. The price is $14.95 plus shipping ($2.00 by surface,mail, world-wide), and payment must be in US Funds (international money order, etc.)

Geoff Arnold

New Book

Well, not really a new book, because it was published in 1987, but it only recently came to my notice, through the kindness of a reader of *RB*.



The book is entitled *Radios – the Golden Age*, and it comprises a collection of the most gorgeous colour photographs of domestic receivers made in the USA between 1933 and 1959. Some of the most amazing sets you've ever seen, plus a selection of advertisements, cartoons, etc., of the era. It's not difficult to see a common influence of product styling with the American motor industry in some of the sets!

There are several nice touches to the book, including details of the set-up used to take those beautiful photographs, and an index which reproduces the pictures at small size, so you can easily find a particular set without having to leaf through the whole book, making the pages dog-eared in the process.

Radios – the Golden Age was written and compiled by an Englishman who is now a US motion picture executive, Philip Collins. It is in paperback, 119 pages 8½ x 10in, published by Columbus Books, London under ISBN 0-86287-392-4, price £9.95. It is currently available to order through booksellers in the UK.

Geoff Arnold

Can You Help?

Tony Hopwood is seeking information about the Murphy A28C receiver to help him in restoring one to full health. Please write c/o the Editorial offices.

G4YXX is putting together a ship's radio office display of the late valve era, and is desperately seeking a Marconi 'Oceanspan' MF/HF transmitter to complete the installation. For space reasons, he would prefer it to be one of the bench-mounted versions, Mark VI or VII. Contact him on 0963 32389.

Please can an anyone help John Paice, 25 Stanley Close, Elson, Gosport, Hants PO12 4AS with information about the Pye 'Seafarer' Model No. 1112, 9-waveband, 4-valve receiver.

In Memoriam

With the relentless shift of emphasis in marine radio communications towards the new technology, automatic telegraphy, satellites and so on, many coast radio stations around the world have already closed down their emergency and traffic watchkeeping on the long-established distress and calling frequency of 500kHz (600m).

Ex-seafaring types will probably wipe away a tear at the very thought, but if you really like to wallow in nostalgia you will find it in abundance on an audio cassette called *500kHz – The End is Nigh*, produced by ex-Marconi Marine radio officer Bruce Morris GW4XXF.

Recorded 'off-air', the tape carries the close-down signals and exchange of final farewells of seven European coast stations which ceased operations on medium frequency W/T between 1986 and 1988 – Anglesey/GLV, Ilfracombe/GIL, Humber/GKZ, Niton/GNI, Stonehaven/GND, Scheveningen/PCH and Malin Head/EJM – with an accompanying spoken 'potted history' of each station.

Copies of the tape, which lasts about 40 minutes, are available from **Bruce Morris, 62 Gerllan, Tywyn, Gwynedd LL36 9DE, North Wales**. The price, including post and packing, is £5.00 or $10 US (in dollar bills only).

Wireless Set No. 38

by L. Meulstee

Wireless Set No.38 MkII showing front panel of the set. On the left the aerial base in which a thin 4ft 'F' type aerial rod has been placed. In the centre the tuning dial with lock nut; and on the right the combined 'off-send-receive' switch. Lying in front of the set is 'Junction Box No. 2'. The dry battery, 'phones and throat-microphone are connected to the set by plugs and leads to the junction box. In the right of the picture a metal spare-valve box. Remarkable is an abridged fault location procedure, attached to the inside of the lid*

Early in 1942 the British Army fielded a novel light-weight 'man-pack' R/T transceiver, type No.38, designed for infantry short range patrol communication. The set, developed during 1941 by Signals Experimental Establishment (SEE) and the trade, was very compact and relatively light weight. It could be carried by one man and was extremely simple in operation, thus eliminating the necessity for training special operators.

It was, however, not the first Army man-pack radio set. Several years before the war, in 1937, trials were carried out with Wireless Set No. 13 working around 55Mc/s (5 metres). The No. 13 set was not a striking success, mainly because of underestimating the possibilities of VHF, the typical characteristics of the super-regenerative design and its instability when used in the field.

Monoblock

Wireless Set No. 38 MkI was originally produced from WS No. 38 experimental model No. 2 in 'monoblock' form (dry battery and set in a single case). Approximately 8500 MkI sets were manufactured. Users stated that they preferred the 'duoblock' version, (experimental model No. 1, dry battery carried in separate haversack) and production was changed to the MkII model. Up to 1945, in total 187 000 sets were produced by various radio manufacturers such as Mitcham Works (MW), Murphy Radio (MR) and Radio Gramophone Development (RGD) At the peak of production in 1943, 7000 sets were delivered monthly.

The complete set was used by one man and could be worn in various ways. Usually it was carried on the left breast, the batteries being carried in the bottom of the set (MkI) or separately in a satchel on the back (MkII).

Wearing a throat microphone, the operator was not hampered in his movements and kept the use of both hands, which of course was of vital importance in front-line action. Additionally, it could also be used when wearing a gas mask. The set could be tuned between 7.4 and 9 Mc/s (42 to 35 metres) in a single range by a tuning dial, common for both sending and receiving.

Construction

The set, built up on a single chassis, was housed in a metal case. When in operating position the control panel faced upward, the aerial socket being at the left hand side. A raised guard rail at the edge of the control panel protected the controls against damage.

The phones and throat microphone were connected to the set by means of a Junction Box, permanently attached to the MkI set. For MkII sets a detachable Junction Box No. 2 was provided, normally carried in the haversack with the battery. Connection between this box and the battery was made by a 4-point plug, while a 6-core cable terminating in a plug connected the junction box to the set.

A combined, single-pack, dry battery provided 3 volts LT and 150 volts HT. Two models of batteries were used:

1. Batteries, dry , HT/LT No. 1, layer type battery with a long shelf life having approximately 20 hours working.

2. Batteries, dry, HT/LT No. 2, can type battery with a limited shelf life but a longer 35 hours working life.

In MkI sets only the No. 1 type could be fitted.

Conspicuous Aerial

Vertical F type rod aerials were normally issued with a station consisting of a number of 4ft sections. A single thin 4ft section inserted in the small aerial socket giving a half-mile range and a 12ft rod (three sections fitted together) in the large socket up to two miles range. When in close contact with the enemy, a rod aerial was often much too conspicuous. A ground aerial, consisting of 45ft of insulated wire, was provided as an alternative. It was usually laid out

How a No. 38 MkII set was normally worn by a regimental signaller. The set was carried in a canvas web carrier. A ring, attached to the carrier, was hooked to the standard infantry web equipment by means of a brace hook. A body belt, also fastened by a ring and hook, secured the set at the lower end. The battery and junction box were normally carried in a haversack in place of the water bottle. The spare battery and other accessories, all carried in a second haversack ('Satchel, Signal No. 2'), and a canvas aerial case are visible just under the set. They were carried on the left, with the straps slung over the shoulder

in a straight line, one end being attached to an adapter plug, fitted in the large aerial socket of the set. The other end was left free and thrown out on the ground, preferably in the direction of the distant station. On the move the wire was trailing along the ground. As can be expected, the range was reduced, but in many cases communication was just as satisfactory as with the rod aerial.

Wired Wireless

A special feature was 'Wired Wireless'. A special adapter plug fitted into the large aerial socket and was connected to the end of a field telephone cable. Two sets connected via a cable could communicate in the normal way with an extended range and absence of interference.

The author has, however, found no records of use of this system in action.

Circuit

Except for a few minor details, all models are internally identical. The circuit diagram of the most common MkII(*) model only is given.

Five valves are employed of which two are common for both transmitter and receiver. The filaments work from a three volt battery, reduced by dropping resistors to two volts. Changing from off to receive and send is effected by an 8-pole 3-position switch, including disconnection of idle valve filaments.

Grid Modulation

Valve V1b (ARP12) operates as an ECO master oscillator at half the signal frequency. In the anode circuit the frequency is doubled, driving RF power amplifier valve V2a (ATP4). This valve has two internally parallel connected pentode systems. The effective RF output power, when fully modulated, is approximately 200 milliwatts. Remarkable is the very positive and clear modulation with the absence of notable distortion when modulated to 100 per cent. This is no doubt due to the characteristics of the ATP4 power amplifier valve having an easy task in this set. RF neutralisation of the ATP4 valve is achieved by means of a few extra taps on L1, via C17a coupled to the grid of V2a. In order to match a 4ft or 12ft aerial, series condensers (C2a) and (C1a) are used. The RF power amplifier is grid-modulated by V1d (ARP12), connected as an AF amplifier, driven by a rather insensitive electromagnetic throat-microphone. A small bulb (B1, connected in series with coil L2) and a rubber test button are mounted on the front panel in MkI models and early issues of MkII. It is inductively coupled to L1 and by pressing the button while transmitting the performance is indicated by the brilliance of the lamp. However, it proved to be very unreliable and fitting was later discontinued.

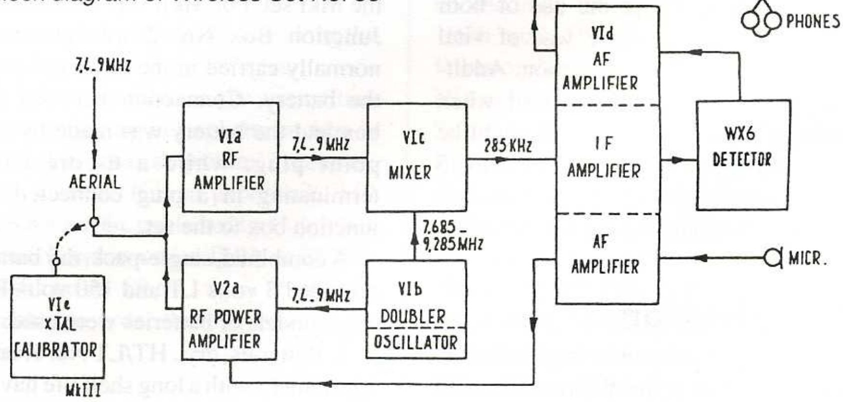
Westector

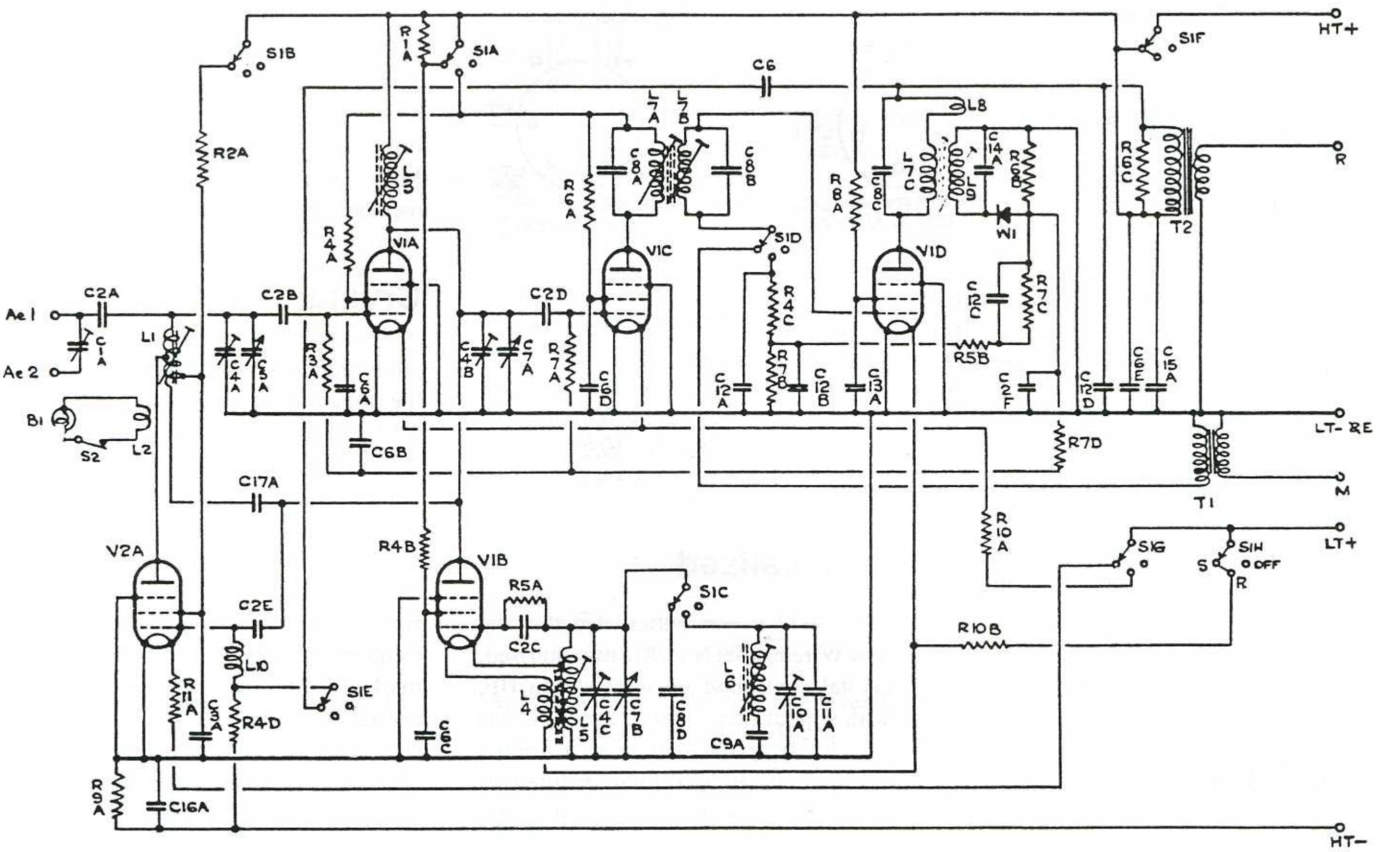
The receiver is a superheterodyne with an intermediate frequency of 285kc/s. Signals from the aerial circuit (common for both transmit and receive, no aerial switching therefore being necessary) are amplified in V1a (ARP12), operating as tuned anode RF amplifier. The transmitter oscillator V1b, now acting as local oscillator with a compensating network (L6, etc.), is oscillating on half the signal frequency +142.5kc/s. The second harmonic (signal frequency +285kc/s) is passed from the anode to the grid of mixer valve V1c (ARP12). The IF signal at 285kc/s is amplified by V1d (ARP12). The bandwidth is given as 12kc/s, fairly broad, but intentionally to cope with tuning and tracking errors. A WX6 'Westector' metal rectifier is employed as second detector and AGC bias. Being not very sensitive it is an ideal substitute for a thermionic diode. It saved the use of a special pentode-diode valve thus limiting the number of different valves.

Reflex Circuit

The AF signals are amplified to headphone level by V1d, connected in a reflex circuit which has three functions: Modulation amplifier, IF amplifier and

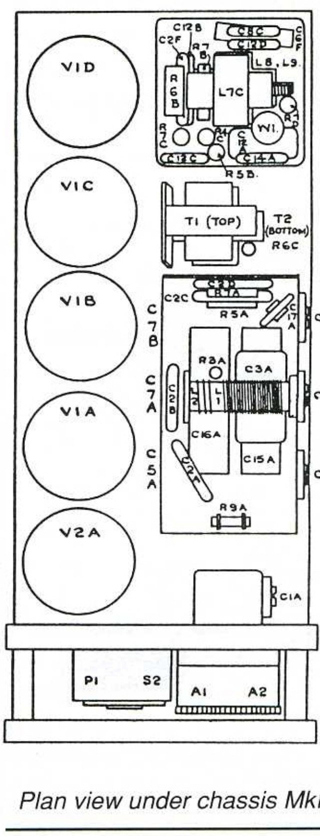
Block diagram of Wireless Set No. 38



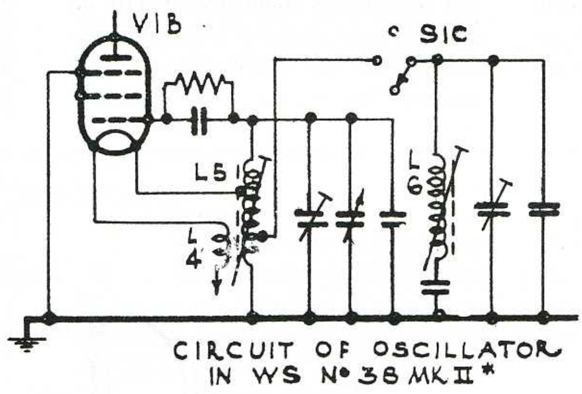


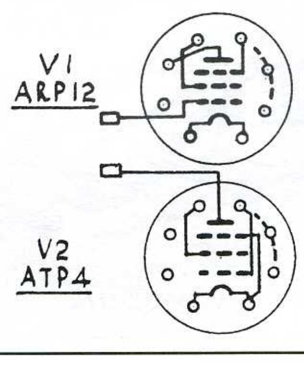
*Circuit diagram of Wireless Set No. 38 MkI, II and II**

COMPONENTS									
C1	5–40pF	C8	45pF	C16	25µF	R1	0.22MΩ	R9	1.5kΩ
C2	100pF	C9	30pF	C17	4.5pF	R2	600Ω	R10	5Ω
C3	0.01µF	C10	3–12pF			R3	1.0MΩ	R11	1.7Ω
C4	5–40pF	C11	35pF	**MkII***		R4	0.1MΩ		
C5	5–35pF	C12	200pF	C6E	0.1µF	R5	50kΩ	V1	ARP12
C6	0.01µF	C13	0.1µF	C9A	680pF	R6	0.47MΩ	V2	ATP4
C7	5–50pF	C14	175pF	C10A	5–30pF	R7	2.0MΩ	W1	WX6
		C15	4µF	C11A	18pF	R8	0.18MΩ		

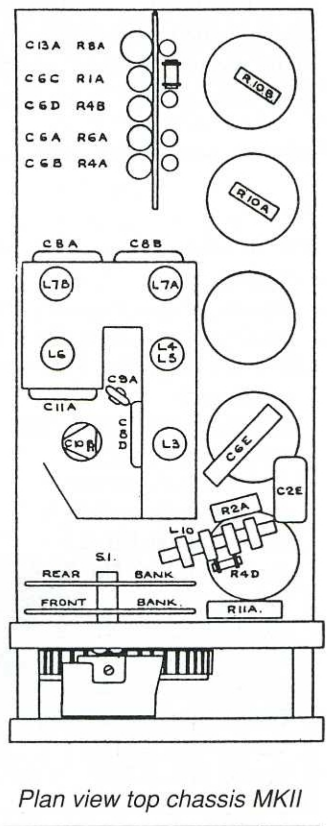


Plan view under chassis MkII

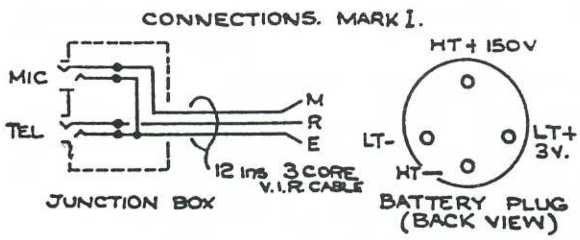


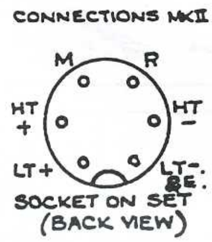


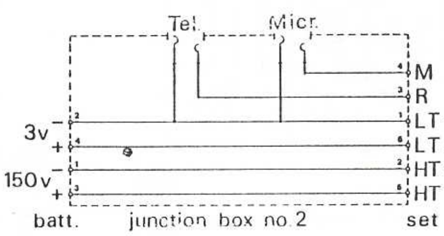
Valve base connections, viewed from underneath



Plan view top chassis MKII







External connection arrangements for the WS38, Mks I and II, and Junction Box No. 2

AF amplifier. Side-tone (hearing of own speech in headphones) is provided by means of the receiver AF output transformer (T2) still in function when connected as transmitter modulator.

