The Bulletin

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Sunday 12th May 2013
National Vintage Communications Fair

Now in our 17th year!
10.30 to 4.00 £8 admission (under-14s Free),
early entry 9.00 at £25

Up to 250 Stallholders

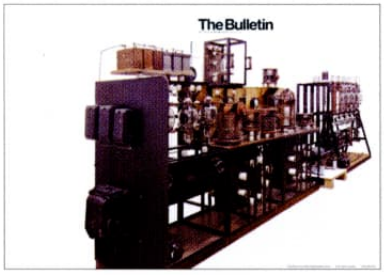
Free car parking!

Event details plus downloadable stall booking form available at: www.nvcf.org.u
Any enquiries: info@nvcf.org.uk or Post:
NVCF, 13 Warneford Road Oxford OX4 1LT, UK (enclose an SAE)

Bulletin of the British Vintage Wireless Society
Incorporating 405 Alive
Volume 37 No.4 Winter 2012

www.bvws.org.uk

Separations and Printing by Hastings Print



Front and rear cover: 2LO at the Science Museum Store.

Photographed by Carl Glover
Graphic design by Carl Glover and Christine Bone
Edited by Carl Glover. Sub-Edited by Ian Higginbottom
Proof-reading by Mike Barker and Steve Sidaway

Contents

From the festive Chair

Here we are, nearing the end of another fantastic year for the Society. Lots of different events with vast quantities of radios and other equipment turning up. Where does it all keep coming from? Only the other evening we had a call about a collection which needed dealing with quickly, so the next day we set off with an empty van and returned with another interesting assortment of radios and a huge quantity of valves! All of this will appear at Wootton Bassett together with much more we have here in the store.

We constantly receive requests from members and non-members to auction off part or all of their collections.

We offer a special service for this and anyone can use it. Where whole collections are to be auctioned we are able to collect everything and take it to our storage unit where it can be catalogued and photographed for a later auction. Where we have a great many items to dispose of and the quality of those items warrant it, we will set up special auction days at Wootton Bassett where we have many nation-wide and often international visitors.

We are expecting a huge delivery of BVWS Capacitor stock, which should arrive before Wootton Bassett and will bring us back to a position where everything is once again available. I can never understand why in these times where businesses are crying out for orders, we are quoted lead times of 22 weeks or more on what I would expect to be parts that are just sitting around as warehouse stock. These orders usually require payment 'up front'.

In 2013 we will once again produce the "BVWS Members Handbook" so look out for it with the membership cards in February. Not only have we been able to produce an interesting DVD containing an array of both professional and amateur material this year, but we have made it a double feature which includes an audio CD. Full details of this can be found later in the Bulletin. I would personally like to thank Peter Lankshear, one of our New Zealand members for his generosity in supplying the audio material for all of us to enjoy and Terry Martini for all his hard work in compiling and editing it. I think you will enjoy it.

If you are reading this then you MUST have received your membership renewal form! Please check it and add anything that is needed in way of updates, then hurry it back to Martyn Bennett as soon as possible. So if it's not to hand, go and rescue it from the bin now!

I have recently received news from the Bodleian at Oxford, which is the new home of the Marconi Collection that the "Douglas Byrne Marconi fund" has been renamed to the "Byrne Bussey Marconi fund". This is done in recognition of the enormous amount of work undertaken by Gordon Bussey to establish the fund.

Please! Please! Please! Get your renewal form sent back to Martyn Bennett as soon as possible, it makes life very difficult when they are returned after the end of January.

It is neither right nor fair for the Membership Secretary to have to handle renewals after 31st Jan 2013. The first Bulletin of 2013 is due out in February so unless you have sent in your membership you will be missing out.

I would like to take this opportunity to wish you all a very happy Christmas and a prosperous and exciting New Year.

Merry Christmas!
Mike

Gordon Farrance 1919-2012

It is with great sadness that I report the passing of Gordon Farrance. A very long time member of the BVWS.

Gordon was often seen at Harpenden and always at Wootton Bassett. I first met Gordon at the Portishead radio meetings many years ago where he could be heard quoting the original sale price of just about every radio to be seen.

Gordon entered the radio trade at an early age; he spent the war years in the RAF but returned to radio and TV after WWII when he setup his own business.

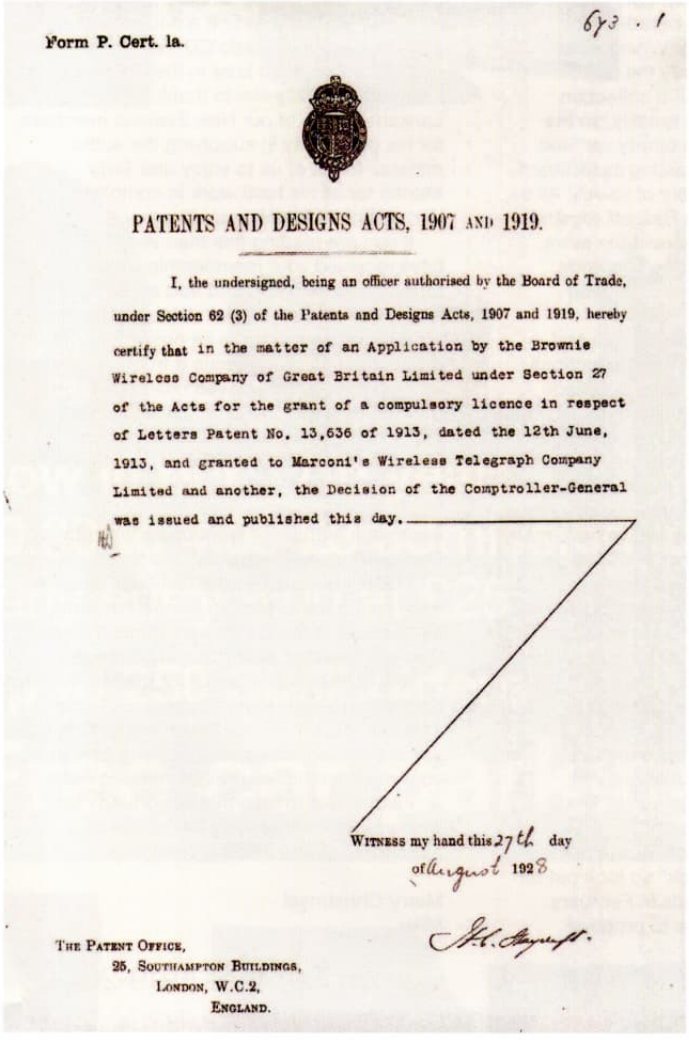
He always had time for people and would call a spade a spade. I remember at one Harpenden meeting, we were all sitting in the restaurant having breakfast, one of the gathering was explaining a rather chilling tale of a surgical procedure he had recently undergone. Gordon laughed so hard that his top set flew out of his mouth and on to his breakfast plate. He will be missed!

David and Goliath – Brownie Wireless challenges the Marconi Company

by Ian L. Sanders in collaboration with Shane Brownie

"...The conclusions we have so far reached involve, in our view, the finding that the monopoly rights under the Respondent's patents have been abused, and that the question of relief must be considered. We have found that it is in the public interest that a licence should be granted to the Applicants, and we have found that the terms on which the licence is offered are unreasonable terms, prejudicial to their trade. The conditions of an "abuse" as defined in Clause (d) are thus established."

William Smith Jarratt, Comptroller-General of Patents, Board of Trade, August 27th, 1928.



Form P. Cert. 1a.

693 . 1

PATENTS AND DESIGNS ACTS, 1907 AND 1919.

I, the undersigned, being an officer authorised by the Board of Trade, under Section 62 (3) of the Patents and Designs Acts, 1907 and 1919, hereby certify that in the matter of an Application by the Brownie Wireless Company of Great Britain Limited under Section 27 of the Acts for the grant of a compulsory licence in respect of Letters Patent No. 13,636 of 1913, dated the 12th June, 1913, and granted to Marconi's Wireless Telegraph Company Limited and another, the Decision of the Comptroller-General was issued and published this day.

WITNESS my hand this 27th day of August 1928

THE PATENT OFFICE,
25, SOUTHAMPTON BUILDINGS,
LONDON, W.C.2,
ENGLAND.

WIRELESS PATENTS.

MARCONI COMPANY APPEALING.

LONDON, Sept. 6.

The Marconi Wireless Telegraph Company is appealing against the recent decisions of the Comptroller-General of Patents on the applications for compulsory licenses or revocation of letters patent brought by the Loewe Radio Co. and the Brownie Wireless Co.

The company announces that if the Appeal Judge affirms the Comptroller's decisions it intends to grant licenses to all manufacturers on the same terms forthwith.

The Brownie Wireless case brought against The Marconi Company made the news worldwide. *The Sydney Morning Herald*, September 7, 1928.

Pre-decimal Currency

Decimal currency was introduced in Britain in 1971. Prices here are quoted in the pre-decimal currency units of pounds, shillings and pence (£ s. d.) in use at the time the Brownie Wireless Company was in existence. Under the system, one pound was divided into twenty shillings and one shilling was divided into twelve pennies. Thus there were 240 pennies to the pound, so that a post-decimalisation *new penny* is equivalent to 2.4 *old pennies*. One shilling was the equivalent of five new pence.

For amounts less than one pound, the conventional notation was to use a forward slash symbol to separate shillings and pence, as shown in the following examples:

Three shillings .. 3/-
Five shillings and three pence .. 5/3d.
Seven shillings and six pence .. 7/6d. and so on.

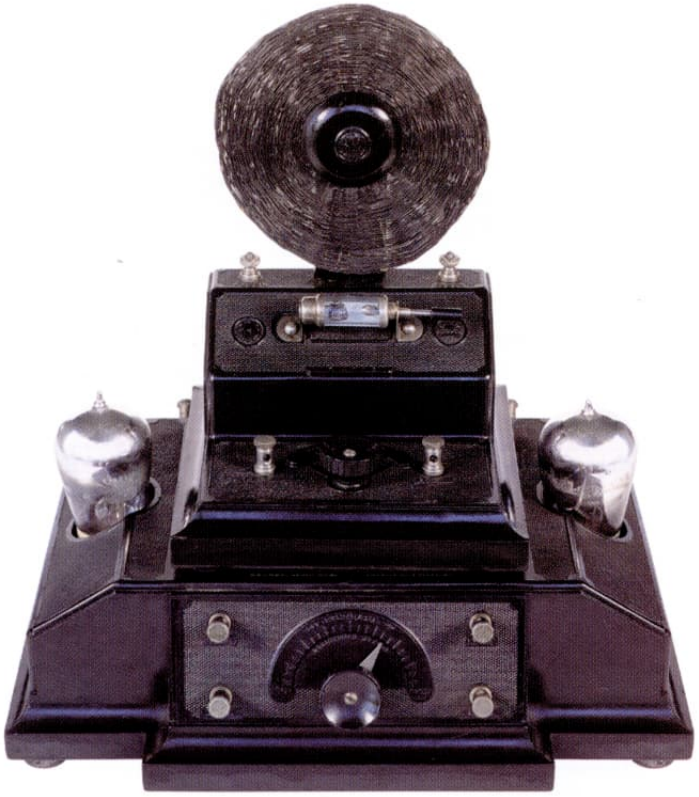
For amounts of one pound or more, the full notation of pounds, shillings and pence was generally used. For example:

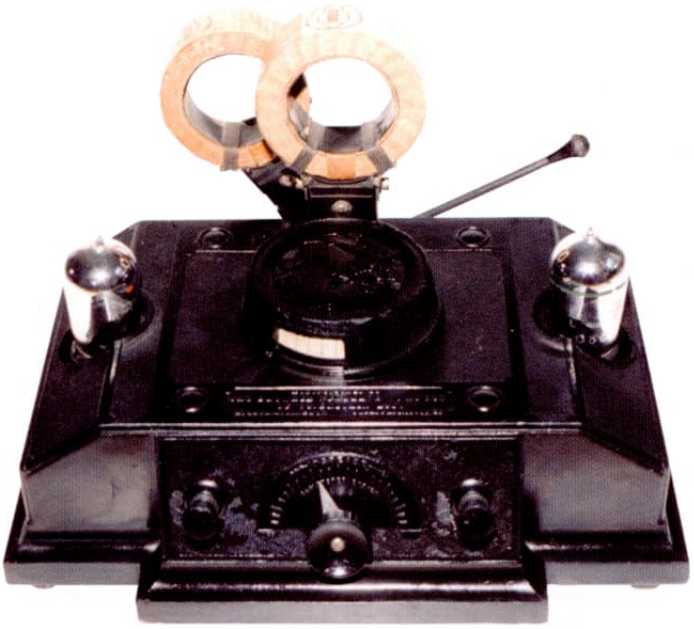
Two pounds, six shillings .. £2 6s. 0d.
Five pounds, fifteen shillings and six pence .. £5 15s. 6d.

In 1927, members of the Radio Manufacturers Association (RMA) organized opposition to the patent royalty of 12/6d. per valve-holder levied on the sale of valve receivers by Marconi's Wireless Telegraph Company (hereafter referred to as the Marconi Company). The fee was imposed on a wireless set manufacturer if they made use of any one of Marconi's thirteen patents in their products – a limitation that was practically impossible to circumvent. With the aggressive price reduction of all types of valve receiver brought on by the cutthroat competition throughout the 1920s, the Marconi payment became ever more burdensome to the industry. Royalty fees, if they were applied at all, were much less in most other European countries and the United States, putting UK manufacturers at a distinct disadvantage.[1]

The stipulations of the standard licence offered by the Marconi Company to manufacturers of wireless receivers were nothing short of draconian. The terms of the royalty were based on the number of valve-holders (rather than valves), because receivers at that time were usually sold without the valves fitted. Suitable valves had to be purchased separately. Licencees, however, were forbidden from selling valves other than those manufactured by the M.O. (Marconi-Osram) Valve Company or by firms licenced by the Marconi Company. Limitations were placed on manufacturers exporting their wireless receivers manufactured under the Marconi licence and they were further restricted from importing any components connected with the subject matter of the licence. Worst of all, the terms forced licencees to pay a per valve-holder royalty, even on non-patented equipment. The Marconi Company exercised a strangle hold on the domestic wireless receiver industry and rejected all overtures from the RMA for a reduction in royalty fee. It was no wonder that the RMA members were out to slay the giant.

The Brownie Wireless Company of London was archetypical of the many small to mid-sized member firms making up the RMA. In the early days of the Company, when the product line was comprised only of low-cost crystal receivers, of which they claimed to have sold half a million by 1928, the Marconi royalty was a moot point. True, the Company also produced a two-valve





Top: The Brownie Wireless Company's amplifier – exempt from Marconi royalties as long as the Company didn't receive a licence to build their two-valve receiver. (Shown here with the Company's inexpensive *Brownie No.2* crystal set mounted on the top).

Above: Brownie Wireless Company's inexpensive two-valve receiver, subject of the infamous challenge to the Marconi Company, was constructed in a moulded ebonite case to reduce manufacturing costs.

N° 13,636 **A.D. 1913**

Date of Application, 12th June, 1913
Complete Specification Left, 12th Jan., 1914—Accepted, 11th June, 1914

PROVISIONAL SPECIFICATION.

Improvements in Receivers for use in Wireless Telegraphy and Telephony.

We, Marconi's Wireless Telegraph Company, Limited, and Charles Samuel Franklin, Electrical Engineers, both of Marconi House, Strand, London, W.C., do hereby declare the nature of this invention to be as follows:—

It has been shown that an exhausted tube which contains a heated cathode consisting of a strip of metal covered with an oxide and two anodes, one of which is in the form of a plate with holes and which screens the cathode from the other anode, can be used in a wireless receiver for magnifying both the received oscillations and the telephone currents.

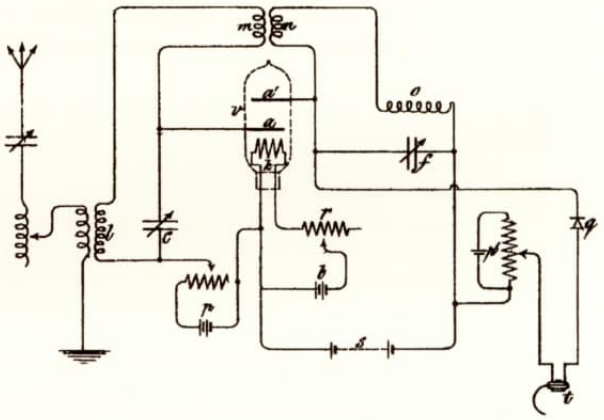
According to this invention when such a tube is used for magnifying the received oscillations we make the circuit, in which the magnified oscillations occur, react on the circuit, in which the oscillations to be magnified occur, by coupling these circuits, either electrostatically or electromagnetically, to a certain degree.

If the coupling be too strong, the tube will be unstable and will itself tend to produce oscillations but there is a certain critical strength of coupling below which the tube is unable to maintain oscillations. At a coupling a little below this critical strength the tube and circuits are stable but act while receiving oscillations as though the resistance in the circuits was very small.

The result is that the damping of the receiving system can be reduced to any required degree and the tuning of the system is made very sharp.

Dated this 12th day of June, 1913.

CARPMAEL & Co.,
Agents for Applicants,
24, Southampton Buildings, London, W.C.

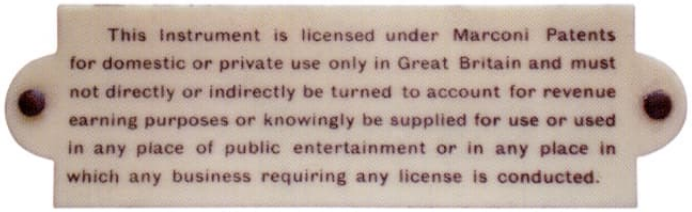


The Marconi Company patent at the heart of the Brownie Wireless case. It came to be known as the *"high-frequency reaction"* patent.

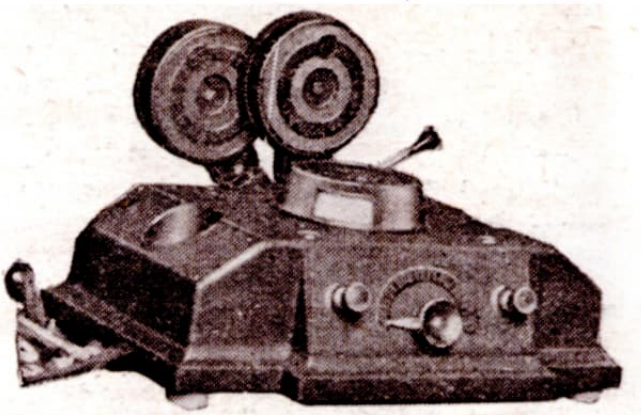
note-magnifer (amplifier) introduced in 1926, but this was not subject to any royalty since no Marconi patents were being infringed. Things changed, however, with the introduction of their inexpensive two-valve receiver in 1927. The industry-wide royalty payment would now apply to them also. The Brownie plan was to produce the receiver in very large batches of perhaps 10,000, and employ simple, inexpensive construction techniques, just as they did for their successful crystal sets. In keeping with Brownie's policy of competitive pricing, the two-valve receiver was intended to be one of the cheapest on the market at the time. It retailed for a modest £2 10s. 0d., about half the average price of competitive models typically selling for between £4 10s. 0d. and about £6 0s. 0d. The royalty, which manufacturers traditionally passed directly on to the customer, was a significant fraction of the total retail cost for all manufacturers, but especially so for low-cost suppliers like Brownie. Profit margins were already slim – Brownie Wireless received roughly one half of the consumer sales price from its distributors (approximately 30% going to the retailer and 20% to the wholesaler) and estimated its profits at only about 20% of what they received.

Prior to taking legal steps, James W. Barber, Managing Director of Brownie Wireless had proposed a royalty of 5% of retail price, meaning that their two-valve receiver, which then sold for £2 10s. 0d., would be subject to a fee of 2/6d.,

The Wireless World and Radio Review, November 16, 1927.



A plate of the type Brownie Wireless would have been forced to attach to their two-vale amplifier, if the lawyers for Marconi's Wireless Telegraph Company had prevailed, even though it did not make use of any Marconi patents. Managing Director, James Barber suggested he should appear in the dock of Bow Street Magistrate's Court if he agreed to such a step, since no Marconi patents were used in the Brownie amplifier.



An inexpensive two-valve Receiver on the Brownie stand. The novel form of condenser scale is of interest.

(145) BROWNIE.

Styled "a valve set for the million" the two-valve Brownie receiver represents extraordinary value. Selling at £2 10s. complete with coils, but plus the price of valves and Marconi royalty, it is a thoroughly robust set, of good appearance and sound technical design. Its circuit is the typical two-valve arrangement, using coupled plug-in coils of durable construction having carefully arranged air spaced windings. There is a tuning condenser with attractive indicating scale. The set is in the form of a large moulding in good black material, possessing a matt surface comparable with sand-blast ebonite. No screw leads are to be seen. Connection to H.T., L.T. and grid batteries is made by a coloured multi-wire cable.

Brownie Wireless Co. of Great Britain, Ltd., Nelson Street Works, Mornington Crescent, London, N.W.1.

The Wireless World and Radio Review, September 28, 1927.

compared to the £1 5s. 0d. demanded by Marconi under the conditions then in place. If the Marconi Company insisted on a "per valve-holder" payment, in keeping with their current practice, then Brownie Wireless would agree to paying 5/- for the first valve and 2/6d. for the second one, increasing the royalty on their receiver to 7/6d. Either way, it would result in a huge reduction in the price paid by the customer. The Marconi Company refused to negotiate.

Frustrated with the industry conditions, Brownie Wireless launched a test legal challenge in July 1928 against both the Marconi Company and the British Thomson-Houston Company (BTH) on their right to exact patent royalties on the *Brownie Two-Valve Receiver*.[2,3] The Marconi patent in question[4] was jointly assigned to the Company and to Charles S. Franklin, a distinguished, life-long Marconi engineer. It covered a fundamental and widely used concept related to the basic principle of reaction whereby a radio frequency signal could be strongly amplified by a single valve using a feedback arrangement. The BTH patent[5], similarly fundamental to receiver circuits of the time, covered the so-called "leaky grid" detector in which a triode valve functioned both as a detector and amplifier, producing an audio frequency output signal suitable for headphones or to be further amplified to drive a loudspeaker. Because The Marconi Company administered the BTH patent under its own licence, it took responsibility for mounting the defence to the Brownie contest on behalf of both firms. For convenience, the two patents were referred to simply as the *"high-frequency reaction"* and *"grid-leak"* patent throughout the proceedings.

"Had Brownie Wireless been proposing to manufacture a different article (in other words, something other than a wireless receiver), then refusal to grant a licence might arguably be an abuse of monopoly rights."

Of the two valves in the Brownie receiver, the first was a detector/high-frequency amplifier and the second a low-frequency amplifier. Such sets were typical of those in vogue in the mid- to late-1920s and, for listeners living within ten miles or so of a BBC station, could operate a horn loudspeaker quite comfortably. The second valve did not violate any patents, but the first infringed both the *"grid-leak"* and the *"high-frequency reaction"* patents. It was on the grounds that rights to only one of the Marconi patents was needed in their sets that Barber had petitioned for a reduction in the fee. The Marconi Company's position was that is was neither *"convenient nor*

practical to grant licences piecemeal covering a few selected patents." Brownie Wireless was given a stark choice – either take a full licence or take no licence at all!

A few days before the Brownie case was heard, the Loewe Radio Company had filed an appeal against the Marconi Company and British Thomson-Houston. The two applications were quite similar in scope, although in the Loewe case different patents were involved – three owned by the Marconi Company and two by BTH. Loewe Radio, a subsidiary of the Greman parent company, Loewe-Audion, G.m.b.H. wished to manufacture their unique broadcast receivers using the Company's "multiple" valves. These valves contained two or three sets of active elements (that is filaments, grids and anodes) interconnected with passive components, resistors and condensers (capacitors) within the glass envelope. They were, to all intents and purposes, the earliest incarnation of an "integrated circuit". While the parent owned a large number of patents covering these multiple valves, the receivers themselves could not be manufactured in the UK without infringing some or all of the five patents controlled by The Marconi Company and BTH.

The Loewe Radio case was obviously unusual, since it introduced the complication of interpreting the Marconi per valve-holder royalty in the light of their multiple valve arrangement – effectively several valves, but one valve-holder. No general order was issued, but the Court did rule in favour of Loewe Radio finding that the respondents had indeed been guilty of an abuse of their monopoly rights. A reduction in royalty payment was granted. It is not clear whether Brownie Wireless and Loewe Radio had colluded in advance of bringing the applications before the Board of Trade, but the timing would certainly lend credence to such a conclusion. Both companies had requested to be granted a licence without *"unreasonable conditions"* and at a rate of royalty determined by the Comptroller-General of Patents, to be calculated on the basis of the actual retail price of the equipment in question. That way, so the argument went, manufacturers of low-cost receivers would be subject to a more appropriate fee.

The Brownie action against Marconi and BTH was brought under "Section 27" of the Patents Act of 1919. Section 27 addressed the grant of compulsory licenses in situations where there was an abuse of monopoly rights by a patent holder, in conflict with the public interest. Under Section 27, the Comptroller-General of Patents for the Board of Trade was authorised to grant licenses in a patentee's name on terms that he judged to be expedient and did not need the patentee's concurrence. Furthermore he could cancel all of the existing licenses, substituting the new licenses in their place. The right of the Board of Trade to interfere with the freedom to assess royalties or to change existing contracts put the all-powerful Marconi Company in a delicate position.

From a legal standpoint, though, the provisions of Section 27 were subject to interpretation and, arguably, could be construed as completely contradictory to the inherent protection afforded companies and individuals by the patent process itself. Prior to the Loewe Radio and Brownie Wireless action, the provisions of Section 27 had rarely been exercised. In fact, up to that time, only one definitive decision had ever been arrived at under Section 27, a dispute unrelated to the wireless industry. In that instance, the decision reached by the Comptroller-General was appealed and the case was settled between the parties involved. While the Board of Trade was responsible for hearing the initial applications, the ultimate jurisdiction technically lay with the Judicial Committee of the Privy Council. The Judicial Committee, however, had never been called upon to deal with any questions arising from Section 27.

As expected, Mr Whitehead, King's Counsel, lawyer for Marconi and BTH, argued vehemently against any reduction in the licence fee. Whitehead asserted that as long as his clients were manufacturing wireless receivers in adequate quantity and selling them at a reasonable price, they were perfectly entitled to refuse to grant any licence at all under their patents. Had Brownie Wireless been proposing to manufacture a different article (in other words, something other than a wireless receiver), then refusal to grant a licence might arguably be an abuse of monopoly rights.

The Board of Trade review of the case required that Brownie Wireless prove two things – first that it was in the public interest that a reduction in licence fee was granted and second that either their own business was prejudiced by the refusal of The Marconi Company to grant them a licence on reasonable terms or that the industry as a whole was adversely affected. Whitehead urged the Court to consider the fact that since Brownie Wireless' object was to enter the field of valve receivers in which they had hitherto not been engaged in at all, how could they possibly suggest that their business was being prejudiced in any way? They were perfectly free to carry on the trade in which they were currently active.

Underlying the Brownie Wireless case was the contention that The Marconi Company was getting rich at the expense of other companies and was stifling legitimate, healthy competition. When questioned about the revenue generated by the royalty, Isaac Shoenberg, General Manager of the Marconi Company, formerly in charge of Marconi's patents, refused to be drawn into any discussion of the subject when Mr. R. Moritz, King's Counsel, representing Brownie Wireless, suggested that it amounted *"to some hundreds of thousands of pounds."* Shoenberg's response to Moritz's questions was terse: [6]

Moritz: *"Do you know in France the T.S.F. Company only charge a royalty of five francs per valve-holder; that is, only ten pence?"*

Shoenberg: *"No."*

Moritz: *"And that in Germany the royalty is 10 per cent on the selling price, with a minimum of 1/6d. per valve holder?"*

Shoenberg: *"I don't know."*

Addressing the larger question of whether the industry at large was being disadvantaged by Marconi's actions, Moritz argued that there was "general discontent" in the trade about the terms both Marconi and BTH had imposed on manufacturers and that he was authorised to speak for the members of the Radio Manufacturers Association as a whole. Playing to the court's patriotism, Moritz pointed out that the United Kingdom *"lives by exports"*. The Marconi Company's prohibition of exports was a *"prima facie unwarrantable restriction restraint of trade"*. This one is likely to have resonated with the Court.

In the witness box, James Barber picturesquely summarized his views of the clause in the Marconi licence extracting royalties on non-patented equipment. If he agreed to such an arrangement, he claimed, *"he would deserve to appear in the dock at Bow Street Magistrate's Court, rather than as an applicant in the Comptroller's Court"*. He made a compelling point. The *Brownie Two-Valve Note Magnifier*, of which some 4,000 had been manufactured in the two years since it was introduced in 1926, was an amplifier for crystal sets. Not itself a receiver, it had hitherto, therefore, been exempt form royalties. As long as Brownie Wireless did not become licencees, they could continue to manufacture their amplifier without interference. But, if they accepted the licence they would in future be liable for a royalty £1 5s. 0d. on each amplifier. Further, they would be required to attach a plate to each unit bearing the statement: *"This instrument is licensed under Marconi patents for the reception of broadcasting."* Barber claimed that the imposition of a royalty on the amplifier was a *"completely unreasonable and monstrous condition"* and that to attach the plate would amount to *"making a false and fraudulent statement, calculated to deceive the purchaser into the belief that the amplifier was subject to one or more Marconi patents"*. In Barber's view this was nothing short of criminal.

Whitehead responded aggressively. On the pretext that the Brownie amplifier was most likely to be used in conjunction with the receiver, he argued that the Marconi royalty payment was clearly justified. At best, it was a very weak argument, at worst it was a complete distortion of the truth – the fact was this amplifier had been expressly designed to be coupled to the Company's crystal sets.

A declaration by Barber, dated January 2, 1928 was submitted as an exhibit at the hearing. In it, he had included a copy of the Annual Report of the RMA in which considerable space was dedicated to the problem competition from the *"home constructor"* of wireless receivers. No royalty was levied on these amateurs and there were an awful lot of them building wireless receivers in the 1920s. As a result, the trade was put at a significant disadvantage. Apparently this argument carried considerable weight with the Board of Trade and seems to have tipped the balance.

The Comptroller-General, William Smith

Jarratt, was sympathetic to the Brownie Wireless position. In his view, the fact that the Marconi Company was only offering them the same licence as it provided to companies who were given rights to its full portfolio of thirteen wireless receiver-related patents was inherently unfair. Further, he stated that for a *"very large manufacturer"* to refuse a reasonable licence to Brownie Wireless for the intellectual property they required to produce their low-cost receiver would be an arbitrary exercise of monopoly rights.

Coming down on the side of Brownie Wireless, Jarratt ruled that it was in the public interest that they be granted a reduced licence at a reasonable rate. In the Board of Trade's view, the Marconi Company was not acting in the public interest by insisting on offering only the full licence and was, by extension, guilty of an abuse of their dominant position in the industry.