Tracking

A technically interesting circuit feature is an offsetting (or tracking) network causing the oscillator to work on the transmitter frequency +IF frequency at receive. Difficulties with receive and transmit frequencies being not the same, caused by temperature changes between 15 and 50°C, were experienced with MkI and MkII sets. The trouble was rectified in MkII* by a modified tracking network across the oscillator circuit. The difference between transmit and receive frequency is given as no more than 2kc/s over the whole band with a MkII* or MkIII model.

Tropicalised

In 1944 it was anticipated that the new Wireless Set No. 78 (a miniaturised, crystal controlled set working on HF, with similar performance to the 38 set) was likely to have only a restricted application. It was then decided to develop a Mark III version of Wireless Set No. 38, based on the existing set but with a tropical finish and improved netting facility (tuning a set into a radio net is called 'netting'). In many ways, compared with the previous MkII* model, it was an improvement. The complete set was carried on the back of the operator, the only control being a mechanically operated remote control of the send-receive switch. Microphone and headphones connected directly on the front panel of the set without the use of a junction box. The basic circuit was unchanged with the exception of a limiter circuit in the receiver AF, a modified side-tone circuit (providing direct detection of RF signal) and an applied bias to the 'Westector' detector, improving the receiver sensitivity. More advanced, however, were the mechanical improvements.

Crystal Calibrator

The set was hermetically sealed in an aluminium case and suitable for use in the tropics. One of the drawbacks of the MkI and II models was the inaccurate calibration of the tuning dial. The MkIII was provided with a larger tuning dial and a reduction drive of 15 to 1. A crystal calibrator, mounted on the side of the MkIII model gave six reference frequencies evenly spaced over the frequency range of the set and were marked A through F on the dial. The crystal oscillator, working on 285kc/s (IF frequency), provided an audible beat note on the calibration points and on incoming signals which improved the netting accuracy considerably. Late in 1944, prototypes of the MkIII set were ready and field trials arranged. Production started early 1945 but only a relatively limited number of sets are known to be manufactured.

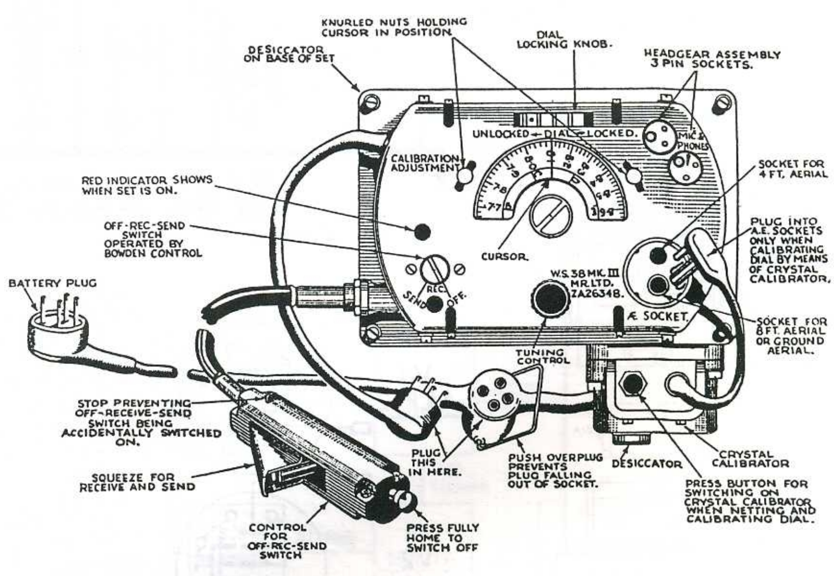
Milestone

The 38 set was technically and operationally a milestone, being simple to operate and very cheap to manufacture. Though the electrical and mechanical design is rather crude through our eyes,

STATION KIT

A complete station comprised the following components:

WS 38, MkII or MkII*	1
Wireless set web carriers, No. 2	1
Microphones, throat, No. 1 or 2	2
Phones, DRL, No. 2 with canvas headband	2
Batteries, dry, HT/LT, Nos. 1 or 2	2
Aerial rods F, section 1	1
Aerial rods F, section 2	1
Aerial rods F, section 3	2
Cases, aerial, No. 3	1
Junction Boxes No. 2	1
WS No. 38 Hooks, Brace	2
Satchels, Signal No. 2	1
Adaptor plug for ground aerials	1
Working instruction card	1
Cases, spare valve, No. 2	1
Valves W/T, ARP12	4
Valves W/T, ATP4	1



Wireless Set No. 38 MkIII front panel

Wireless Set No. 38 MkI, II, III

TECHNICAL SPECIFICATIONS		
Frequency coverage:	7.300 – 9.000Mc/s	
Range:	½ mile with 4 ft rod	
	2 miles with 12 ft rod	
RF power output:	200mW	
Power supply:	3 volt LT	
(dry battery)	150 volt HT	
Power consumption:	HT	LT
Send	15mA	480mA
Receive	9mA	240mA
Receiver sensitivity:	35μV for 0.5mW AF	
	(MkIII: 25μV)	
IF:	285 kc/s	
Weight complete:	MkII, 22 lbs	
	MkIII, 21 lbs	

ASSOCIATED PUBLICATIONS

Wireless set No. 38 MkII and MkII*, Working Instructions, ZA 29596.
Wireless set No. 38 MkII and MkII* in Churchill I, II, III and IV tanks, working and fitting instructions, ZA 21996.
Wireless set No. 38 Mk 2, Working Instruction card, ZA 14284.
Wireless set No. 38 AFV, Working instructions, ZA 24925.
Working instructions No. 2, WS No. 38 Mk.2, airborne station for parachutes and gliders, ZA 16066. (card).
Wireless set No. 38 Mk. III, working instructions No. 1, ZA 26349. (card).
E.M.E.R.'s, Telecommunication:
F 410/1 - 419/1 Wireless set No. 38, Mk.1, 2 and 2/1.
F 410/2 - 419/2 Wireless set No. 38, AFV.
F 410/3 - 414/3 Wireless set No. 38 Mk. 3.
S.E.E. pamphlet No. 310, WS No. 38 (Experimental model 1), Dec. 1941.
S.E.E. pamphlet No. 313, WS No. 38 (Experimental model 2), Jan. 1942.
Ordnance telecommunication note (Wireless) No. W/28. WS No. 38, Mk.I/II.

it contained quite a few novelties. Furthermore, it served the initial purpose: very short distance radio communication. According to many war-time signal reports it performed satisfactorily within its limitations if the sets were properly netted. However, the set was never very popular with operators because being conspicuous it invariably drew fire.

Condensers

Bringing a 38 set to life again after many idle years in the shed or loft does not involve much effort. Usually most of the paper condensers show more or less leakage and need replacement. The electrolytics must also be checked and re-formed. A simple method of both checking for leaky condensers and re-forming electrolytics is to connect a milliammeter in the HT lead with a 10kΩ resistor in series. The 3 volt LT must be disconnected. If the meter continues to indicate current when switched to receive or send, some condensers will probably be leaky. Replacement condensers are usually much smaller; purists who like to keep their set original should carefully open the cardboard case of a defective condenser and replace the content. Dipping the condenser in bees-wax should finish the job. It is remarkable that, after re-forming, all condensers in a MkIII set appeared to be OK and the set worked fairly well after 40 years.

When the author recently tested a surviving MkII* set, aligned to cover the 40 metre amateur band, the transmitter could hardly be heard over 400 metres with a 4ft rod aerial, but the reception with the same aerial was amazing, considering the limitations of the circuit.

Tanks

The 38 set has been used in tanks for liaison with the infantry. In a forthcoming article details are given of two plans, eventually leading to Wireless Set No 38 'AFV' working in conjunction with the standard tank set No 19. In conclusion, you will find an abridged alignment procedure, suitable for all varieties of 38 sets.

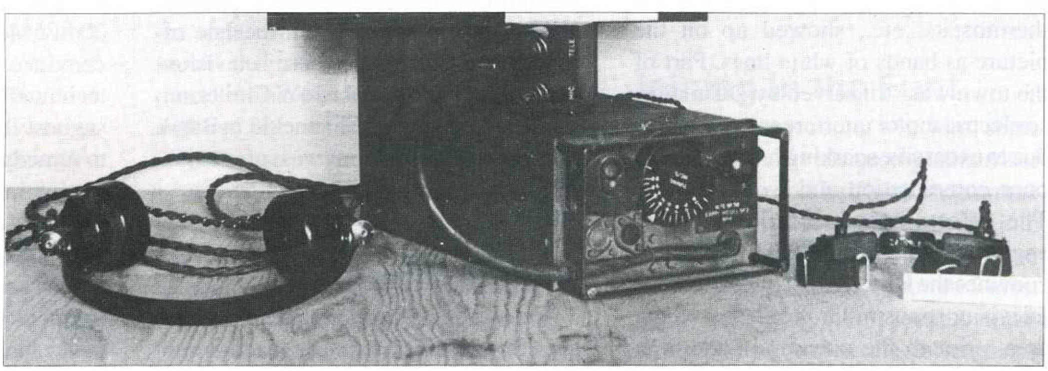
Acknowledgements

This article has been read through by Desmond Thackeray and changed according his valuable advices.

The author wishes to thank the Deputy Director, Curator and staff of the Royal Signals Museum, Blandford Camp, Blandford Forum, Dorset, for their help and co-operation.

Both 38 MkII and MkIII sets, described in this article are on permanent display there among many other Army radios and signalling equipment used by Royal Signals and RE over the past 100 years.

The museum is open to the public on Monday to Friday from 10am until 5pm throughout the year, and on Saturday and Sunday from 10am until 4pm from the beginning of June to the end of September. ***RB***



Prototype Wireless Set No. 38 experimental model No. 2. Note that the battery is placed in the bottom of the set and the junction box is permanently fitted. The pilot-lamp and test button (see text) can be seen under the aerial base

Radio and Television Interference Work in the 1950s

by David Rudram

I started work for the Post Office Telephones in 1949, and after two years training, followed by two years National Service as a Wireless Instructor in the Royal Corps of Signals, came back to telephone work in 1953. In 1956 I transferred to the Radio Interference side of the business, where I worked for four years. At that time, the Postmaster General, being the licensing authority, was responsible for seeing that the terms and conditions of the Broadcasting Receiving Licence were complied with, and also that reception was not spoiled by unauthorised radiation or interference.

At this time in 1956, sound radio was still the main source of entertainment for many people, although television, especially since the Coronation boom of 1953, was increasing in popularity. In the Worthing area where I worked, it was work of colleagues of mine which, prior to opening of local television transmitters, had 'cleaned up' the area, so that viewers could watch a reasonable picture from the London Channel 1 (45Mc/s) transmitter. The signal strength of this station was well down as the town was outside the recognised service area, and any interference from electric motors, thermostats, etc., showed up on the picture as bands of white lines. Part of the town was still served by DC mains, so electric motor interference was worse due to excessive sparking resulting from poor commutation and worn brushes. The efforts of one particular GPO engineer and a local dealer helped to convince the BBC that a low power local television transmitter would serve the area, prior to the opening of the high power station on the Isle of Wight. This local transmitter opened in 1953 at Truleigh Hill at Shoreham, and served the coastal strip from Brighton to Worthing. It was originally on Channel 3 in Band I, but later changed to Channel 2 when the Rowridge IoW station opened on Channel 3 in 1955.

Post Office television receiver detection van (1952)

Reproduced from British Telecommunications Journal, *by kind permission*

So when I started on this work in 1956, the area was served for BBC television in Band I, by Truleigh Hill on Channel 2, Rowridge on Channel 3, and for those who were willing to erect high elaborate aerials, ITV was just about viewable on Channel 9 in Band III from Croydon. For sound radio, the Home Service and Third Programme were on medium wave, and the Light Programme was on long wave. These were also on Band II FM, and could be received from Wrotham in Kent, or from the Isle of Wight. Independent Southern Television opened in 1958 from the IoW Chillerton Down transmitter on Channel 11 in Band III. All the television was of course 405-line.

Mutual Interference

Due to being in an area where some sets were using Channel 2, and some Channel 3 for BBC reception, and because of the different intermediate frequencies used in different makes of superheterodyne-type receivers, the chances of neighbouring sets causing mutual interference were high. It was sometimes quite an involved exercise to work out oscillator harmonics, second-channel responses and so on. Straightforward IF breakthrough from commercial transmitters in the short wavebands also occurred. One trouble we had was that the locator set we used was also a superheterodyne receiver, and so it had its own spurious responses. At one time we used an Ekco portable television in the van, but this was a bit hazardous driving and looking at the screen to see the patterning.

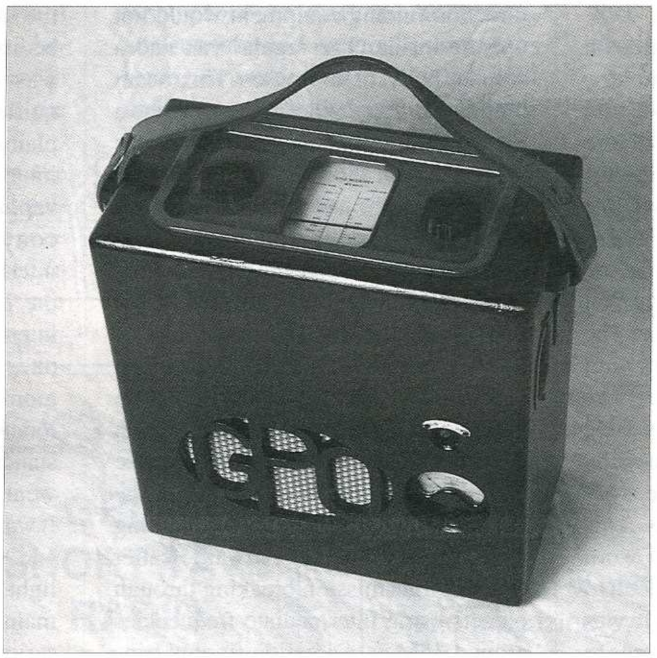
An example will show the type of problem we had to deal with. A well established TV set that had been used quite happily for some time on BBC Channel 2, was suddenly found to be the cause of patterning on a neighbouring set tuned to the new ITV Channel 11. The theory behind this was that the local oscillator in the Channel 2 set was running at (51.75 + 16) = 67.75Mc/s, the third harmonic of which was 203.25Mc/s – very close to the Channel 11 vision frequency of 204.75Mc/s. It was our job to try to convince the Channel 2 set owner that technically their set was at fault, and to suggest they contact their dealer to try to remedy the problem. This was rather tongue-in-cheek advice, as we knew that there was not much that could be done, as few dealers were prepared to re-align a set to change the intermediate frequency, and the set would probably never have been the same again if the attempt was made. An alternative was to suggest that they changed to viewing BBC on Channel 3, but as this was coming from the opposite direction it meant turning the aerial round.

Although we had the backing of the non-interference regulation on the Television Licence on our side, in practice it would have been difficult to enforce it. Many neighbours who had been good friends for years fell out over situations like this, in spite of our diplomacy. It was surprising how important good television reception was to some people, indeed it seemed to be their main reason for living!

For some households, everything revolved around the television set, and I remember one family that had two sets in the same room, one tuned to BBC and one tuned to London ITV. Whenever the London signal was strong enough to give a reasonable picture, they turned up the sound and watched that, otherwise it was just BBC for that evening. They even made a point of watching the barometric pressure, as the strength of London varied with a change of weather conditions. The only cure in many cases of oscillator radiation was for the offending set owner to get another set with the more modern high intermediate frequency around 35Mc/s. This, together with better set design reducing local oscillator radiation, cured the problem and I knew of one case where the complainant actually bought the offending set owner a new set.

We Haven't Got One...

To track down sources of television interference, we used a portable locator receiver to pick up the offending signal, and try to pinpoint its source with a loop aerial. The set has a signal strength meter, and you could listen to the sound with a pair of headphones. The first reaction of a householder opening their front door to be confronted by a man wearing headphones, carrying a radio set with a loop aerial, and seeing a GPO van parked in the street was one of apprehension. Often, before we had a chance to say what we were about, the person made some reference to the fact that they 'Had a licence all right' or that 'We haven't got a TV set', or that they had a television but didn't use it. The conclusion they had come to was that we were checking on unlicensed sets, which was certainly a duty of the Radio Group and Postal Authorities at that time, but not in our day-to-day work. In one case, I remember the door was closed in my face, only to open again a little while later with an invitation to enter and see for myself that they had no television. I found out later that the set had been put out in the garden!



GPO Receiver WT No. 11, used for tracing sound radio interference. Made by McMichael Radio Ltd

Sound Interference

Sound radio interference on the medium and long waves was often mains-borne. We used a portable receiver to cover these wavebands, again it was fitted with a signal strength meter, and had a loudspeaker and provision for headphones. To find the source of interference usually meant tracking the street mains cables for maximum signal, but due to peculiarities of the cables, the apparent maximum point was often nowhere near the source. It was often quicker to have a walk around the streets and use ones eyes and ears to spot a likely cause. A very common problem with long wave reception of the Light Programme on 200kc/s was a whistle caused by radiated harmonics of the line timebase oscillator (10.125kc/s) of a 405-line television set. This could be mains-borne, or radiated interference if the sets were close, for instance on either side of party wall. The cure was often very difficult. Although technically it was the fault of the television for radiating, the situation was aggravated on many occasions by the fact that the radio set had a built-in aerial, or a poor indoor one. Moving the sets further apart, or demonstrating the beneficial effect of an outdoor radio aerial was sometimes effective, although not many people were prepared to go back to the days of an outdoor long-wire aerial, even if they had garden in which to erect it.

We sometimes persuaded listeners to buy an FM VHF receiver, but because the signal strength in the area wasn't that good, again an outdoor aerial was necessary to give good reception. However, some FM sets themselves radiated harmonics of the 10.7Mc/s intermediate frequency they used. The fifth harmonic was 53.5Mc/s, right on the Band I Channel 3 TV sound frequency, so we had the situation where someone had bought a new radio to overcome interference from a television set, only to find that they were the cause of interference to a nearby TV set!

Many other sources of interference were traced, such as vacuum cleaners, hairdryers, thermostats, indeed anything with a sparking contact. The complainant was supposed to keep a log of the interference on a form obtained from the Post Office. From the log we could decide when it would be best to visit the address to witness the trouble. This often meant working evenings, and a colleague of mine would arrange his visits to coincide with a programme he wanted to watch. As he said, he probably wouldn't have time to watch it if he was at home, so he might as well combine work with pleasure!

Joining in the Fun!

When I was working with him, some nights we would visit a complainant and sit through a whole half hour programme with the family. He would laugh and join in the fun, making me feel a little embarrassed by it all, although I must say the household didn't seem to mind. Of course, he hoped the interference wouldn't come on, and frequently it did not, in spite of the complainant assuring us that it usually did on a Friday night, and would probably start when we had gone. So we would leave, confirming that we would be back next week to catch the interference, and of course the programme.

If we were successful in tracking down a source if interference due to motors, etc., we offered to carry out the suppression work at the cost of the components used, with a minimum of five shillings (25p). When you think that we used to collect the item where possible, fit the suppressors back at the workshop, and deliver and test for that price, it really was a good service. The work involved fitting chokes and sometimes capacitors to suppress the interference. All new appliances were supposed to be already suppressed by the manufacturer, so much of the work was dealing with old appliances. This was often a problem, because of worn armatures and brushes it was difficult to achieve good suppression, and it was difficult to justify an increased charge to the owner, particularly as it was probably going to benefit a neighbour. In more that one case I remember taking a hairdryer to bits, only to have the whole thing disintegrate before me. All the while it was screwed together it was alright, but it was actually completely broken inside. If we couldn't convince the owner it wasn't our fault, the Department had to pay up for new parts.

Radio amateurs were another source of problems. Harmonics of the popular amateur bands seemed bound to fall on a television channel somewhere! Most radio amateurs were very co-operative in either fitting filters to their gear or providing band-pass filters for fitting in the aerial lead of the complainant's set. Others confined their transmitting times to outside of television hours, which at that time was not all day as it is now.

Still Warm...

Unlicensed transmitters also had to be dealt with. There was a well-known local 'pirate', and on one occasion when illicit transmissions were in progress, a knock at the door was not immediately answered. A colleague who walked round to the back of the house saw a transmitter being lowered on a rope out of a window. The valves were still warm...

In order to be a bit less conspicuous, rather than use our well known green Radio Group van, a special incognito vehicle was borrowed from Headquarters for work in tracking down illicit transmitters. The trouble was that it was a metal bodied J-Type Morris van, so direction finding equipment would not operate inside. The regular van had a wooden body for that reason. This meant putting aerials outside on the roof, and a further give-away was that the van was all black with the registration number PGO1. It might just as well have been GPO1 and had done with it!

During 1957, sunspots were causing strange freak reception interference, and Sporadic E propagation in particular was spoiling television pictures. Television sets tuned to Channel 1 (45Mc/s) were picking up mobile radio services from America, and it was difficult to convince complainants that this was where the strange voices and patterns were coming from. There was also a Forward Scatter military transmission breaking through on sets using intermediate frequencies around 35Mc/s. Direction finding trips around Sussex to find the source of the interference proved inconclusive, and it was some time before we found out that it was coming from Greenland. A high-pass filter in the aerial lead usually cured this trouble, at the viewer's own expense, unfortunately.

Barkhausen Effect

Another source of television and VHF interference was caused by electric light bulbs radiating RF due to Barkhausen oscillations. A particular lamp prone to this was the old carbon filament type, with the filament strung up and down inside. They often had an external glass pip seal on the outside of the globe, and because of their long life and relatively low power, were often used to light passage ways, hallways and toilets. They were thus switched on for only short periods, which made them difficult to locate. I remember feeling pleased when I located an oscillating lamp in a flat, as usual in the toilet light. I tactfully suggested that the lady buy a new lamp, only to be shown a stock of about a dozen such lamps that her late husband had bought some years ago. As these would have lasted a lifetime, the person experiencing the interference paid for a replacement lamp. Thinking back to those times, I think we were lucky not to have been arrested for loitering around houses in the dark, waiting for toilet lights to be turned on and off.

Electric bed blanket thermostats were another difficult area, as they didn't usually come on until late evening, and one had to be wary about knocking on the door and asking to inspect the bedroom equipment! A day-time call was usually necessary to make enquiries. On another occasion, a complainant was sure that the television interference was caused by the mercury vapour street lights, and produced a convincing log showing that the interference started each evening when the lights came on. Sure enough, the interfering signal seemed to peak near one particular lamp standard. In a moment of misguided enthusiasm, I removed the cover at the base of the standard and pulled the fuses. The light went out but the interference stayed on. It wasn't the next one either, or the next, and when I had managed to put four lights off, causing a dark section of the main road, I decided to do a bit more serious direction finding. The trouble proved to be another television set across the road, with a tracking EHT lead. For some reason, it didn't affect its own picture. Also for some reason, the street lights hadn't come back on when I replaced the fuses, but just flickered. I was somewhat relieved the next night to see that the lights had come on properly. I learnt not to trust the decisions of the public, but to make my own observations and conclusions. Many an innocent dabbler in electronics was blamed for every spot of interference, and had to put up with quite a lot of abuse from the neighbours. It was difficult to convince the complainant that it was nothing to do with a particular suspect, as the very knowledge that they had seen the lights on in his workshop when the interference was on, was proof enough!

Oscillating Pre-amps

When ITV started, it was usual for viewers to have an additional Band III aerial put up, as the original Band I aerial was still serviceable. This meant using a diplexer or changing aerial leads when going from BBC to ITV and vice-versa. Viewers trying to receive the London Channel 9 ITV often had an aerial pre-amplifier fitted to boost the Band III signal. This was peaked up for maximum gain. The trouble was that when viewing

BBC on Band I it left the pre-amplifier output unloaded, so that it became unstable and went into oscillation. This constituted a very effective transmitter connected to an efficient Yagi aerial, and caused severe patterning on other sets tuned to ITV. We used to be able to have a guess as to the location of one of these oscillating pre-amplifiers, because most of the complainants were in line with the forward direction of the offending aerial.

With the opening of BBC2 on the 625-line system, and the advent of colour, many of the old problems have gone away. The higher frequencies used in Bands IV and V meant less trouble from electric motor interference, and better designed sets had reduced the mutual patterning cases. The 405-line system is now no more, and the stability of picture quality of modern sets is quite remarkable. The old valve sets were very prone to drift in the pre-set adjustments, and required frequent resetting to correct frame hold, line hold and contrast defects. Many of our cases of 'interference' proved to be set defects, and indeed books were published to try to educate the viewer in telling the difference.

Foreign station interference is still troublesome under certain weather conditions, and Citizens Band radio has been another source of trouble.

However, the control of interference now comes under the jurisdiction of the Department of Trade and Industry. It is no longer a free service, and no doubt there are a whole lot of new situations they have to deal with.

I look back at my time on this work with happy nostalgic memories, and although it was only 30 years ago, it might have been another age as far as technology is concerned, and the old Post Office Radio Service just about qualifies as a Radio Bygone. ***RB***

The First Airborne Radio Telephony

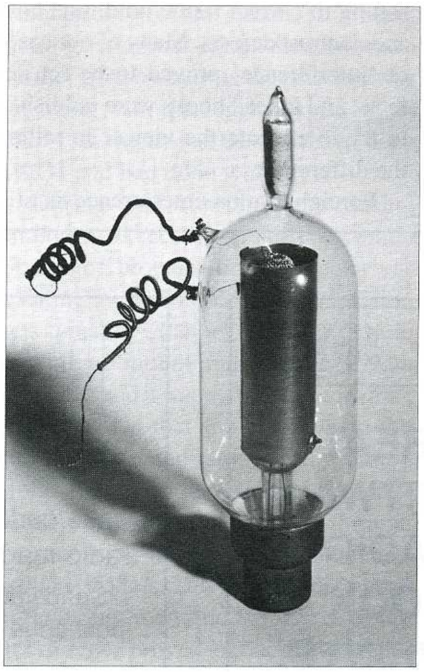
by David Pritchard G4GVO

The employment of wireless telegraphy from aircraft to the ground had been viewed by the Army as impracticable, even though it had first been used in 1910, but as the First World War progressed its advantages became obvious, especially for observing the fall of shells and the reporting of troop movements. But it was a slow business. The pilot not only had to fly his aircraft but had to tune his transmitter and to operate a Morse key usually strapped to the top of his knee. Time was of the essence, and very often the Morse message took too long.

For this reason Major-General 'Boom' Trenchard, commanding the Royal Flying Corps, laid down his requirements for a system of air-to-air and air-to-ground radio telephony: a one-mile all-round range was a minimum, no adjustments to the transmitter when in operation, and only one tuning adjustment allowed on the receiver. Perfect speech quality with one hundred per cent reliability was demanded, and the maximum aerial length was 150 feet, to be replaced by a fixed aerial if possible.

Experiments began at Brooklands in Surrey in the spring of 1915. Sets were designed, tested and often scrapped. Microphones were either too insensitive or too sensitive and the carbon granules were subject to the heavy vibration from the aircraft's engine. Copper long-wire aerials, weighted at the far end, were often forgotten when the aircraft came in to land, and the trees around the aerodrome soon became draped with them, to the annoyance of the technicians and the men who had to climb after them.

The research was under the direction of Major C. E. Prince, RFC, who had much to endure under the then existing regulations because all communications work for the Royal Flying Corps was undertaken by the Royal Engineers, and the relationships between the two were not happy. Prince had little regard for the stolid unimaginative approach of his military rivals and decided to go his own way and bring in the best men there were, and in those days the Marconi company was the only source.



The Round Valve

Photograph by kind permission of GEC – Marconi Limited

The Round Valve

At that time – when 'broadcasting' was a science fiction fantasy – a device actually existed which enabled speech to be transmitted over the air, although knowledge of its existence was confined to very few people. This was known as the Round Valve Telephone, designed by Captain Round of the Marconi Company, who had demonstrated that the transmission of speech was possible over a continuous period, although in laboratory conditions rather than the rough and tumble of aviation. Prince got the ear of an RFC officer who was sympathetic to new ideas, a Major Hugh Dowding who, in later years as Air Chief Marshal Sir Hugh Dowding, was to use radio to devastating effect in the Battle of Britain. After listening to Prince and recognising the tremendous importance of radio telephony, he offered his wholehearted support and asked for a demonstration as quickly as possible.

Although hindered by lack of money and equipment, Prince and his technicians struggled through the summer of 1915 and successfully transformed the very delicate laboratory equipment into a sturdy apparatus where one had merely to switch on and talk. The first air to ground wireless telephone in the world was now in action. Prince made a report:

'It seemed almost beyond hope to achieve really practical wireless telephony from an aeroplane, but the difficulties have been overcome, and the new set is by no means a toy, or only of scientific interest. A new and amazing power is conferred by it.'

Dowding, much impressed by the results, arranged for Prince to demonstrate the equipment to the Chiefs of Staff in France. Lord Kitchener, deeply impressed, was amazed to hear clear speech on the ground from an aircraft twenty miles away and spoke in gratified terms of the work that had been done.

But he reckoned without the military conservatism of the day. The upper echelons of the High Command would not recommend the employment of wireless telephony, fearing that if it fell into the enemy's hands it could turn out badly. In fact, it was not until shortly before the Armistice that they showed signs of relenting. However, the RFC, defiant of the crass complacency of the General Staff, virtually ignored them and carried on as if nothing had happened. Returning to England, Prince resumed his researches.

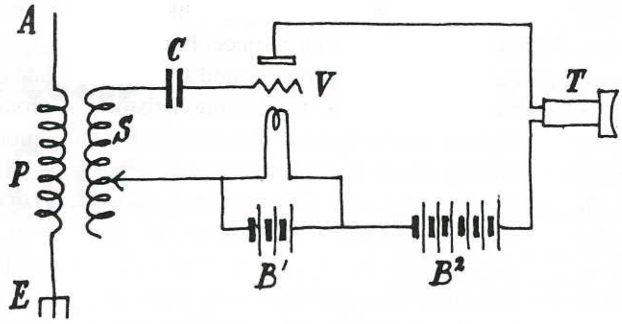
Inter-Service Rivalry

The regular wireless technicians of the Royal Engineers had a great dislike for the Marconi personnel who were 'hostilities only' men, and especially for their unorthodox ways of doing things. Things soon reached the point where Prince was more than once called in to settle ridiculous inter-unit disputes, and the result was that in August 1915 most of the research work was sent to an establishment at Woolwich and the

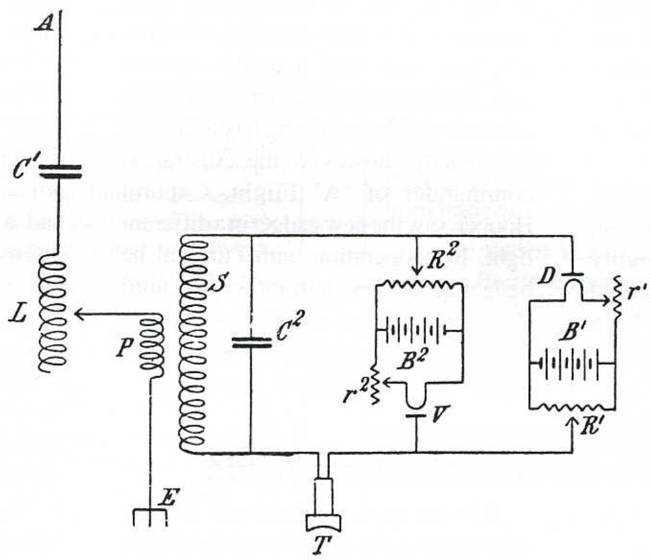
RFC staff were despatched to Joyce Green.

Even then, four-fifths of the work for the RFC was officially undertaken by the RE Signals Experimental Establishment and only one RFC officer was allowed on the premises and he was unable to influence the designs and equipment. Of all the dozen new sets submitted to the Wireless Testing Park by the RFC, all were subjected to damning comments such as 'a monument of incompetence', 'hopelessly bad design' and 'a primitive attempt to get round real difficulties'.

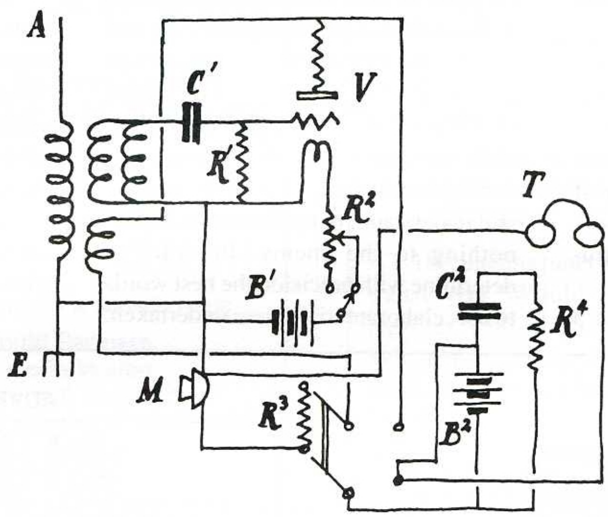
As these comments grew to alarming proportions on the desks of the Royal Engineers' brass hats, it began to dawn on some of them that no matter how competent they might be in military matters, aviation was not really their speciality. The seed took a little time to germinate but eventually it took root and sprouted into something resembling sanity. It gradually occurred to them that these RFC fellows probably knew a bit more about flying conditions than they did, and that perhaps the weather and state of the ground at Joyce Green was not conducive to the best research. The move to Biggin Hill got under way.