There was much discussion on what the actual rate of the royalty should be. The simple approach of grading the payment according to the price of the receiver was seriously considered. In line with the Brownie proposal, the RMA had earlier recommended a royalty of 5% of the retail price, subject to a minimum of 2/- per valve-holder. The argument being that even at this lower rate, the Marconi Company would still receive substantial royalties. Cheaper valve sets would certainly mean an increase in the number of receivers sold to the public who would have previously purchased inexpensive crystal sets. In addition, the amateur constructors would be driven out of the equation. Whitehead countered with what became known as the *"box of tricks"* argument. He suggested that unscrupulous manufacturers would find a way to build the patented circuits into some cheap unit that could be manufactured separately and necessitating a small and possibly negligible royalty. This box of tricks could then be fitted into the actual receiver (also sold separately) and whose price more closely reflected the working receiver as a whole. He went as far as to imply that the box of tricks, selling for perhaps as little as one pound, and consisting only of a single valve-holder, a reaction coil and grid-leak, might be fitted into a receiver that retailed for as much as twenty pounds. It was a stretch and the Court regarded it as such. The vast majority of manufacturers, especially high-class ones, would be most unlikely to go to such lengths and Whitehead's box of tricks argument was duly discarded.

The Court was of the opinion that the 5% figure put forward by Brownie Wireless and the RMA was too low. Also, since the royalty was collected from the manufacturer, they felt it should really be based on the wholesale and not the retail pricing. They finally settled on 10% of the wholesale price, with a minimum charge of 5/- on the first valve-holder and 2/6d. on each subsequent valve-holder. Other conditions included the prohibition on export of only patented receivers, but only to those countries where the Marconi Company and British Thomson-Houston controlled the relevant patents. Non-patented equipment would not be subject to any royalties, but the restriction on the import of goods by the licencee which infringed either or both of the *"high-frequency reaction"* and *"grid-leak"* patents was upheld.

The Court acknowledged the difficulty in assessing which of the thirteen Marconi patents were being used in any particular receiver. While recognizing that the 10% figure may be on the high side for the manufacturer of simpler sets, Marconi's position had to be taken into account and they would be losing out on more complex receivers using more of their patents. On the whole, it would even itself out. Specifically, though for the Brownie Wireless Company, who admittedly was in the business of building cheaper two-valve receivers using only two of the patents, the judgment was thought to be fair.

The Board of Trade's decision was published by the Assistant Comptroller, H.C. Haycraft in a report dated August 27, 1928. A broad order was not immediately issued and it was left to the Marconi Company, BTH, and Brownie Wireless to settle on terms consistent with the ruling. If no agreement could be reached in three weeks, then the Court would issue such an order.

The decision sent shockwaves through the industry. Based on the unprecedented success of the Brownie case, the RMA rashly proposed that henceforth all manufacturers of wireless receivers (regardless of whether they were actually members of the Association or not) should pay the new, smaller royalty. Anticipating a backlash, they even offered to cover the cost of the expected lawsuits that would likely result from this inflammatory decision. The Marconi Company was not amused and appealed immediately.

In the end, the whole affair turned out to be a bittersweet victory for Brownie Wireless and the RMA. The Marconi Company never signed up to the lower royalty and in June 1929 the decision was reversed on appeal – Mr. Justice Luxmoore of the Chancery Division of the High Court of Justice ruling that the Marconi Company was indeed *"entitled to monopoly rights flowing from the patents it had acquired."*[7] Reveling in their victory, the Company's Managing Director, F.G. Kelloway (who had served as Postmaster General from 1921 to 1922) reminded the RMA that the UK wireless industry had been *"built under the protection of the Marconi licence"* and that it would be *"a bad day for this country and the position of its industry if anything were done to shake the confidence of the inventor in securing adequate reward for his invention."* Kelloway acknowledged that the price of receivers would be reduced if the royalty were lowered or abolished, but he pointedly stated that it would also be reduced if the manufacturers went without profit, workmen without wages or if retailers give away the products!

But, even the Marconi Company could not hold out indefinitely against the overwhelming opposition. That same year they finally succumbed to increasing pressure and, as a goodwill gesture to the wireless industry, offered manufacturers the option of a lower royalty premium of 5/- per valve-holder. Companies could choose to carry on under the old scheme, but if they accepted the reduced royalty, there was a catch – they had to agree to abide by its terms for a further five years, until August 1934. Bearing in mind that several of the key Marconi-owned patents were due to expire during the five-year period, the gesture was a lot less generous that it might have at first appeared. The Marconi Company was not about to be beaten by the likes of Brownie Wireless!

1. Burns, R.W. British Television – *The Formative Years*. Published by Peter Peregrinus Limited, London, 1986.

2. The account of this patent dispute given by Keith Geddes and Gordon Bussey incorrectly refers to two Marconi Company patents.

Geddes, Keith and Bussey, Gordon. *The Setmakers – A History of the Radio and Television Industry.* Published by The British Radio and Electronic Manufacturers Association (BREMA), London, 1991.

3. The Board of Trade Report on *Brownie Wireless versus Marconi's Wireless Telegraph Company,* August 27, 1928. Museum of Science and Industry, Manchester. The National Archives, Kew, Richmond, Surrey.

4. *Improvements in Receivers for use in Wireless Telegraphy and Telephony.* British Patent 13,636/13 assigned to C.S. Franklin and Marconi's Wireless Telegraph Company, Limited. Issued: June 11, 1914.

5. *Improvements in and relating to Electron Discharge Devices.* British Patent 147,148 assigned to The British Thomson-Houston Company, Limited. Issued: October 7, 1921.

6. *The Glasgow Herald,* July 26, 1928.

7. *The Times,* June 19, 1929.

The BBC "Official" One-Valver by Rod Viveash

On the 14th of October 1929 the BBC opened its first high power Regional transmitting station at Brookmans Park Hertfordshire, just north of London. This 30kW station replaced the old 3kW 2LO transmitter on the roof of Selfridge's department store in Oxford Street. The following year the National service was added at 45kW, and the station became the first twin channel medium wave transmitting station in the world.

Front cover of *Amateur Wireless* magazine featuring the *BBC "Official" one-valver*.

To coincide with the opening, the BBC published a one valve radio design for home construction, the "official" BBC one-valver. The BBC also designed a crystal set at the time.

I was lucky enough to purchase one of these sets at a recent BVWS auction. It was of particular interest to me as I had worked at Brookmans Park for 20 years, 10 of which were spent operating the original 1929 transmitters which were kept operational as reserves until 1979, 50 years after they were built.

The set came with an original copy of Amateur Wireless magazine for Saturday November 16th 1929, which featured the official BBC one-valver giving full constructional details in its centre spread and many advertisements for components and full kits of parts to build the set. Described as "a practical receiver based upon the BBC officially recommended circuit", the article claimed that although crystal set reception was possible up to 50 miles from Brookmans Park, the one-valver gave better results especially if one only had room for an indoor aerial. It would also give better selectivity when the National service started the following year. Living about 60 miles from the station, my set gives good headphone volume with an indoor aerial of "Radio 5 Live" and "Talk Sport" from Brookmans Park, although the transmitter power is considerably more than it was in 1929.

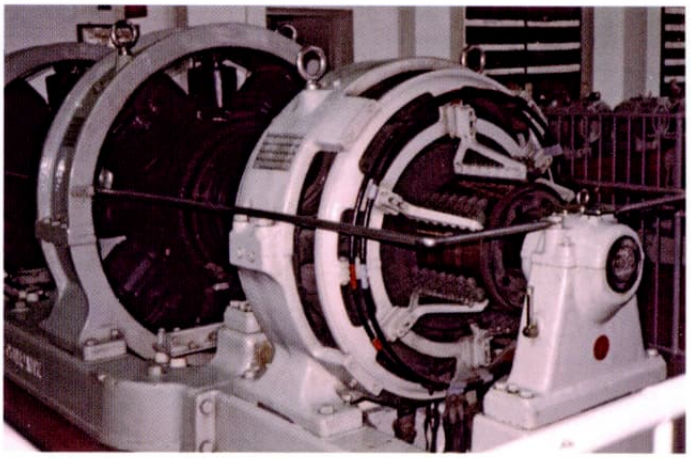
The circuit of the receiver is quite simple. A tuned aerial coil with adjustable coupling (by swinging the coil) couples to the tuned grid coil, another swinging coil couples the anode to the grid for reaction control, giving you 4 knobs to twiddle plus an on-off switch. As both Regional and National services were on medium wave no coil changing would have been necessary unless you wanted to receive Daventry 5XX on long wave.

The set has been extensively restored with all the woodwork replaced. An excellent job has been made of it and miraculously a transfer has been sourced for the top of the cabinet stating- The BBC "Official" One-Valver, in gold script.

I have many memories from my days working at Brookmans Park and the following description is of the plant as I knew it.

The two 1929 transmitters at Brookmans Park ran down either side of the large

1



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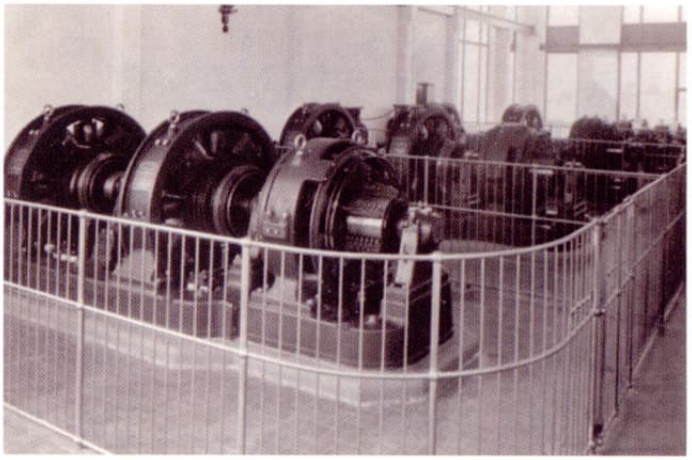

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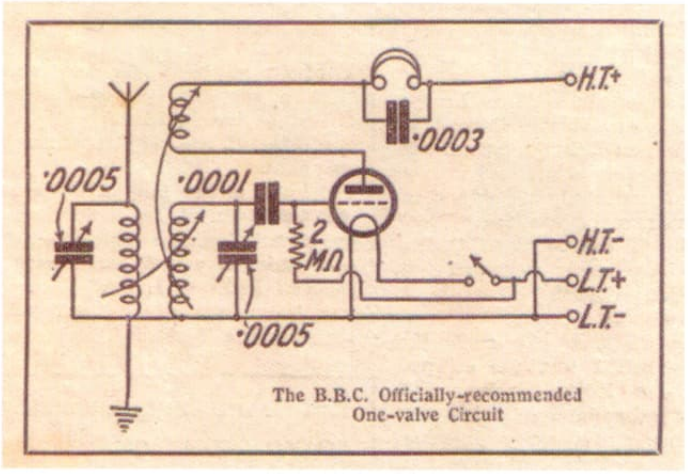


5

1: Brookmans Park "National" transmitter in its early years.

2: H.T. motor generator, the motor is nearest to the camera with the 2 generators behind.

3: Part of a 1929 transmitter in later years. The "D" unit is behind the control desk and "C2" is to the right with its eight C.A.T 6 valves (7 in use plus 1 spare). Note the ancient Ericsson internal telephone on the control desk.

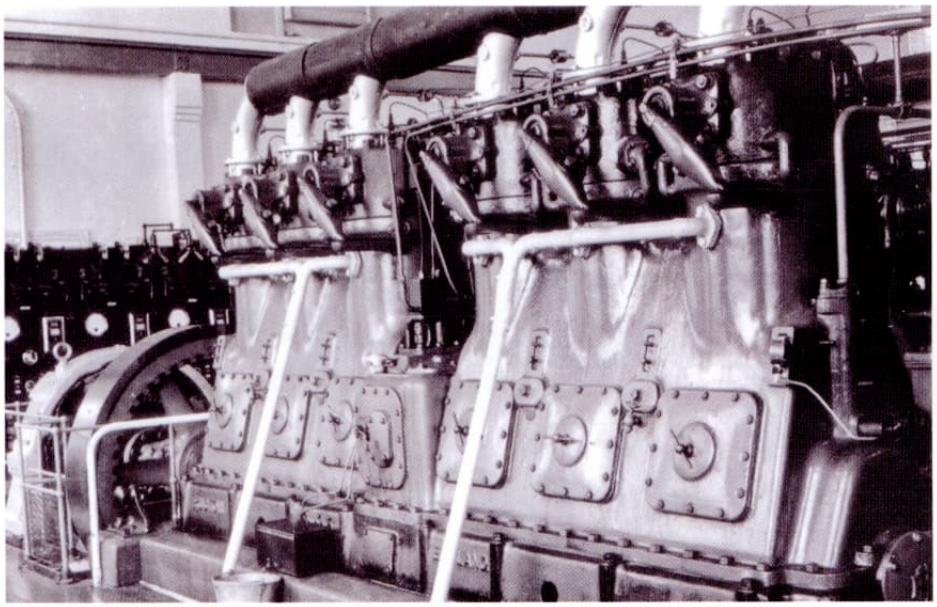
4: The motor generator or "machine room" with the HT sets in the foreground.

5: The circuit of the BBC one-valver printed in Amateur Wireless magazine.

transmitter hall, with a switchboard along the back wall, like the one- valver they too were designed by BBC engineers and built by Marconi's Wireless Telegraph Co Ltd.

Each transmitter consisted of five units in large screened boxes. First the "A" unit contained large round goldfish bowl sized valves and produced modulated R.F. at carrier frequency at relatively low power-a few hundred watts. This fed unit "B", a push-pull pair of water cooled C.A.M.3 valves operating in class B. The "B" unit output was coupled to units "C1" and "C2", each containing seven C.A.T.6 water cooled valves in parallel, each of the 14 valves taking one amp of anode current with an H.T. of 10kV. The "C1" and "C2" units were connected in push-pull to unit "D", which contained the tuned output circuit and R.F. transformer that matched the transmitter output to the aerial feeder. Each transmitter had its own aerial, a wire "T" slung between two 200ft masts. The four masts still exist to this day. As there were no standby units installed at the site, spare valves were mounted within the units, and could be switched into use at short notice reducing the outage should a valve fail. Power for the two transmitters came from three Ruston & Hornsby diesel engines with a forth as spare, each coupled to a 230volt 200kW D.C. dynamo, situated at the far end of the building. They were floated across a huge 2000 amp hour battery of accumulators that occupied its own room. The battery provided the auxiliary power for the station during closedown periods (no 24 hour broadcasting then!) and also kept the station going should an engine fail while the reserve was started.

The 230 volts from the engines fed motor generators that provided the supplies required for the two transmitters. Each motor generator consisted of a D.C. motor driving a D.C. generator providing the required voltage, (for example 22 volts at 1,200 amps for the valve filaments) one set per transmitter and, the same as everything else, one spare. The largest and most impressive sets were the H.T. motor generators producing 10,000 volts at 160kW for the water cooled valves. Each generator consisted of two machines on the same shaft connected in series each with a double armature giving four armatures in series to distribute the voltage stresses. The total rotating mass of the armatures was 5 tons! The motors of the motor generators were started by progressively shorting out



Left: Power for the transmitters, Ruston Hornsby 300hp diesel engine type 6VE of 1929.
One of four, three in use one spare, the 230 volt dynamo can just be seen beyond the flywheel.

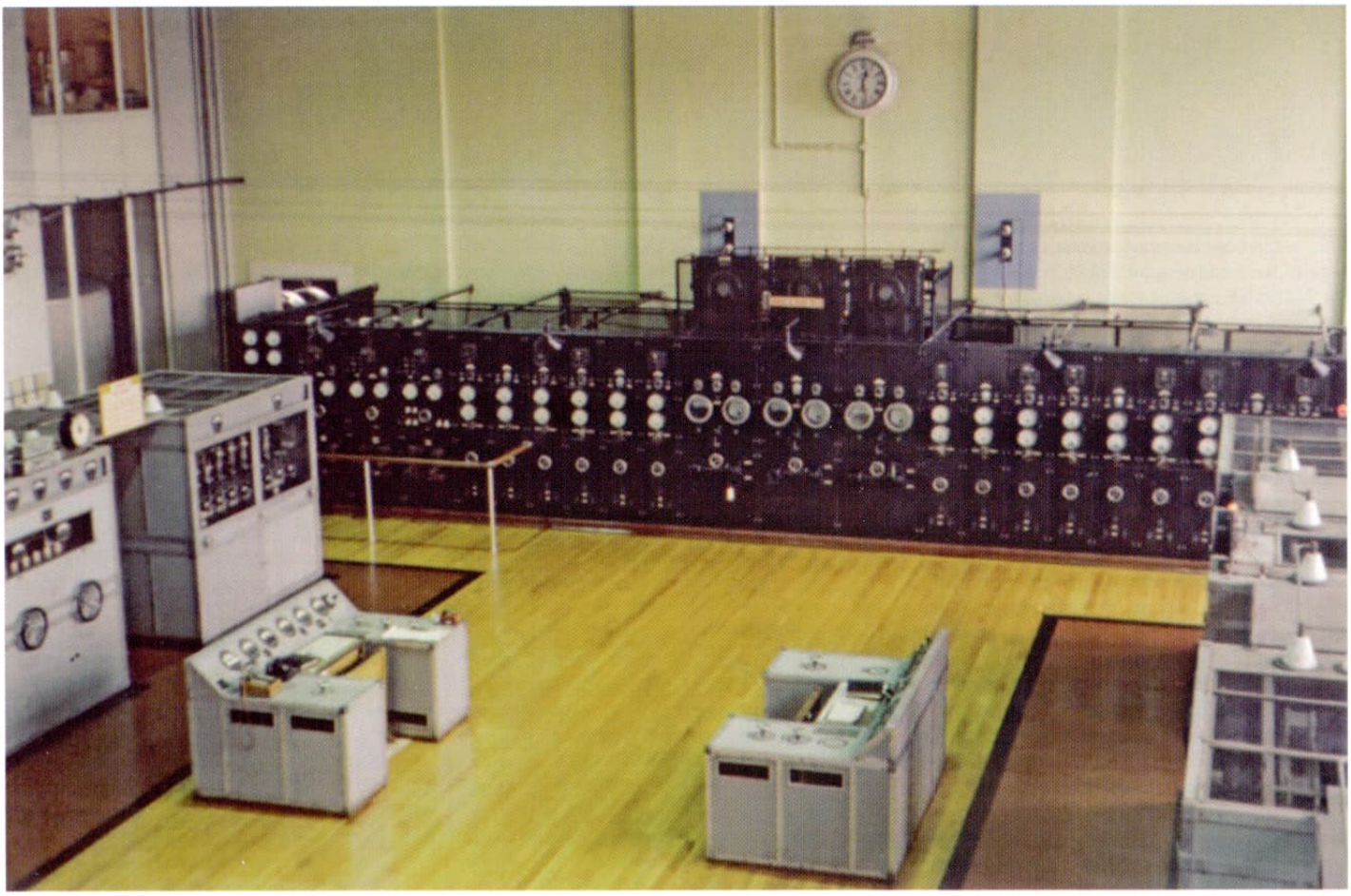
Below: transfer found on cabinet of *BBC "Ofificial" One-valver* set.

resistance mats in series with the motors until the full voltage was reached, all done with knife switches on open 230 volt switchboards. Health and safety wasn't such an issue in those days although the spoked flywheels of the engines and various other items were sheeted in steel for the last few years.

Powering the transmitters themselves consisted of closing various switches and running up hand regulators on the generator fields, gradually increasing supplies until the required voltages were reached.
When I was there Brookmans Park radiated Radio1 and Radio 2. The old transmitters were reserves for the main Marconi and Standard Telephones and Cables units of 50 and 140kW respectively. We ran the old 1929 units to their maximum power of 50kW using the diesel generators if the mains had failed, or a mains to 230volt transformer-rectifier set (converter plant) in the event of a main transmitter fault. During the period of the 3 day week in 1972, the mains electricity to the building was being cut regularly, load shedding. Sometimes we were told in advance and sometimes we were not. This meant a sprint to the engine room to get the engines started followed by the running up procedure taking about 5 minutes in total to get the old transmitters on.

Eventually the day came when new transmitters were to be fitted in the old motor generator room, and all the 1929 equipment was scrapped. I was on shift the night before the fateful day. I powered one of the old transmitters for the last time and sent "good bye" in Morse code using 400Hz test tone and the programme key.

One of the "A" units, I think from the old Regional transmitter went to Marconi's for display in their main entrance and is now at the Science Museum London. The museum hopes to display it in their new Communications Gallery, along with 2LO transmitter, opening in the autumn of 2014.



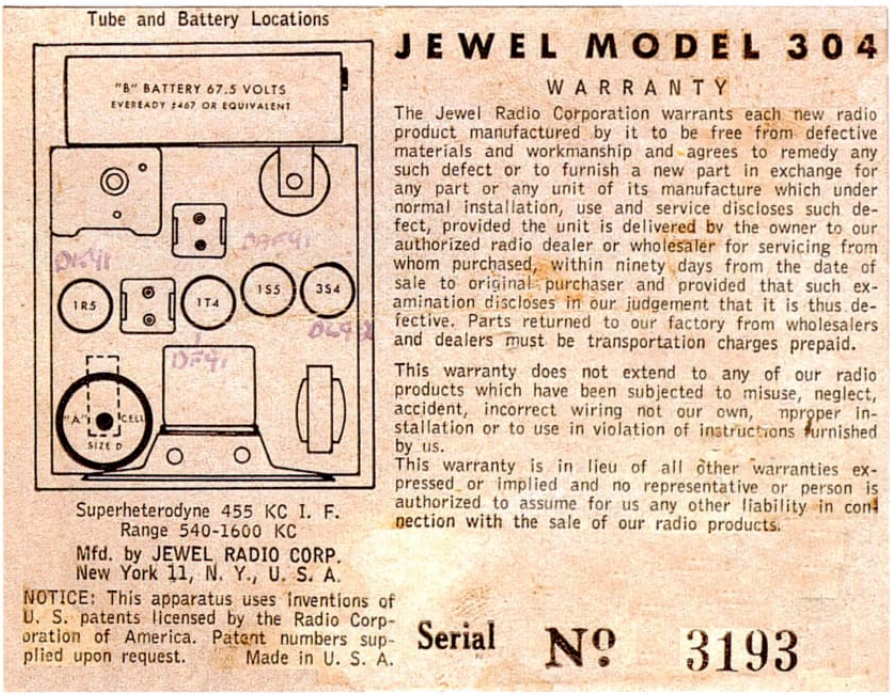
The transmitter hall switchboard showing the output units and control desks of the two transmitters. Note the railing round the exposed end of the switchboard

Restoring a Jewel Radio Corp (New York) Model 304 "Pixie" Radio (and constructing a suitable mains power unit)

by Tony Fell

This set was of interest because it provided me with a number of challenges: I had limited familiarity with battery valve receivers: I had never seen this US brand before, and; I would need to construct an outboard mains power unit for the owner.

This set is considerably smaller than most British sets of the same era circa 1950. It is designed for AM (medium wave) and originally used a 67.5 volt layer battery for HT and a D cell for the filaments.The owner told me that when he last used it over 30 years back it had functioned, and held sentimental value. I decided to pursue as it was virtually intact. The external appearance of the rexine faux snakeskin case was good, with the marble pattern interior just needing a light clean. However inspection of the chassis showed much rust on the steel chassis from a leaking D cell. I did not wish to dismantle in entirety so I covered key components with vinyl tape, and brushed on a standard rust remover gel, especially in the battery area. A second application returned a clean chassis but physically thinner here so I soldered a brass washer for the battery negative. The bracket for the positive contact was similarly derusted. I painted the badly pitted areas with a silver grey hammer paint. It was my intention that restoration permitted battery operation and that the external power unit would make contact via a dummy battery and the usual press studs


Tube and Battery Locations

"B" BATTERY 67.5 VOLTS
EVEREADY 3467 OR EQUIVALENT

1R5 1T4 1S5 3S4

"A" CELL SIZE D

Superheterodyne 455 KC I. F.
Range 540-1600 KC
Mfd. by JEWEL RADIO CORP.
New York 11, N. Y., U. S. A.
NOTICE: This apparatus uses inventions of U. S. patents licensed by the Radio Corporation of America. Patent numbers supplied upon request. Made in U. S. A.

JEWEL MODEL 304

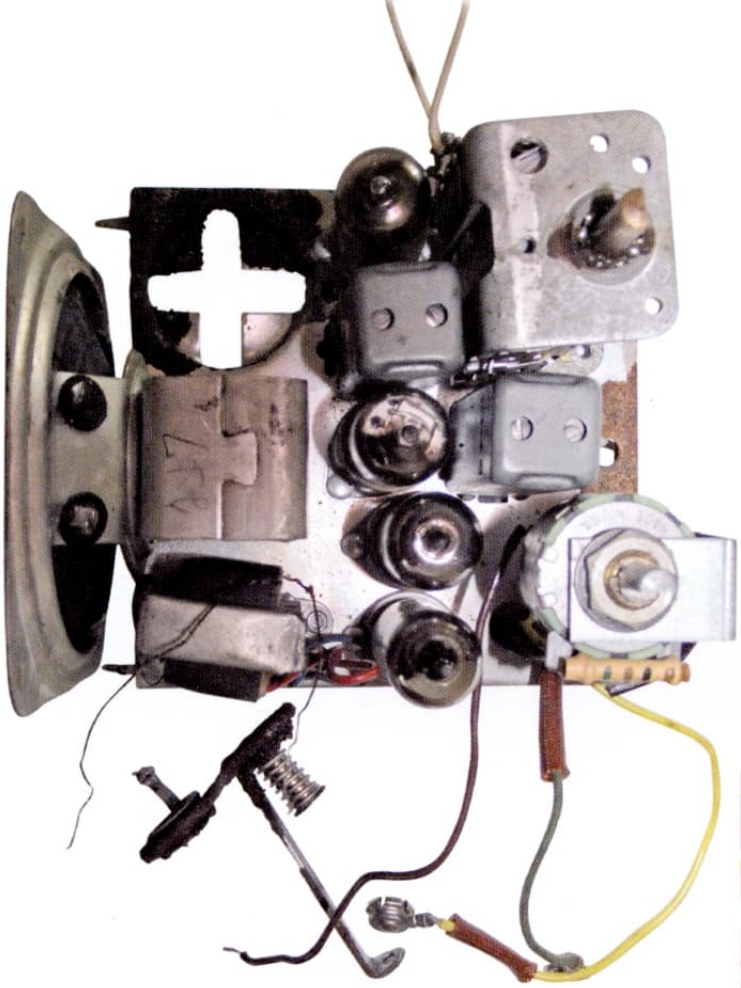
WARRANTY

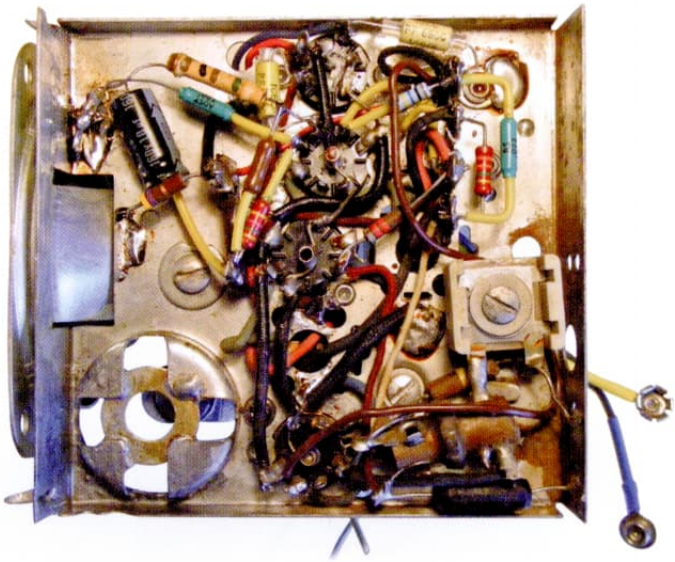
The Jewel Radio Corporation warrants each new radio product manufactured by it to be free from defective materials and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part or any unit of its manufacture which under normal installation, use and service discloses such defect, provided the unit is delivered by the owner to our authorized radio dealer or wholesaler for servicing from whom purchased, within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgement that it is thus defective. Parts returned to our factory from wholesalers and dealers must be transportation charges prepaid.

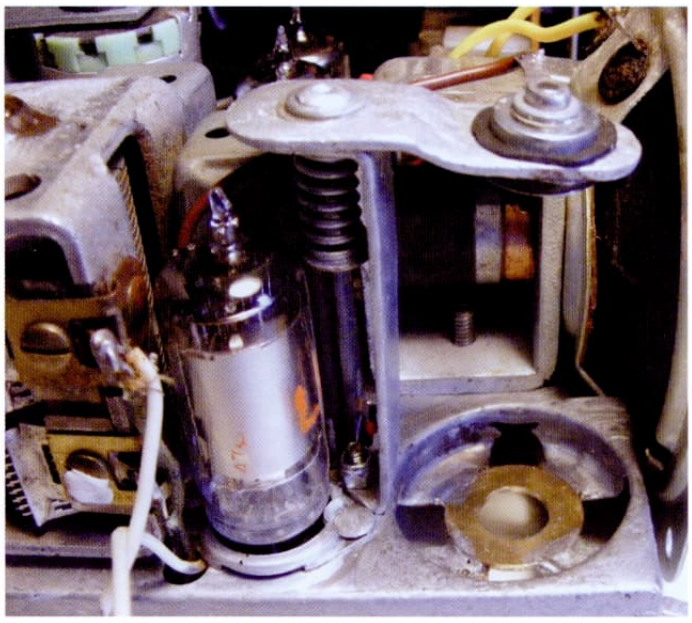
This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, nproper installation or to use in violation of instructions furnished by us.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

Serial Nº 3193







Above: The rusty chassis
Top right: Underside of the restored chassis
Right: "D" clip and contacts

for the HT. Before refitting the tubes (all original) I checked the filaments- all intact.

Testing and alignment

I connected the set to my variable bench supplies for 67.5 and 1.4 volts. Operation was not expected after 30 years (it didn't) and the usual R's and C's were suspect.I found the circuit on the web and most of the capacitors were leaky (the 8uF was o/c) and all the high value resistors were either too high or open circuit. I used new ½ watt resistors (R3, R5, R6, R7, R8) and new 160 or 250 volt caps of modern values for C10, C17, C16, C12, C13) much smaller than the originals. Now there was sound of sorts, so I injected modulated 455KHz into the first stage and tuned all the IF trimmers (all were out) with my 'scope connected across the speaker for maximum, then I connected the loop aerial to which I had attached new wires and some protective heat shrink and was rewarded with coverage of 550 to 1602KHz including all the local stations at a good volume (275mW is stated) when the rf and oscillator trimmers were set (with a bit of wax) However after a while a loud ringing sound developed – this was not instability but the 1S5 was microphonic, accentuated when tapped. A UK replacement DAF91 cleared this fault. The loudspeaker cone had a few splits but all were repaired with a soft glue.

Cabinet restoration and installing the chassis.

I gave the case a gentle clean and applied a beeswax polish, The front panel was originally attached to the case with a continuation of the rexine affixed with staples, but this 'hinge' was rather worn so it was bolstered with fabric tape and glue and held in place by a lolly stick and three short wood screws. The original knobs were missing so I chose some old stock with aluminium caps, large enough to cover the scuffed rexine front, these had grub screws but the existing tuning and volume spindles were rather short so I omitted the spacer on the speaker fixing screw and made a fibreboard plate for the underside,both forcing the chassis up by about 5mm. The chassis is secured to the outer case by a long M4 screw and wing nut which helps line up the spindles with the holes. A small depression was drilled on each knob and filled with engraving wax to act as a pointer. The internal paper label was scanned and the replacement laminated and stored in the lid. The front panel is held in by a ball catch which was lubricated and the missing brass ring pull handle replaced.

1.4v and 67v external mains power supply.

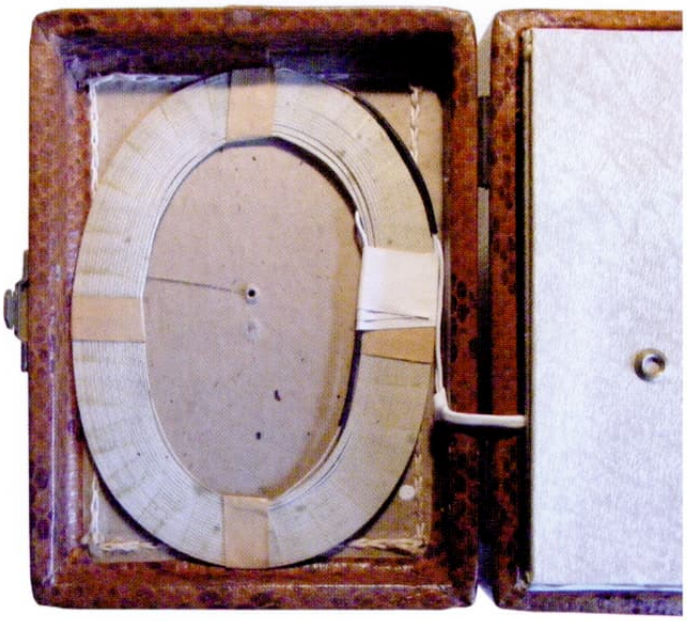
Many designs and even built units of this type are around but I decided to make my own. I used two separate surplus 6VA transformers. The pcb type (70 volts secondary) I mounted on stripboard. I used a standard bridge rectifier and for low ripple I used a 470µF 100v cap with a 22k bleed resistor. Off load this gave around 95 volts (drops to 88v under load) and inserting a series 1k resistor

gave me the desired 67.5 volts -only 20mA is needed. The filament supply used a 6 volt transformer, the standard LM317T regulator circuit made use of the excellent Velleman pcb kit K1823, with the transformer bracket on the pcb mounting holes. I replaced the supplied smoothing cap with 3300µF/10V radial mounting it in the 1µF pcb holes with that cap soldered underneath. To restrict the adjustment range replace the 4k7 preset with 220R. Finally I used a RS 24V panel LED across the 3300uF as an "ON" indicator ; this supply can deliver rather more than the required 100mA at 1.4 volts (adjust preset under load). So that the radio can be disconnected the HT and LT is connected via a 4 core cable and 5 pin 240° DIN socket and plug. All was mounted in a standard ABS box and is not critical. Use a 1 or 2A fuse in the mains plug. Note that I have used a cable gland to provide the cord grip. It passed the PAT and was labelled thus. Instead of hard wiring the DC lead a dummy "D" cell was made using a plastic medicine container. The +ve terminal is a domed washer, the -ve a penny washer, and I attached a PP9 connector to park the HT + and – clips.The 4 core cable P-clip is also anchored to the container (all affixed using pop rivets and small washers).

Conclusion

The radio is a low cost design but functions well and is from the era when the first transistor radios would be made and later dominate the portable market. I have never been too fond of the UK genre of these receivers (I dismantled a few as a youngster for parts) but this one makes a pleasing sound. Battery operation requires a 'D' cell and 6 x 9 volt batteries – there is sufficient space – the latter are now available in lithium versions.

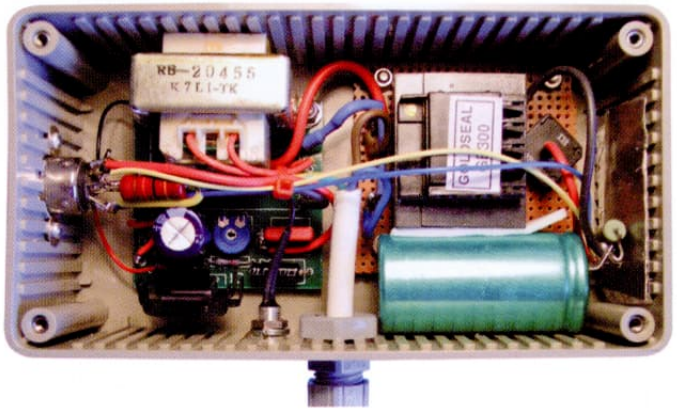
I recently acquired a very clean Vidor CN429 to have just one battery valve set in my collection. Another power unit (up to 90v being available) will be made as described.



Lid mounted loop aerial

Hinge repair

Above and below: dummy D cell with HT clips

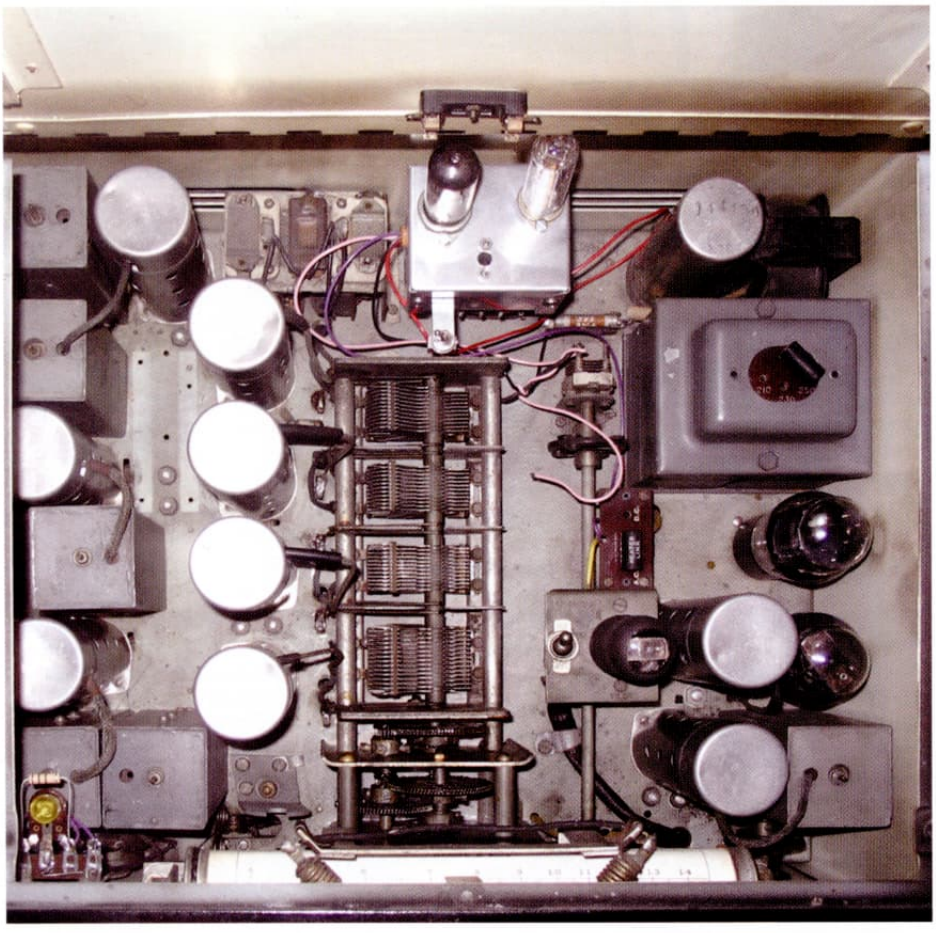


Power supply with lid off. Below: working setup

The Marconi CR 100 HF communications receiver

by Phil Moss

The Marconi CR 100 HF communications receiver, also known as the B 28 was ubiquitous in shacks for many years: looking back through old Short Wave magazines it was often featured. Nowadays whilst the RCA AR 88 and the HRO Senior are still talked about the CR 100 is almost forgotten. The three sets are electrically very similar, although very different in appearance



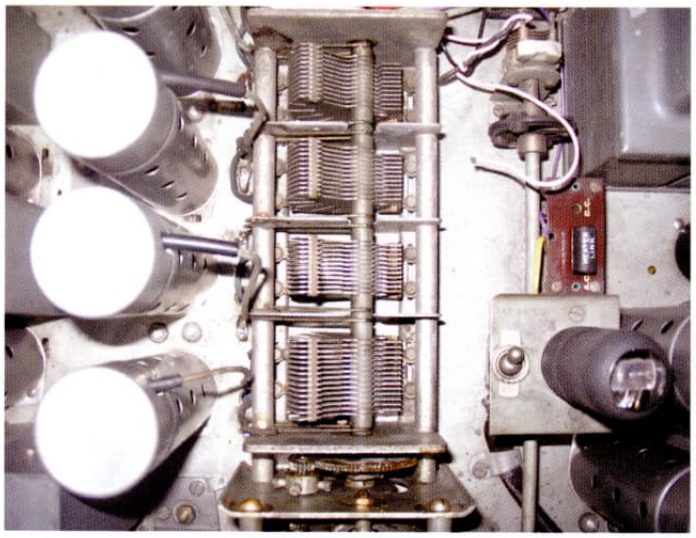
This set came with a photocopy of the manual. You will have noticed it isn't just that they don't make sets like this any more: they don't write handbooks like they did. Now that it is so cheap and easy to produce really good drawings, specially prepared for use in servicing, one gets thinner and thinner volumes for more and more complex equipment, not written in what most of us would call English, and with reducing information. This manual is comprehensive, including some guidance on using the receiver, technical description, layout diagrams, specifications and alignment procedures. It also includes the sensitivity figures, which are worth quoting. There are two sets, the typical and the minimum acceptance figure. Using the latter, they vary from 2 uV over most of the range to 5 uV at 11 Mc/s at the bottom end of band 6: 11 to 30 Mc/s, though at the top of band 5: 4 to 11 Mc/s it is back to 2 uV. The typical figures are significantly better. These are quoted as those required to obtain 20 dB signal to noise for an unmodulated carrier, or a 40% modulated tone at 400c/s. The bandwidth is 3 Kc/s, as one would use to receive AM in the presence of interfering signals: the usual case on the short-waves.

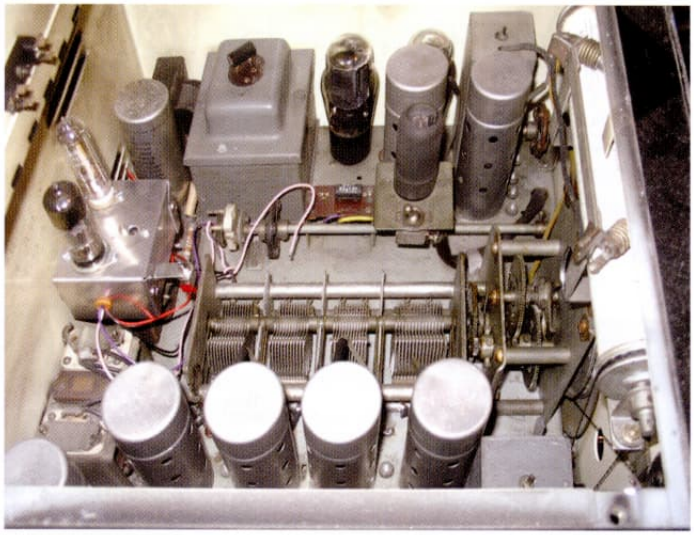
The layout is two tuned RF amplifiers, a hexode mixer, separate local oscillator, a triode connected pentode, three IF amplifiers, detector and AF pre-amplifier, and power stage. A BFO injects a signal at the detector, and in the narrowest bandwidth position, an LC audio filter of high Q is switched in between AF stages.

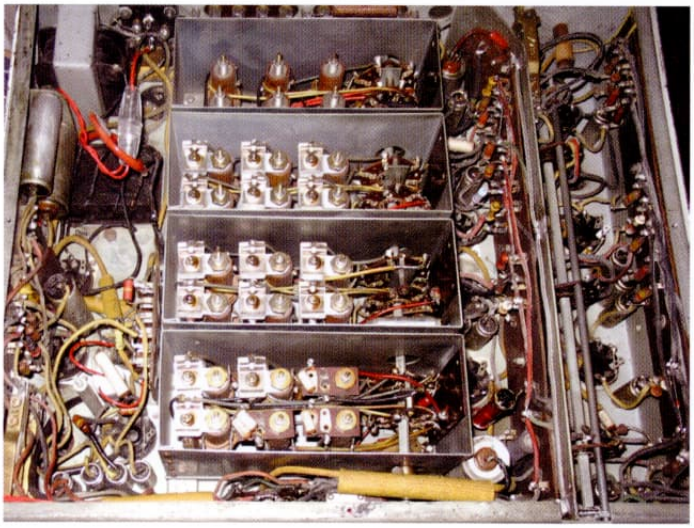
The set covers 60 Kc/s to 30.5 Mc/s almost continuously as follows: Band 1: 60-160 KHz, band 2: 160-420 KHz, band 3: 500-1400 KHz, band 4: 1.4-4 MHz, band 5: 4-11 MHz, band 6: 11-30.5 MHz.

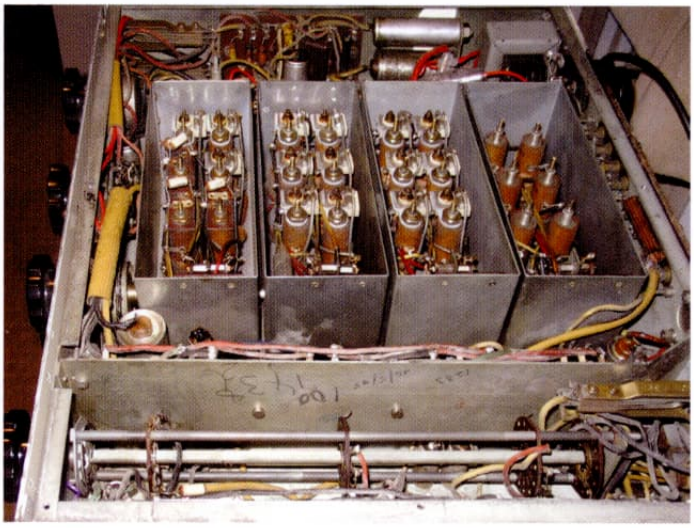
The valve line-up is, with International Octal equivalents to the Marconi types in brackets: RF amplifiers, 2x KTW63 (6K7). Mixer: X63 (6K8). Local Oscillator KTW63. IF amplifiers, 3x KTW63. Detector/AGC/ audio pre-amp: DH63 (6Q7). AF power KT63 (6F6 or 6V6). Rectifier U50 (5Z4).

There is an option (fitted to most sets including both of mine) of a noise-limiter, with either a front-panel on/off switch or an internal one. There were two designs, very similar and both using a CV1054 /VR54 double diode: the latter being dated 1959, which seems rather late. The stated reason for fitting Noise Limiter No. 1, pattern 56703, is to limit radar interference. No reference is made to other noise sources. Radar interference was clearly a major problem: probably because although one always thinks of the CR 100 as an Admiralty receiver, it was used by other services: the blue front









panel of these suggesting RAF. At airfields, they would be subject to high levels of radar pulses therefore. Two other modifications were available to suppress this: an external filter to go in the antennae system, and an R.I.S. input, which I assume stands for radar interference suppression. This consists of a connector in the top LH corner of the front-panel, leading to an audio frequency transformer, actually by it's marking intended for anode to push-pull grid drive, and a pot to feed a variable amount of signal to the suppressor grid of the first R.F. valve, thus applying a pulse to desensitise the valve synchronously with the radar's pulse.

There were a number of other slight modifications, mainly concerning the type of connectors on the rear panel. Some sets had an output available via break-jack from the cathode of the third I.F. amplifier. Where this was done the bypass capacitor was disconnected. The output was D.C. coupled. The reason for this was not stated. A number of audio output configurations exist, by impedance and whether the headphone jacks disconnect the speaker. 100 volt line was also available. Surprisingly there is a tap on the primary of the output transformer which is not used on any of the variations. It could be used to make the output stage ultra-linear, but it is not easy to modify the wiring, so I have not. Another version the /2, had a side-tone input socket and internal side-tone pot. With this set it is important to short the side-tone sockets together or the set will be muted. The purpose is to allow muting when a transmitter is keyed, with the pot allowing it to be set so that the operator could hear their signal at the required level.

There are five bandwidths, 6KHz, 3KHz, 1200 c/s, 300 c/s and 100 c/s. The first two are selected by varying the degree of coupling in the IF. The 1200 is selected by introducing a single crystal, and the 300 c/s by using this crystal with a phase control capacitor. This is not brought out on the front panel, unlike some sets and this is an obvious modification for those whose main interest is CW operation, as careful setting helps to resolve CW under poor conditions it is said. (I only listen to AM and therefore do not speak from experience). To achieve the variable IF bandwidths, requires very considerable complexity compared with a normal IF arrangement. Only the final IF transformer, IF5, has no switching involved, but even here both primary and secondary are tapped windings, with the tuning capacitor across the whole winding to maximise Q, but the anode current flowing in only part of the primary, and even on the secondary side the detector diode is tapped down the winding (the AGC being taken from the anode to reduce loading). All the IF control grids are tapped down, and all IF amplifier anodes also, but the arrangement is different for the frequency changer's anode: the untapped anode winding in IF1 is coupled via a link winding and the switching to IF2. This is a single winding, coupled either by the crystal as mentioned, or by the link-winding. The maximum selectivity is introduced therefore after the mixer, and before the first IF amplifier, as one would expect.

The great problem with receivers with low IF frequencies is image reception: because the image frequency is too close to the wanted signal to be adequately suppressed by the RF tuning, unless more than one stage is used, hence the use of three tuned stages and two amplifiers before the mixer as standard in most high quality receivers of this vintage, before the use of high first IFs was introduced to make image reception a thing of the past.

Clearly it is very expensive to have all those ganged tuned circuits, switching and coils. This set has 24 HF transformers before the IF. Another reason to have two amplifiers is because the mixer is far the most noisy stage in the set: and the more electrodes the worse it is. It is unclear why a more expensive triode hexode was used here not another pentode, which would also have reduced the inventory requirement by one valve type. Both the AR 88 and the HRO

Valve	6J6	EF 184	EF 183	6J7	ECH 35	ECH 81	6BE6	ECF 82	6J6
Use	amp	amp	amp	amp	mix	mix	mix	mix	mix
ENR/	470	300	490	16400	290000	66000	190000	9300	1880

ENR= equivalent noise resistance.

use pentodes. Apart from image rejection therefore, the use of amplifiers before the mixer improves the signal to noise ratio by increasing the wanted signal's level such that mixer noise is no longer important. There is however one more advantage to high pre-mixer selectivity, suppression of spurious responses. It must be remembered that any two signals which when mixed produce a frequency in the IF bandwidth will be reproduced at the receiver's output. These can include the mixed product of two strong unwanted signals then mixing with another signal, not necessarily the local oscillator, or signals mixing with the oscillator's harmonics. Regrettably, the RF stages can themselves act as mixers for unwanted signals, which is why they have fallen out of favour in modern designs, and why excessive pre-mixer gain should be avoided.

Digressing from that which is strictly about the CR 100, below to illustrate the relative levels of noise in valves I have extracted some equivalent noise resistances for several valves from the RSGB handbook, see table on top of page.

The dramatic difference in noise means that modern sets can either do with no RF amplifier, or only one to get the higher image rejection. The modern valves have better intermodulation performance and better AGC characteristics also. Clearly however much one may like Octal valves, as I do, if one wants performance one has to go for modern valves, especially as the frequency rises.

The image performance of the CR 100 varies greatly with frequency: from > 100 dB at 1.4 Mc/s and below, falling to a mere 30 dB typically at 28 Mc/s. In linear terms that is a voltage ration of > 100,000 down to 18:1. The noise performance of the valves is such that up to 11 Mc/s the noise of the tuned circuits predominates, above that of the valve noise. No mention is made of sky noise, but one assumes that only above 20 Mc/s would the valve noise be worse than the sky.

A point of note is how the screen grid voltage is derived for all but the frequency changer. It is usual to have a potential divider so that the voltage stays relatively stable despite the substantial current swing with AGC action. In this set the screen grids are held at only 80 V, and there is a common potential divider, consisting of R39 with R40 in series with the HF gain pot, R41. The current lost in the lower leg of the divider is therefore used to stabilise the operation of the HF gain pot, by keeping the voltage up as the valve current drops. The screen supply is on even when the set is switched to off, on the function switch, which could perhaps have been labelled stand-by more helpfully. This switch disconnects the anode supply to the RF and IF stages, and also surprisingly to the local oscillator. One would have thought that for the sake of stability it would be left running.

The local oscillator is a triode connected pentode, as is often the case. Its control grid is directly connected to the control grid of the triode, and local oscillator grid of the triode hexode X 63. This is also conventional, though I fail to understand why this is more stable than using the triode in the X 63: one would have thought that the coupling would have been looser to reduce loading on the oscillator.

The set is predictably heavy at 87 Lbs though less than the AR 88. The set is made of standard car-body steel of 1/16" the hand-book advises. It has a novel tuning scale in the form of a drum, which rotates to display the required band. This gives a narrow window, surprisingly plastic not glass, in a set where there is no room for anymore. Below this scale, which does not allow accurate determination of frequency, there are two logging scales which allow very accurate resetting. It gives the equivalent of 18' of scale with 1250 divisions, visually dividable into 4. This gives setting resolution of 5 Kc/s/¼ division at the top of the range, which seems to me not good enough. Unlike the main scale these are driven by gears off the tuning capacitor, and therefore backlash is not a problem.

The set featured had broken stringing, which had been replaced by some ordinary thin string. This was stretchable, and hopeless in operation. I have used thick cotton, two lines wrapped together. This is not as quaint as it may appear: the original looks as though it was cotton, but thicker and very strong except where it had failed. The procedure was complicated and took several attempts. It is to be sincerely hoped that it does not need doing again. To even get at it requires considerable striping-down: the front panel and case have to come off.

The set featured was bought for the princely sum of £5, along with another for the same. On entering the shack, a suspicious smell was noted. Was that just warm transformer? Regrettably no, this set had a burnt out mains transformer. The other set has been butchered by someone with a little theory, and less skill, or indeed common- sense. All the bypass capacitors have been replaced by Mullard/Philips C280 "Liquorice Allsorts", just strung between nearest available points. An attempt to add a product detector has also been made. I had little difficulty deciding this is a case for complete rebuild one day with modern valves, and that the transformer could go in the other untouched set. Checking the HT resistance did not reveal any fault: so it looks like age and poor storage killed the transformer: there is some corrosion, they have not always been kept dry.

With the new transformer, the set was tried and came to life. The old rubber cables are variable in condition. I have decided not to replace them except where imminent failure seems likely, but with the mains live from socket to switch and back to transformer it was another matter. This was replaced with PVC, and a fuse added under the chassis in an in-line holder, with the transformer lead forming one of its connections. The other transformer lead goes directly to the socket for the neutral connection. C110 and C111 directly from mains to chassis were disconnected: there is nothing wrong with them but 60 year old capacitors used as Class Y components were deemed inappropriate, especially as they come before the mains switch. Too risky. The three 8 MFDS capacitors on the HT did not warm up at all. It is interesting to note that the manual says they must have a resistance of 200 kOhm per section. All three in parallel after 60 years are almost exactly that. The mains cable was non-original rubber, and perished. Replace, there being no proper cable-grip, this has to be improvised with tie-wraps.

The smoothing arrangement is interesting: there are two chokes, 8H/120 mA, three small capacitors. The result is a hum free HT without using a large choke or large capacitors. All current is drawn from the output, the AF power stage does not get fed after the first choke. There is a facility to power from batteries, the HT directly connecting from other pins in the mains plug, and the heater wire from this plug going to a plugable link inside which must be moved to connect the relevant supply. This link proved a little problematic, it has a link-wire through it and the pins were loose, due to the body cracking. I soldered it. To save power it is suggested only 160 V HT is used, and the O.P. valve be changed to an L63 triode if only headphones are used.

The second fault was manifest however severe audio distortion, and a warm smell. Checking the voltages around the output valve revealed the control grid to be positive the predictable leaky coupling capacitor. This was a can-type, and I decided to keep the can for authenticity, so drilled it out, and fitted a newer capacitor in the can, then sealed it in with silicone rubber, no it does not look like the original bitumen, but better than nothing. The cathode resistor looked as though it had been hot a long time, but the stage now worked. The decoupling capacitor had not blown. The audio was now much better, though the 6V6 GT/G fitted seemed weak. It should be a KT 63. Comparison of characteristics shows the 6V6 is the better valve all round. I fitted an EL 35 which was to hand. Also the rectifier fitted was a directly heated type U50 which is the original, and was replaced with a 5Z4G, as the indirectly heated valve protects the set from premature application of HT before the valves are hot enough to draw current without stripping of the cathode. A bit embarrassing to admit, but it was not until I came to write this that I checked the resistance across the L.S terminals 106 Ohms, clearly a line output. Rewiring to the only low resistance

secondary gave proper speaker operation, and the old 6V6 was restored.

The next problem was interesting the set was running fine, but whilst looking at the underside, there was a flickering light. Very odd. This was traced after some time to reflection of light emitting from behind a resistor decoupling the second RF amplifier's HT. The voltage across it was excessive, though the value of the resistor was OK. I had noted a glistening waxed-paper capacitor. It was leaking, and getting hot. So was the one for the other RF stage. Most of the capacitors are can types, mounted onto the chassis. They were no problem except C82 as above. Initially I just cut the lead to the offending capacitors. The set went on working with no apparent difference. Whilst leaving it and not going in for the considerable effort of dismantling the coil boxes was tempting, especially as I feared damaging the wafer switches, they were dismantled shortly afterwards. To do this one releases the switch-shaft and pulls it out through a hole in the rear of the set. Then one unscrews the compartments, and finally unsolders the wires, some of which were replaced. Not only were the two HT decoupling capacitors replaced but also the two AGC line decoupling capacitors. I did not want to have to go through this process again. In any event one capacitor measured >20M Ohm, but then crept down to 12, then up again, clearly odd, so it was worth changing. The replacement capacitors were themselves old, but much younger, and of the metal tube type. The damping resistors across the oscillator coils on the two top ranges were checked for value and found to be reasonably accurate. Many resistors were checked on their tag-strips, and none found to have drifted far, a surprising outcome. Clearly these old rod resistors are incomparably more reliable than the later ceramic-tubed carbon-composition types, which fail even with no power dissipation at less than half the age of these.

The set now worked fairly well, but on band 6: 11 to 30 Mc/s, the audio was very distorted. This was cured by using the manual HF gain control. It depended on how the antennae was connected however it only happened when using the transformer input, not the direct coupling, with one side earthed the input is floating at the back-panel to allow balanced antennas to be used. Checking through the stages it was found there was no negative bias to the first RF amplifier grid, because there was a short between primary and secondary of the RF transformer L27 & L6. This was caused because the thin primary wire ran under the tag for the secondary winding, and the pressure had caused the enamel to fail. It was easy to repair: just slightly lift the tag.

The tuning knob kept sticking, and regrettably I embarked on a strip-down of the mechanism in the belief it needed regreasing. This involved much fun with the gear-box, but the outcome was that there is a ball-bearing missing from the bearing for the main tuning shaft, so someone has been here before, though I found no evidence. After all my efforts the solution is to lift the knobs and then they run fine for a long time. The two knobs drive concentric shafts. The inner is coupled to the outer by three ball-bearings, which run through holes in the outer shaft and then run against the static body of the tuning capacitor. The inner shaft is waisted to take the balls, and these in turn hold the shaft in once the assembly is done up. There is a small spring and T-piece that press on the inner shaft, tensioning it in the outward direction. The drive, missing ball notwithstanding, runs very smoothly, with the outer large knob having a 25:1 ratio, the inner 170:1. The missing ball is from the bearing for the outer shaft.

At low frequencies, tuning is generally by turning the main knob, quickly. However at the high end of range 6 especially, the tuning is too course, and a 250:1 ratio would be an advantage. The tuning is highly non-linear it is increasingly compressed at the high frequency end of each range.

Alignment

Regrettably a point comes where one has to face all those adjustments! The trouble is that there is a call for special equipment, which appears to be an old version of what one would now do with a "sweeper" in either frequency or time domain analysis or spectrum analyser or Polyscop. I have neither. So its about adapting, and hoping. To quickly review what the manual says there are three methods, laboratory, work-shop, and emergency. The trouble is due to the crystal-gate one is advised that the proper gear is essential to set this up. As it happens my crystal is duff, and attempts to revive it by cleaning did not work it can be taken out of its screw together case.

Method one requires ganging oscillator, Marconi alignment scope TF 852, or Cossor scope with Marconi Special DC Amplifier D2A/403, and calibrated generator. Also ganging tool TE 137, which allows the 6BA locking-nut to be un/screwed, and the core to be adjusted, the absence of which required awkward manoeuvres with a spanner. The emergency method is to align an identified duff IF stage only, after doing stage gain tests to identify it. Not for use with the three bandwidths using the crystal.

Two options present themselves: to align on the centre frequency only, or to try the sweeper method using the wobbulator I built as per RB 82. That meant too many variables, and the first was decided upon. Fortunately as this set is intended for maximum selectivity not fidelity, the IFs are intended to peak, not have a flat-top response as one would have in a domestic receiver, so only one frequency is needed. The RF stages are different needing to be aligned at two frequencies per band. The IF varies between sets, being chosen to match the exact frequency of the crystal 464.91 Kc/s in this case, inconveniently marked on a label on the side of the first IF can, accessible only by taking off the case or remove transformer!

Before any alignment was attempted though, it seemed reasonable to check the set's performance, and also to mechanically align the tuning drum as it has moved during the re-stringing. The actual frequency the set tuned to at the band-edges was noted, and then the drum moved along, the RH side needing to be packed with a washer, to take up the free play. It was noted that with a frequency-counter connected, even turned off, to the TF 2002B signal generator there was an awful droning noise, unless the level was turned up high. Disconnecting causes a slight but acceptable frequency change, so the counter had to be disconnected. It is a Sabtronics 8610A kit I built years ago in a plastic case obviously does not help with noise, but it still represents very good value for money, working up to at least 600 Mc/s, amazing at the time. It was also found that at 30 Mc/s the set could not be used switched to 1200 c/s or less because it motor-boated so seems there is some subtle fault, not noted when working on-air. After investigation mainly in adding parallel decoupling capacitors, it was decided this may not be a fault at all, the manual specifically states it is better to align the 30 Mc/s end on noise not signal, because of local oscillator pulling. This does seem very odd to me I must say. It would be logical though as the LO is pulled, the signal goes off frequency, the level drops, and the AGC voltage drops too, increasing gain. The signal must be kept very low not to cause fault suggesting again below the AGC threshold, but that is not very convenient to work with.