Experimental receiver used with the Round Valve transmitter



Receiver circuit circa 1916



Circuit of the 1916 radio telephone

In a Manner of Speaking

Despite the orders of Trenchard and the support of Dowding, all work on radio telephony was still the official responsibility of the Royal Engineers, and this was the case right up to the beginning of 1916. And in accordance with the directive from the General Staff the work on the original Round Valve Set was abandoned, much to the disgust of Trenchard and other RFC officers who knew only too well the advantages radio telephony would bring to the battlefield.

But officialdom had reckoned without Trenchard's sturdy perseverance. Never a man to give in to the crass objections of brass hats, he took the initiative himself, and although his head might be on the block for so doing, gave further orders that air-to-air and air-to-ground radio telephony experiments should now be undertaken by the RFC proper without hindrance from the Royal Engineers. This of course did nothing to improve relationships between the two branches of the services, but at least the RFC were now free from the rivalry that had for so long hampered them.

At Biggin Hill, therefore, the technicians of the Wireless Testing Park began experimenting with new designs, but these were mostly unsuccessful and had the habit of breaking down at inconvenient moments. Then someone suggested that the original Round-Prince set of 1915 might be resurrected for a final appraisal, and accordingly the sole remaining set was hunted down and the one and only Round Valve still in existence was cautiously fitted into the set. A microphone of very old vintage, the 'Hunningscone', was fitted into a cardboard box filled with cotton wool, and to everyone's joy it worked. The original air-to-ground results which Prince had achieved were once more reproduced, and the observer's voice was heard, although distorted, in a second aircraft some two or so miles away.

This was encouraging but still not up to the standard ordered by Trenchard. The radio technicalities themselves were fairly easily solved, but speech was irritatingly distorted and at times unintelligible. Every type of microphone was pressed into service, with diaphragms of mica, celluloid, aluminium and steel, and to the annoyance of the team those which worked well on the ground were virtually useless in the air. After countless experiments, however, some small success was had when it was found that an officer who carried out the test-speaking had so trained his voice to get the best out of a microphone, but another speaker produced only gibberish.

Then it was discovered that if headphones were connected to the transmitter circuitry the operator could then hear the sound of his own voice, and this would certainly be a help. Perhaps for the first and only time in history the Marconi technicians became hatters, designing and making helmets with pouches for microphones to replace the standard flying helmet of the time.

Thus it was, after much heartbreak and anxiety, that success came at last. The testing pilots and operators practised assiduously and improved their results until they felt confident enough to make a flight to France and demonstrate their success before Trenchard and the Air Staff. There, near St Omer, the two aircraft circled the field, one transmitting instructions which were obeyed by the other. On the ground, Trenchard had a receiver so that he could ensure that there was no deception by a pre-arranged scheme. Officers were given the opportunity of flying as observers and found that they, too, could speak and listen to their satisfaction. Trenchard was so delighted with the results that he at once sent a message to the Directorate of Military Aeronautics:

'With regard to the wireless telephone apparatus recently sent here for test, trials have been made with highly satisfactory results. I am very pleased that this problem appears to have been solved and I consider that it reflects much credit on those who have been engaged in the experimental work and the design of the apparatus.'

A Useless Box of Tricks

Somehow the Germans had got word of this most secret apparatus. Prisoners were taken carrying leaflets offering large rewards for any parts of the sets they might come across. Trenchard was at once on guard:

'As far as we know, the enemy has not yet evolved any practical form of wireless telephony, and it is therefore most important to prevent our instruments falling into his hands intact.'

Nevertheless, it was realised that a risk had to be taken, and an order for twenty sets was made at once. Furnival had the task of equipping and training No. 11 Squadron, then using Bristol Fighters on the front near Arras, but his training flights had to be fitted in between operational sorties. Great care had to be taken in removing the sets before an aircraft flew over the front. And as 11 Squadron was airborne up to three or four times a day, little progress was made in the training programme until permission was given for 'A' Flight to be out of action for a week, to the disgust of the aircrew. As far as they were concerned this new-fangled wireless telephone was only a useless box of tricks that prevented them from carrying out their real business of chasing Huns. Fortunately, however, the Australian commander of 'A' Flight, Captain Hooper, saw the new gadget in a different light. In cooperation with Furnival he badgered his recalcitrant crews until 'Hooper's Circus' was born – the first Flight flying as one unit in obedience to orders given by wireless telephony.

The Best of Words

It is not generally realised that the codewords commonly heard during the Battle of Britain had their origin at Biggin Hill as early as 1917. It was obvious that sooner or later the Germans would come across an intact radio telephony set, and that the would be able to listen to our airmen speaking *en clair* as they flew near the Front. The officers at Biggin Hill realised that some form of code was needed. Something easy to pronounce and understand, but which would mean nothing to the enemy. In order to determine with precision the best words to use, elaborate trials were undertaken.

The aircrew at Biggin Hill were offered long lists of words which they had to repeat in flight, while on the ground the listeners patiently noted the amount of clarity and intelligibility.

'Hullo Dollars *(the callsign of Biggin Hill)*, hullo Dollars. Pole... Pole... Pole... Bole... Bole... Bole... Toll... Toll... Toll... Pale... Pale... Pale...'

The listeners soon realised that a code using 'Pole' could use 'Pale' but not 'Bole' or 'Toll'.

'Tale... Tale... I'm thirsty! Beer... Beer... Beer... Sorry, as you were... Moll... Moll... Moll... Male... Male... Male...'

The curious thing was that in English the meaning of the word is normally conveyed by the consonants, and from a telephonic point of view these were not so dependable as the vowels which had a greater amplitude. It was soon discovered that diphthongs and long vowels were the best choice, and two-syllable words reduced the chances of misunderstanding.

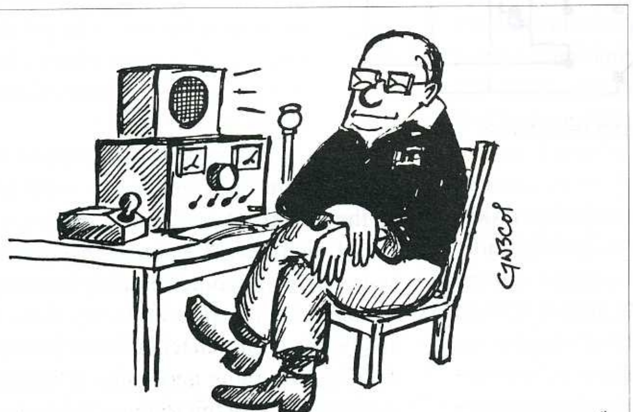
'Hullo Dollars... Bolo... Bolo... Bolo... Koodoo... Koodoo... Koodoo... Daily... Daily... Daily... Baby... Baby... Baby...'

The listeners on the ground exchanged puzzled looks. The last two words sounded exactly the same.

'Scrap "Baby", try "Booty".'

After weeks of patient and exhaustive tests it was discovered that short double words like 'Shot-gun', 'Dog-rose' or 'Bee-hive' made the best and most effective code. Transmitted clearly and employed in a short context, they somehow had a comic meaning of their own, perfectly guaranteed to confuse an unimaginative enemy. Thus it was that airborne telephony was born.

RB



'...THEY DO SAY ONE BEGINS TO LOOK LIKE LONG CHERISHED EQUIPMENT...'

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Time-warped Transmitter

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From the 1952 film *Ninotchka*

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Circuit or handbook covering RAF receiver Model Tuning Unit 131. Could be over 40 years old? All costs paid. Tony Cousins, 35 Ridgeway Road, Herne, Herne Bay, Kent CT6 7LL or phone 0227 363200.

An original working crystal set of the 1920s, plus a good radio set from the 1940s. Young, Orchard Cottage, Sunningwell, Abingdon, Oxon or phone 0865 735243.

Good AR88D or LF. No mods, switch or drive trouble. Tools, manuals, spares, if available. All letters answered. M. Shepherd, 66 Westerland Avenue, Canvey Island, Essex SS8 8JS.

AT-180 antenna tuner and VFO-180 required for TS-180S transceiver. Would consider unserviceable TS-180S together with above. Also 'Toni-Tuna' RTTY tuning indicator. J.H. Lepper G3JHL, 'Turlington', Salisbury Road, Shootash, Hampshire SO51 6GA, phone 0794 512283.

Assistance in restoring short wave working on Ambassador 1949 all-wave valved RX; only 16m operative at present. G6FBR (Ron), Bournemouth 531996.

Good quality photographs of Murphy radio receivers 1931 – 1949. Lorin Knight, 0462 685693.

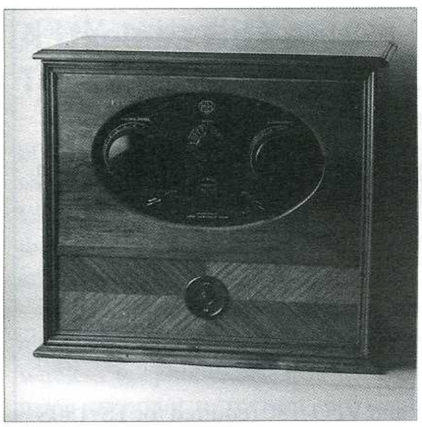
Crystal sets wanted – I have many duplicate models available for exchange. H.H. Journeaux, 7 Blair Avenue, Poole, Dorset BH14 0DA, phone 0202 748072.

Have Marconi Type 730 ship's receiver, 4-valve. Seeking any info and source for instructions. Hugh Miller, 6400 Maltby, Woodinville WA, 98072-8375, USA.

RB No. 6 READERS ADVERT

The Vintage Wireless Museum
West Dulwich, London SE21

Keston Lindley receiver, dating from about 1930



Mains Screened Dimic 3 made by McMichael Radio Ltd

A visit to the Vintage Wireless Museum is a 'must' for anyone with a love of old radio sets; with memories of what 'the wireless' used to be like twenty, thirty or more years ago, or perhaps just an admiration for the style and line of the old cabinets, whether of wood or bakelite.

The Victorian house in a tree-lined Dulwich road which houses the museum has been home to its founder and curator Gerald Wells all his life, but the house's association with wireless goes back further than that. It was once the abode of Alfred Rickard-Taylor, who was science master at nearby Dulwich College and an amateur radio enthusiast. In 1908, using his callsign 2AF, he operated a spark transmitter there, and remnants of the extensive earth-mat which he laid down are still coming to light in the garden to this day.

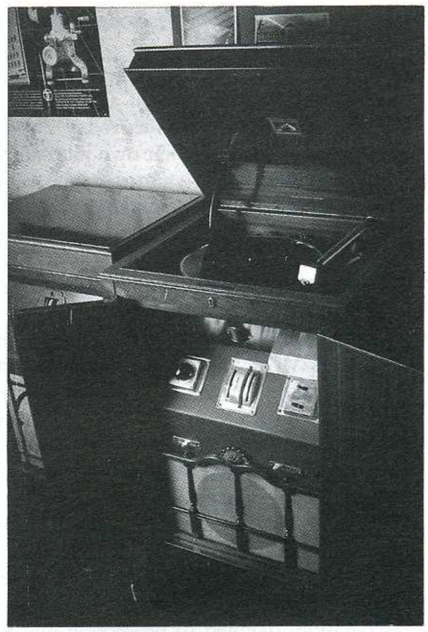
After building his first set at 12 years old, Gerald went on to work in the radio industry, but following a succession of health problems in 1973, he decided to seek refuge from the pressures of domestic radio and TV servicing and start up his own vintage wireless company. As he accumulated more and more equipment, the collection or museum activities took over. In 1979, Radio Rentals used many of the exhibits in making a film about their company history, and this brought him considerable publicity.

Shortly afterwards, an article about the museum in the now sadly defunct magazine *Sounds Vintage* was seen by millionaire philanthropist John Paul Getty II, who was seeking help to repair an old radio. He contacted Gerald Wells, found the help he required, and has in his turn been helping the museum ever since.

The museum now includes around 1000 exhibits in total, predominantly domestic radio receivers, but also TV sets, tape recorders, gramophones, telephones and cinema sound systems, and a few items of broadcasting studio and transmitter equipment.

Every room in the house has walls lined with shelf upon shelf of equipment – even Gerald Wells' bedroom, which houses also the control desk for the in-house public address system **and** the two 7ft-tall, 19 inch racks housing standards-converter systems which are used to provide programmes for the 405-line TV sets in the collection!

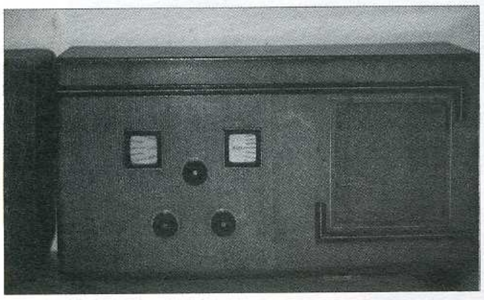
One room is devoted to the McMichael Collection, comprising sets from the museum of the former McMichael Radio Company, which were otherwise in danger of being consigned to the rubbish dump.



HMV Model 521 all-electric radiogram, made by The Gramophone Co. Ltd. in about 1929/30

And it doesn't stop there! In the large back garden are a growing collection of huts which house yet more displays of sets and valves, plus workshops where sets are overhauled, repaired and refurbished, or if necessary totally rebuilt. There are stores of vintage components including valves, transformers and loudspeakers, all neatly labelled as to type and origin or use. In a little hut of its own is an STC CG1 TV transmitter, which was formerly installed on the Isle of Man. This is at present a non-working exhibit, but there are plans!

In yet another hut is a recent acquisition – a complete set of valve-manufacturing equipment donated by the M-O Valve Company. With a little tuition from experts in the field, Gerald and his band of helpers are learning how to make filaments and electrode assemblies, to blow glass and make glass-metal seals, to exhaust the air from the valves and fit the bases. Their efforts have already produced a working 'R' valve – well, not exactly – it looks like an



Climax Model S5, produced in 1934

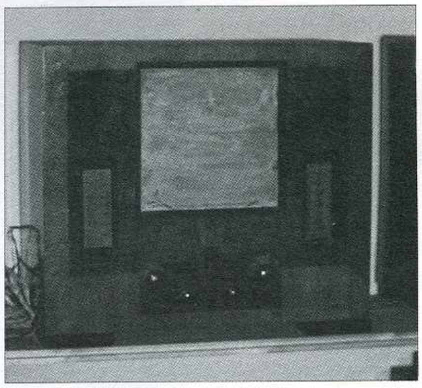
'R' valve and it works, but the characteristics are not those of an 'R' valve. No doubt practice will make perfect!

Other work undertaken in the workshops, and making good use of the metal and wood working, polishing and wiring facilities, includes the manufacture for sale of replica 4-valve vintage radios, using original components. An interesting item under test in the workshops while *RB* was visiting was a sound radio 'standards converter', intended to produce good old-fashioned medium wave AM versions of the future all-VHF FM BBC national radio channels, for distribution to the museum's working exhibits.

Memories

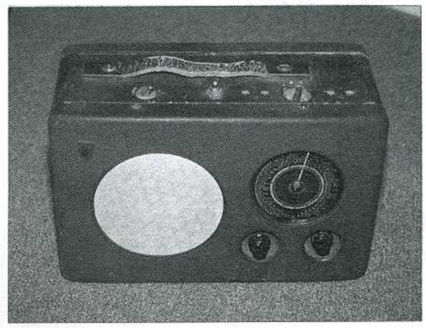
While looking round the many rooms of the Vintage Wireless Museum, boyhood memories were brought flooding back by the sight of two sets which I have not come across for more than 40 years.

My father was something of a radio listening fanatic, and I can recall him, when he came home after WWII, sticking pieces of paper carrying lists of wavelengths of foreign medium and long wave transmitters to the front of our HMV Model 296, marking off those stations that he heard.



HMV Model 296

In the late 1940s, he bought a German receiver made, he thought, by Telefunken, though it bore no maker's name, inside or out. It had long, medium and short wave-bands on it, which expanded our horizons greatly (quite literally!). We listened to broadcasts from America and Australia, and I heard my first radio amateurs. That set would run from AC mains of anything between 100 and 250 volts, or from a 6 volt DC supply. It used strange valves – squat, fat, metal-cased devices rather like an octal valve that's been 'sat upon', with

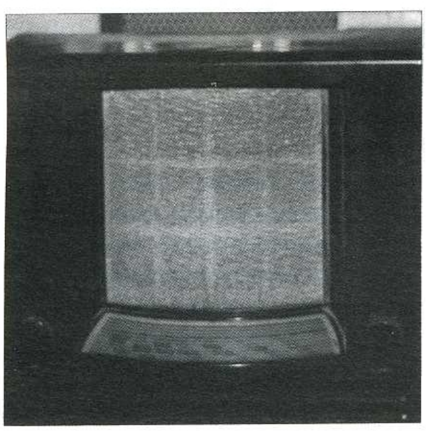


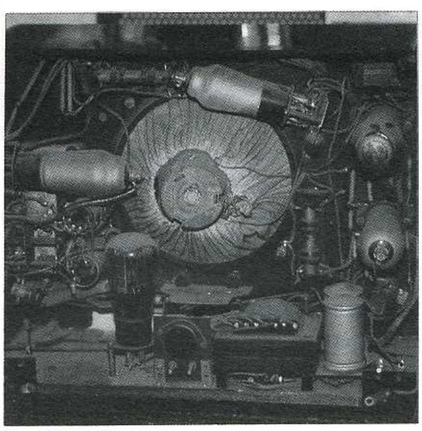
Radione Empfangsgerät R2

an 8-pin base with three pins on one side of the centre spigot and five pins on the other. The type numbers, as far as I can recall, were in the European-format series Exx11.