Next it seemed reasonable to note the performance before alignment starting at 4 Mc/s, 1 uV 40% mod at 400 c/s.

The SNR was very good, and checking at 11 & 30 Mc/s again gave good signal–to–noise ratio. I did not actually set it up and do a proper measurement, listening demonstrated it was more than good enough. At 11 Mc/s top of band 5, 0.1 uV was clearly perceivable, below noise, with 1 uV being damn loud! This compares rather well with the Redifon R 551, which I used to work on when a test engineer at Redifon. It had a SNR of 10 dB at 0.1 uV, but that was into a narrow bandwidth on CW, and often only just in spec. I find the comparison with an "obsolete" old set such as the CR 100 interesting. My conclusion is that there is no justification in realignment, unless I should find a new crystal, and be able to properly restore the functions. Actually I found the results so good I suspected that my TF 2002B had a defective attenuator, and at first tried to repeat the tests using a TF 144, but although it set up OK, it actually did have a duff attenuator, give no O.P. and reading O/C across the O.P. terminals. I then checked the 2002B by using the manual gain turned far down on the CR 100, and checking each step on the attenuators actually worked, all the way from 1V to 0.1 uV. At each step one could discern a reduction of level. When rechecking the poor results originally obtained on bands 1 & 2 and at 30 Mc/s, I found them much better: I suspect that in the morning there was much less in the way of extraneous signals getting in. Obviously I used a screened cable from the genny to set, with only a couple of inches of wire to the terminals, but no-one reading this magazine will be unfamiliar with the ability of radio signals to get where they are not supposed to. I had tried adjusting the RF stages alignment, but

Table 1 Measured performance figures for CR100

Band	1		2		3		4		5		6	
Freyu. c/s	70k	155k	155k	420k	0.5M	1.4M	1.4M	4M	4M	11M	11M	28M
Level *1 µV	1.5	1.2	1.4	1.3	1.4	1.3	1.6	1.2	1.9	1.4	3.6	1.7
Minimum Acceptable µV	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.0	2	5	3
Measured dB	15	17	16	22	22	23	22	19	25	17	15	17

*1 level required by average set. Min acceptable = Max level for required SNR. Tests done at average, not higher level.

they made no difference: 60 years of virtual zero drift! The obtained results are above.

Settings: 3 Kc/s B/W 40% 400 c/s modulation. Required SNR 20 dB. 100 Ohm resistor across terminals to match 50 Ohm generator. All measurements at maker's minimum acceptance input level. 10 Ohm across speaker O.P. level measured on HP 334A distortion meter/AVM. 60 Kc/s unusable because of MSF interfering. Used 70 Kc/s instead. Moved other frequencies slightly where needed for same reason.

Clearly it fails the original requirements in several places, and possibly more perseverance with the alignment would have got some into spec, but it is going to make little difference in practice, and is very good for age.

Modifications

Others include the ubiquitous adding of a signal meter. No version of the set had one. The usual method as I have used is to measure the reduction of current in the AGC controlled valves. This can be done in the anode circuit, or in the joint cathode circuits where they go to the manual gain pot. This is conveniently situated, and the slider contact is disconnected. The wire to the cathodes extended and taken to a 10 Ohm resistor across which a pre-set resistor is connected. The lower common wire goes to meter -Ve and back to the pot. The meter +Ve goes to the pre-set slider. The meter is mounted upside-down, so that the needle swings to the RH side as expected for a strong signal, even though the number indicated reduces. I used a 10 mA meter as sensitivity is not required, and a 470 Ohm pre-set. The strongest signal causes an indication of 3, on a scale of ten. As the total current available is high, one should start the set-up procedure with the meter set to minimum sensitivity, and then adjust for FSD when the set has warmed up for a few minutes, with no signal received. The stability of the FSD point is not that good I find.

Looking at the picture into the top of the set, a small chassis with two valves can be seen at the rear centre. This is a crystal calibrator giving 100 Kc/s points. The heater is always on, and the HT is operated by the switch in front of the box. The coupling is by wrapping the OP wire around the wire to the aerial trimmer. And yes, the wiring is intended to be neatened up at some time! Adding 5 self-adhesive rubber feet stops it scratching work-tops with its bare metal feet.

Conclusion

This old set still gives hours of entertainment finding distant stations, and vast numbers of UK local AM stations, if you are interested in them - I am not. For all the CR 100 seems forgotten, it still represents a capable receiver available cheaply, and it's British. For its age it did not have a lot wrong with it. Will it go in the lounge or dinning room? I doubt it, but then the HRO and AR 88 probably won't be welcome there either.

Reference (1): valve noise figures extracted from table 4.1 on P4.8 of the fourth edition of the RSGB Radio Communication Handbook, 1968. The section, and others gives detailed explanation of noise sources, measurement and calculation.

Notes on the BVWS DVD and CD package

by Terry Martini

I am pleased to be associated with the production of this year's DVD and would like to mention a little more about the content that has been included on the disc.

Westinghouse produced a number of film titles over the years and there is at least one commercially produced DVD still available, which covers a range of promotional films that feature everything from air conditioning to fridges, so it was nice to be able to include a lesser known technical title on 'Travelling Waves', an interesting subject that is helped along in this film with the use of a cleverly designed mechanical wave to assist the demonstrations. Also included is a British Electrical Development Association film covering the subject of high frequency heating using as a test subject, a loaf of bread. We don't recommend though that you try this one at home! The B.E.D.A produced a small number of technical films so perhaps more of these will turn up in due course.

During the 1950s, Bell and Howell, best known for their enduring range of cine projectors, produced this short film designed to help you lace up your projector. I am not quite sure how you would be able to watch this first though if you did not know how to lace up the projector, to then be able to watch the instructions that follow in the film!

For those of you who have an interest in vintage television we have included two very rare 8mm films entitled "Tee Vee" and New Vistas. Believed to be both amateur productions, the first film centres around a day in the life of a TV repairman and is very amusing to watch. The second film covers the art of regunning a CRT and makes the process look very easy indeed. Both of these films contain the audio on magnetic stripe which have suffered the ravages of time. I have attempted where possible to improve things so I hope that the poor soundtracks on both these titles will not spoil your enjoyment too much of what are otherwise two rare and entertaining short films.

Our final title, 'Cold Cookery' is from my own film archive and features the voice of a young Bob Monkhouse as the fridge salesman. The film is a short colour animation produced for the Electricity Council and is believed to date from the early 1960s. It is missing its opening titles. I can only imagine that this would have been shown in local cinemas to promote the fridge at a time when white goods were still seen as a luxury item in the average home.

In producing this year's DVD, I would like to thank John Wakely, Phil Marrison, Keith Wilton, Hugh Sanders and Andrew Finch for sharing with us such an array of interesting material. The production of these discs would not be possible without these important contributions.

The BVWS would love to hear from you if you are able to help with interesting material and we can accept the footage from film and all of the usual video formats. The Committee can be reached via the contact details in your Bulletin.

The CD contains Recordings of speeches given by Major EH Armstrong, Paul Godley and Captain HJ Round at the 50th anniversary of the Radio Club of America in 1952 with the presentation of the Armstrong Medal to Captain Round Thanks for making this CD possible go to Peter Lankshear.

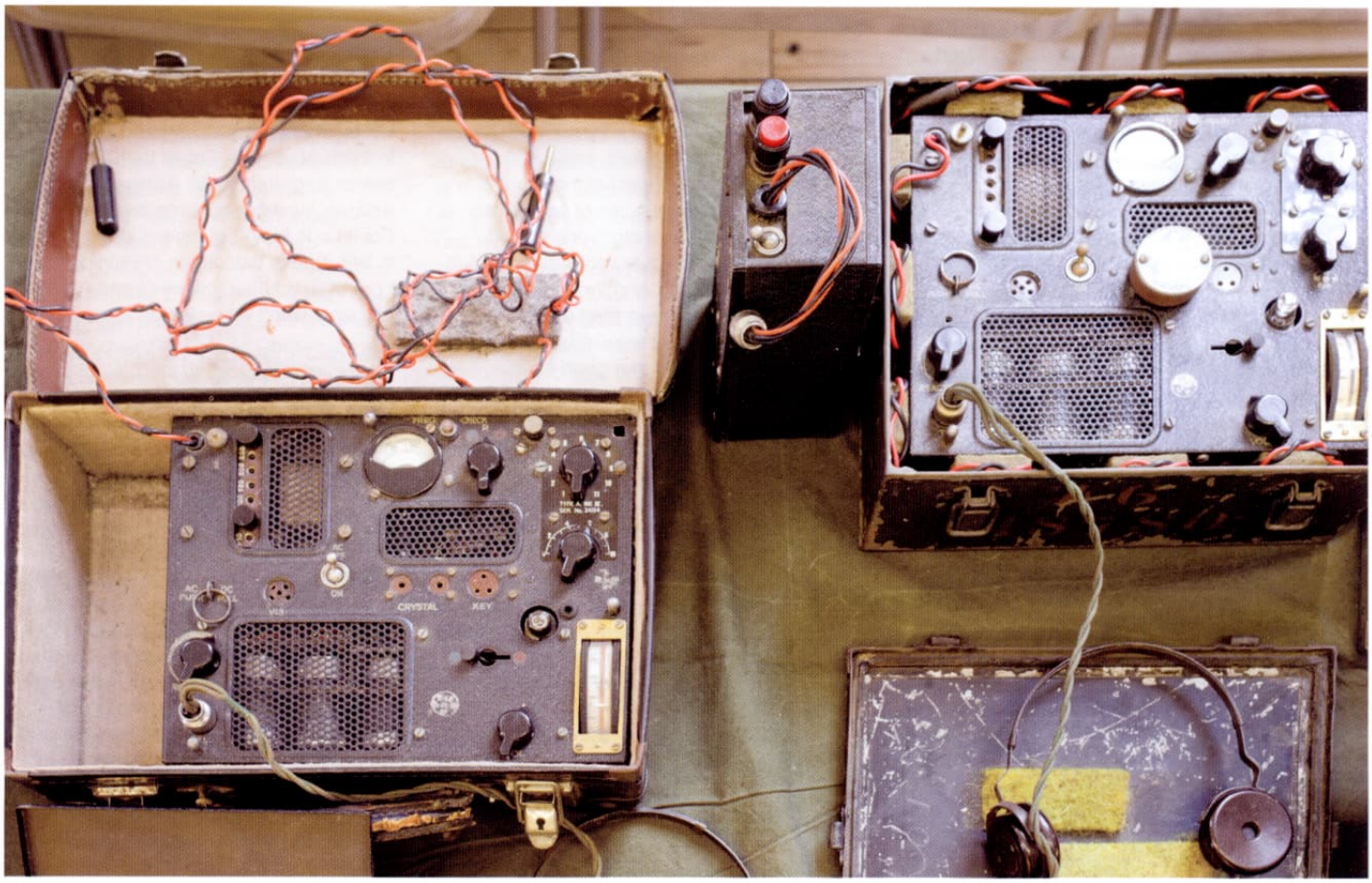
We hope that you will enjoy the content of this DVD and CD package.

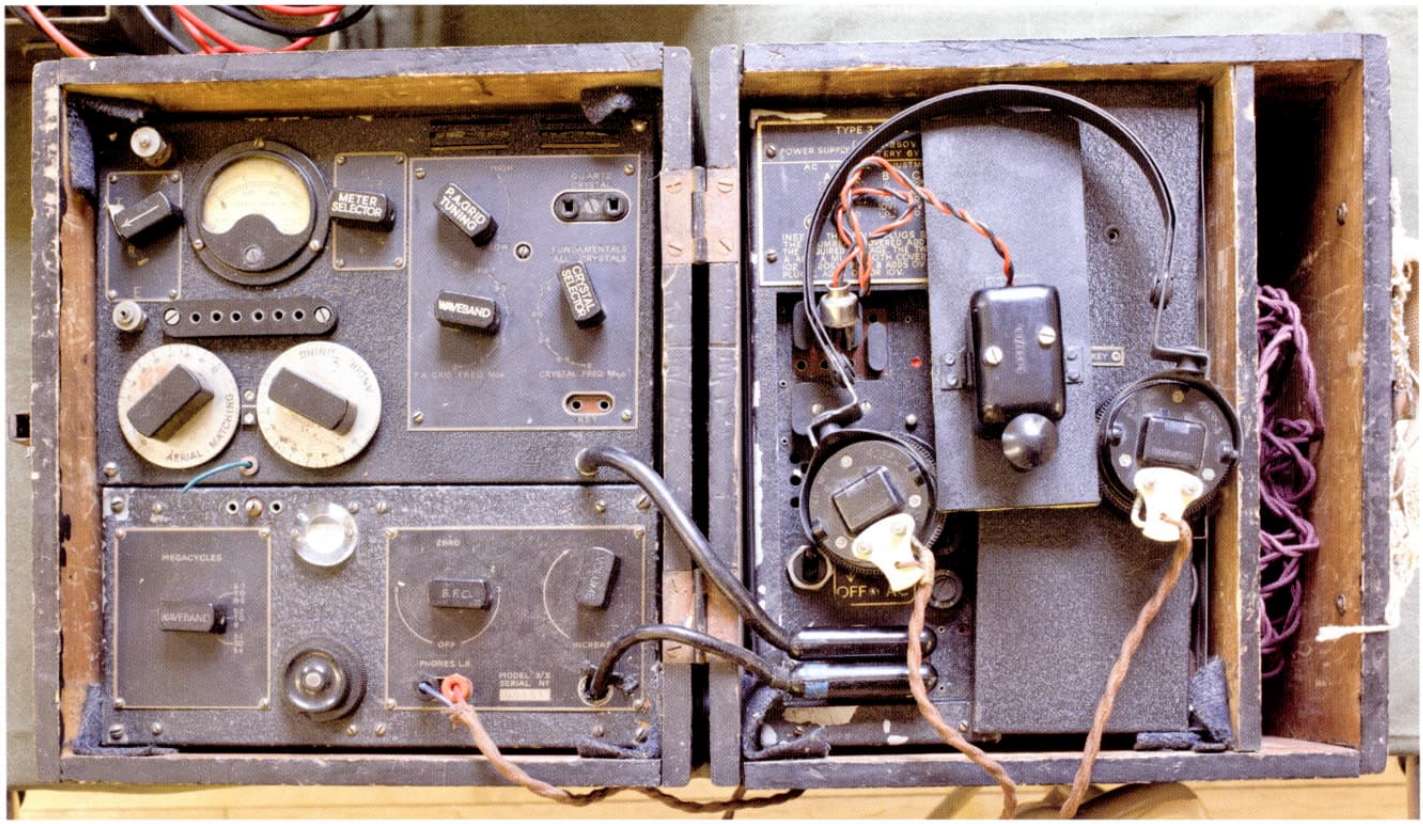
Romney Marsh Clandestine Collection at Harpenden September 23rd 2012 photographed by Carl Glover

We were very pleased to host John Elgar-Whinney's exhibition of clandestine equipment in the small hall at Harpenden as a part of the swapmeet and auction in the larger hall within the same building.

John was at hand to offer helpful explanations regarding some of the equipment and their uses in dangerous territory. The scale of John's collection is nothing short of amazing bearing in mind how hard it is to find this type of equipment. It is good to know that John enjoys demonstrating apparatus, giving lectures and talks about the Romney Marsh Clandestine Collection, his enthusiasm for the subject helps bring it all to life.

John Elgar-Whinney talking about the exhibits

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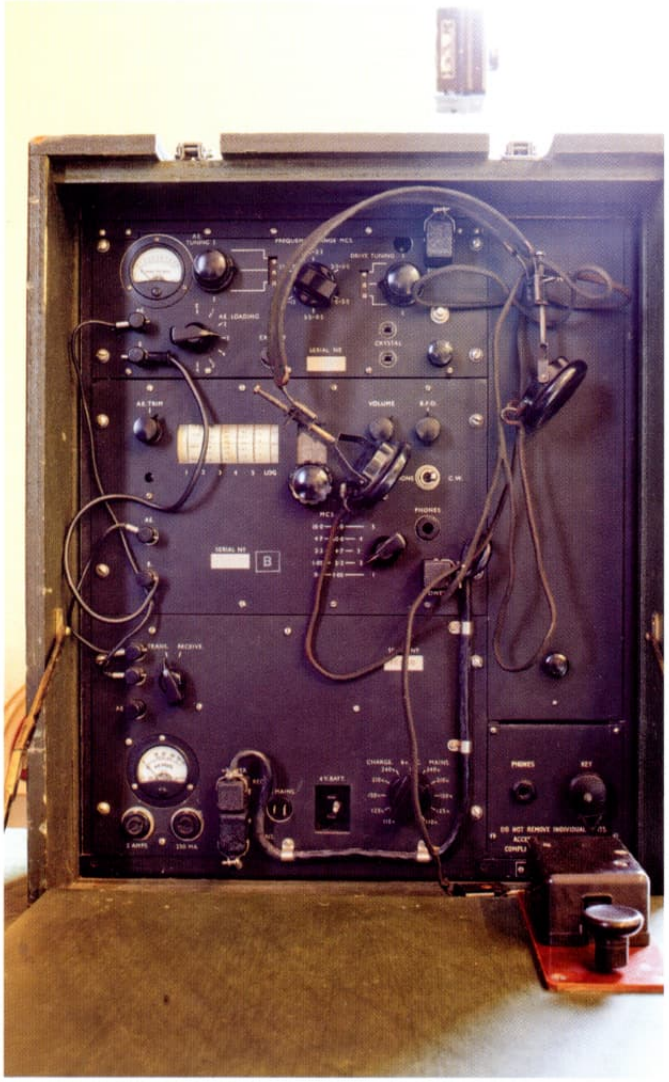
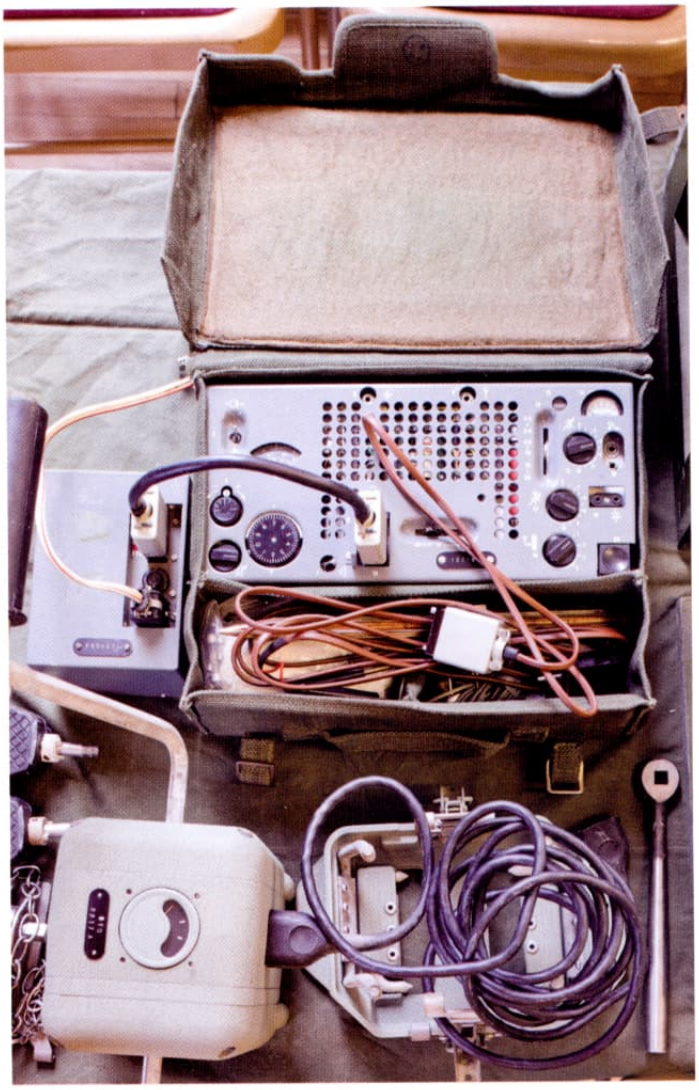
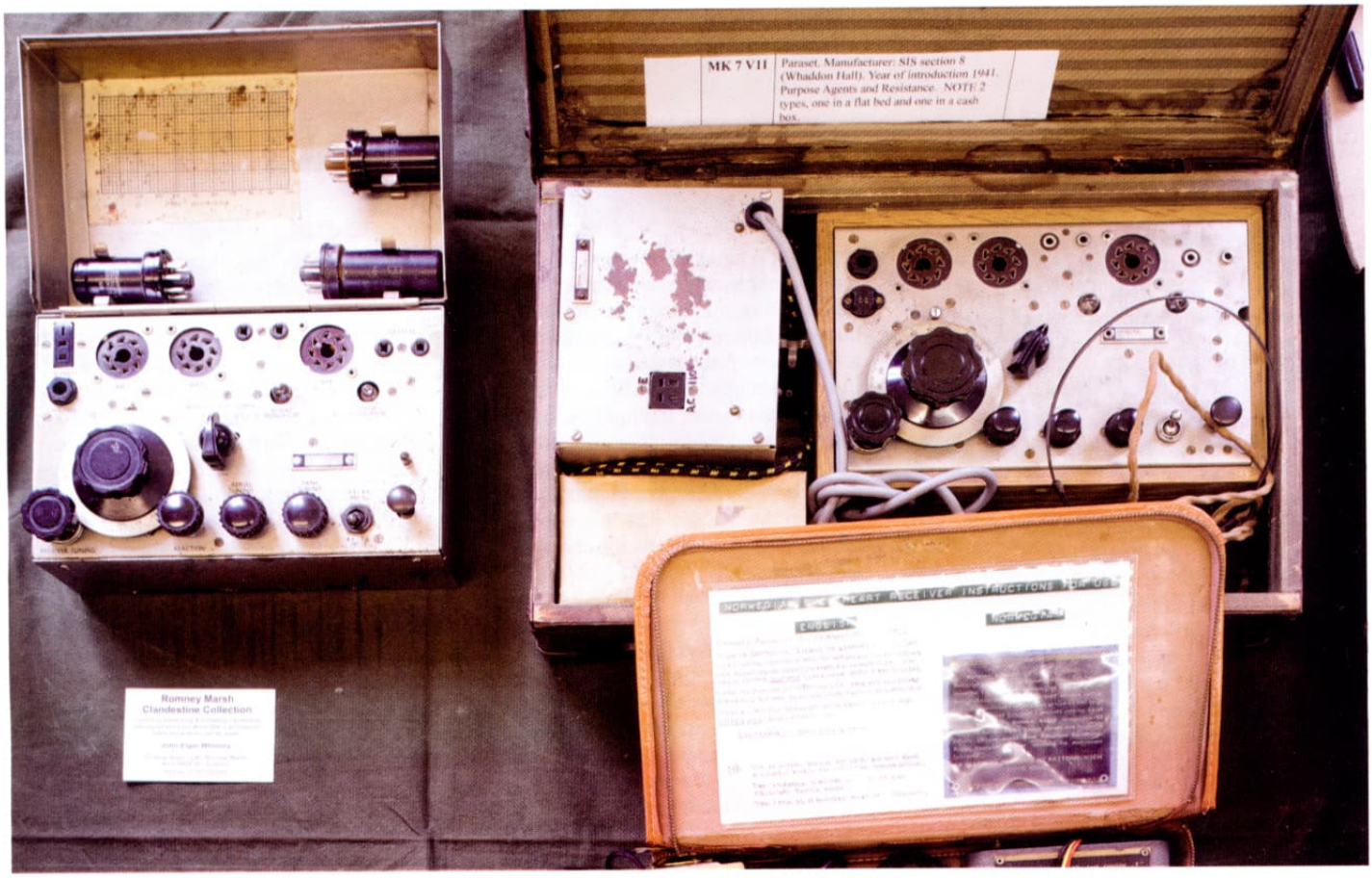



6 V=
10 Amp.
0,5÷1 Amp.
97÷250 V~


MK.12 TX/RX
DESIGNED BY G.C.H.Q.
EARLY 1950's USED BY
AGENTS STAY BEHIND
AND B.W.S.
3 TO 8 MHz USING
C.W.
Romney Marsh
Clandestine Collection
Romney Marsh
Clandestine Collection
Romney Marsh
Clandestine Collection




MK 7 VII
Paraset. Manufacturer: SIS section 8 (Whaddon Hall). Year of introduction 1941. Purpose Agents and Resistance. NOTE 2 types, one in a flat bed and one in a cash box.
Romney Marsh
Clandestine Collection

The Air King 23X
An unusually austere American Midget

by Roger Grant

This set came as a jigsaw puzzle in yet another job lot of radio junk, a box full of radio odds and ends from a local wheeler-dealer. This chap turns up occasionally full of stories of the valuable antiques he has found in skips and council tips, all in 'pristine condition' (his favourite expression) and the money he has made from the big auction houses. I usually end up with the left over radio junk as he always wants far too high a price for anything worth having, even offering the asking price doesn't always get him to part with the item, as he would now think it was worth a lot more and haggle on, very annoying, but he is a useful source of spares as this set was going to be, so its sometimes worth putting up with the banter, bartering and horse manure for the occasional gem, on this occasion, to save a lot of time, a case of 'this box of junk is worth a fiver, take it or leave it!'

After a lot of sorting through this box of junk, a set of parts emerged into a complete radio, it was all there including its back and knobs.
The cabinet, broken with some small bits missing, had been badly glued back together, this looked like it had been done a long time ago, some of the poor workmanship had failed and broken again, the cabinet now being in three pieces.
The chassis, complete with valves, had a strange line up and I assumed that the valves that were fitted, were just to fill the holes with anything to hand. The rest of the chassis and components appeared to be complete and intact.

I quite liked this midget of midgets and thought it was at least worth a closer look.

First a pre-cursory look at the cabinet to see if a reasonable restoration was possible, this looked promising as the Bakelite in this case is fine grain with a smooth surface and a reasonably high gloss finish, re-polishing relatively easy, compared to the coarser type of bakelite moulding where trying to simulate the texture of the coarser surface and hiding a crack is almost impossible. This set is going to be an interesting challenge if nothing else.

I started by completely dismantling the previous cabinet repairs, it appears to have been repaired on several occasions each time with a different type of glue, most of the glues were dissolved with solvents or paint stripper and scrubbed out of the crevasses with a very stiff brush, some of it needed warming up with a paint stripping heat gun, taking care not to over heat and damage the Bakelite.
With all of the broken edges now cleaned of glue, close inspection showed that a lot of the breaks were not clean and 'crumbs' of bakelite had chipped away from the edges and there were a few small pieces completely missing.

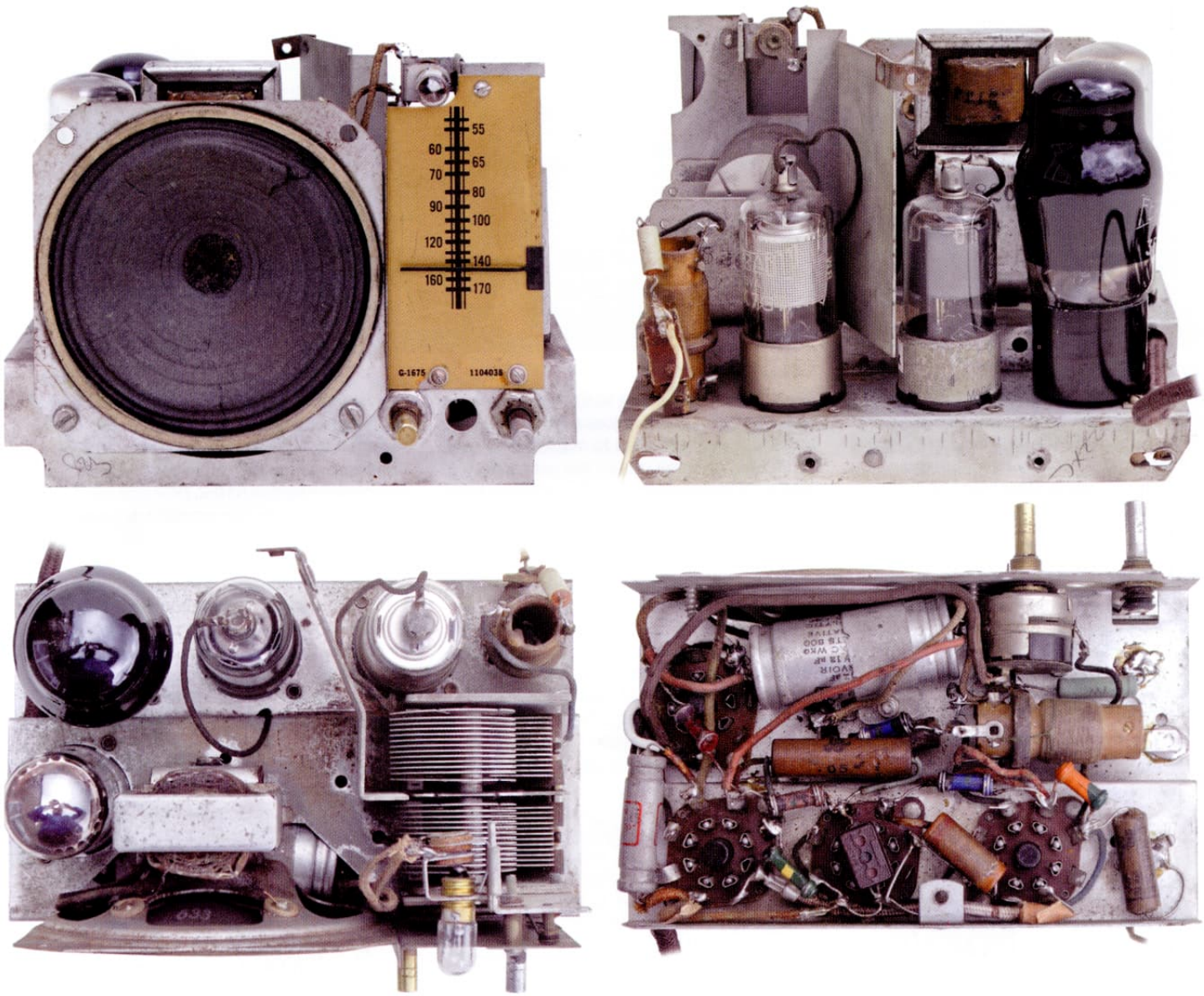
This little set continued to grow on me and I found myself committed to a full restoration.

I reassembled the cabinet bit by bit using rapid Araldite. This filled the small gaps in the cracks and a layer was built up inside the cabinet to strengthen it, with the pieces held in place by strips of masking tape while the Araldite set.