There is a set in the Chalk Pits Museum at Amberley, West Sussex, which is very like our old one, and probably came from the same stable, but the set at Dulwich is identical, even to the shape of the control knobs. I was delighted to have the mystery of its origin solved after all these years, when Gerald Wells produced the maker's handbook identifying it as a Radione Empfangsgerät R2. Thank you, Gerald!

Geoff Arnold





Model V5A, made by Philips Lamps Ltd. in 1936. This set did not use a chassis; instead, as a cost-cutting exercise, the components were fixed to the cabinet in small groups, as shown in the internal view (right)

Gerald Wells is aided in his work of running the museum by a willing band of helpers of all ages, ranging from school children, through enthusiasts professionally involved in broadcasting and other areas of the radio and electronics industry, to retired engineers. Several youngsters who have had their interest in radio technology kindled whilst working there, have gone on to careers in the industry.

Visitors are welcome to look round the museum collection by appointment. You should phone Gerald Wells on 081-670 3667. No charge is made, although donations to the museum running costs are naturally much appreciated. **RB**

Coast Radio Stations
The First Sixty Years
by Brian Faulkner

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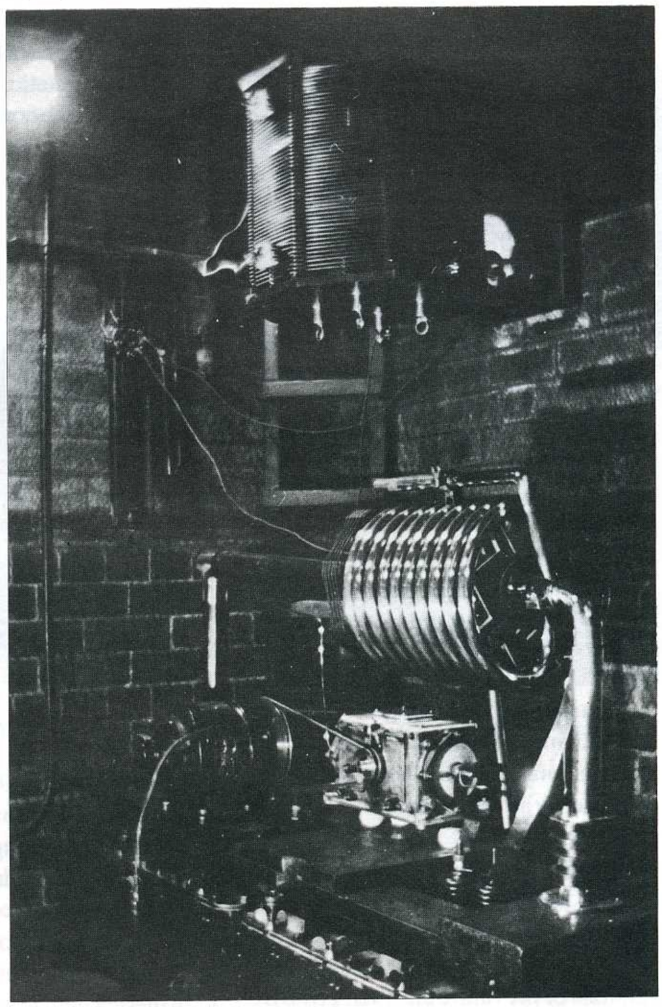


Fig. 1 - Spark transmitter at Wick, 1921

The beginning of the twentieth century saw a major step forward in safety of life at sea. Before the advent of radio, if disaster overcame a ship, months often elapsed before any news reached land.

Marconi, who was a captain in the Italian Naval Reserve, realised the potential of this new invention and worked closely with Lloyds, who had traditionally communicated with ships at sea, and the Post Office who were themselves experimenting in this area. Towards the end of 1901 Lloyds signed an agreement to fit Marconi equipment at their stations and allow the Marconi company its use for commercial traffic. In July 1903, while the Marconi company itself was establishing a series of stations around the coast of Britain and Ireland, the Admiralty came to a similar agreement.

The First W/T Act

By 1904 the government, realising that their monopoly did not cover these new services, passed the Wireless Telegraphy Act giving the Postmaster General full control of the use and licensing of wireless telegraphy, and an agreement was signed allowing the Post Office to collect, deliver and transmit ship to shore and long distance messages on behalf of the Marconi company.

Litigation took place several times during these early years, culminating in 1906 with Sir Henry Hozier, Secretary of Lloyds, challenging the Postmaster General, Sydney Buxton, to a duel following the realisation by Lloyds that their licence to operate wireless was not to be renewed. Hozier lobbied MPs and Peers and believed that Buxton had called him a liar when making a speech on the subject in the House. Buxton wrote to Hozier and nothing more was heard of the matter.

That same year the Berlin Radio Conference introduced two frequencies for public correspondence, 1000 and 500kc/s, along with an agreement to change the distress signal from CQD to SOS.

The Post Office had, at this time, no stations of its own so plans were drawn up in 1908 to build the first at Bolt Head in Devon.

The following year all disputes were finally settled and arrangements were made for the Post Office to take control of all British coast wireless stations.

The nine stations, at Crookhaven, Malin Head, Lizard, Niton, North Foreland, Caister, Cullercoats, Seaforth and Bolt Head, were by today's standards very basic. Equipment varied from station to station, but in the main consisted of an engine driving a converter which, in turn, charged accumulators. The transmitter, with an output of some ¼kW, consisted of a Marconi jigger and a Leyden jar or Poulsen condenser producing a 300 or 600 metre wave, while the receiver was a Marconi magnetic detector multiple tuner and a recording receiver.

Wavelengths used at this time were 150 to 180 metres, known as Tune A, and 450 to 540 metres, known as Tune B.

The next radio conference was held in London in 1912. It made 500kc/s the preferred frequency for communication and introduced silence periods, three minutes beginning at a quarter past and a quarter to each hour when ships were not allowed to transmit, enabling a vessel in distress to send an SOS with a reasonable chance of being heard.

A major reorganisation took place in 1913, resulting in the Post Office having a highly efficient network of coast radio stations, each maintaining a 24 hour distress watch and providing a commercial service to ships up to 300 miles from the coast. New stations were built at Niton, St. Just, Fishguard and Malin Head while Lizard, Rosslare and Crookhaven were closed. Transmitter power was increased and now ranged from 1½kW at Niton up to 10kW in the case of Valentia, with each station having its own distinctive spark. Land's End and Fishguard also used 800 metres for much of the day because the excessive amount of calling on 600 metres was fast becoming a nuisance.

Another major problem was being experienced on broadcast frequencies in some coastal areas with ships using 600 metres causing interference to domestic wireless sets.

The BBC eased the problem somewhat by using 1600 metres, helping listeners near the coast, but making little difference to those some distance away from the BBC transmitter but close to a coast station. The Post Office, in its turn, tried to help by arranging that ships near the coast should reduce sending on 300 and 450 metres as far as possible.

World War I

The First World War brought the stations under the control of the Admiralty. A series of direction finding stations were created which had a large measure of success in locating German submarines and Zeppelins, and which played a major part in the Battle of Jutland. Following the war, the commercial radio service was not restarted until 1920 when, in addition to their existing stations, the GPO took over Admiralty stations at Wick, Portpatrick and Grimsby. The two Scottish stations were modernised, and **Fig. 1** shows the naval transmitter used at Wick. The tanks under the table were condensers and the copper coil, which was about 18 inches in diameter, was the primary of the aerial coupling, tuned by the movable arm and clip at the top. The wire cage was the secondary and aerial circuit coupling was varied by sliding the cage along in relation to the copper coil. The cage hanging up was the aerial inductance, which was varied by moving the wandering lead up and down. The spark gap was mounted on top of the condensers and was rotated by a motor and belt, the stationary electrodes having three points each to correspond to the six points on the rotating central electrode. On the wall is a radiation meter and earth arrester.

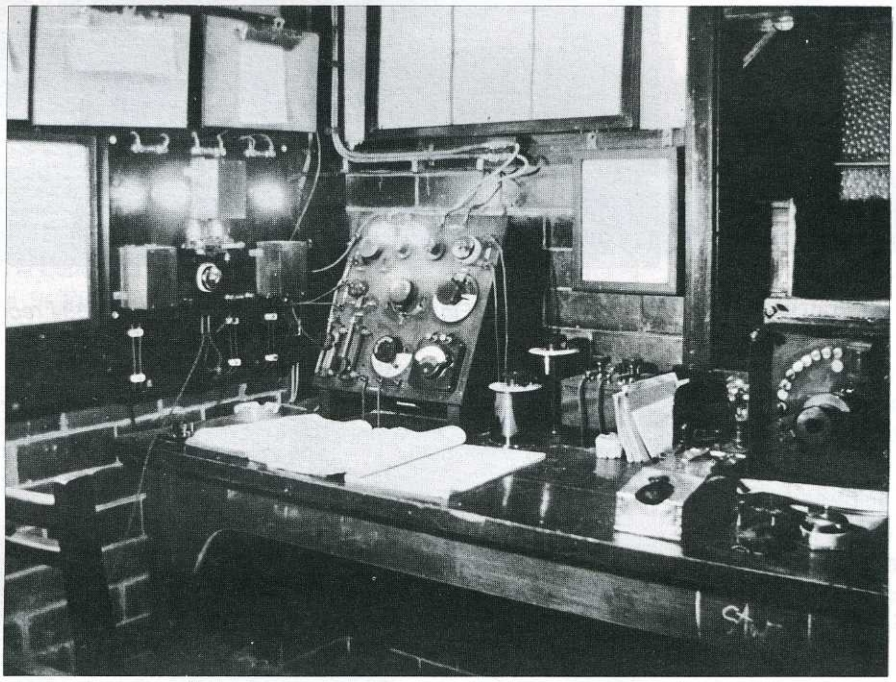


Fig. 2 - Early Post Office receiver at Wick, 1921

The associated receiver at Wick is shown in **Fig. 2**. This was a set built by the Post Office and became a standard piece of coast station equipment. The two cylindrical condensers on the right of the set were tuning for the aerial and intermediate circuits and the square box was the aerial inductance. The knob in the centre was the jigger switch with the aerial coupling switch at the top left and the intensifier in the middle at the bottom. The starter for the transmitter is on the right of the picture.

Staff at these stations normally consisted of an officer in charge and eight or nine operators, two being on watch at all times.

Grimsby Radio, which was accommodated in three redundant railway coaches on the West Pier, had replaced Caister but was closed itself in 1927 to be replaced the following year by a new station at Mablethorpe, Lincolnshire. The new station, in addition to its distress and commercial work, was to function as a direction finding station, and was the first coast station to be fitted for radio telephony. For W/T and DF purposes a Marconi 12A DF receiver, a 9-valve set with an oscillator for reception of CW, and a frequency range of 66kc/s to 1000kc/s was used, while the W/T transmitters were a 1½kW main and 100W emergency type supplied by RCC, (the Radio Communication Company), both fitted for CW and ICW. The main transmitter was sited in a room away from the operator and to change wavelength an ingenious combination of wheels, pulleys and cords were used.

The cost of sending a radio telegram in those days was 11d (11 old pence or about 4½p), with smaller charges for vessels on short voyages, and the total number of words received and transmitted totalled over three million.

At the World Administrative Radio Conference of 1927 it was agreed that spark transmissions should be forbidden from 1930 unless the output power was less than 300 watts, and the Conference of 1932 limited spark transmissions to 375, 425 and 500kc/s only. At the same conference the W/T auto-alarm signal which consists of twelve 4-second dashes separated by 1-second spaces was introduced, and the fitting of auto-alarm receivers was made compulsory on ships that did not keep a 24 hour human watch. Plans were also made for a radiotelephone distress frequency on 1650kc/s.

Radio Telephones

Following tests at Cullercoats, 1932 saw Humber Radio (Mablethorpe) offering the first radio telephone service to ships. Up to this time suitable equipment had not been available, but the rapid development of thermionic valves now made it possible. The service was simplex only to start with, but by 1938 a voice operated constant amplifying device had been developed which permitted full duplex working.

The Marconi XMC1, a self contained transmitter and receiver, which operated on 200 and 220 metres was used at Humber for the inaugural R/T service. The transmitter, which had an output power of 500W, used choke control modulation and was inductively coupled to a 6-wire cage aerial 70 feet long, suspended from the top of a mast. The receiver was a 4-valve reaction type with a large horn loudspeaker, and the complete system achieved good results with a range of over 200 miles.

Early R/T services at Land's End used the Marconi 503 transmitter, shown in **Fig. 3**, tuneable from 109 to 220 metres on R/T and 600 to 800 metres on W/T, and the 394 receiver, a TRF with two tuned RF stages, a diode detector and pentode output valve.

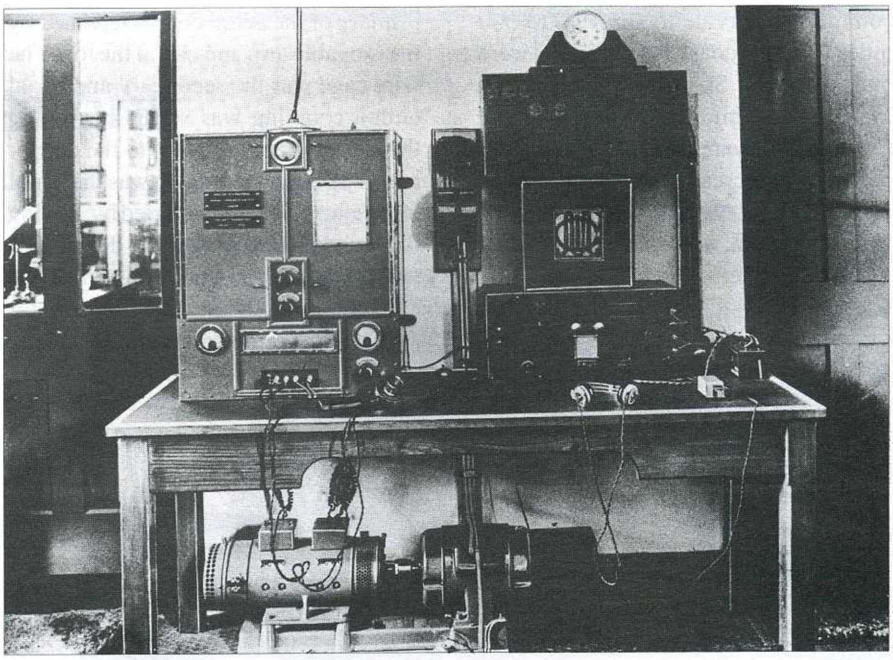


Fig. 3 - Marconi 503 transmitter and 394 receiver

A Post Office designed W/T transmitter which combined both main and emergency transmitters in one is shown in **Fig. 4**. The emergency transmitter, which was a basic single valve self oscillating type, was housed in the two far sections, and ran off 110V batteries, each so big they had individual hydrometers for easy monitoring of the specific gravities of the electrolyte. The main transmitter, consisting of an oscillator, power amplifier with a valve whose envelope was made of pure quartz, and rectifier was in the nearer three sections.

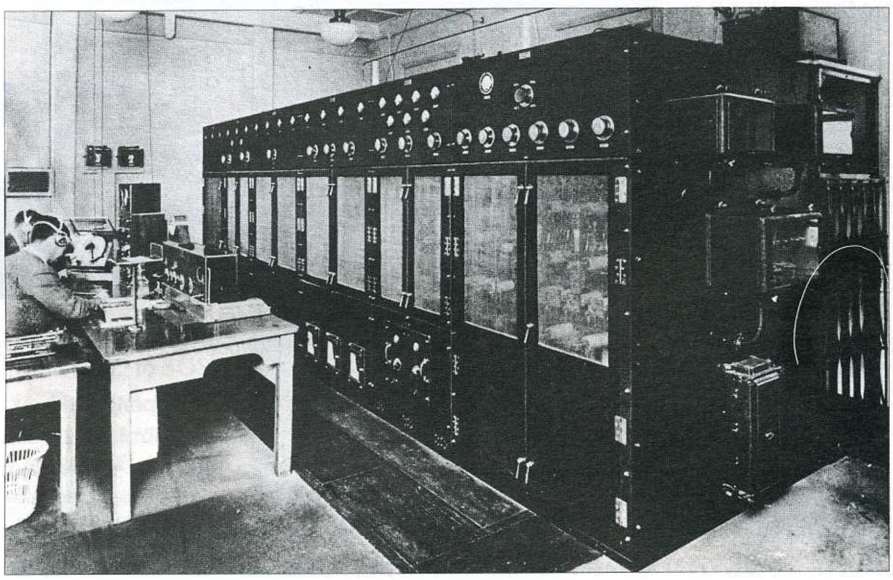


Fig. 4 - Combined main and emergency transmitter at Land's End, 1930s

The whole massive contraption was cooled by a rough and ready system of centrifugal fans. The operators' receiving position can be seen just in front of it.

Aerial configurations varied from station to station, but for W/T generally consisted of two 200 foot masts supporting a 'T' aerial with spreaders, having a 3-wire capacitance top and 3-wire downlead. Masts also had Bellini Tosi loops on top for direction finding and the aerial feeders were connected to the station by overhead lines.

World War II

The Admiralty again took over the stations during the Second World War, and they once more played a vital role in direction finding. In the build-up to the invasion of France, Niton and North Foreland had extra R/T transmitters installed which were controlled from Portsmouth and Dover.