When all the bits of this jig-saw were glued back together, the odd gaps where pieces are missing were filled with Isopon P38 car filler, masking tape placed on the outside of the cabinet following its contours and filled from the back, when set, sanded to match the contours of the cabinet.
The cabinet is now back together, but the several very unsightly repaired cracks are clearly visible and the light patches of car filler require painting.

When the Araldite was fully hard I raked off any surplus proud of the surface and sanded across the cracks to remove any slight discrepancies in levels. I used 240 grade wet and dry cutting paper, this revealed some slightly hollow parts of the repaired crack where the crumbs of bakelite had chipped away. To reduce the number of paint applications these were then filled with Holts P38 car filler, making the track of the crack now flush with the surface. The cracks were scored with tip of a "V" shaped scoring tool intended for scoring Formica or Perspex for cutting, the tip was ground flat about 1mm wide, this was to form a flat bottomed shallow grove a few thou deep, ready to be filled with paint, colour matched with the bakelite and polished flush with the surface.
Ford Rio Brown was a very good match. This was sprayed into its lid, allowed to thicken up for a few minutes and then applied with a paint brush. Several applications were made to fill the score, then leaving the paint for 2-3 days to fully harden then cut back through the grades of wet and dry cutting paper. I started with 240 grade, then 800 and finally 1500 (multiple grades of cutting paper are available at Halfords). This should leave a nice fine surface ready for polishing with Brasso.

The areas where bits were missing and filled with car filler were painted in decreasing layers from the centre outwards like contours on a map. This allowed the new paint to be blended in to the bakelite without rubbing through the paint in middle of the area. This process



took a long time and was done in stages, sometimes going back to refill with paint as it tended to shrink as it hardened.

The Rio Brown paint appeared much darker than the bakelite during the sanding stages as the bakelite darkens when finally polished.

This process will never completely hide the cracks and repairs and wasn't really intended to, it just makes it much nicer to look at and doesn't drag your eye out at a reasonable viewing distance, you now have to look very closely to see them. Satisfied with the repair job on the main part of the cabinet, my attention was turned to the tuning window and speaker grille. The thin Perspex tuning window, poorly glued had become detached during the cabinet repair. This just required cleaning and polishing with Brasso and refitting.

The pressed aluminium speaker grille had been repainted with quite thick gold coloured paint by a previous owner. It was badly scratched and needed stripping and repainting, Nitromors paint stripper easily removed all the old paint in one, fortunately the scratches were only in the paint. As the old paint came off, the original colour could be clearly seen underneath and the newer paint had been a reasonable match just badly applied, the colour being the same as the background of the tuning scale. I found some antique gold spray paint in a hobby shop that was a very good match with the tuning scale, at least it was before it was viewed through the tuning scale window which seemed to slightly shift the hue. The cabinet now finished, I was very pleased with the result, all I needed to do was to get it working.

The chassis offered no model number and neither did the back, there is a small plaque full of licence numbers but that is all. An Internet search found one on YouTube, with the possible model No 23X, further searching produced a just about discernable schematic with a drawing of the component layout confirming the model number, 23X. The set was built by Air King Radio Corp. Brooklyn N.Y. around 1940.

The circuit shows a very austere Medium Wave only. Three valve plus rectifier TRF set with 15 feet of wire for an aerial. This came as quite a surprise as I didn't think the Americans made anything that could be considered austere, quite the opposite, most things American are bigger and better, with more 'tubes' and with all the bells and whistles. The circuit of this very cheaply produced little set reminded me of the peoples sets produced by the Nazis in the 1930's, only sensitive enough to listen to their local broadcasts. It'll be interesting to see how this set performs. It does make this set a bit more interesting, a change from the all very similar superhets.

The circuit diagram shows the set as 117v AC/DC designed for the American market, my set has a line cord. With no third wire for the HT, my first thought was

Inside the repaired cabinet

The Car filler stage

this modification just makes it a 240v set for import into the UK, but being manufactured in 1940 with WW2 in Europe in full swing, the set may have entered the country via some other route and the line cord modification added later.

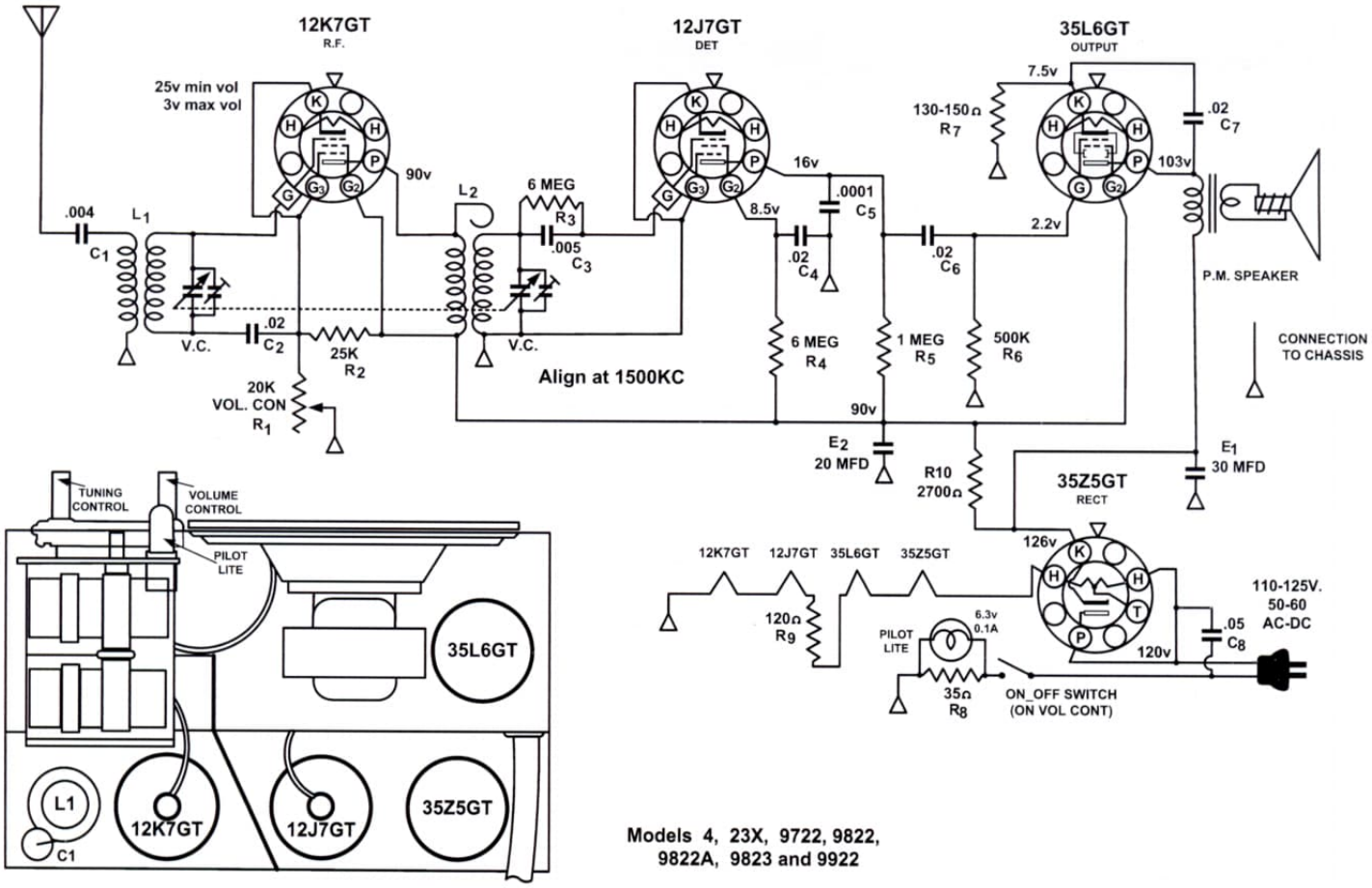
The line cord was open circuit, so I probed along its length with the AVO and a dressmakers pin, this found the break about a third of the way along. Checking from the other end found another break about 6" away from the first. Measuring the half way point shows the full length about 420 ohms, this was just out of interest and for the record as I don't have any line cord in stock, so I now have three options. One, fit a dropper resistor, but there's not much room inside the cabinet to fit one. Two, use a wattless dropper (capacitive) this method is very sensitive to mains voltage variations, or Three, return the set to its native 117v. I have chosen the latter as I do have a 117v transformer for powering my American sets and as it's originally from America, lets keep it American.

The valves fitted proved to be correct, 12K7 RF amp, 12J7 Det/AF amp, 35L6 output and a 35Z5 rectifier, although all different manufacturers. Checking the valves on the valve tester showed the rectifier open circuit heater, I didn't have a 35Z5 in stock but do have a few 35Z4's, the only difference is that the 35Z5 has a heater tapping, the circuit shows this is unused so I've fitted a 35Z4.

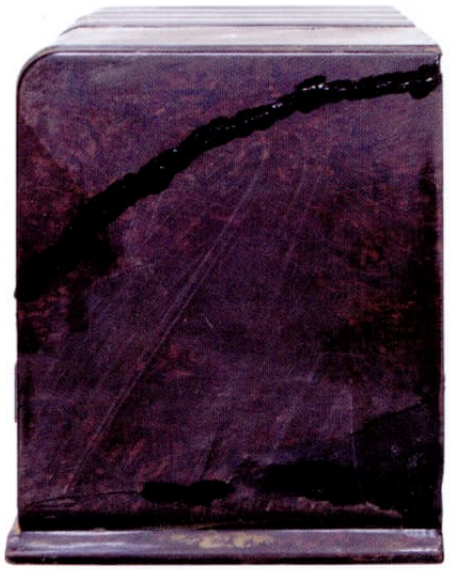
The smoothing capacitor had been replaced and mis-wired. Someone had fitted a single capacitor across the smoothing resistor R10 2.7k. I assumed it originally had its two smoothing capacitors in one can with the can common negative and replaced it likewise. These are the only electrolytics in this set.

All the other capacitors checked ok. Some of the resistors read a bit high but I'll change these on a necessity basis.

The pilot lamp, holder and shunt resistor, are all missing, and look like they were never fitted, the on/off switch is connected directly to the chassis and the wiring looks original, perhaps



Models 4, 23X, 9722, 9822, 9822A, 9823 and 9922



The paint fill

Polished

Final rub

it was for the export model after all.

The circuit shows the shunt resistor at 35 Ohms. With series heaters, the chain draws 0.15A, throw in about 10m/A for the HT current and this will give about 4 volts across the lamp, just about right for a dim glow without popping the lamp on switch on.

A 6.3v 0.1A pilot lamp with holder and 35 Ohm 7 Watt wire wound shunt resistor were fitted.

The original line cord has a tan coloured outer braid, this was replaced with some of a similar colour from stock but with modern twin flex inside, this was connected to the set and a 117v American 'Hubble' plug on the other end.

The speaker cone has become partly un-glued around its perimeter, it's still central and doesn't rub so I just re-glued the third or so that was adrift with Evo Stik.

With everything together and the cold checks all giving expected readings, I plugged into the 117v transformer and fired it up, the pilot lamp glowed very brightly for a few seconds and then dimmed as the valve heaters settled towards their hot resistances, then brightened slightly as the output valve drew some HT current. A buzz was obtained from the grid of the output valve at about the expected level and a very much stronger buzz from the grid of the detector.

With the volume control at max, a sweep through the tuning band produced a few faint stations, this was with the aerial lead still hanked up, so this was unravelled and plugged into my 75' outside aerial and the set burst into life. At this point I left the set playing for a while to give it a good warm-up and longer test while I put away a few tools and tidied the bench. After ten minutes or so the set burst into uncontrollable oscillation, the volume control and tuning capacitor had no effect over this. I switched the set off and looked around for anything getting warm or hot. All the valves were a bit warm but no more than expected, there was no evidence of excessive current drawn as this would cause the pilot lamp to glow brighter and it didn't. I switched the set back on, after about a minute the oscillation returned, turning up the volume control, the tuned station could be faintly heard in the background, the volume control made no difference to the volume or pitch of the screaming din indicating the fault is in the detector or output stages as the volume control controls the RF stage only.

The next step involved the age-old standard test procedure of tapping around with the plastic handle of a small electrical screwdriver looking for any mechanical intermittencies. This produced an instant result, Bop! and the set returned to normal, more tapping localised the area of intermittency, the most sensitive component appeared to be the 6 meg grid leak resistor R3 feeding the12J7 detector. When measured this was found to be completely open circuit. This resistor had been checked earlier and read about 10 megs, on disconnecting one end and applying the AVO, it appeared to have about three stable states when mechanically tapped, open circuit, 10.7 megs or 6.2 megs. This resistor is one of the 1930's Body, Tip, Spot coded type (Blue body and spot, Black tip). Unfortunately I didn't have one of this value in stock, so the answer was to fit a modern 1/3rd watt 10 meg resistor in parallel with the original, this was painted matt black and hidden underneath the original, the varying value of this bridged intermittent original resistor didn't seem to make any difference to the performance of the set but was now not going to be completely open circuit and cause the valve to oscillate. The other 6 meg resistor feeding the detector screen grid, also read about 10 megs, and likewise a parallel resistor fitted just for good measure.

The 1 meg detector anode load resistor read about 1.8 meg, I had a 1 meg resistor of this type in stock and replaced it.

To my surprise the set now works very well on its 15 feet of aerial alone and quite exceptional on a full 75 feet garden aerial, and with a quite good tone considering the size of the speaker. Its sensitivity could match most superhets of a similar size but the selectivity is very lacking with several stations overlapping as expected with this type of TRF wide band width circuit.

This design uses some unusual features, although the RF amplifier is a standard tuned grid tuned anode circuit, there's no AGC and the total gain and volume level of the set is controlled in the RF stage, this done by varying the DC voltage on the RF amplifier cathode, done via potential divider R1 and R2, R2 being the volume control.

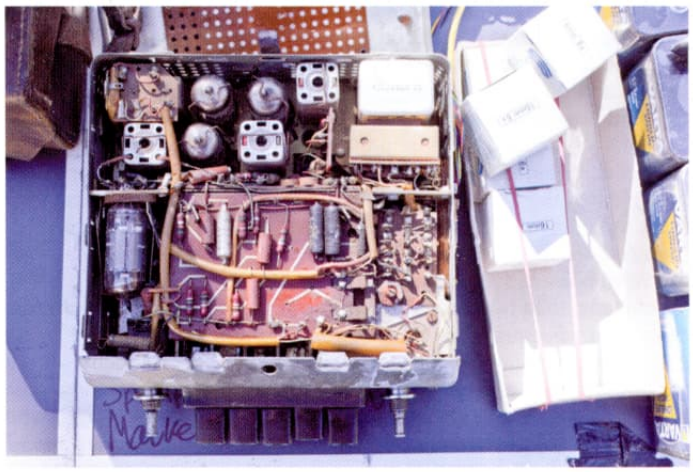
With R1 at maximum resistance applying around 35v to the cathode, making the grid –35v with respect to the cathode and reducing the gain of the valve to cut off, this works very well with a reasonably linear action, due to the 12K7 being vari-mu pentode and what it was designed for.

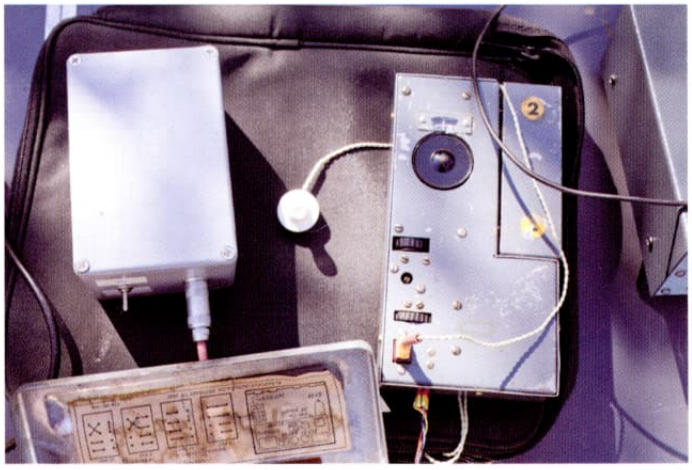
The detector AF amp stage has a 1 meg anode load resistor and a 6 meg screen grid resistor, this gives this stage just about as much gain as could be obtained from this 12J7 standard amplifier pentode, this is coupled to the output valve grid by capacitor C6 and tone corrected by C5.

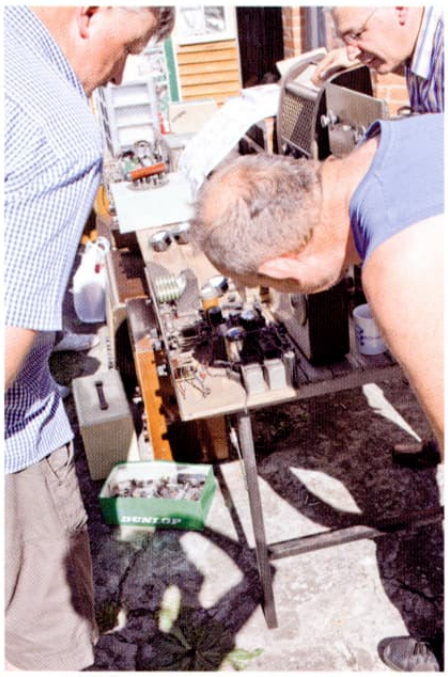
The output stage is a standard beam tetrode, with feedback applied by C7, a little unusual, this applies a lot of top-cut and may account for a reasonable tone, this also eliminates the need for a cathode bias electrolytic, another measure of austerity.

This delightful little set fits very well in my collection, it really looks the part of the 1940's and even better, when playing Glenn Miller and the other big bands of WW2 on my local oscillator, a really magic little midget and a thoroughly enjoyable restoration project.

Table top sale at the British Vintage Wireless & Television Museum, Dulwich photographs by Carl Glover







A Tale of Two Fergusons by Tom Smith

Here I describe my encounters with a couple of Fergusons, model 329A. According to "Trader" service sheet 1238 they appeared first in 1955, priced at 27 pounds seven pence, plus purchase tax. Now that's a fair old sum for the time, and it seems to me to cast these radios well towards the professional class. So I was interested to see what one of these sets could do, especially in the VHF band which was just coming in at the time of their manufacture and to which I listen daily, now and hopefully for a good long time to come.

Figure 1: Job finished: the working Ferguson 329A

Initially just the one set confronted me. It came my way from a friend who is a machinist and general technician. Smoke rising from a smouldering valve socket had dissuaded him from trying to mend it for a pal of his who is discovering the attraction of valve radios. So, after a little arm twisting from my friend, I agreed to see what could be done.

Now I don't work at my best when under pressure, and, as I wasn't sure anyway that I could get the thing going, I sent along a couple of radios by way of compensation so that I could experiment fearlessly on the sick Ferguson at my own pace and in my own time. These were a solid well made Pye short superhet - redolent of sensible shoes, dumpling hats and food rationing---and a Cossor Melody Maker 520, a favourite of mine and of which I had two. When shown these sets the pal's reaction, I am told, was to ask whether he had to choose one of them. Now if ever there should be a response to catch my loyalty that is the one, and I resolved to do my best to bring the Ferguson back to the land of the listening.

The First One

On dismantling the set I was pleased to notice from the original sales registration tag still tied to the back that it had originally belonged to someone living on Woodlands Road, Bushey, near Watford. Looking up the house number on Google's "Street View" verified my hunch that the set came from a comfortable provenance. It is an AC only model of good physical size and it boasts an EM34 tuning indicator, a tone control, and it uses an EL84 and good sized output transformer to drive a high quality six by ten inch three ohm Celestion speaker possessing a decent magnet. The bands covered are MW and LW of course, a useful SW band from 5.4 to 19.1 Mc, and FM to just above 101 Mc. Thus, for those who care, it is "Classic FM" friendly. For AM reception one must use an external wire but for FM there is a basic dipole antenna stapled around on the inside of the cabinet.

Upon viewing the innards, the first thing I noticed was that the mains 0.01 µf Hunts RF bypass condenser had spectacularly self destructed. I would have liked to have been present when that occurred, but instead I had to content myself with replacing it with a proper 250 Vac rated type. The important matter to hand, however, was the smouldering paxolin socket for valve V2, an ECH81 triode/heptode. This functions as an oscillator/mixer on AM,

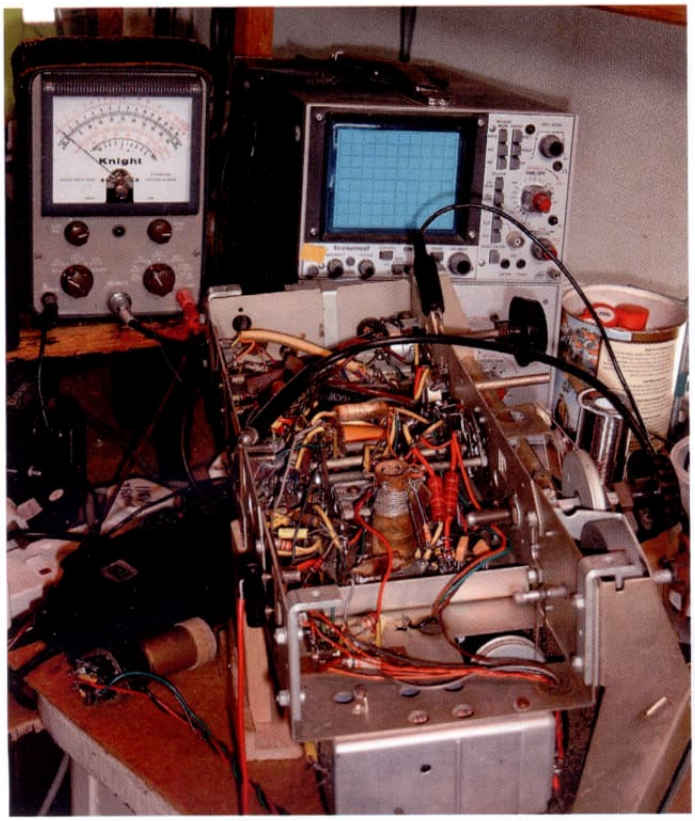


Figure 2: Ferguson 329A on the bench and under repair

Figure 4: This Knight kit VTVM has been with me since about 1954, giving good accurate service.

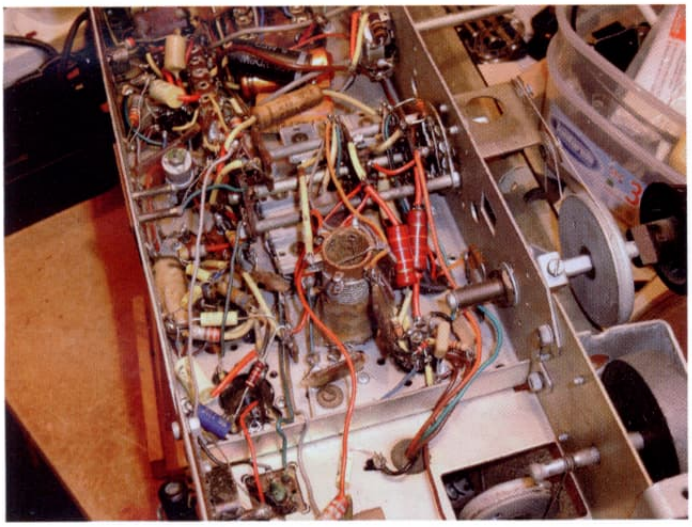


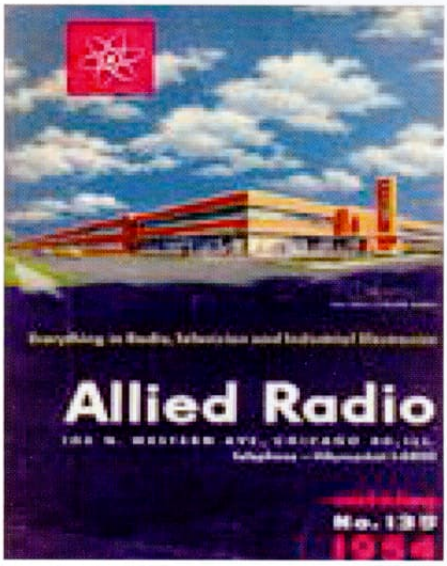
Figure 3: The socket for valve V2 and various condensers and a few resistors have been replaced

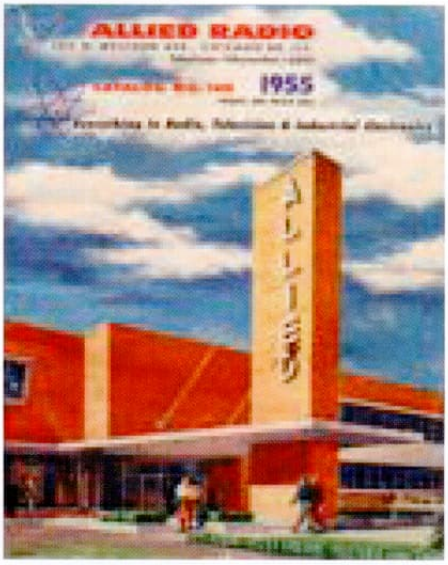
Figure 5: 833 West Jackson Boulevard, inner Chicago. Allied Radio was located here in the early 1950s, in the building on the right with brown upper stories.

but on FM the heptode section works as an intermediate frequency (IF) amplifier at 10.7 Mc while the triode marks time. I suppose it may be a weakness of paxolin that it can pick up moisture, and as the voltages on that socket run to about 240 Vdc, time and age had overtaken it. With the hope that its replacement would get the set well along towards health I got stuck in. This was a rather fiddly job. The result is shown in the right foreground of Figures 2 and 3. To achieve this, and to save the dial drive pulleys from damage, I had screwed two aluminium stubs to conveniently placed holes in the top of the front panel and propped the set upside down with a couple of wooden blocks in the back. This done the actual socket replacement provided a pleasant exercise in forceful manual dexterity, requiring detachment of the coil former carrying AM oscillator coils, pushing it to one side somewhat, and replacing several of the smaller components clustered around the valve socket. Although I do agree with Chas Miller's philosophy of leaving well alone, and in spite of the possibility that these original components may well have been ok, it was much easier just to replace them. I also took the opportunity of replacing the relatively high wattage resistors (R10 and R14 shown in service sheet 1238) that feed the screen grid and triode plate of V2, for no better reasons than the fact that the original ones had drifted somewhat in value, and also because I could. At this point I unnecessarily tested the valves. They were ok and I plugged the thing in not bothering to reform the filter capacitors first because my technician friend had already had it on for some time. In the event all was well with the voltage supply. But reception was very weak and distorted.

The 0.05 µf audio coupling condenser, C61, was a little leaky. Replacing it gave a healthy negative grid bias at the output valve, but reception was still naff. At this point I clocked a number of black Hunts RF bypass condensers, mostly of value 0.01 µf. I have had trouble with these before and have found that for some reason they may be prone to losing value, fading to very nearly zero capacitance. Indeed that was the case here for several of them although a couple were fine. The little modern replacement yellow perils show up in Fig. 3. Things were now looking up: I was getting signals at a reasonable strength accompanied by some few negative volts at R9 the AGC decoupling resistor as

Figure 6: 100 North Western Avenue, outer Chicago. Allied had moved here by 1954. their catalogue covers for 1954 and 1955 are reproduced below. It looks like another floor may have been added since.





measured with my trusty Knight-kit VTVM, Figure 4. By this time the reception on VHF was pretty good, and, although I felt that I had crossed the Rubicon with the repair, all was not right on AM.

The problem was one of unstable signal strength with occasional frying sounds. By setting the band switch to medium wave and selectively probing around with a signal generator at the 470 Kc intermediate frequency I pretty well established that the problem was most likely with the first AM IF transformer, L18/L19. Indeed according to the Trader sheet both primary and secondary should measure about 8 ohms, but the primary here measured high in value. That marked the first time that I appreciated the effort that Trader took in giving the dc resistance of all coils. Live and learn I guess. So we seemed to have a problem somewhere within that IF transformer. This may have been another paxolin leakage problem, for after all, this transformer's primary is connected to the plate of V2 and so carries a similar high voltage. On the other hand, given that the primary's resistance was higher that it should be, I wondered whether the fault might not lie with some strands of its Litz wire coming adrift. Now there are stout souls who seem to think nothing of unwinding turns from such coils and resoldering them. See for instance the article in reference 1. But I certainly will try to avoid such perilous attempts if I can. Fortunately help was at hand in the form of an old Ferguson 325A chassis. This radio is essentially a 329A without the VHF option and its first IF transformer is identical to the one I needed. Or nearly so, for to allow for the FM option I needed to dismantle it and disconnect one side of the 100 pf mica condenser across its primary, running that end on a flying lead out to be connected to the second FM IF transformer. This went fine, and both sides of this replacement IFT now measured a proper 8 ohms dc resistance.

At this point I was winning. Everything about the reception was stable and clear. I could sense that when reassembled it might sound rather good. Now it seemed evident to me that this set had not been "got at" in any way, but, having replaced an IFT, I acquired a bee in my bonnet about its alignment. Resolving to go over this in detail, by dint of scraping and judicious melting with a soldering iron set to a temperature just too hot to touch, I went to no small effort to clear out the beeswax from most of the IF transformers. I lack a wobbulator so alignment was carried out more mundanely using an ordinary signal generator, frequency counter and VTVM. It all went well and, reassembled, the set sounds very good.

The Second One

In fact it sounds so good that I was loath to return it. And so it underwent soak testing for a few months in pride of place upstairs on a bookshelf in a bedroom, and was used daily. Conscience driven, however, I made a mental note to keep a lookout for another one so that it could be returned. Quite soon, on May 13, 2012, another one did turn up, at the NVCF in Warwickshire, and was purchased for three pounds.

This second Ferguson had clearly been left to sit somewhere reasonably dry for a decade or two and was scruffy. On dismantling it I encountered twenty or thirty years of dust and the speaker had some tears, for it had fallen out of its mounting and was knocking around inside the cabinet. I'm afraid that I added a couple more tears to it as it floating around on the bench during repair. Later all tears and rips were mended using several thin coatings of bicycle inner tube rubber glue and small pieces of Kleenex. This works for me as the glue doesn't seem to shrink at all when drying and it stays flexible. Next, before getting stuck in, I decided to treat the set with a little respect and reformed the high voltage electrolytic condensers in situ by feeding in a gradually ramped DC voltage from my Heathkit bench supply, current limited by a 47 k ohm resistor. After an hour or two I had the voltage up to about 300 and the current drain was quite acceptable, giving me hope for the future. Moving on, however, I had to face the fact that the tuning dial was stuck fast. Stupidly I assumed this was due to a jammed spindle or bearing somewhere along the line and I forced things a bit, breaking the cord. In the event, corrosion had caused the two pointers to stick in their run along the top of the dial fascia. The runs were easily sorted with a few swipes of fine emery paper, but now, owing to my elementary error, the dial needed restringing. Live and learn, I guess. This was no simple task, but in kamikaze mode I dived in. I am sure that there are more fiddly dial drive replacements than this one (on a Murphy perhaps?), but this stands as my current worst case. It requires stringing six feet of cord in somewhat restricted and obscured spaces, but fortunately Trader 1238 gives pretty detailed instructions. This was good for me, for I hadn't been able to sketch the layout of the broken cord. The cord winds along the top to drive the dial pointers, circuitously finds its way around the VHF tuner's drum, then, via the control spindle, around the main drum and so back along the top. Things went ok on the whole with a little judicious poking and prodding, but a slight misjudgement resulted in the tension spring being a little lax. Unfortunately this

set has only a single hole in its main drum to anchor this spring, and not a choice of several to allow some compensation for slightly different cord lengths. So a slight shortening was unavoidable. Using bits of tape and maintaining the tension by hand to hold things together, I was able to untie the cord from the spring, to shorten and retie it and then, using my special long nosed pliers with a hooked end, to replace the spring back in its anchoring hole in the main drum. All this was very good, so far as it went, but I wasn't happy with the cord's action: it seemed prone to a little slippage at one end of the dial. Maybe my new cord wasn't quite a perfect replacement. Whatever the case, in a spontaneous act of pique, I smeared a little bees wax on the drive's spindle. For a fact this did improve things temporarily. But it was a warm day and as the radio itself warmed the cursed wax began to act like a lubricant, making things worse. After a little reflection a light bulb went on over my head and, wiping clean the drive cord as best I could, I tried rubbing it slightly with a chunk of violinists' rosin given me by a local instrument maker. This completely sorted the cord's action, and it continues to be perfect.

Now that the set was mains friendly I plugged it in. Reception was very sick so I replaced several of the Hunts RF bypass condensers, finding that most, but not all, had wilted to zero value. The AF coupling condenser was a bit leaky too, just as on the first Ferguson, and I also replaced the mains RF bypass condenser as well, not wanting an explosion in my bedroom. By this point reception on AM had improved, and aligning the 470 Kc if transformers helped a bit more. But FM was very nearly deaf. Checking the alignment of two FM IF transformers on the main chassis at 10.7 Mc went normally but that didn't help significantly. I did appreciate that all these transformers, AM and FM, had been "waxed up" at the factory and were therefore probably pretty well on tune, but I checked them anyway. VHF was still deaf however. Persevering, and using the signal generator rather like a stethoscope, I finally reasoned that the fault must lie within the VHF front end. Indeed, consulting the schematic knocked some sense into me: there is a third FM IFT, in the tuner section, and the primary of that one, L7, is unsealed and accessible from the top of the chassis. Oh dear! It had been tightened down. Turning it out by several rotations caused the vhf reception to burst up by something like 40 or 50 dB - like a shaft of sunlight on a winter's day. Clearly there had been play with a screwdriver by a person or persons unknown attempting to "tweak" a set that couldn't possibly be made to work for all its rotten bypass condensers. Thus ends my tale: aligning all the other unsealed local oscillators and aerial trimmers brought reception up superlatively. This set is now sensitive and sounds clear, undistorted and balanced, with a decent suggestion of bass. It gets daily use and gives pleasure. Now, I wonder whether the Pye Fenman II currently resting on the shop floor can improve on this. I will take some convincing, and I have to repair it first. That should be fun.

Roots

In the background of Figure 2 one can see my Knight Kit vacuum tube voltmeter (VTVM), lurking benignly. This was a kit, built by me very nearly at the same time as these Fergusons were being turned out in the UK. It is one of the very few things I have troubled to bring to England and it works perfectly, Figure 4. I actually brought it over in a back pack 25 or more years ago and suffered no scepticism or accusations of terrorism at any checkpoint when I explained what it is. I guess valve technology didn't scare people then. Used as a DC volt meter its input impedance is ten or twelve megohms, similar to modern digital meters, but its huge advantage is that it's an analogue meter and thus of great use in maximizing or minimizing readings. In their wisdom the designers included a one megohm resistor in the DC voltage probe itself, shown lying across the chassis in Figure 2. This has the benefit of decoupling the meter to a useful extent from whatever one is measuring. For instance I can use it to get a good idea of grid voltages on operating circuits, once, for instance, on a "leaky grid" stage when I rebuilt wreck of a TRF chassis (Reference 2). If you try this with a digital voltmeter it will load the circuit down to an unacceptable degree, but that fault is correctable by the same device, if a digital reading should be of any use.

When I built the VTVM I lived in Evanston, one of the oldest suburbs sited on the north border of Chicago, itself affectionately known as "the hub" in recognition, I believe, of all the railway tracks that radiate from it like the spokes on a wheel. The metropolitan area is and has been the home of many American electronic companies: Scott, Hallicrafters, Grigsby-Grunow, Motorola, and others. Of particular importance to me as a teenager was Allied Radio, whose origins go back to 1928 as a parts supplying arm of the Columbia Radio Corp (Reference 3). In my early teen years Allied Radio was located on 833 West Jackson Boulevard, the older brown corner building to the right in Figure 5. That location is somewhat near the north side of Chicago's inner area and in Figure 5 we are looking due eastwards towards Lake Michigan only a mile or so away. I don't know whether the company occupied the whole building, but I do remember going up several floors with my patient dad to order, and wait ages for, a posh looking "Shure" microphone that I had set my heart on and had saved for. I used it a year or two later as a ham, with a homemade transmitter using "screen grid modulation" on those few occasions when I forsook transmission using the Morse code. By the mid 50s Allied radio expanded moving to a newly built modern building at 100 North Western Avenue, Figure 6. This figure, from Google "Street View", shows below, the covers of Allied's catalogues for 1954 and 1955, my peak teenage years for messing around with electronics. Reference 4 gives more details of Allied Radio's catalogues. In Figure 6 we are looking due north towards Evanston, maybe about 10 or 12 miles distant. The view is characteristic of outer Chicago: there it merges towards a more suburban layout with plenty of space and wide streets laid out on an open mesh pattern given over to cars and the occasional bus, and maybe even a water tower perched high in the distance. It was a terrific adventure for me and a couple of mates to take the bus from the Evanston city limit south down North Western Avenue, dead straight for 10 miles and more, and then to pile, a little breathless and wide eyed maybe, into the spacious Allied show room to goggle at things and buy a kit or maybe parts for one's latest project. In passing I note that every cent that we spent we had earned ourselves. The building is still there, but these days, after one or more incarnations the company itself is now called Allied Electronics, mainly web based I believe, and located in Texas. It seems to me that, in limiting the possibility to view and handle things in real physical time and space, the web may be a double-edged sword.

References

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2: "A T.R.F. Chimera", The Radiophile, Issue No. 108, Christmas 2006.
3: http://www.radiomuseum.org/dsp_hersteller_detail.cfm?company_id=1865
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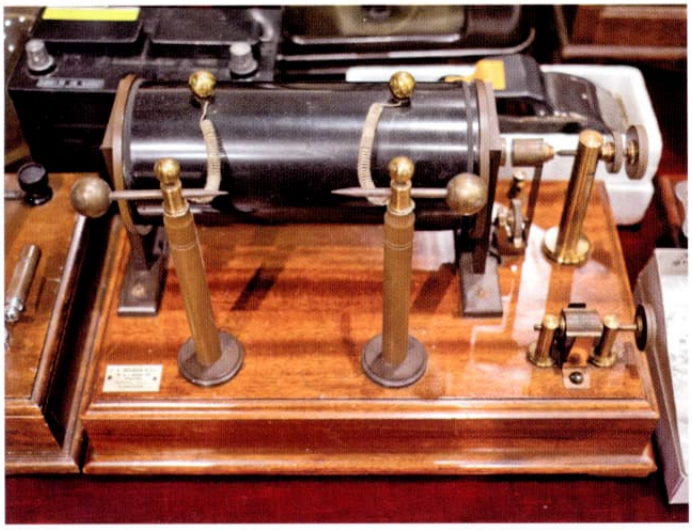
Harpenden!

photographs by Carl Glover

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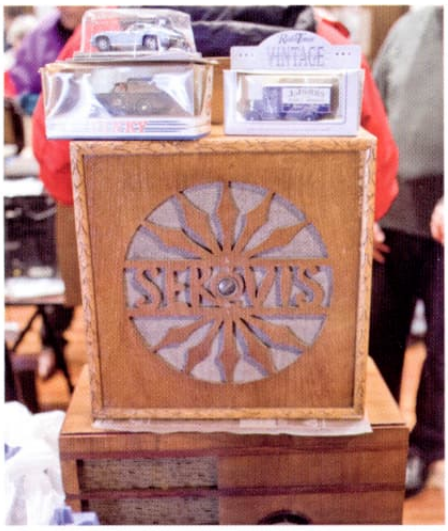
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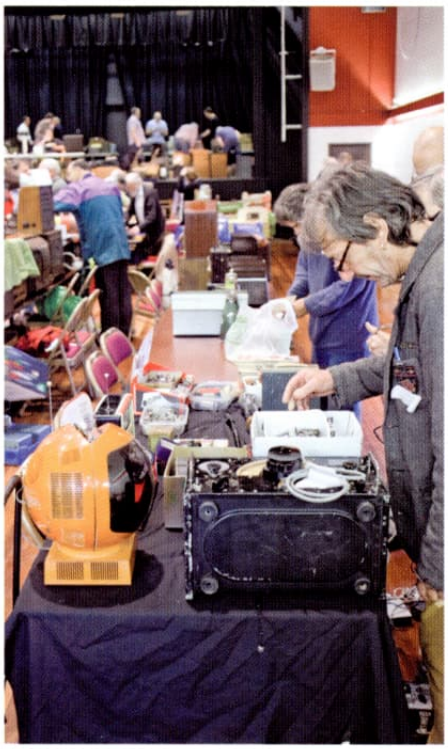



BRITISH TOMATOES
SAINSBURY'S
SAINSBURY'S

Telefi by John R. Sully

'Telifi' is the product name of a device retailed by Celestion some 40 years ago. Its purpose is to enable a television viewer to enjoy better quality audio sound from television broadcasts than was attainable from most television receivers of the early 1970s.

Fig 1: Telefi packaging

Fig 2: Telefi Advert April 1973

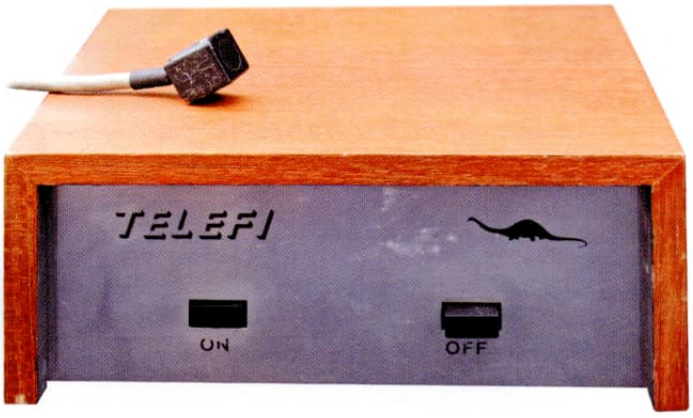


Fig 3: ED10 Front panel

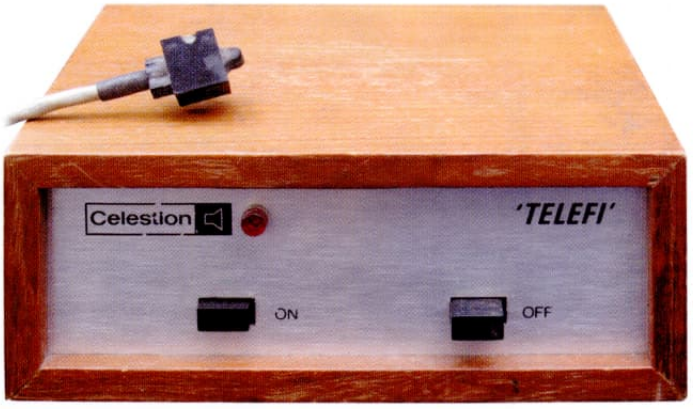


Fig 4: ED14 Front panel

It is worth considering the progress of sound transmission over the last 75 years before returning to the Telefi device itself. Regular scheduled television transmissions began in the U.K. in 1936. The biggest selling first generation receivers were made by the E.M.I. group, branded as either H.M.V. or Marconiphone. All these receivers had loudspeakers and audio stages capable of providing at least 4W of high quality sound. The large energised loudspeakers and substantial cabinets projected a pleasing full sound. The same could be said of the majority of television receivers from most manufacturers available before WWII. At this time sound was considered to be as important to the televisual experience as the vision picture itself. After the cessation of hostilities a significant proportion of television receivers continued to be manufactured in console form, which inherently promotes good sound reproduction.

As is well known, one of the reasons television was really brought to the masses was because of the desire of the populace to watch the Coronation of Queen Elizabeth II. Costs were brought down by making the cabinets smaller, which had the added benefit of making it easier for buyers to find a place for a television in the home. This was perhaps the start of the era when television sound began to take second place to the picture. As screen sizes grew larger due to improved tube technology, loudspeakers tended to get smaller to enable the cabinet to be of restrained proportions. This process continued through the 1960s, where loudspeakers began to appear in strangely elongated elliptical versions, or else demoted to the side wall of the cabinet so that sound no longer emanated directly from the front of the receiver. The introduction of 625 line receivers did not make a significant difference to broadcast sound quality. By the 1970s, wooden cabinets were beginning to be seen as dated, and plastic cabinets began to take over, though ironically often with some kind of wood grain effect applied to the plastic. The plastic cabinets did not have the rigidity of the wooden cabinets though, and produced a sound of limited frequency range, often with associated rattling of the cabinet when the volume was turned up.

In the late 1980s Near Instantaneous Companded Audio Multiplex (NICAM) broadcasts got underway. This leap forward in sound quality warranted a logo on screen during the program introductions, and in fact was of near CD quality. Domestic television had progressed to very large screens, often of 28" or 30". Sound quality had improved again by now, but it still lacked a good bass response due to the flimsy cabinets with the large areas of unsupported plastic walls. However, sockets were often provided to the rear of the receiver to enable the owner to take the stereo signal to his hi-fi system, amplifying it further prior to feeding through to higher quality loudspeakers, which hopefully also had the effect of improving the stereo separation. As the new century dawned, many were expecting to enjoy programmes, particularly feature films, with the same sort of viewer involvement as might be found in a cinema. 5:1 surround sound was now available, together with remote bass sub-woofers and soundbar type combined reproduction equipment.

So it can be seen that the real nadir in television sound quality available from domestically available receivers was the late

Fig 5: ED10 (left) and ED14 wand

Fig 6: Telefi Rear panel

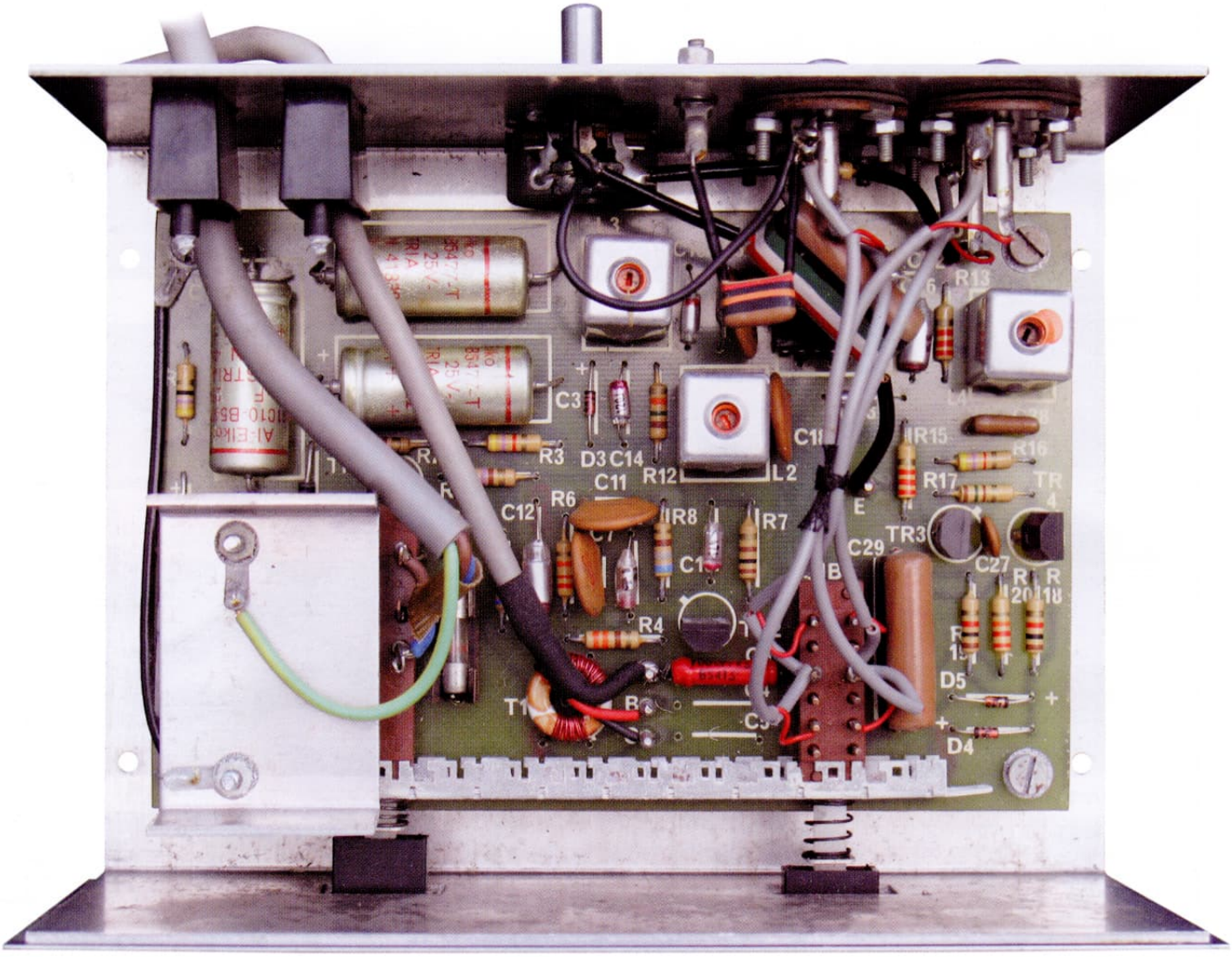


Fig 7: Telefi Internal view

1960s/early 1970s. At this time a high quality FM sound signal was being broadcast, but most television receivers had a small loudspeaker, of acoustically poor design, housed in lightweight cabinets with limited rigidity, and no way of extracting the audio component via user sockets at the rear of the cabinet. This was the market opening for which the Telefi intended to provide a solution; by enabling viewers to improve the sound quality and therefore overall enjoyment of television. The major problem to be overcome in developing such a device is the method by which the audio component is retrieved. An obvious solution was to simply include a U.H.F. tuner, constructed so that the signal from the tuner was available to the user's Hi-Fi via appropriate connection sockets. Clearly this was going to be an expensive option though, and has the attendant problem that an aerial will be required, and the potential buyer's existing aerial system may suffer an unacceptable degradation in quality if the aerial feed is shared. The other apparent possible solution was to extract the audio component from the potential buyer's existing television receiver. However, this option was not really viable, because a large percentage of the population (perhaps the majority), did not own their television set in the early 1970s, but instead rented it. One of the requirements of all television rental agreements was that no alterations were to be made to either the chassis or cabinet of the receiver in any way. Of course the fact that many people rented their television receiver in the 1970s was just one difficulty on top of the technical challenge of extracting the sound signal at circuit level from a vast range of receivers on the market.

The designers of the Telefi decided upon the quite ingenious idea of extracting the audio component of the television transmission from the IF strip of the television receiver, hoping that poorly shielded IF strips would enable the signal to be received by an adjacent wand containing a ferrite cored inductance. The wand is placed in close proximity to the IF strip, where it 'picks up' stray electromagnetic emissions which occur to a greater or lesser extent with all televisions. The signal is picked up at the 6 MHz intermediate frequency, resulting in a high quality audio signal largely free of distortion. This audio signal is amplified and then demodulated by an integrated phase discriminator. The signal becomes available

at the rear of the Telefi presented on a pair of phono sockets. The signal output level is variable, and can be adjusted up to about 1v output by means of a variable resistor also located on the rear connection panel. Celestion advertised the device as providing true high fidelity from your television, which seems a plausible claim given that the stated frequency response is 30Hz to 20KHz.

Clearly the quality of the available resultant audio signal is directly related to whatever is picked up by the wand, and the stray electromagnetic signals will not travel far from the area of the IF strip of the receiver. The average buyer is unlikely to even know what an IF strip is, let alone where it might be positioned in his/her television. In order to set the device up the user therefore had to wave the wand all around the television, concentrating on the sides, rear and underside of the television, until the best signal source was located. A promotional leaflet for the product admits that with some sets, it may be necessary to locate the wand inside the television right next to the IF strip. The leaflet states that positioning of the wand inside a television receiver should be done by a "qualified TV engineer or dealer and not be undertaken by an inexperienced person". One wonders how many people decided against paying for a TV engineer to visit the home to wave a probe about his television, and instead took the back off and tried it himself, regardless of voltages perhaps in excess of 20,000v which might have been present in colour televisions at that time. The previous owner of the ED14 pictured admitted that he had put the device inside his television himself without having any knowledge of television.

I have come across two versions of the Telefi, though there may be others. The two pictured in this article are model ED10 branded as Dinosaur, and ED14 branded as Celestion. However the Dinosaur ED10 was supplied in cardboard packaging with Celestion branding. One therefore surmises that Dinosaur designed the product, with the intention of marketing it themselves, but before long an agreement had been reached with Celestion to promote the device. Celestion was (and still is) a company well known for producing excellent loudspeakers since the 1920s. During the 1970s Celestion were producing an exceptionally high quality series of loudspeakers, including the model 15 and later incarnation 15XR, and the model 66. Both these loudspeakers enjoyed an enviable reputation for high quality, and today are still highly regarded and sought after. Celestion were not known for producing hi-fi components, so one wonders how they came to be associated with the Telefi. (The Dinosaur Electronics group has no connection with standards converter's from the 1990s).

The ED10 has the legend "patent applied for" printed on the back of the device, so Dinosaur must have entered production as soon as they had proved their development models and prototypes worked. The Celestion branded ED14 has the legend, Patent No. 45105'71 applied for' to the rear of the cabinet. It also states that the device is made under license from Dinosaur Electronics. Patent office records show that Application No. 45105/71 was filed on 28th September 1971 by Anthony John Burton of Windsor. The complete specification was filed on 7th March 1972, and published on 3rd April 1975 as Patent Specification 1 389 228. The Patent Specification is granted to Dinosaur Electronics Limited of Windsor, though not the same address given in the original patent application.

One presumes that Telifi was originally marketed by Dinosaur alone, as the model ED10 has no reference to Celestion anywhere on the device itself. The serial number of the ED10 pictured is GA191, and it was supplied in a Celestion branded cardboard box with Celestion instructions. One therefore assumes that the Dinosaur Company itself had not been successful in selling their product, and sought the added marketing power of an existing brand together with their rather more substantial advertising budget. The Telefi is advertised in contemporary early 1970s Hi-Fi periodicals alongside the Celestion loudspeaker range (see fig 2 from "Audio" magazine April 1973).

The ED10 is quite compact, (see fig 3) measuring 18.5x14x8.5cm. It is formed of a "U" section chassis over which a "U" shaped three-sided solid teak cabinet is positioned. An additional brightly polished front panel incorporating a screen printed image of a dinosaur is fixed to the "U" section chassis. The front panel of model ED14 (fig 4) is largely similar, but sports only the Celestion name and loudspeaker trade mark symbol, and has also gained a pilot light. The brightly polished front panel has been dispensed with in favour of brushed aluminium, a Hi-Fi "separates" equipment finish that was in vogue in the 1970s. Instead of standing on rubber feet it has gained a matching teak panel to the base of the cabinet. The ED14 cabinet is 19x13x7.5cm which is of similar, but not the same size as the ED10. The serial number of the ED14 shown is GA2845, and is fully branded as Celestion, the only mention of Dinosaur now being the "made under licence" details under the patent application. Internally the two examples utilise the same printed circuit board with no obvious component differences. The wand which would be placed around or inside the television is shown in fig 5, the ED10 version on the left, and the ED14 version on the right. The ED14 wand is a little larger, which suggests that early models may have already exhibited difficulties picking up the signal.

The rear panel of both models is similar, and is shown in fig 6. The upper pair of phono sockets is the output from the Telefi device, and is connected to the amplifier aux input or similar. The lower pair of phono sockets are provided for owners of amplifiers without a separate aux input. In these circumstances the owner would route the output from their tuner into the Telefi unit, and the output from the Telefi unit (appearing on the upper pair of phono sockets) is then routed to the tuner input of the amplifier. When the Telefi unit is switched off the owner's tuner is switched through to the amplifier as usual. When the Telefi device is switched on the output from the tuner is interrupted, and the signal from the Telefi appears on the tuner input of the owner's amplifier. Also located on the rear of the Telefi device is the variable resistor for controlling the output level of the Telefi. Finally there is an earth connection which may be utilised if hum proves to be a problem.

The internal construction of the Telefi is very neat; all components are located on a single printed circuit board. (Fig 7). All the components are annotated on the upper side of the P.C.B for easy reference to service data, though I have not been able to find any original service information so far.

Having tried the device, I have to report the performance is poor. It is clearly working, as movement of the wand varies the received signal. Unfortunately the received signal is drowned in mush and white noise. It was possible to discern the picked-up sound from Telefi, but the level of signal picked-up was never enough to defeat the background noise level. Having not used the device during its retail period in the 1970s, I am unable to say if it performed better then, but I have spoken to a couple of owners of the devices, and both reported that it was very difficult to pick up the signal with the wand. One owner said it worked okay once the wand was actually nestling within the television set. The earliest television I tried the device on was a 20" colour receiver from 1981, it could well be that IF strip screening had improved in the 10 years since the device was available in the early 1970s. Additionally, these days there is far more interference from the increased number of devices to be found around the home incorporating switch-mode power supplies and similar.

The device was reviewed by The Gramophone magazine, and the reviewer seemed quite impressed with the quality. In fact the review actually undertook some reasonably exhaustive testing to gauge the performance of the unit. The unit was tested at a laboratory in the Polytechnic of North London, though there were problems finding a suitable signal source. However, it was measured that the output of the Telefi between 40Hz – 20KHz was within +/- 6dB. Providing the signal to the pick-up was in excess of a few millivolts, the limiting circuitry produced a noise free output.

The presumption must be that the unit worked well at the time once the wand was suitably positioned, and would have provided a much enhanced listening experience especially for music programmes etc. The Telefi was not cheap though, retailing at around £29. There seemed to be no real competitors for this market, and few of these units seem to survive. Now digital broadcasting is upon us, (unless an analogue modulated signal is fed into the television), the Telefi will not even have a signal to pick up. It is a measure of progress that Celestion incorporated the term "Hi-Fi" into the brand name of the device, when the mode of operation involved waving a wand about to locate best reception, then affixing the wand in that position with double sided tape. But one can't but help admire the innovation and inventiveness of the Telefi.

Vidor CN431 Marquisa restoration - Two into one WILL go

by Stef Niewiadomski

I bought a Vidor CN431 Marquisa on eBay about four years ago but hadn't got round to restoring it until I found an identical model recently, in poorer condition, for an even cheaper price than I paid for the original set. I thought it was about time I tackled the restoration as having two apparently complete radios of the same model should make the restoration of one of them a relatively straightforward task.

Figure 1: Front view of the restored CN431 Marquisa.

The CN431 isn't particularly rare but the 'upright' Vidor portables don't come up for sale as often as the attaché-case models, so I presume they sold in smaller numbers. I hadn't restored a battery / mains portable before and so I thought it would be an interesting exercise and would result in a useful radio. I think it's a good looking radio in its light green and cream case, see Figure 1. Before I dive into the restoration of the radio I thought it might be interesting to give some background to the company itself and put the CN431 into the context of the Vidor radio range.

Brief History of Vidor

Vidor was formed in 1934 by Thomas Noah Cole, whose experience in the radio and battery industry included forming Lissen and serving as its Managing Director after the company had been sold to Ever Ready in 1928. He had received more than £1m in the take-over on condition that he did not form any company competing with Lissen's - and hence Ever Ready's - business. With the money he bought Burndept which had a long history and a strong name, but was not doing well from a business perspective. Cole also formed a new company, Vidor, at the same time. The Vidor name was derived from the Christian names of the founder's two daughters, Valerie and Denise, and his wife Rebecca. The Vidor-Burndept venture was set up in the long time empty Vickers-Armstrong factory in Erith, Kent. The address of the company - Burndept Ltd, Light Gun Works, Erith, Kent – betrayed the history of the site.

At first the Burndept name was used on the radios they produced, and Vidor exclusively on batteries. While the Burndept name continued to be used pre-war for mains-operated and battery sets, from 1936 onwards Vidor-branded radios were also produced at the factory in Erith. All radios were numbered in the 2xx series with no duplication of the Burndept and Vidor identity numbers, though some sets, such as the three-valve battery-operated Burndept 251 and the Vidor 253, used identical chassis. The last Burndept sets seem to have been designed in about 1940, after which all sets were produced under the Vidor name.

In deference to the agreement with Ever Ready, Cole ran Burndept-Vidor 'at arm's length' by appointing Mr R P Richardson

as managing director whom he secretly met at out-of-the-way cafés and instructed him in the way he wanted the business to precede. As you would expect this frustrated Cole and in 1935 he appealed against the restrictive agreement with Ever Ready and an out-of-court settlement was achieved, though relations between the two companies were always strained. Cole was now master of his own destiny and formally took over the reins of the company.

During the early years of the war there was a chronic shortage of radio batteries. It's estimated that at that time something like one third of all houses in the UK did not have mains electricity, hence the importance of batteries for domestic radios. The large Vidor battery factory in Erith was destroyed by enemy action on 21 April 1941, exacerbating the national shortage. The replacement factory was located in a former jute mill in Dundee, Scotland - considered to be safe from further damage, and this factory continued to be a significant producer of batteries for many years. Eventually another battery factory was built in South Shields.

The company boomed after the war, driven by the demand for portable radios, and by 1953 had a total workforce of over 3,500. Vidor could of course provide the radios themselves and then benefit from the ongoing business of the batteries, in competition with Ever Ready (who of course also produced radios) and other battery suppliers. Vidor didn't just restrict their battery business to domestic radios and torches; they also supplied batteries for professional and military uses.

Vidor also produced some mains-only radio models and even dabbled for a short while in the 1950s satisfying the booming demand for TVs, with their TeleVidor set. The company also produced at least one radiogram - the 1936 model 217, based on the three-valve model 216 TRF radio chassis.

Decline and Fall

In the late 1930s Thomas Cole had moved with his family to the United States and the day-to-day business had been run very well by Mr Richardson, who owned 10% of the company's shares. In early 1954 Cole returned to the UK and resumed control of the company, immediately starting to upset the management with his dictatorial ways. He forced the resignation of Richardson and he became even more eccentric as he micro-managed the business. Vidor's sales declined and eventually radio production stopped in 1960. Cole tried to sell the battery business to Ever Ready, but this was not attractive since Vidor bought most of its materials from Ever Ready anyway, and relations between the two companies were still strained. In the end the company was sold to the Royston group who needed a specialised Vidor battery for one of its products, but this company called in the receivers in 1968, at which point the Vidor brand was acquired by Crompton Parkinson. Thomas Cole died in 1972 but the Vidor brand lived on for many more years, eventually being sold to Ray-O-Vac in 1989, and is now believed to be dormant. Having been a well known and well respected brand for many years perhaps the Vidor name will reappear on batteries at some time in the future?