Coast stations were forbidden to communicate with the enemy, but there were many examples of stations of both sides, especially on the North Sea coasts, advising each other of the position of shot-down aircraft so that assistance could be sent.

Following the war the Post Office designed and installed much of its own equipment. The WT7, shown in **Fig. 5** at Cullercoats in 1947, was one such receiver. A superhet, it remained in service until 1952, mostly on Morse services and, along with its associated goniometer (seen on the left of the receiver), was generally thought of as a reasonably reliable piece of equipment. A simple wind-up auto-alarm sender can be seen to the right of the Morse keys.

The W12 transmitter along with Hallicrafters and CR100 receivers were used on R/T circuits of this era and in 1947 Niton, which had up to then worked exclusively on W/T, joined those stations offering an R/T service.

That same year also saw the opening of a new station at Oban following complaints by Scottish fisherman that there was a lack of distress coverage around Hebrides and the Western Isles. The station, which was financed by the government, was to be sited on an old airfield at Connell just outside Oban and until refurbishment of the buildings was complete it consisted of one operator in a caravan full of equipment.

In 1952 the maritime band was contracted to between 410 and 525kc/s, and watch kept on 500kc/s only. In 1953, 2182kc/s replaced 1650kc/s as the R/T distress and calling frequency. Watch was kept on 2182 using a Plessey receiver which had a motor-driven condenser across its oscillator circuit so that it would search about 10kc/s either side of the required frequency. Crystal controlled ships' transmitters were few and far between in those days and most of the others were often off frequency.

The operating room at Land End as it was in 1956 is shown in **Fig. 6**. The Plessey receiver is against the wall by the windows, while in the foreground on the right is the 500kc/s distress watch and calling position with the Morse working point to his left. Both have Marconi 'Mercury' receivers which replaced the WT7, and a goniometer. The 'Mercury' was a single superhet on its lower ranges and double superhet on the higher, and was considered to be a very reliable receiver. The position in front of these was the main radio telephony point with a spare radiotelephone point to his left.

The W12 was reduced to a standby role when a new transmitter, the W5, was introduced in the mid 1950s. It was used for R/T as well as W/T, had an output power of around 800 watts, and was one of the most reliable transmitters built by the Post Office, remaining in service on W/T at some stations until 1982.

Towards the end of the 1950s, three new stations were planned and built to fill gaps in coverage areas. All three were built to the same basic design with a hexagonal glass-fronted operating room giving the impression of an airport control tower.

The first was opened in January 1958 just outside Stonehaven, on the Scottish east coast, replacing an Admiralty station built in 1942 and taken over by the Post Office after the war.

A year later the second was completed, sited on a hill overlooking Ilfracombe in Devon. This station replaced an earlier one which had opened in 1955 in the attic of Ilfracombe Post Office.

Fig. 5 - Post Office receiver and goniometer No. 7

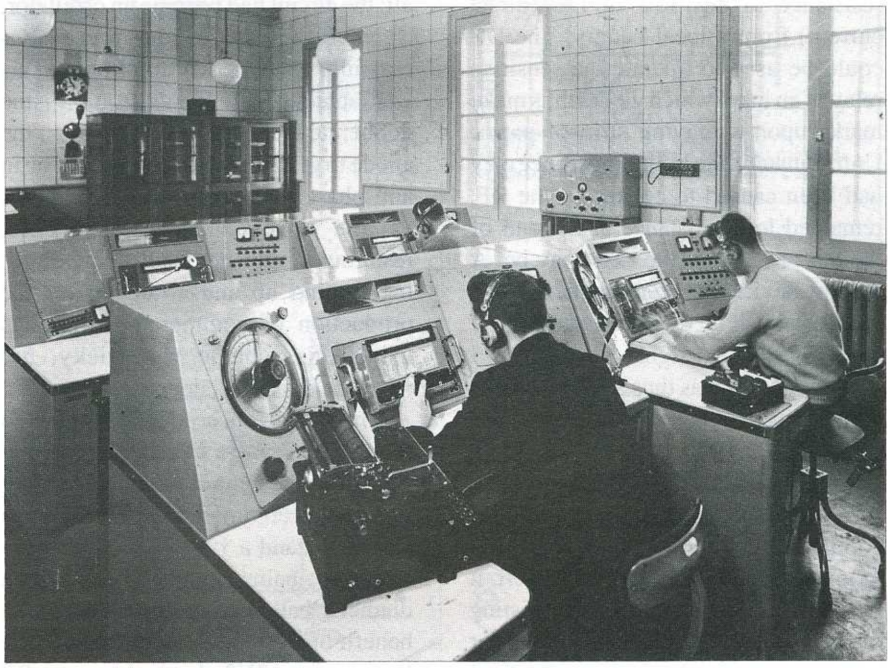


Fig. 6 - The operating room at Land's End, 1956

The previous station was R/T only, but the new one took on the medium range W/T service that had originally been worked from Portishead Radio, home of the Post Office long-range short wave maritime service.

The final station of the three to be built was near Amlwch on Anglesey, and was opened in April 1960. There had been a station on the island previously, at Holyhead, but this had moved to Seaforth in 1903 and was one of those taken over by Marconi in 1909.

Equipment arrangements at all three stations were basically the same, W5 transmitters for W/T and R/T and 'Mercury' receivers.

The final development of this period was the introduction of a short range VHF radiotelephone service in 1959, with Niton and Land's End being fitted with Marconi equipment.

Coast stations were now firmly established as integral members of the Safety at Sea organisation, and their first sixty years had seen huge strides made in the development of radio. They were now ready to face the challenge of future technology, some of which Marconi could only have dreamt of. ***RB***

Reaction

by Ian Hickman

In the early days of wireless communication, receivers were entirely passive. The detector, usually a crystal, converted the incoming radio frequency energy to base-band, i.e. audio in the case of an amplitude modulated (AM) station. Another type of detector, used in the early days for the detection of Morse signals, was the coherer. With this device there was some gain. The incoming radio frequency (RF) energy caused iron filings, loosely packed in a glass tube, to stick together. This lowered their resistance to the flow of DC (direct current) from a local battery. The DC could be used to operate the sensitive relay of an inker which would thus make marks upon a moving strip of paper. Unfortunately, the iron filings, once they had been caused to cohere by the RF, remained low resistance at the end of the dot or dash, as the case may be. A tapping device was therefore necessary, to re-establish the high resistance state ready for the next signal element.

The coherer was thus a form of base-band amplifier, another being the ingenious device marketed by S. G. Brown and Co. This consisted of a telephone earpiece mechanically coupled to the diaphragm of a carbon-granule telephone microphone insert. It was thus an audio amplifier consisting of an electrical to mechanical transducer coupled to a mechanical to electrical transducer. As with the coherer, the incoming energy was used to control the flow of power from a local battery, both devices being audio amplifiers. What was really needed for the further development of radio communication, however, was radio frequency amplification and, along with it, greater selectivity.

The Valve

The thermionic valve was readily adapted to provide audio amplification, but the earlier types were simple triodes. These were far from ideal as RF amplifiers, due to the internal capacitance between anode (plate) and grid. Of little importance at audio, this capacitance provided a path feeding back a fraction of the RF energy in the anode circuit to the grid circuit. Now the amplitude of the anode signal was considerably greater than that of the grid signal, that's what amplification is all about, so under certain conditions the amount of energy fed back could equal or exceed the original signal at the grid. Thus the RF oscillations in the circuit could be self-sustaining without any input signal at all: the circuit had become an oscillator.

Nevertheless, triodes were successfully used as RF amplifiers. This was achieved by 'neutralisation', the deliberate feedback of current from the anode to grid. This was arranged to be in anti-phase to the inescapable feedback via the valve's internal capacitance, resulting in zero net feedback. Designing, setting up and arranging for the production of commercial radio sets using this scheme was tricky, but nevertheless it was done.

The author once possessed, alas no more, a five-valve Pye 'transportable' set. The substantial wooden cabinet included accommodation for a 2V accumulator and a 120V HT battery, the whole set being mounted on a 6 inch diameter ball bearing turntable, for the benefit of the built-in frame aerial. The line-up was a 2V2, that is to say two RF stages preceding the detector and two AF stages following. The two RF stages were neutralised triodes, the set evidently dating from before the general adoption of the SG (screened grid) valve. Each RF amplifier, together with its associated tuning coil and a gang of the tuning condenser, was contained within a fully screened compartment, as one can well imagine was necessary with such an ambitious line-up!

For the benefit of connoisseurs of vintage radios, I may add that the speaker grille was not of the stork-on-one-leg variety but the almost equally popular rays-of-the-sunset-over-the-water pattern.

Enter Reaction!

The extensive screening and neutralising required by triode RF amplifiers was beyond the capabilities of the average home constructor. But with a greater choice of stations becoming available, including many European ones which were receivable after dark, extra gain and selectivity – beyond that obtainable with a single tuned circuit and simple detector followed by AF amplification – were desperately needed. Who first thought of and applied reaction I do not know, but with its aid immense improvements in both sensitivity and selectivity were obtained, for very little increase in either the cost or the complexity of a receiver. The basic idea is very simple. A proportion of the amplified signal at the anode is returned to the grid circuit where it reinforces the incoming signal. The result is increased gain, and since the reinforcement applies only at that frequency which was amplified in the first place, increased selectivity also.

Now if you think the description of reaction just given sounds suspiciously like the description of the conditions for oscillation mentioned earlier, you are exactly right. Some over-enthusiastic writers of the period described reaction as being able to increase the gain of a receiver 'right up to infinity'. In the sense that, used to excess, it caused the valve to oscillate in the absence of any signal – even with the aerial disconnected, this is true. But in fact the increase in sensitivity to weak signals, though very large, was strictly limited, being greatest when the valve was just on the point of oscillating or only oscillating very weakly. In the earliest arrangements, reaction was controlled by physically adjusting the coupling between the main (usually the only) tuning coil, and a reaction coil which was in series with the anode of the detector triode. The arrangement was known as 'swinging choke' reaction; nothing whatever to do with a swinging

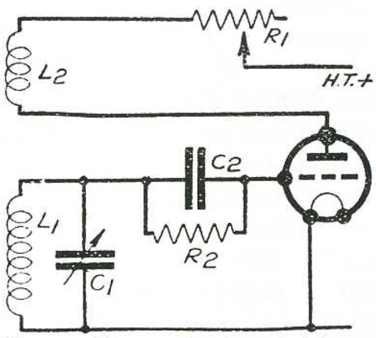


Fig. 155—The reaction is varied by an adjustable resistance in the anode circuit

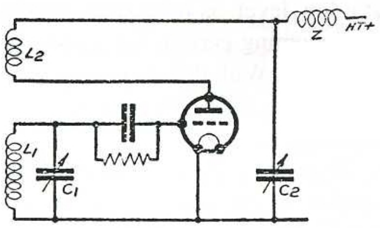


Fig. 156—The variable condenser C2 modifies the choke effect of Z

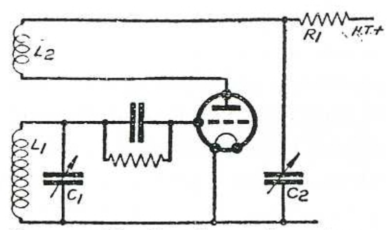


Fig. 157—The impedance of a resistance is counteracted by a variable condenser C2

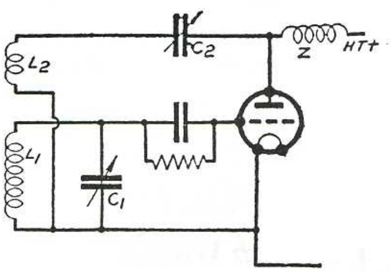


Fig. 158—One of the most popular and successful methods in use to-day

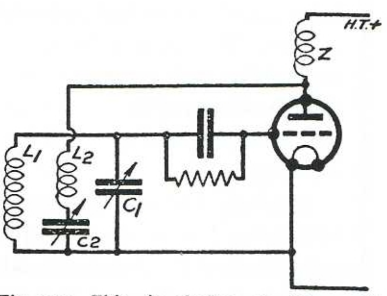


Fig. 159—This is similar to Fig. 158, but hand-capacity effects are reduced

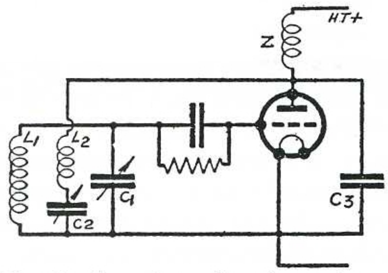


Fig. 160—A condenser C3 reduces adverse Miller effect when reaction is at zero

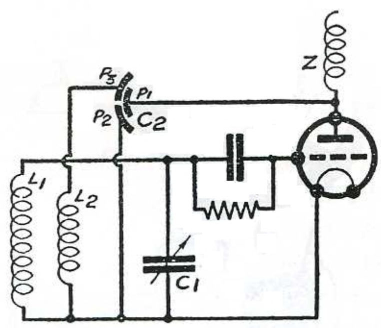


Fig. 161—A differential reaction circuit of great popularity; unwanted reaction currents are earthed

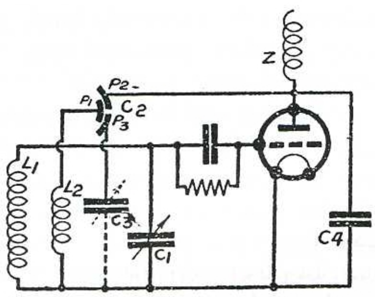


Fig. 162—A special form of differential reaction to avoid mistuning

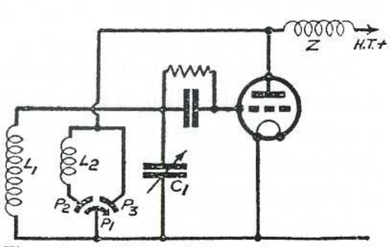


Fig. 163—A differential reaction scheme for reducing hand-capacity effects affecting tuning

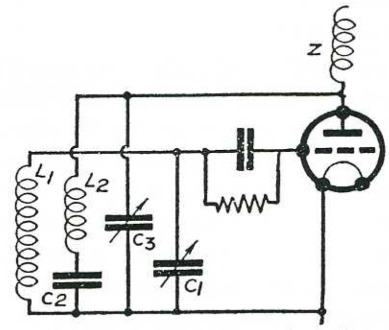


Fig. 164—Parallel-fed reaction coil with choke effect varied by C3

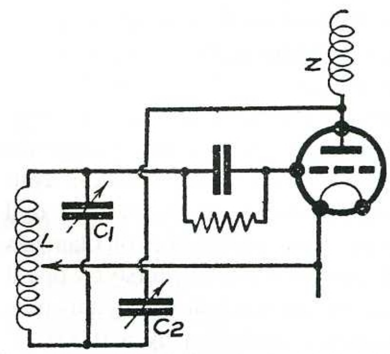


Fig. 165—A single-circuit reaction method. Reaction is applied to one end of coil

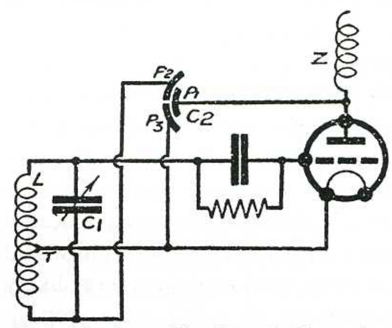


Fig. 166—A modification of Fig. 165 using a differential reaction condenser

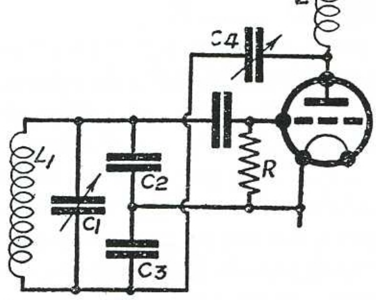


Fig. 167—Instead of a tapping on the coil itself, two condensers are used

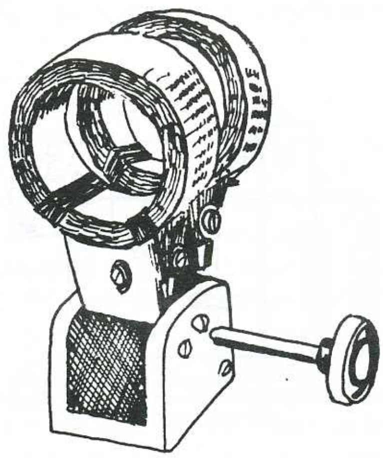
choke as used in power supplies, which changes its inductance according to the amount of DC current flowing through it. The main tuning coil was usually fixed, with an aerial coupling coil on one side and the reaction coil on the other. The coils, invariable single windings, plugged into holders, a popular type having one of the two pins on the holder and the other on the coil. A 'basket weave' construction was used for the winding to maximise the Q factor, and the well-known variety produced by the Igranic company carried the slogan 'What are the wild waves saying?' The holders for the aerial and reaction coils were mounted on shafts each carrying a bakelite knob on the end, providing the means for adjusting the aerial coupling and reaction respectively (see picture).

However, swinging choke reaction was already passé by the time of the main boom in home wireless construction. The more economical dull emitter valves with their 2 volt filaments had replaced the earlier, thirsty 6V bright emitters, and reaction was by this time commonly controlled by a 0.0001μF variable condenser. Numerous different arrangements were used, as the accompanying circuits extracted from *The Manual of Modern Radio* show [1].

Note that in the partial circuit diagrams of Figures 155 to 167 (see page 23), where the anode circuit is shown as going off to HT+, this would in a complete circuit pass first via an anode load of some sort, across which the detected audio would be developed. In a one-valver, the anode load would be a pair of high impedance headphones. In a two-valve or three-valve set, it would be an anode load resistor or more likely the primary of a 3:1 ratio step-up transformer. The secondary of this drove the grid of the following stage, the voltage step-up extracting the maximum gain possible from each stage.

Improvement

The improvement in both sensitivity and selectivity achieved by the judicious use of reaction was very great, but difficult to quantify. An advantage of the valve leaky-grid detector, around which the reaction was almost invariably applied, was that its gain was greatest for small signals. If the reaction were advanced to the point where the valve just started to oscillate, then as the amplitude of the oscillation increased, the gain of the stage decreased. This meant that it was possible, nay simple, to adjust the reaction so that the set was just 'weeping' on the verge of oscillation. In this condition, the amplitude of the oscillation was very unstable, that is to say it was very open to influence by factors outside the set, viz the incoming signal. In addition to the increased sensitivity, the selectivity was increased, to the point where the bandwidth became less than that of the broadcast being



received. This resulted in a 6dB per octave treble cut extending across pretty well the whole of the audio band.

The author, man and boy, has constructed many a 'straight' set (i.e. not a superhet) and found that it is much easier to produce a design that works well using valves than using transistors [2]. This is because with transistors, the gain tends to rise as the amplitude increases: the result is that as the reaction is advanced to increase the gain, the circuit plops into heavy oscillation. In this condition, the amplitude is defined by non-linear operation such as bottoming, in which the stage is totally deaf to any incoming signal. By the time that the reaction has been wound back to the point where the oscillation stops, it is no longer sufficient to have any beneficial effect on the small-signal gain at all.

However, with care, it is possible to design an all-solid-state receiver incorporating reaction, with good performance, as in the design in reference [2]. More recently, I have constructed a receiver for the 80m amateur band, covering also the adjacent broadcast band, for which some performance figures have been measured. The line-up is a long-tailed pair RF stage with reaction, followed by an infinite impedance detector feeding a TL084 quad op-amp. In addition to providing gain, the latter implements a fifth-order elliptical low-pass filter, providing an audio bandwidth of 3kHz and 50dB of attenuation at 4.5kHz. This supplements the considerable selectivity provided by the RF stage itself. The measured sensitivity of the receiver is 1μV for a 10 dB signal to noise ratio in SSB mode. AM signals can be received with the set not quite oscillating, although reception is equally possible even if it is oscillating at a low level, as it becomes locked to the incoming carrier, i.e. synchrodyne operation. With the set just oscillating, both SSB and CW signals can be resolved.

If you count the two transistors of the long-tailed pair as a single RF stage and the TL084 as a single device, I suppose the set is a 1V1. If you count the op-amp sections separately, then it is a 1V4, while if you count the 16 individual transistors in each section of the op-amp, then it would be a 1V64! This just emphasises that in modern circuit design, the number of individual active devices is really immaterial, a far cry from the days of valves, when every extra device meant another hungry heater to be fed.

References

[1] J. Scott-Taggart, *The Manual of Modern Radio*, Amalgamated Press Ltd., London, 1933.

[2] Ian Hickman, 'The *PW* "Imp" Three-waveband Receiver', *Practical Wireless*, May 1979.

RB

Full Circle

by Bob Wilson

When I was at Marine Radio College thirty years ago, we occasionally had old Radio Officers who came back for refresher courses. We often used to joke with them and say things like: 'When old so and so looks inside a receiver he asks, what are all those glass things?'

Recently, I heard a young Radio Officer say: 'When old Bob opens a receiver and looks inside he asks, who's pulled all the valves out?'

The Vintage Years of Amateur Wireless
Part 5
by Stan Crabtree

Nineteen hundred and eight saw the appearance of the first textbook specially written for wireless hobbyists. *Wireless Telegraphy for Amateurs* by R. P. Howgrave-Graham MIEE was produced by the publishers of the *Model Engineer* and sold for 2/- (10p). Up to this time enthusiasts had made use of *Wireless Telegraphy and Hertzian Waves* by S. R. Bottone which was first published in 1901. However, the text of this volume was mostly historical. Only the final third of the book was devoted to constructional details – chiefly Bottone's speciality – the coherer.

Howgrave-Graham's new offering covered the whole spectrum at this time: Principles of radiotelegraphy, aerials and transmitting apparatus, receiving apparatus and tuning applications. There was even a chapter on the magnetic detector and how to use it.

The text described an experimental installation working between Hampstead Heath and Tufnell Park, a distance of some 1¾ miles. Useful, factual advice was given on matters that would probably not have been considered by the newcomer with no experience. It was suggested that advantage should be taken of 'all earth connected bodies in the neighbourhood'. As an example it suggested a connection be made at two or three points on a row of railings and also the gate.

Detectors

The author compared the qualities of the three main detector systems at this time:

Magnetic detector (maggie): Insensitive but very reliable and not affected by transmissions.

Lodge-Muirhead Wheel Coherer: Very sensitive, fairly reliable but adjustment impaired by the transmitter.

Crystal substances, Zincite, Bornite, etc: Sensitive, reliable but adjustment completely destroyed by the transmitter.

Howgrave-Graham observed that a 'long fat spark is not necessary for long distance work – the most important factor being the quantity of the current flowing combined with the character of the spark'.

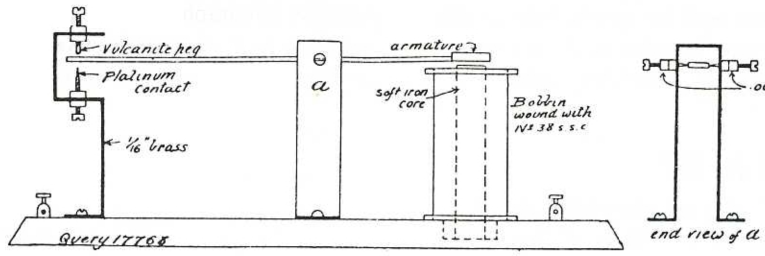


Fig. 1 - The relay design proposed by 'GVB'. It is not polarised and has no spring to retain it in the OFF position

There were no power indicators or RF meters in use at this time. An ammeter in the output circuit of a battery might show the current drawn but this would not necessarily represent usefully radiated energy. The only way in which an experimenter could hope to even try to assess the effectiveness of his transmission was by observing the spark taking place. When describing their equipment, correspondents often gleefully wrote of 'a big fat spark' or 'sharp cracking sparks'. But the intellectuals had gone into this matter more deeply. One 'Telemachus Thompson' writing in the *English Mechanic and World of Science* observed: 'bushy sparks are absolutely useless. The spark must be blue and give a sharp pitting crack. A bushy spark can mean the electrodes are losing their polish with the result that the energy radiated can be reduced, even down to 1% of the original power'.

Constructors were now taking more care with their connections and feed to the apparatus. Cloth or rubber covered insulated wire in lead sheathing (used in household electrical wiring at this time) was found to be suitable for connections from the coherer to the relay and printing mechanism. Aerial feed wires were supported by strands of catapult rubber or waxed string. Wood was extensively used as an insulator but only after being 'thoroughly boiled in wax'.

One correspondent's advice on establishing an earth could have been mistaken for the nourishment of roses! 'A rust protected metal plate two feet square should be attached to a wire and buried five feet in the ground. The hole should be filled with good coke breeze and well watered – finally a little salt or other alkali should be added'.

Constructive Criticism Please!

Writing in the *Model Engineer* of February 1908, 'GVB' (Brockley) offered a design (**Fig. 1**) for a relay for wireless telegraphy and asked the editor for some constructive criticism. He also requested information on where he could purchase a wheel for a coherer of the Lodge-Muirhead pattern.

In his reply the editor thought the relay should work but felt unhappy about gravity being relied upon to hold it in the 'OFF' position. He went on to say the moving part was 'too long and the whole thing too big and clumsy' and strongly recommend a polarised type for wireless work. He advised that the coherer wheel could be obtained from the inventors Muirhead and Company, Elmers End, Beckenham, Kent.

Mr F. E. Bornhardt, writing in the *English Mechanic* described an electrolytic detector he had developed for use with wireless telegraphy. He said the results with his apparatus were 'the best I have had with any receivers up till now and I can thoroughly recommend a trial'. He went on to say that a complicated system of chemical action was involved and the chief difficulty was the search for the very thin 'wallastone' *(usually spelt 'Wollaston' – Ed.)* wire needed for the anode. He thought the larger opticians would hold stocks but it was very expensive. However, according to the writer 'all the efforts will be worthwhile as this detector was found to be three times as sensitive as the best filings coherer'.

What Is It?

'HK' (Weymouth) writing in an April 1908 edition of the *Model Engineer* commented on the fact that the magnetic detector had been referred to in answer to queries and asked what this instrument was.

The editor must have been having a good day as instead of brusquely referring him to Howgrave-Graham's book he briefly gave an account of the intricacies of the 'maggie' and reproduced a diagram (**Fig. 2**).

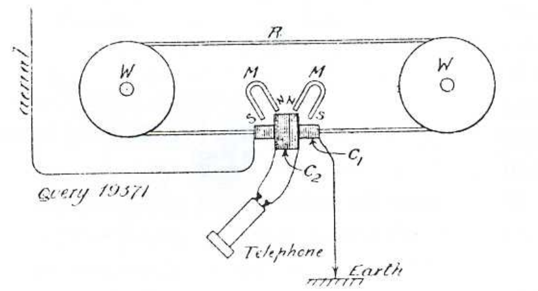


Fig. 2 - 'The magnetic detector. An endless rope R made up of fine wires passes through two grooved wheels W, and also two coils, C_1 which is in series with aerial and earth and C_2 which connects to a telephone earpiece. Permanent magnets M, M complete the assembly. The wire rope is subjected to some magnetisation from the permanent magnets. Wireless signals in C_1 result in some demagnetisation of the residual field causing it to move. This sudden movement induces a voltage in C_2 and a current flows in telephone circuit causing a click. A click is heard for every transmitted spark – a long crackle representing a Morse dash and a short one a Morse dot.'

Up to about this time sources of power for amateur wireless apparatus had been obtained from batteries. However, a few experimenters were beginning to have ideas which closely followed those of 'RKR' (Sutton, Surrey). Writing in a June 1908 edition of the *Model Engineer* 'RKR' said that he had a 220V 50 cycle supply to the house. He wanted to know if he could transform the voltage up by means of a transformer in order to obtain the required spark and if so could particulars be supplied.

The editor saw no reason why this should not be done but warned that the transformer would need to be carefully insulated, preferably in oil. He pointed out that the secondary discharge would be dangerous and that caution should be exercised in the construction of such a transmitter.

In the August 21 edition of the *English Mechanic and World of Science* a short article reported the fact that Signor Guglielmo Marconi had patented what was later to become known as the disc discharger. Instead of the usual spark in the oscillator circuit the current was caused to discharge across a small gap at the periphery of an insulated disc caused to revolve at a high speed. This was the introduction of what was to become known as continuous wave (CW) transmission.

Tuning was still a mystery to many amateurs with no technical background. 'MJD' (Liskeard, Cornwall) wrote in a July edition of the *Model Engineer* . 'Suppose four ships were fitted with wireless telegraphy and A & B were speaking to C & D respectively. How would the operator on C know he was receiving a message from A and not from B? Surely there would be confusion from interference?' He went on to say that 'a friend of mine said he had heard that the instruments were tuned for this but I do not see how this can be done'. (Apparently his knowledgeable friend was also in the dark).

The editor gave quite a lucid answer. 'Your friend was quite correct by saying the interference is prevented by tuning. The difficulty is to tune so sharply as to prevent the receiver from responding to powerful waves rather near when it is desired to receive other waves from a distance'. He went on to explain that the transmitter and receiver aerials and circuits were adjusted to provide a definitive natural period of oscillation; he gave as an example the characteristic of a pair of tuning forks.

A further question on this subject later appeared from 'DG' (Kings Heath) who said he had been experimenting with wireless telegraphy for several years and had been able to cover up to 30 miles using a simple aerial coupled to a 6 inch spark coil. He wanted to know particulars of transformers capable of working with two differently tuned circuits and also an arrangement for reducing atmospheric discharges.

The editor felt this would not be very practical on the transmitting side but offered some suggestions on receiving circuits by the use of 'oscillation transformers, constructed on cardboard or ebonite tubes an inch or two in diameter and 4 to 5 ins long. A few trials will probably produce a satisfactory transformer'.

The circuits of **Fig. 3** and **Fig. 4** show an adjusted self induction coil – by shifting the point of contact 'the receiving apparatus may be made to respond to various tunes'. **Fig. 5** shows two coils of different self-induction with a change over switch. **Fig. 6** gives two different coils switched as required to two different detectors.

The editor's answer on atmospherics was a little evasive but reassuring: 'Where an oscillation transformer is employed, atmospheric disturbances usually pass quietly through the primary coil to earth but we know of no other way of getting rid of them'.

Induction Coil

In the early 1908 editions of the *Model Engineer* V. W. Delves-Broughton continued his enlightening series of constructional articles with a design for a induction coil. In his usual painstaking style he described how the former was made by 'winding sheets of blotting paper (having previously been thoroughly boiled in a mixture of equal parts of clear resin and paraffin wax) round a mandrel as tightly as possible'. During the process the paper was 'ironed

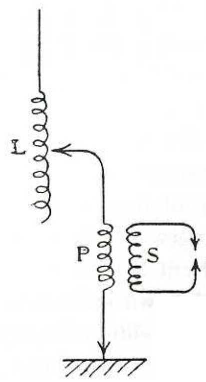


Fig. 3

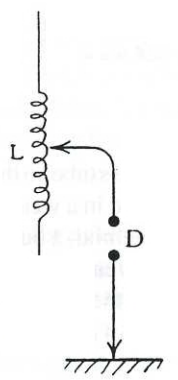


Fig. 4

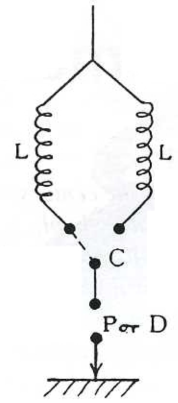


Fig. 5

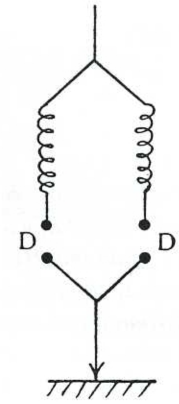


Fig. 6

down with a hot iron until a tube ¼" thick is formed'.

Preparation and treatment of the windings was even more painstaking and involved the use of 12lbs of No 29 single cotton covered wire. This was first 'thoroughly dried in an oven and kept in an air-tight box with a few pieces of chloride of calcium in zinc trays'. This was to keep the air in the box thoroughly dry.

The core was made up of a 'bundle of iron wire, 22 gauge, 14" long and 1½" in diameter, sewed over at intervals with fine sewing cotton and from end to end with sarsenet ribbon stitched down carefully'. The finished bundle was 'thoroughly soaked in shellac and baked, the process being repeated until the wires are thoroughly agglomerated together'.

It is interesting to note that in spite of certain components being available, the writer still felt it economical to construct the item himself. Or, considering the measures he felt were necessary, was he just a glutton for punishment? He calculates the cost of his specially designed induction coil as £4 10s. 0d. but points out the cost of the wire alone for a 10in coil would be £7 0s. 0d. and would probably not give such good results for a wireless telegraphy system. Again, the labour charges are reported as being 'considerable'. Apparently then as now technical skills were at a premium and he states it would require a specially trained man to tackle a 10in coil.

With Collar and Tie

One can picture our Edwardian amateur contemplating his project during a day at the office. His wife would be forewarned of the evening's work and of course ensure the nine children had an early meal. They would then be lined up for his homecoming to give their father a quick kiss before retiring to bed. They would be told that the reason for the change to the household routine was that daddy intended conducting experiments with WIRELESS.

After a quick meal our experimenter would retire to his workshop which would be immaculate and reek of paraffin wax. He would prepare himself by merely taking off his coat and working in his shirt sleeves – the starched collar and tie would remain. As the evening's operation proceeded he would possibly condescend to undo a few buttons on his waistcoat.

As a special privilege the eldest son would be allowed to remain up for a short while to view his father's work – from a distance – but comment or questions would be frowned upon. However, he would be content to stand and watch attentively as father started the early preparatory work. One day he too would conduct experiments in this marvellous new invention called WIRELESS. But for now he was only too pleased to watch and learn and later run to his mother carrying the rather mysterious message: 'Father says is the iron ready – and can he borrow your sewing box?'

RB

Alan Douglas Remembers... 1914 – 1919

Alan Douglas was born just before the turn of the century, and first took an interest in wireless at boarding school, when he was 12 years old. He served with the Royal Engineers signals section during the First World War, returning to civilian life to experiment with radio and to start writing books about it – his Construction of Amateur Valve Stations, *published by Wireless Press in 1921, sold over 120 000 copies. Declining a job offer from P. P. Eckersley, he turned instead to design, bringing out the first entirely self-contained portable set in time for the 1924 Wembley Exhibition.*

With a father who was a Doctor of Science and a Fellow of the Royal Society, and a mother who was an organ pupil of Sir Frederick Bridge at Westminster Abbey, it was perhaps inevitable that Alan Douglas would try to marry science and art, and he did so to great effect.

His interest in music, and in particular in organs, led Alan Douglas to write many books and magazine articles on the subject, and he was much involved in the development of electronic organs for the home constructor. He was highly respected in professional circles as a lecturer, and in 1960 was commissioned to write the section on electronic organs for Encyclopaedia Britannica. *He is currently curator of the Nottingham Royal Concert Hall organ, and adviser to a number of church committees.*

In this first instalment of his reminiscences, he recalls some of the technology in use around the time of WWI.