Figure 2: An advert of the Vidor portable radio range from the November 22 1952 issue of Illustrated magazine. This is pre-Marquisa: the CN421 Gala shown in the advert was introduced in August 1952.

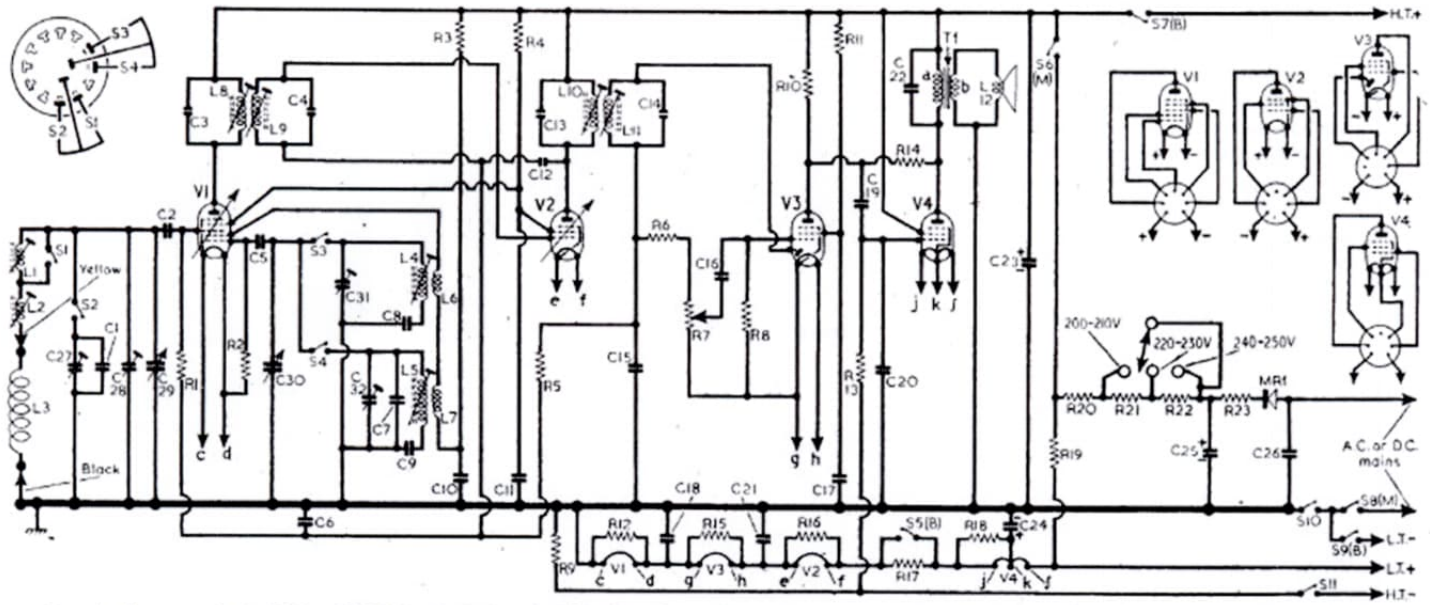
The Vidor Radio Range

Starting with the mains-operated CN349 Chanson, introduced just after the war, there was a tendency to give Vidor radios names as well as model numbers. The names tended to evoke relaxation (for example Riviera, Lido and Regatta) or prestige locations (Henley, Royal Ascot) or female 'genteel' ladies (Lady Margaret, Lady Anne, etc). Since he'd incorporated his wife's and daughters' names when dreaming up the company name perhaps Thomas Cole asked his wife and daughters for their opinions on how to make his radios more attractive to female buyers? Whether or not the majority of buyers were female is lost in the mists of time.

Although the Vidor company had been producing mains-operated radios since 1936, the CN351 Riviera was its first 'all dry' battery portable radio, produced in 1945. The Riviera name was re-used in several subsequent models, including the CN444, the final radio to be produced by Vidor. Figure 2 shows an advert of the Vidor portable radio range from the November 22 1952 issue of Illustrated magazine. This magazine was somewhat up-market, containing frequent features on the royal family, and maybe indicates the demographic that Vidor was aiming at. This period is pre-Marquisa (the Gala was introduced in August 1952) but shows how Vidor offered attaché-case and upright radios, and pure-battery and mains/battery technologies, at the same time, hoping to fulfil any and all the needs of someone looking for a portable radio.

I'm not sure where the 'CN' prefix to the model numbers comes from – it's possible that it stands for 'chassis number'? If readers have opinions on this, I'd be interested to hear them.

Vidor produced only one model of an AM/FM portable radio, the CN436 Vanguard, released in September 1957. It was valve-based using multiple DF97s, a DAF96 and a DL96, and a



Circuit diagram of the Vidor CN431. Switches S5-S9 close for mains or battery operation as indicated by the suffixes (M) and (B) respectively. The waveband switch unit diagram is inset in the top left-hand corner of the drawing.

Figure 3: Circuit diagram of the CN431.

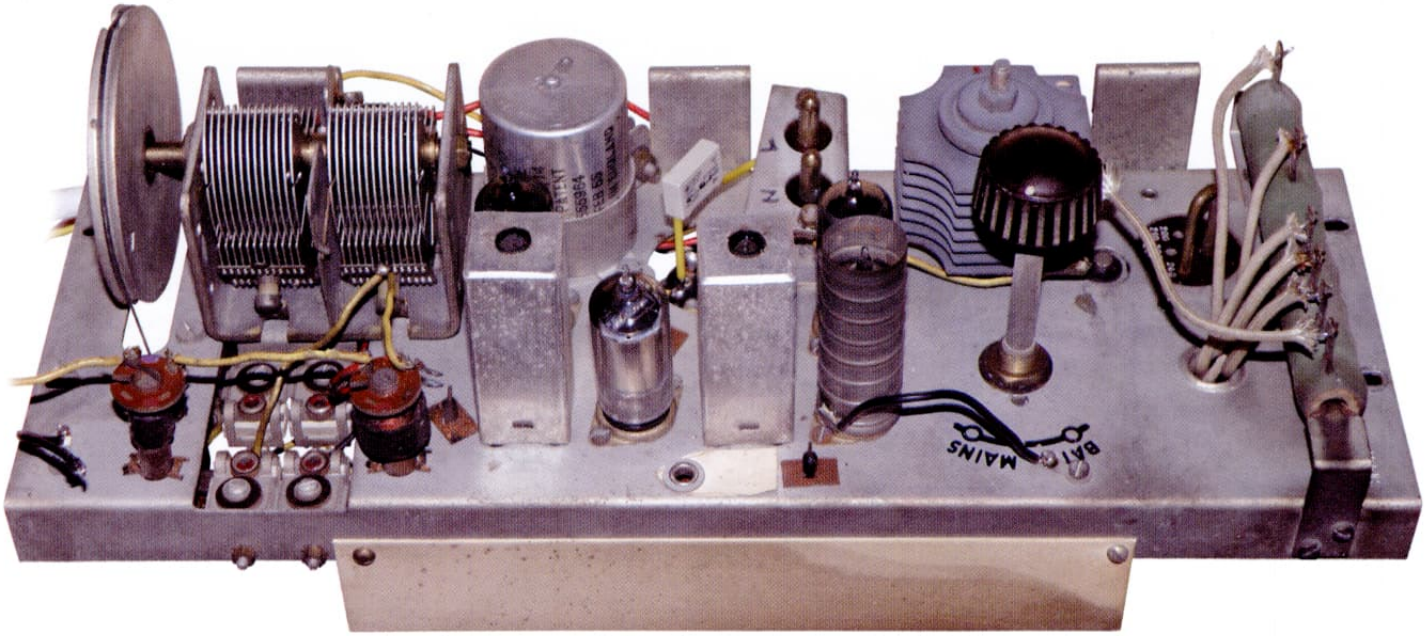


Figure 4: Top view of the chassis removed from the cabinet.

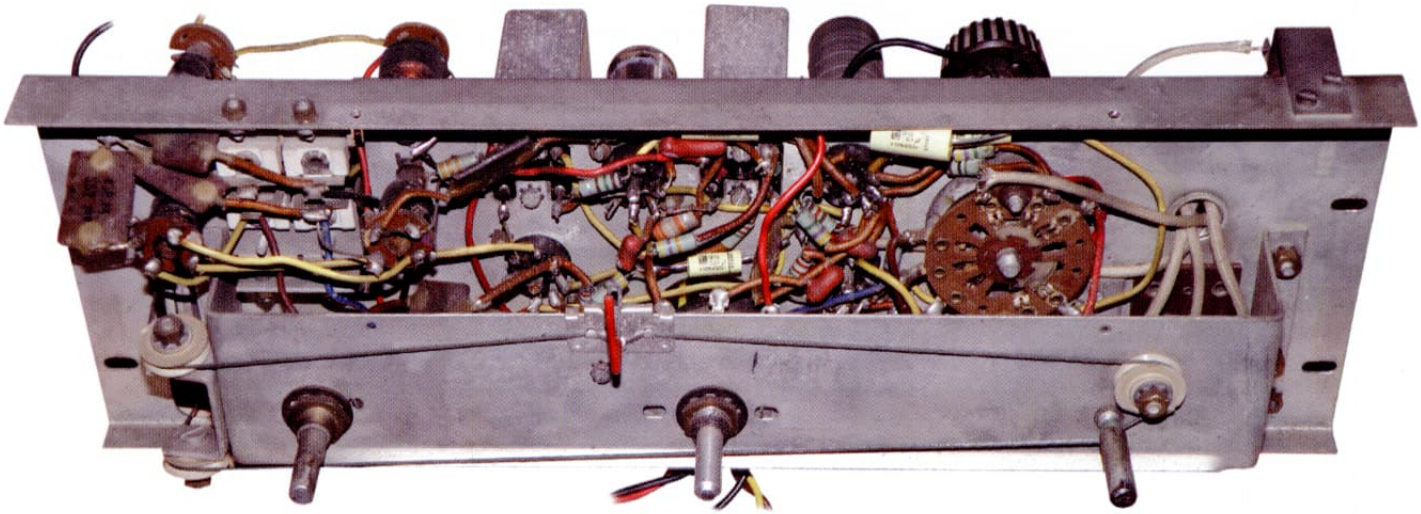


Figure 5: Under-chassis view showing the restricted access to components under the plate mounting the volume control, bandswitch and the shaft that drives the tuning mechanism.

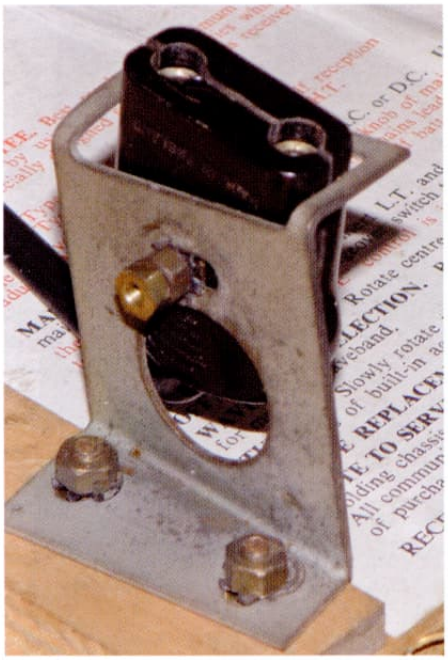


Figure 6: The mains auto-removal device fitted into the lid which disconnects the internal plug when the lid is opened, hence isolating the radio from the mains. You may also be able to see part of the useful instruction label glued to the inside of the lid.

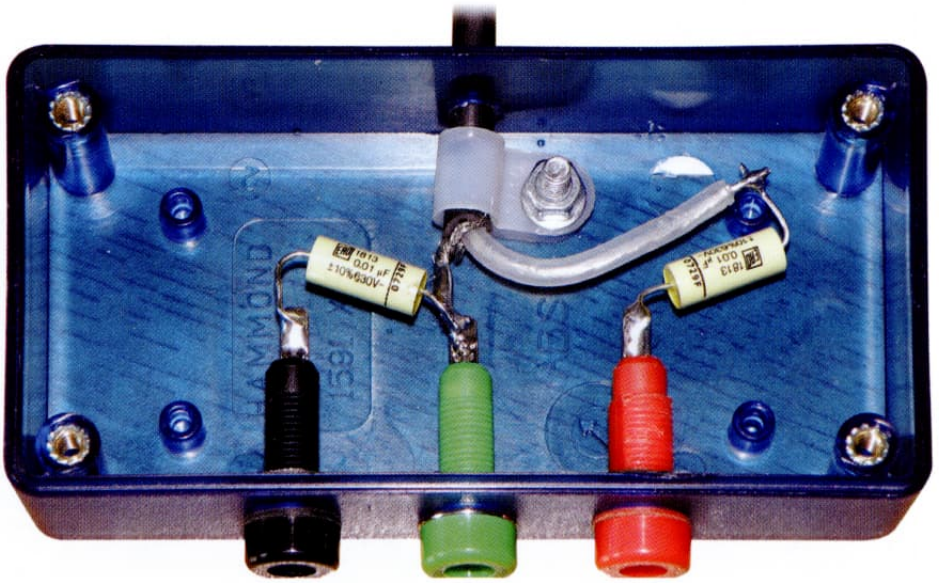


Figure 7: The isolation box I made to AC-couple the signal and ground sides of my signal generator via 630V 0.01µF capacitors, and hence isolate the neutral-connected radio chassis from the signal generator's mains earth.

couple of 0A79 germanium diodes in the FM ratio detector stage.

As far as I can tell Vidor only produced one transistorised radio, the CN440 Gem, released in February 1958. The set covered medium and long waves, and used six Ediswan PNP germanium transistors plus one diode built on a printed circuit and with a ferrite rod aerial, so Vidor were on the right track with technology trends. A Vidor T6050 6V battery was specified in the service sheet. The radio used the same case as the valve-based CN439 Vagabond released a few months earlier. Sadly the Vidor company folded before it could produce another transistor radio, which is a shame because it was the transistor era that caused the portable radio market to really boom.

The company was clearly still hedging its bets as regards valve technology as three more valve-based portables were released in 1958: the CN441 Lady Elizabeth in May 1958, the unnamed CN442, and the CN444 Riviera in July 1958. And that appears to be the end of the line as far as Vidor radios are concerned. It's perhaps unfair to wholly blame Thomas Cole's eccentric ways for the demise of the company: it was the arrival of cheap transistor radios from the Far East in the early 1960s that killed off many British radio manufacturers. Maybe it simply affected Vidor slightly earlier than the rest of the industry.

Vidor continued to make batteries and went through many acquisitions in the 1960s and 1970s, and acquiring companies still used the Vidor brand for batteries and torches. Radio production at its arch-rival Ever Ready lasted just a few years longer than it did at Vidor with production of the final models stopping in 1968. As at Vidor, Ever Ready then concentrated on producing batteries.

Schematic of the CN431

Figure 3 shows the schematic of the radio. The circuit is a medium/long waveband, four valve plus metal rectifier superhet with an IF of 470kHz. A useful description of how this circuit works was given in 'Another Look at a Vidor 'My Lady Anne' CN430 Portable from 1955' by Gary Tempest, published in The Bulletin for Summer 2009. The CN430 could operate from the mains (AC only, as it had a mains transformer driving a full-wave metal rectifier) or from batteries of course, but the method of operation of the filament supply and the radio section is very similar to the CN431. These two models appeared within a month of each other (the CN431 was launched in February 1955) and so it's not surprising that their circuit designs are similar.

One significant difference between the CN430 and the CN431 is that the former uses 1.4V (apart from the audio output valve) 25mA filament valves (DK96, DF96, DAF96 and DL96) whereas the latter uses the 1.4V 50mA series of DK92, DF91, DAF91 and DL94. For portable radios that were also designed to operate from the mains (such as the CN431) Vidor's designers connected the valve filaments in series so that they operated from a 7.5V LT supply. This meant that in mains-mode only 50mA of filament current had to pass through the rectifier and dropper network, and be smoothed to DC. For purely battery-operated radios they tended to connect the filaments in parallel which called for a 1.5V LT battery, which presumably dropped to close to 1.4V under load. The valve producers had ensured that their audio output valves (DL94, DL96, 3V4, etc) had centre-tapped filaments so that they could be operated at 1.4V or 2.8V.

Disassembly of the two Radios

To get access to the two chassis I needed to remove the six push-on knobs, hopefully without breaking too many of them. It's interesting to note how many hopeful restorations fail at this first stage when stubborn knobs won't come off their shafts or they get broken in the process. I was lucky and only one knob resisted all attempts at removal until it shattered into several pieces of cream coloured plastic. I decided I'd lubricate the knobs with Vaseline before re-fitting in the hope that some future owner of the radio wouldn't have problems removing the knobs.

Once the knobs were off the next step was to remove the four nuts holding the chassis into the case, unsolder the two frame aerial connections and the three leads to the output transformer, and lift out the chassis having pulled the handle to its extended state. I reconnected these five leads with long wires so I could work on the chassis and still have the frame aerial and output transformer connected. Figure 4 shows a top view of the chassis removed from the cabinet.

Access to components under the chassis is somewhat restricted by the plate mounting the volume control, bandswitch and the shaft that drives the tuning mechanism. This plate also guides the tuning pointer and mounts the pulleys for the dial cord, as shown in Figure 5. When I took this photo I'd already removed the L-shaped backing plate to the dial pointer which gives a cream coloured background to the red pointer when viewed through the dial.

Pre-Switch On Checks

I intended to get the radio working on mains and so I made sure the mains/battery switch was set to the mains position. The knob on this switch looks quite old-fashioned - even for the mid-1950s – so maybe the knobs

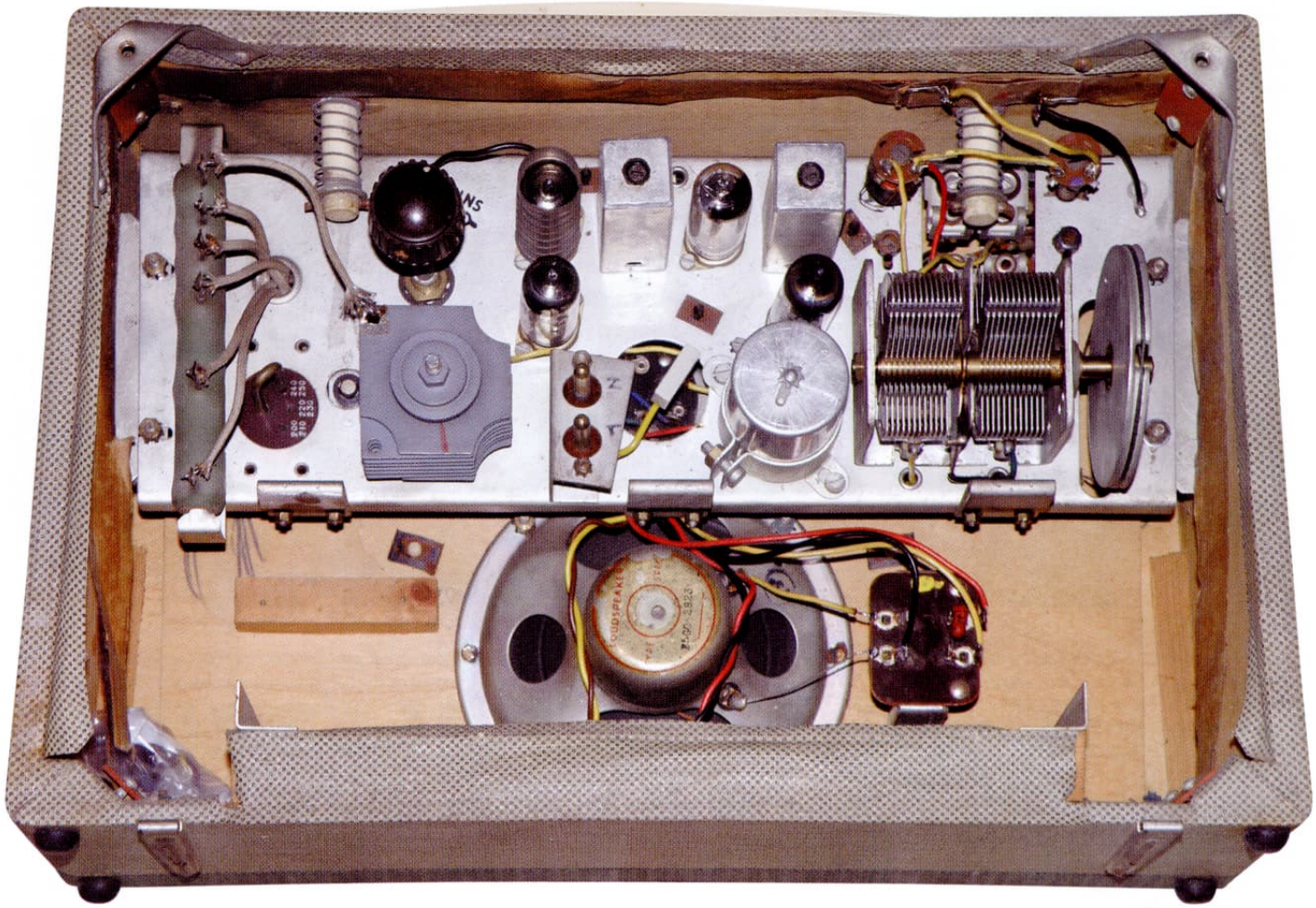


Figure 8: Rear view of the chassis re-assembled into the case. The spring-loaded ends of the handle can be seen.

used were stock from an older Vidor model? To eliminate any risk of short circuits while I worked on the chassis I insulated the plugs on the ends of the HT and LT battery leads by taping on small plastic bags. I think this is 'friendlier' than cutting off the plugs as it keeps the option of running off batteries should this be wanted in the future.

I started by checking some key parts of the power supply: the R21 and R19 sections of the mains dropper were open circuit so I replaced this with the component from the 'donor' chassis, all sections of which measured very close to their nominal values. The 32µF+32µF HT smoothing capacitor (C23/C25, dated February 1955) had no bulge at its contact end and so it looked OK. To be on the safe side I changed C26, the mains interference suppression capacitor, for a 0.047µF 275V AC class X2 capacitor.

In the service sheet MR1 is specified as a Westinghouse 14B261 half wave rectifier, rated at 210V RMS at 70mA. The 210V voltage rating looks rather marginal for modern mains to me, but my rectifier seems to have survived so far. Maybe this component was uprated at some time. The design of the power supply means that all the filament current of 50mA plus the HT current of about 14mA passes through the metal rectifier, so the current rating of 70mA doesn't leave too much to spare.

Before applying mains power I thought it would be a good idea to check which side of the mains the chassis was connected to. Hopefully you can see from the top chassis view the arrangement for connecting the mains through a plug/socket into the power supply. There's an auto-mains removal device fitted into the lid (see Figure 6) which disconnects the internal plug when the lid is opened. I presume this was to cover the eventuality where the user opened the case to change the batteries while the set was still plugged into the mains, and ran the risk of encountering a live chassis and/or high voltages on the rectifier and dropper resistor terminals. I think we can assume that a service man would be well aware of the potential dangers, but it makes sense to protect the public.

To my surprise the way the plug was orientated and the way the 13A mains plug was wired meant that the chassis would have been live had I plugged the radio in without checking. I replaced the mains lead and plug (fitting it with a 1A fuse) and made sure that the radio now had its chassis connected to mains neutral, as the designers had intended.

The wooden case, plastic control knobs (with no grub screws) and plastic handle ensured that users of the radio couldn't come into contact with a live chassis while operating the radio.

Beware the Mains On/Off Switch

Many radios with no mains transformer only have an On/Off switch in the neutral connection to the mains. Close examination of the CN431 schematic shows this to be the case for this radio. This was often done to reduce the cost of the radio, so that only a low voltage, single-pole switch was needed. In the CN431the reason is that the On/Off switch needs to disconnect the negative side of the LT (via S10) and HT (via S11) feeds from the battery, as well as one side of the mains. Since the negative side of the LT is connected to the radio's chassis, then the neutral side of the mains that is switched on and off by S10. This has an interesting, and potentially dangerous, side effect: when the radio is switched off, there is a path from mains live through the power supply components to the chassis.

Therefore even if you have taken great care to ensure that the chassis is connected to neutral when the mains switch is in the On position, the chassis now becomes connected to mains live when the radio is switched Off. From a user point of view this is safe as long as the case is closed and the knobs are in place. If you are servicing the radio with the case open, you must beware of this. The solution is: never rely on the mains On/Off switch to isolate the radio from the mains – always unplug the radio from the mains before touching the chassis when the radio is switched off. This is the strange case where the chassis of the radio is safer to touch when it's switched on than when it's switched off!

Directly Heated Cathodes

A radio using valves with directly heated cathodes (where the filament is the cathode of the valve) has to power the filaments with a DC supply whether it is operating on batteries or from AC mains. This means that the filament current has to pass through the same rectifier as the HT current and has to be smoothed into hum-free DC, just as the filaments would 'see' when the radio is operating from batteries. In the CN431 the metal rectifier MR1 rectifies the mains supply, C25 provides initial

smoothing for the HT and filament supply, and then the feeds are split with C23 further smoothing the HT, and C24 smoothing the LT.

This contrasts with AC/DC-type radios using U-series valves which have distinct cathodes which are indirectly heated. These radios run their heaters from AC and the design of the valve itself prevents this AC from causing mains hum in the audio produced by the radio.

Though I had no reason to suspect it was faulty I replaced C24, the filament decoupling electrolytic 200µF 6V capacitor (a BEC component, dated December 1954) with a modern 220µF 100V electrolytic. Not surprisingly the new component was smaller than the old one so there was no problem fitting it into the vacated space. I was then sure that the filament supply was being filtered of mains hum effectively.

With these 1.4V 50mA valves it's difficult to tell if the filaments are actually passing current because they don't get particularly hot and it's not easy to see a glow. I therefore thought it was worthwhile to remove the valves one-by-one before switch on and measure the filament resistance cold to check continuity. The valves had a cold resistance of typically between about 6Ω and 11Ω, so I was happy that the filaments were good. 1.4V at 50mA equates to 28Ω and so you can see how much the resistance increases when such a valve gets hot. The DL94 is rated at 2.8V at 50mA and so its cold and hot resistances are about double that of the 1.4V valves.

All the resistors I could easily probe measured to be pretty close to their nominal values. The speaker looked OK but I thought I'd check the output transformer before applying power. The primary winding was open-circuit and so I changed the transformer for the one on the other radio, which tested OK.

The Cabinet

On one of the cabinets the cream plastic handle was broken where it entered the wooden cabinet. This cabinet was also in slightly worse condition generally than the other and so the choice of which cabinet to use in the restored radio was easy to make. I gave this cabinet a gentle wash with soapy water and removed lots of accumulated dirt.

The cabinets are wooden, covered externally in a Rexine-like material, and both my Marquisas were green and cream, though I've heard that there may also have been a blue and cream colour combination. The knobs, handle and grille are all made of a cream coloured plastic. The dial is colour co-ordinated with the case.

Switch On

I was fairly confident in this stage that nothing was going to go bang and so I connected up the mains via a variac, switched on and slowly increased the mains voltage. The valves warmed up within a few seconds and I could hear a faint mains hum coming from the speaker. However I couldn't detect any stations as I tuned around the medium or long wavebands. I replaced all the Ducon / Dubilier / TCC HT and screen grid decoupling and filament by-pass capacitors. The originals were rated at 350V (overkill I know) and I generally used BVWS 630V (even more overkill) 0.1µF capacitors, and for C6, the AGC decoupling capacitor, a 0.01µF capacitor. I measured the voltages around the valves and they were close to the values given in the service sheet.

No matter what I tried I still couldn't get any useful audio output from the chassis. I noticed that the tuning slug of the first IF transformer was quite a bit further out of its can than the one on the second IFT, so I wondered if someone had been fiddling with the core and left it off-tune. I connected the modulated output from my RF signal generator to the anode of V1 and tuned it to 470kHz. With the chassis of the CN431 connected to mains neutral I couldn't connect the ground side of the signal generator directly to the radio's chassis as this would have tripped my house's residual current device (RCD, sometimes also referred to as a residual current circuit breaker - RCCB). I therefore AC-coupled the signal and ground sides from the signal generator via BVWS 630V 0.01µF capacitors, via a useful isolation box I'd made up (see Figure 7). The capacitor in the signal lead forms a DC block of the HT voltage on the anode of V1. I would assume that the signal generator's output is AC-coupled, but I wasn't sure what the voltage rating of any capacitor used might be, hence the 630V capacitor to be on the safe side.

A 0.01µF capacitor has a reactance of about 30Ω at 470kHz, whereas at 50Hz its reactance is greater than 300kΩ. Such a value wouldn't conduct enough current to trip the RCD. I used high voltage rated capacitors in case I used the isolation box on a radio where the chassis was connected to the live side of the mains.

There was a faint audio tone output and as I adjusted the core of the IF transformer the tone got much louder. I moved the injected signal between the two IFTs and peaked them both at 470kHz. Once it was disconnected and I tuned the radio around on long and medium wavebands stations were evident, but I thought still not at the strength I'd expect. I then tuned the radio to a station at the high frequency end of the medium wave (which is where I listen most) and adjusted C28, the medium wave aerial trimmer, for maximum signal strength. I then switched to long wave, tuned in Radio 4, and adjusted C27, the long wave aerial trimmer, again for maximum signal strength. Making these adjustments made a big difference to the sensitivity and audio output on stations that I tuned to.

I used a GWInstek model GRG-450 signal generator which covers 100kHz-150MHz in six ranges on fundamentals, with a smooth slow motion drive. It has the neat feature that it has a frequency counter output socket which makes displaying the exact frequency on an external counter very easy. These generators come up for sale on eBay occasionally and I think are very good value for money.

Now that I had a working chassis I could swap the two sets of valves to test them: all the valves worked OK in the working set except for a Mullard DK92. On both chassis there was a grounded metal screen fitted to V3, the DAF91. It didn't seem to make too much difference whether it was fitted or not, but I left it in place. The two chassis had a mixture of D-series valves and their equivalents beginning with the digit '1' or '3' (for the audio output valve). The final valve line-up I used in the working set was: Mazda 1C2, Brimar 1T4, Brimar 1S5 and Mazda DL94.

Figure 8 shows the chassis mounted back in the case. This gives a good view of the audio output transformer and the loudspeaker, and the available space to accommodate the batteries. The Marquisa is fitted with a respectable 5-inch diameter Celestion loudspeaker. The DL94/3V4 audio output valve is rated at only 270mW output power: this doesn't sound like much but I was pleasantly surprised as it was more than enough in most listening situations. On strong stations like Radio 4 and Radio 5 Live it was only necessary to have the volume control at less than half way.