I well recall how, when away at boarding school, I pored over the catalogues of the Economic Electric Company of Twickenham, and the Universal Electric Supply Company of Manchester – this at the age of 12! However, on attaining the age of 14, I was able at last to realise my ambition to build a wireless receiver. This coincided with the beginning of World War I, when strange to say receivers were permitted, though transmitters were confiscated. I was lucky to have a 70ft long aerial about 30ft above the science lab, where I used to lurk in the evenings winding innumerable coils.

Detectors

I am sure the design and action of crystal rectifiers has been more than adequately covered in the press, so no need to say anything about this. It is well known that General Dunwoody of the US Army first used this property in 1906 to detect wireless signals, though it was known about as long ago as 1874. I tried all the known crystals then available, silicon, galena, hemetite, permanite, kincite, bornite, copper pyrites, and carborundum with an applied potential. The rectifying properties of this material were discovered by General Fessenden of the US Signal Corps, and had the action been better understood, it might have pointed the way to the first transistor. Perhaps mention should be made of the 'bubble' rectifier. A very fine platinum wire, known as a Wollaston wire, was sealed into a glass tube so that only the extreme tip projected. This was immersed in a weak solution of sulphuric acid. On application of a potential, a bubble of hydrogen gas would form at the tip, thus preventing any flow of current. If a strong signal was now applied, the bubble would break down and current could pass. The rate of recovery was too slow to allow of use for Morse, but it could operate a relay to activate a bell or other device.

Experimentation

My many hours of listening resulted in remarkably few signals, but I was able to check on sensitivity by using a high-pitched buzzer. Low pitches radiate too wide an audio field. With a 1ft wire as aerial, many fascinating results were obtained from a variety of crystals; none are permanent except carborundum.

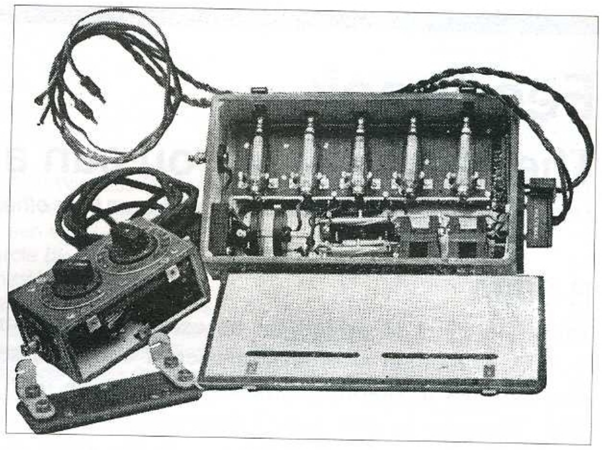
Selectivity problems did not exist since there were only a few ship transmissions (spark) on 600 metres. Other signals were long wave, mostly time signals: Eiffel Tower 2600m; Koenigswusterhausen 5000m; sometime Bordeaux 30 000m, also Leafield 8700m and Rome 10 000m. It is difficult to describe the thrills and excitement on hearing a clear Morse signal out of the blue, the long wave transmitters using arcs giving out both 'mark' and 'space' waves – the arc cannot be stopped, so the aerial circuits were detuned, giving two different notes.

My interest in tuning coils was to try to lose as little signal as possible! I soon found out that wire of 18 to 20swg was better than 24 or 28swg, and that thick insulation and wide turn spacing was best. I did not then know that high frequency currents travel on the outside of a conductor, so that mass is of no account; hence the superiority of Litz wire, which had many strands insulated from each other but connected at the ends. Because there were so few stations, I did not then realise that there were losses in the simple circuits which I had found so satisfactory. Removing the aerial loading and using a step-up transformer in the form of a loose-coupled tuner resulted in quite an improvement. Much more accurate tuning or resonance is possible in this way. Variometers are also low-loss devices with the advantage of continuous tuning over the range. I tried them all! Soldering was unknown in those days, so large brass screw-down terminals were the vogue, but they had to be kept scrupulously clean.

Good quality headphones were a necessity, of course, and the tuned reed Type A of S. G. Brown were easy winners. This ingenious character must have been the first to realise the advantages of a cone instead of a flat disc diaphragm; it radiates far more energy for a given input. Incidentally, the properties of cones *vs* diaphragms were fully explained by Lord Rayleigh in his monumental book of 1900.

Power Buzzer

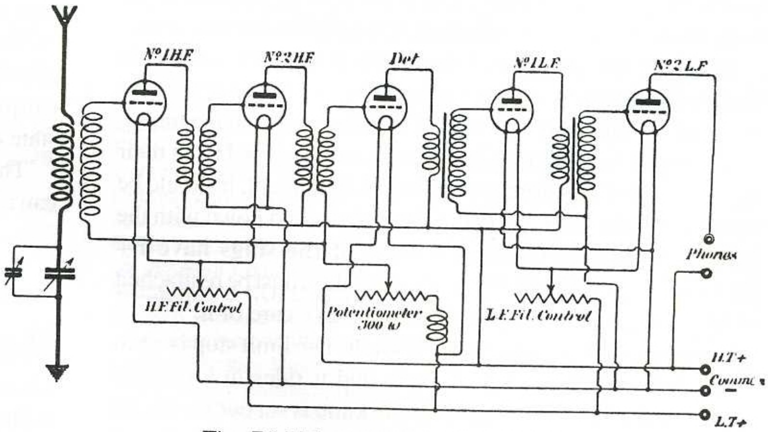
Apparatus developed during the First World War has been so well and adequately covered that I will pass over it in general, but I think that one or two omissions could be mentioned. First, the lethal power buzzer. This peculiar device was a very large and massive buzzer. Two bayonets were stuck into the ground to form a 'V', in the direction of expected enemy signals. The bayonets had field telephone wires attached and connected at the other end to the buzzer contact-breaker terminals. The back-EMF from the device was enormous, generating a raucous noise which blotted out any transmissions over a great distance. I actually had one of these things; it weighed about 30lbs and ran accumulators down in record time.



Once again we have to thank S. G. Brown for a curious device which was actually used in aircraft – the microphone amplifier. In essence a large tuned reed like the headphones, but at the tip there was a carbon granule microphone button mounted on each side of the reed. On applying a signal, the reed drove the buttons and so provided an amplified, if somewhat noisy, signal to a transformer. Beautifully made, and ingenious.

RAF Type 10 Receiver

Although it arrived too late to be put into active service use, mention should be made of another beautifully made piece of equipment, the RAF Type 10 5-valve receiver. From the American General Electric Company, a fabric case contained two HF stages with aperiodic transformer coupling, an anode bend rectifier and two transformer-coupled LF stages. A small remote tuning box also had a potentiometer within to control reaction. The aperiodic transformers were wound with resistance coils in the form of basket coils pressed close together and the LF transformers were the standard note magnifier type as used in all military equipment. The workmanship was superb and I used one for some years in most adverse conditions with excellent results. All valves were type V24, and the circuit was most smooth acting and very controllable. A great many were bought by the City Accumulator Company and sold for £10 each; what a bargain! Perhaps some readers may have used them.



The RAF Type 10 Aircraft Receiver

RB

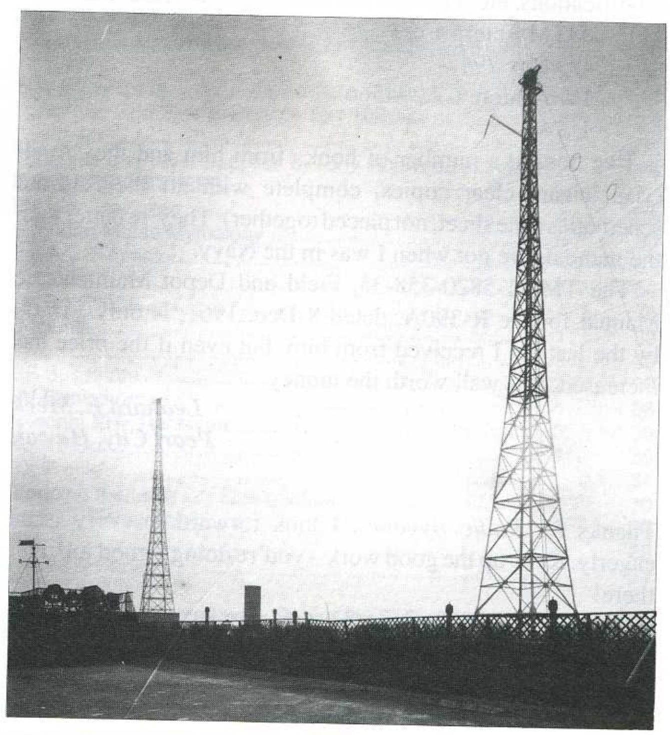
COMPETITION

Where is it? - No. 4

Yes, it's back, the intriguing, irritating, baffling 'Where is it?' Do you know, or can you guess, where these masts and aerials were once located? As this is another rather sneaky one, I feel that maybe you deserve a cryptic clue to help you on your way. I shall just tell you that you'd need to shop around to find it.

Send you entry, on a postcard oir the back of a sealed-down envelope please, addressed to Radio Bygones, 8A Corfe View Road, Corfe Mullen, Wimborne, Dorset BH21 3LZ, England. The first correct answer drawn from the editorial biscuit tin on Friday, August 10 will win for its sender the prize of a year's subscription to *Radio Bygones*! The answer, and another 'Where is it?', will appear in our next issue, due out on August 29.

Dont't forget, the closing date for receipt of your entries is Friday, 10 August 1990. The Editor's decision is final.



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Feedback...

The page where you can air your views

Letters should be original and not copied to or from other magazines

R-390A

Thanks to Peter Hopwood for an excellent article on the R-390A. I, too, am a fortunate owner of one of these fine receivers. It's a Motorola, probably made some time after 1961. The order number doesn't correspond to those listed in the 1961 tech manual. The lettering on the front panel is engraved and filled, rather than printed on. I've done some work on it, but as Peter indicated, it's a bear to handle alone.

Some of the problems I had with it may be unique to Motorola, since there doesn't seem to be any mention of them in any of the literature I've read. The ferrite slugs in the tuning coils seem to be quite fragile and are easily stripped from their adjusting screws. Before attempting an alignment, it should be verified that the slugs are in fact moving up and down with the tuning mechanism. **Caution – some of the slugs have B+ (HT+) voltage on them.** If not, then the slug must be reattached to its screw. A drop of epoxy glue will take care of it.

Another problem was the BFO knob. The limit stop is a pin in the front panel behind the knob and it rides in a circular groove in the back of the knob. If the knob is set out too far on the shaft, the pin will miss the groove, allowing the knob to turn too far and damage the ferrite slug in the BFO coil. Mine did, and broke the slug into 3 pieces. I bought another BFO unit from a surplus dealer, and found the slug in 4 pieces! Again, epoxy glue saved the day, and although the original design characteristics may have been compromised, at least it's functional and now I have a spare.

One of the best sources of information on maintenance and repair for the R-390A is *The Hollow State* newsletter. They print a wealth of information on tube substitutions, circuit modifications, etc. For tech manuals, try Tom Gouveia at

MTM Enterprises,
PO Box 794,
Pleasanton, CA, 94566
USA.

I've bought a number of books from him and they're all crisp, clean, clear copies, complete with all the fold-out schematics (one sheet, not pieced together). They're better than the manuals we got when I was in the Navy.

The TM-11-5820-358-35, Field and Depot Maintenance Manual for the R-390A, dated 8 Dec. 1961, is only $15.00 by the last list I received from him, but even if the price has increased, it is well worth the money.

Leonard E. Meek
Pearl City, Hawaii

Thanks for *Radio Bygones*, I look forward to every issue eagerly. Keep up the good work – you're doing a good job over there!

I am particularly interested in the latest issue (No. 4) and the article on the Collins R-390A receiver as I have one here. There are a few things that are not quite correct and I would like to offer my suggestions, if I may.

The VFO is not entirely linear – it needs to be calibrated to a nearest 100kHz point for this to be true. However, if the 'end points' (0000 and 1000kHz) are correctly aligned, frequency readout to 100Hz is possible. The valve rectifiers are still available at a rather high price. What I have done is to modify the power supply slightly to use EZ80 valves. This modification uses an 'unused' 12.6V winding on the power transformer. The mod works well and is preferable to converting to solid-state.

The RT-510 Ballast valve is not entirely necessary for good stability and was only included at the insistence of the Signal Corps. There are several mods to convert this valve to solid-state or eliminate it entirely.

The sets seem to run well from 240V. The manual says they can run from 115/230V, ±10%, so I'll keep my fingers crossed!

Terry Robinson VK3DWZ
Woodend, Vic., Australia

More on Baghdad Morse

I have followed the correspondence about 'Baghdad' Morse with great interest, having served at RAF Habbaniya in 1942 and 1943. For the sake of good order Habbaniya was not, as I recall, RAF Middle East Command HQ but Air Headquarters, Persia and Iraq Forces (Paiforce). It controlled a number of out-stations, all served by hand-sent W/T and there was daily traffic out of Command particularly with India, Egypt, Syria, Palestine and Persia.

I cannot recall Baghdad Morse being used with traffic at the time I was there. With the outbreak of War an overseas tour in that Command was increased from two to three years so that in 1942 there were still some regulars around who hadn't moved out of Command or returned to the UK as time expired. The majority of operators would, therefore, have been wartime servicemen trained in standard operating procedures. Most messages were in standard five letter code groups. However, during the autumn when atmospheric conditions were terrible various unofficial methods of trying to pass traffic were used including a repetition of one group at a time until acknowledgement was received.

As a side issue, at that time we had one operator who, without doubt, was the worst one in the Command. Somehow he managed to shorten dashes and lengthen dots, thus developing a fist which was almost unreadable. Needless to say he was known as 'Ace' and was instantly recognisable on the air. Finally, he was posted to one of the aircraft staging posts in the Persian Gulf where he couldn't do too much damage. His Morse was always referred to as 'Baghdad' Morse which, in the light of the explanations given in earlier correspondence to its professional use by highly competent pre-war regulars was disparaging to them to say the least! Even now I can recall his name – 'Ace' B... ; perhaps it would be rather unkind to disclose it in case he is a *Radio Bygones* reader!

Ted Jones
Bramber, West Sussex

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ARTICLES & FEATURES

EQUIPMENT

The following equipment references may be articles, photographs or brief text mentions:

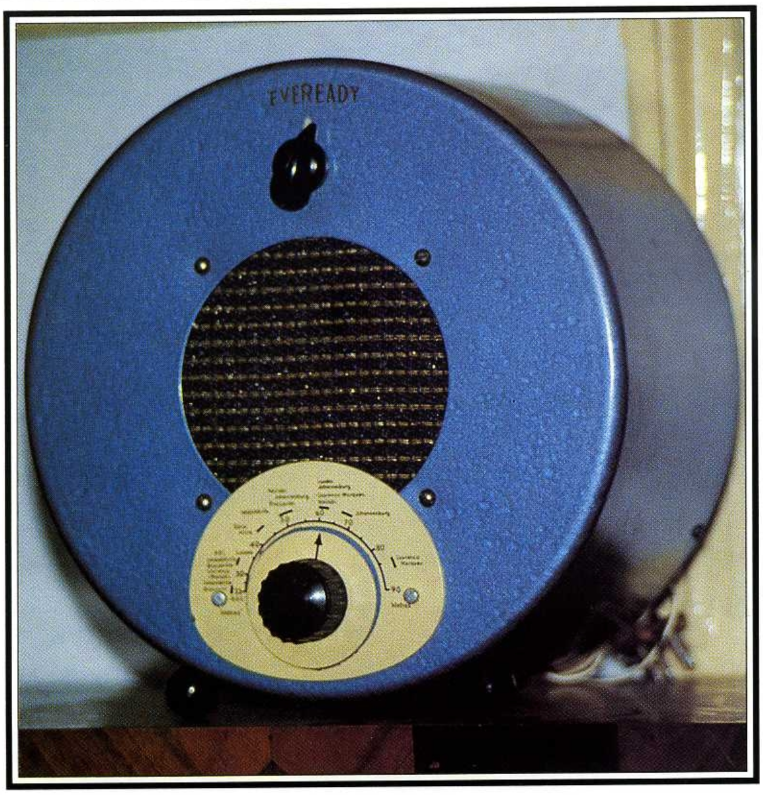
Page references to C1, C2, C3 and C4 indicate Front cover, Inside front cover, Inside back cover and Outside back cover, respectively

COPIES OF ALL THE SIX ISSUES OF *RADIO BYGONES* PUBLISHED TO DATE ARE AVAILABLE FROM THE SUBSCRIPTION OFFICE. FOR FURTHER DETAILS SEE PAGE 11 OF THIS ISSUE

A home-constructed set, a masterpiece of fretwork, built to a design published in *Hobbies* magazine (1929/30)
It uses a mains superhet chassis on a wooden baseboard, and is believed to have been assembled from a kit of components sold by the magazine

MUSEUM PIECES

The McMichael Model 802 (1939). This 8-valve plus rectifier plus magic eye receiver is a deluxe console version of the Model 382.
It features motorised tuning, using the then-popular Plessey motor drive system



The 'Saucepan Special' short-wave receiver, manufactured by Ever Ready (GB) in 1949, principally for the Central African market. The cabinet, made in a North London saucepan factory, was tropicalised, insect-proof and spear-proof – to withstand possible attacks during the reception of controversial programmes! It was sprayed blue because the various African tribes were reported to be superstitious about almost every other colour.
This particular set was presented to the museum by a returning missionary, who had confiscated it from a village where it was being worshipped as a god

MUSEUM PIECES

The museum's '1936 radio shop counter', with valves and components of the era displayed. Behind the counter are the usual accumulator-charging facilities, plus power outlets and simple instruments for receiver and component testing.