Conclusions

Researching the history of Vidor revealed a company that was very successful during the valve era, but didn't make the transition into transistor portables in the late 1950s. This was exactly when portables became even more in demand by teenagers eager to listen to pop music, away from their parents. Of course this also corresponded to the time when cheap imports from the Far East started to impact UK radio manufacturers badly. The Vidor name survived longer, on batteries, and it wouldn't surprise me to see the name revived sometime in the future.

I was pleased that I finally had a working radio, giving good volume on many medium and long wave stations, safely powered from the mains. Having a 'donor' chassis and cabinet helped a lot but in the end I hadn't done too much damage to this chassis, its set of valves (apart from one) was OK and its case was still in fairly good condition. So maybe I'll look around for the missing bits and get this chassis working as well.

Useful References

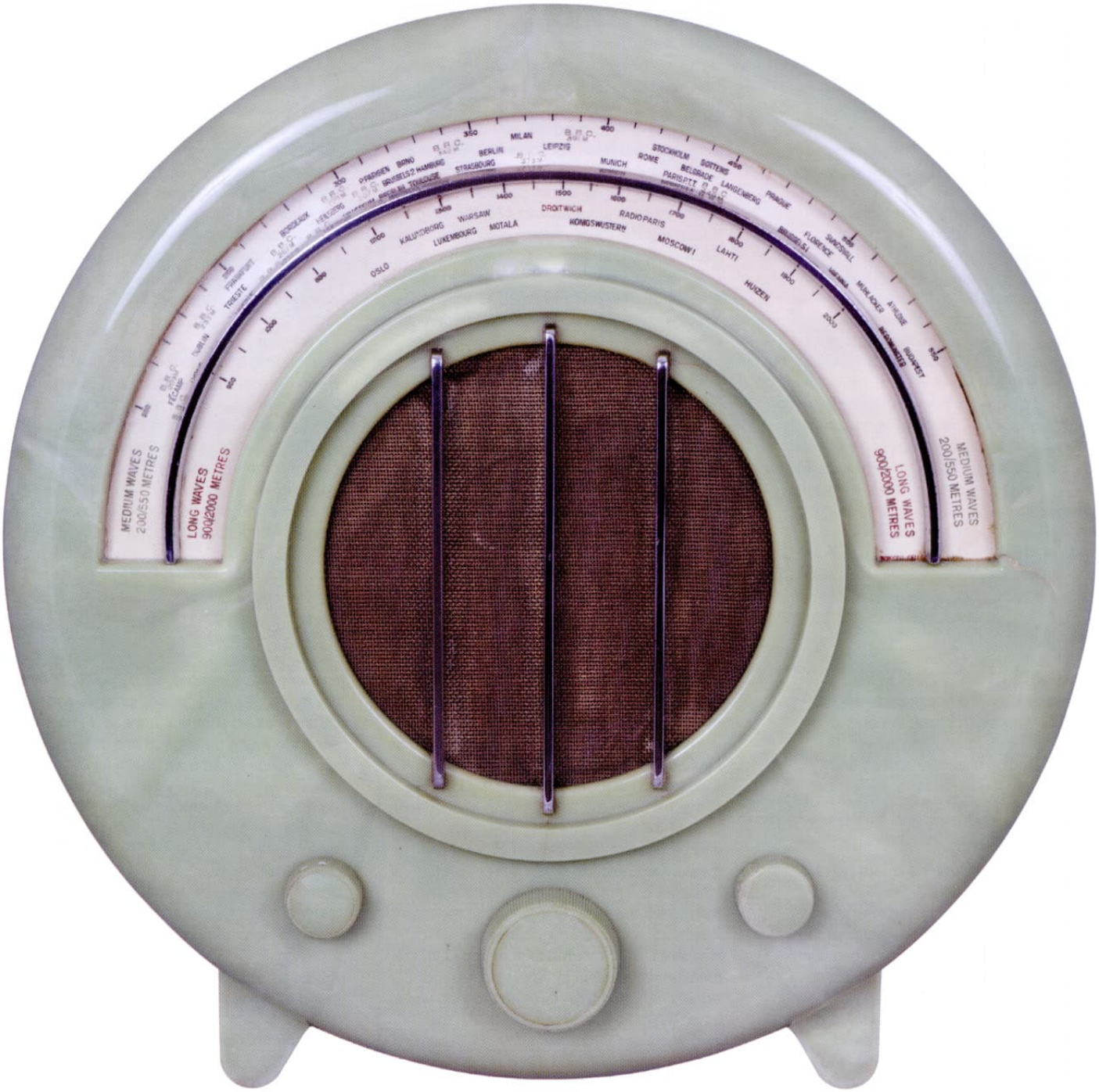
Some interesting facts about Ever Ready and Vidor can be found at: www.portabletubes.co.uk/sitefiles/pthistory.htm

A brief timeline of Vidor's history can be found at: www.gracesguide.co.uk/Vidor

More information on the history of Vidor can be found in 'The Setmakers – A History of the Radio and Television Industry' by Keith Geddes, in association with Gordon Bussey. Published by BREMA in 1991.

'Attaché Radios' by Mark Johnson, published in 2005 by the British Vintage Wireless Society is an excellent book on the history of this style of portable radio. The book is a vast collection of colour pictures of these radios and advertising material, and many useful facts and figures. One interesting fact is that the range of miniature-B7G valves used in attaché radios, and probably the vast majority of other portables, consisted of only eleven DK/DF/DAF/DL types (plus equivalents of course). To me this shows great restraint by the valve manufacturers not to produce numerous variants of the same basic valves.

Five green Ekcos by Carl Glover



The green Ekco, which was previously on sale at Sothebys in 1997 but failed to meet its reserve

In recent weeks a green Ekco AD65 has surfaced via the internet, announcing that it will be available via auction soon.

An email to the owner yielded a visit to the set in north London and the chance to take some very detailed photographs. Whilst there, he was able to inform me of the set's history. It was bought by a man by the name of Alf Stokes from *'Janes and Adam'* of East Finchley – a small shop similar to Currys in that it sold a wide variety of electrical goods. The set was given to the current owner by Alf's widow as he had always admired it greatly. He has now owned the set for approximately forty years.

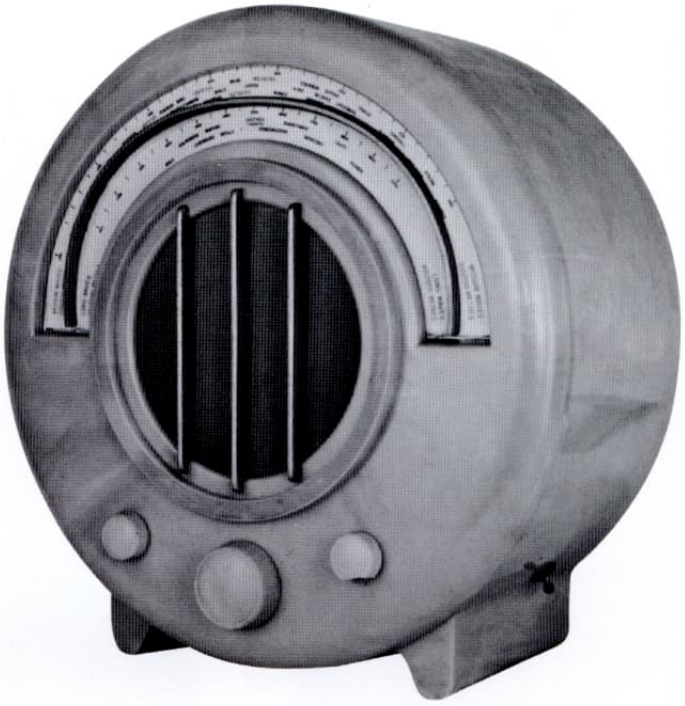
At a time when money was required, he placed it for auction at Sothebys but it failed to meet the reserve. He wishes to sell it now but would be happy if it were to be purchased by the British Vintage Wireless and Television Museum in West Dulwich. I wholeheartedly agree with this idea and hope that sufficient funds could be found to make this happen, it will be a boon for the museum and certainly an incentive for more visitors.

Whilst photographing the set, the owner enquired how many green Ekcos I had seen. I answered that I had seen four others and had photographs as evidence but had heard of others - I tend to err on the skeptical side when it comes to hearsay, though I am sure that there are a few more in various states of condition.

All sets seen so far display the usual cracks and crazing due to a mixture of age, heat and a less than durable cabinet material. In certain

The author with the Ekco at Academy Auctions, 1993

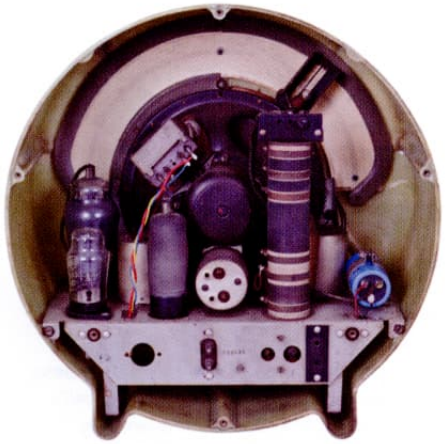
Peter Sheridan's green Ekco, which came from Christies auction house in 1995



The Ekco belonging to an acquaintance of Roger Grant, with damaged volume knob

Below: Clive Masons green Ekco, purchased from *On the Air*, Hawarden, Chester

Below: The late Harry Brown's green Ekco, which is now believed to be with one of his sons (note incorrect knobs – black AD76 ones painted with gouache for photograph)



Inside the set showing the usual replacement parts

cases this is as good as it gets, and having owned several green AWA Radiolettes in the past can testify that has been the case too. The north London Ekco has very clean cracks which do not have dirt ingrained in them. Throughout its life it sat upon a sideboard, has been dusted regularly and never suffered the ignobility of a few years sitting forgotten in a shed, garage or attic. Getting dirt out of Urea Formeldehyde cabinets is not easy and can often contribute to further damage if not done properly (especially if it involves bleach) – it is probably better not to do anything at all if it happens to be quite a rare set. Most coloured AD65s seem to have a crack on the corners of the dial window and hairlines through the cabinet adjacent to the supporting moulded ledges for the chassis.

Values of these sets vary wildly. Harry Brown paid only a few hundred pounds for his set from a small shop in Catford in the 1980s, whereas Peter Sheridan's Ekco cost him £3,375 at a Christies auction in 1995. Clive Mason paid more than Peter Sheridan as his was from from a reputable dealer who had to pay a substantial amount for the set in the first place. The infamous Academy Auction set fetched £17,500 but was never paid for, so the set was returned to the seller. How or why this occurred is a mystery and there are several theories that get aired amongst various Ekco collectors occasionally.

Hopefully, this set could end up on display in the BVW&TM in West Dulwich for all to enjoy for many years to come. Fingers crossed...

Ralph Judson (a.k.a. Ralph Stranger) a short biography by Lorne Clark

Writing under the pseudonym of Ralph Stranger, Ralph Judson Grad I.E.E, F.R.A.S, M.B.E. published numerous wireless, television and scientific works including 'Wireless the Modern Magic Carpet' and 'The Mathematics of Wireless'. A successful and highly respected author of technical works, Ralph also enjoyed success as a writer of science fiction. Following a time at C.F. Elwell and R.C.C. he finally joined the B.B.C. where he had a highly successful career in advertising, spanning some 29 years. An expert in Jiu Jitsu, he also trained WWII British soldiers in the art of unarmed close-combat.

Ralph Judson

Lieutenant Ralph Judson demonstrating the back knee throw, *Manchester Evening News*, Friday 4th February 1944. Photo reproduced with the kind permission of the *Manchester Evening News*

Early Life

Ralph Judson was born Raphael Moishe Neovitch Judkevitch (Judevitch) in St Petersburg, Russia on 25th August 1892 into a wealthy family. The son of an export merchant, he received an early classical education in his native country, attending the Imperial Russian Gymnasium (a semi-military college) situated in Viatke, Northern Russia. In exchange for lessons in the Greek and Roman styles of wrestling, a Japanese instructor had agreed to teach Raphael Jiu Jitsu, a skill which would serve him well later on. His father, Noach Judkevitch, then sent him on a 'Grand Tour' of Europe, visiting Germany, Belgium, Austria-Hungary, Switzerland and France. During this tour he studied languages and science at various European Universities and, in his spare time, took a course in business training. Whilst in France he attended L'École d'Électricité, part of the University of Nancy, where he studied electrical theory.

Arrival in the UK

Raphael came to the UK at the start of WWI to study the City & Guilds of London Institute 'Design of Electrical Machines' course at London University. After 2 years study he volunteered as a Pioneer for the Signals branch of the Royal Engineers (regimental no. 259584) where he attained the rank of Sergeant and was an instructor at GHQ Signal School for officers. The war had interrupted Raphael's engineering course and so, following de-mobilization in 1919, he resumed his studies, obtaining Honours in the final examination.

He was, by all accounts, a loud man with a thick Russian accent and well developed sense of humour. He spoke little of his early life in Russia, always fearful of 'being retrieved'. Men with education and training such as his were considered valuable to the Communists.

Soon after his arrival in England, Raphael met Beryl Bernard Emily Nathan and they were married in 1918. Raphael then adopted the name Ralph Judson and in 1921 his wife Beryl gave birth to a daughter, Joyce Muriel Judson. Ralph and Beryl had three more children: Twins David H. Judson and Sheila W. Judson, born 1925 and June B. Judson, born 1928. Ralph was very fond of his family and enjoyed sharing his love of 'things scientific' with them.

Ralph spoke English, Latin, Russian, French, German, and Scandinavian and was able to understand Italian, Spanish, Serbian, Hungarian and Czech. He played the violin, had a wide knowledge of English, Russian and French (in their original languages) and also Scandinavian literature and had a library of over 4000 books. His wide interest in sports included swimming, rowing, riding, wrestling, skiing, skating, polo and hunting wolves!

Career

In 1921 Ralph became Sales Manager and partner in the firm Dewar and John, Electrical Engineers and Manufacturers' Agents, with premises at 116 Victoria Street, SW1. This enterprise appears to have been very short-lived. A notice appearing in the May 30th 1922 edition of the *London Gazette* declared that the partnership was dissolved on 1st April of that year. The company appears to have been listed just once in the April 1922 issue of the London telephone directory.

In 1922, following the collapse of Dewar & John, Ralph joined C.F. Elwell Ltd. as a draughtsman, later becoming head of the Drawing Office, where he worked on the design of the company's *'Aristophone'* range of commercial wireless receivers. He was later appointed Elwell's Assistant Publicity Manager eventually being promoted to Publicity Manager.

Elwell Receiver No. 53 in an elegant cabinet, from the Martyn Bennett collection. Photo by Lorne Clark

NOTICE is hereby given, that the Partnership heretofore subsisting between us, the undersigned, Gordon Duncan Dewar, William James John and Ralph Judson, carrying on business as Engineers and Contractors, at 116, Victoria Street, Westminster, under the style of DEWAR AND JOHN, was dissolved on the first April 1922. - Dated this 24th day of May, 1922.

GORDON D. DEWAR
W.J. JOHN
RALPH JUDSON.

Ralph's career at Elwell was to be a short one as, in October 1923, proceedings to wind-up the firm were begun. Radio Communication Company Ltd. (R.C.C., Managing Director Major Basil Binyon) were major shareholders in the firm and, under their control, C.F. Elwell continued to trade for a while. In late 1924 Ralph moved to R.C.C. as Publicity Manager, the previous holder of that position, William Ewart Gladstone Murray, having just left to become Director of Publicity at the British Broadcasting Company. Whilst at R.C.C., Ralph wrote three articles about window displays for *The Broadcaster* and *Wireless Retailer.* His designs were featured in the March, April and May 1926 issues.

In July 1926, when R.C.C. was about to be bought out by Marconi, Ralph left to join the B.B.C. (British Broadcasting Company later the British Broadcasting Corporation) as Assistant Publications Manager.

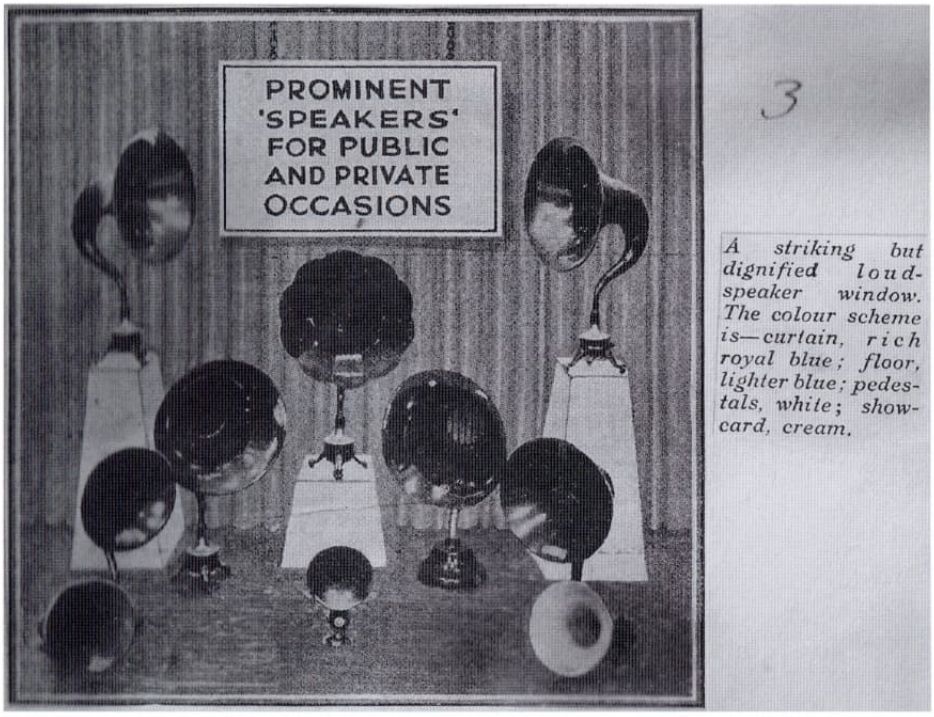
Life at the B.B.C.

Ralph's move from R.C.C. was, in part, assisted by a note that William Ewart Gladstone Murray wrote to Guy Rice, Business Manager at the B.B.C., in July 1926: " ...As a general utility assistant to you he would be invaluable. Binyon thinks highly of him....". In reply Rice writes "I should be very pleased to have him.". A further note from Murray reveals that Ralph started on 21st July 1926 as Assistant Publications Manager, initially for a trial period of 3 months at a salary of £6 15s 0d per week. Normally salaries would have been paid monthly but Murray's note states that Ralph was "... particularly anxious to have it weekly...".

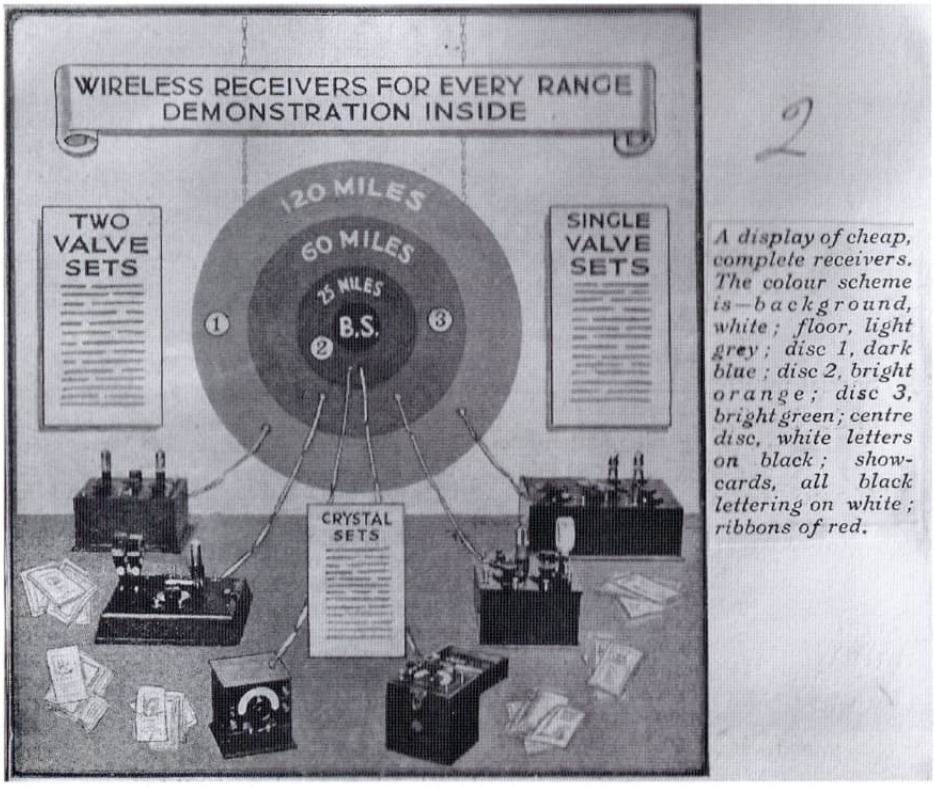
Ralph's move was a wonderful success for him and for the B.B.C. In a letter to him the Director General John Reith wrote "...I depend on you to see that there is secured the maximum possible revenue consistent with the maintenance of reasonable editorial standards.". Ralph certainly did not let his D.G. down!

Up until 1929 the publishers George Newnes had been handling advertisements appearing in the Radio Times. From 1929 on, however, Ralph brought all advertising in-house, not just for the *Radio Times*, but for all B.B.C. publications. A strict policy was adopted to weed out unsatisfactory advertisements, eliminate exaggerated claims and ensure that readers were not let down. Truth and accuracy were key to Judson and, as a result, advertising revenue soared.

Other B.B.C. publications included *The*



Ralph's window display of horn loudspeakers - *Broadcaster and Wireless Retailer,* March 1926 - from Ralph's scrapbook



Ralph's window display of receivers - *Broadcaster and Wireless Retailer,* March 1926 .- from Ralph's scrapbook

Listener and *Radio Supplement*. Radio Supplement had started life on 17th July 1925 as a means of carrying "Dominion and Foreign Programmes". Ralph's first serial "*Mystery of Electricity*" appeared in *Radio Supplement* in November 1928 under the banner "by Ralph Stranger, author of '*Wireless the Modern Magic Carpet*'". The rights to publish this work in Germany were subsequently bought by a German company. Like the *Radio Times, Radio Supplement* was originally published by George Newnes. In 1927 the name was changed to *World-Radio*. Ralph's second serial for the paper, "*Mystery of Magnetism*", appeared in September 1929. In October 1932 Ralph published, under his Ralph Stranger pseudonym, a series of articles called "*The Elements of Wireless*". In August 1933 this was published as a book by George Newnes, with the 15% royalty split 10% to the B.B.C. and 5% to Ralph. World-Radio had a serial by Ralph Stranger called "*Radio Island*" and Judson also contributed a page on new sets and components under the '*Ion*' pseudonym. Ralph took over as Technical Adviser to *World-Radio* from the Christmas 1933 issue onwards and, by April 1934, circulation had topped 204,000. The final edition of *World-Radio*, as a stand-alone paper, was on 1st September 1939. From then on it was amalgamated into the *Radio Times*.

Ralph was promoted first to Advertisement Director of the B.B.C. (1st April 1935), then to Head of Advertisement (2nd February 1948) and finally to Head

Below: Joyce Muriel Wilson, nee Judson, daughter of Ralph Judson. She wrote under the pseudonym Joyce Stranger

1918. Marriage solemnized at The Register Office in the District of WEST HAM in the County of ESSEX, EAST HAM C.B. & WEST HAM C.B.

Columns:— No.	1 When Married.	2 Name and Surname.	3 Age.	4 Condition.	5 Rank or Profession.	6 Residence at the time of Marriage.	7 Father's Name and Surname.	8 Rank or Profession of Father
164	Twenty Third March 1918	Raphael Moishe Yovitch Sudkevitch	25 years	Bachelor	Pioneer R.E.	7 Yourick Road Forest Gate	Yoach Sudkevitch	Export Merchant
		Beryl Bernard Emily Nathan	19 years	Spinster		7 Yourick Road Forest Gate	Henry Jerrold Nathan	Sugar Merchant

Married in the Register Office according to the Rites and Ceremonies of the by Licence Before me,

This Marriage was solemnized between us, R. M. Y. Sudkevitch / B. B. E. Nathan in the Presence of us, J. Jerrold Nathan / H. Jerrold Nathan

H. S. Simmons Registrar
Alfred Cobb Superintendent Registrar

Raphael and Beryl's marriage certificate, 23rd March 1918. UK General Register Office reference: vol. 4a page 577

of Advertisement Department (16th April 1948). In December 1935 Ralph had written a letter to Sir John Reith revealing his ambition to break the million pound advertising gross revenue barrier. This goal was finally achieved in the 1951-52 F.Y., with a gross revenue of £1,703,831. This incredible achievement was due largely to Ralph's drive and enthusiasm. His ingenuity in advertising was recognised in 1952 when the *British Direct Mail Advertising Association* awarded the Kirkland Bridge Silver Tankard to the B.B.C's. Radio Times for the best and most original and effective direct mail letter of the year. Ralph had arranged for promotional mail-shots to be sent to potential advertisers, each one containing a compressed bath sponge carrying the words 'Radio Times swells sales'. This one ingenious ploy grossed the B.B.C. £65,000 in additional orders. In fact, it proved so popular that requests to use the idea for publicity purposes were received from several manufacturers. Permission was freely given and *Sponges Ltd.*, who produced them, ended up making 'a fortune' from orders received from U.S.A., Germany and Sweden.

Not all Ralph's ideas paid off though. Regular high definition television broadcasting in the UK began on 2nd November 1936 and the BBC needed to find a way of incorporating television programme listings into the *Radio Times*. A new London-only 'Television Programme' number was launched on 23rd October 1936 and for the rest of 1936 two pages were dedicated to listing television programmes. At the start of 1937, on Ralph's instigation, the B.B.C. introduced a new, fully self-contained, Television Supplement of up to 16 pages. He was convinced that sufficient advertising existed to maintain the Supplement's existence but, sadly, it was not a success. In 1938 the B.B.C. reverted to an integrated television listing for the *Radio Times*.

Ralph Judson officially retired from the B.B.C. on 31st August 1955, although his last working day was 31st May 1955. He was given a warm retirement luncheon on 2nd February 1955, which was attended by his friends and colleagues. Over the years Ralph had received handsome remuneration in the form of salary and bonuses - a fitting reward for such an industrious and highly respected man.

Judson's War

In 1940 Ralph's home in Broomfield Road, Bexleyheath, was destroyed by German bombs although, thankfully, none of Ralph's family were hurt. Upon hearing the appeal for Local Defence Volunteers (L.D.Vs.) by Anthony Eden on 14th May 1940, Ralph remembered the training in Jiu Jitsu he had received in Russia before the Revolution. Thinking that these combat skills would be of value in training L.D.Vs., Ralph joined the 50th Lancashire (Manchester & Ancoats) Battalion Home Guard as a Lieutenant. In the cold January of 1943, at the age of 50, Judson took the Army's P.T. course in Aldershot, along with regular Army officers, and passed. The normal age limit for this course was 35! In February 1941 Judson then set about forming the *Purposeful P.T. and Close Combat School*, running courses for specially selected officers, N.C.Os. and other ranks at the Garrison School. The students, drawn from all Home Guard battalions of the Garrison, attended the course two nights a week for four weeks. Those who passed satisfactorily were made instructors in their own units. Judson was described by Col. A. Moore of the Manchester Garrison as "... virtually carrying out the duties of Commandant of the *Garrison Close Combat School.*" By August 1943, 606 officers and other ranks had passed through Judson's hands, 291 of them having passed out as fully qualified Instructors who themselves went on to train thousands more men.

By 1944 Judson had attained the rank of Captain and on 15th December of that year the King awarded him the M.B.E. "... in recognition of Meritorious Service in the Home-Guard". In the same month Ralph led the Manchester Sub-District contingent of the Home Guard at a parade in Hyde Park. Ralph returned to London in 1949.

World-Radio Research League

In 1934 *World-Radio* established the *World-Radio Research League* (W.R.R.L.), "... for the purpose of using mass wireless listening as a method of scientific research ...". Judson acted as Secretary and the League's first project was to investigate Long Delayed Echo (L.D.E.), a phenomenon which, under certain circumstances, could cause radio signals to be received with considerable delays, sometimes in the order of several seconds and far in excess of 'world echo'. The League had its own journal which remained under B.B.C. ownership until 11th October 1935 when it was taken over by publishers Bernard Jones who sold it via subscription.

Publications under the pseudonym Ralph Stranger

Books

Ralph Stranger was the successful author of numerous radio-, television- and science-related books. In fact two of these were used as textbooks on signals by the Navy, Army and R.A.F. in WWII. His known books include:

Wireless the Modern Magic Carpet, Partridge 1928

Ralph Stranger's Wireless Library*,
Vols. 1-18, Newnes 1929-1931, comprising:
Vol.1: **Matter and Energy**, 1929
Vol.2: **Electrified Matter**, 1929
Vol.3: **Electronic Currents**, 1929
Vol.4: **Magnetism and Electro-magnetism**, 1929
Vol.5: **The Mathematics of Wireless**, 1929
Vol.6: **Batteries and Accumulators**, 1929
Vol.7: **Seeing by Wireless (Television)**, 1930
Vol.8: **Wireless Waves**, 1930
Vol.9: **Wireless Communication and Broadcasting**, 1930
Vol.10: **Modern Valves**, 1930
Vol.11: **How to Understand Wireless Diagrams**, 1930
Vol.12: **The Selection of Wireless Signals**, 1930
Vol.13: **Detection of Wireless Signals**, 1931
Vol.14: **Amplification of Wireless Signals**, 1931
Vol.15: **Reproduction of Wireless Signals**, 1931
Vol.16: **Wireless Receiving Circuits**, 1931
Vol.17: **Wireless Measuring Instruments**, 1931
Vol.18: **The By-Products of Wireless**, 1931

Tuning In and Tuning Out: Selection at will of regional and foreign broadcasting stations, Newnes 1930
Wireless Communication and Broadcasting, Newnes 1930
The Outline of Wireless for the man in the street**, 1932
The Elements of Wireless***, Newnes 1933
Dictionary of Wireless Terms, Newnes 1933
The Mathematics of Wireless, Newnes 1935
The Mathematics of Wireless for Beginners, Newnes 1935
Dictionary of Radio and Television Terms, Newnes 1941

* A review of Ralph Stranger's Wireless Library. appeared in *the GRAMOPHONE*, March 1930, p30.
** One of the 'Elementary Text Books' recommended in Appendix "D", Handbook of Wireless Telegraphy 1938, Vol. II, B.R.230.
*** Originally published serially in *World-Radio*, starting October 1932.

Periodicals

'Ralph Stranger's Science Reviews'*, Bernard Jones Publications, 1st pub. Dec. 1935
* Ralph Stranger's Science Reviews replaced *World-Radio* as the official organ of the *World-Radio Research League* and received a glowing review in *the GRAMOPHONE* magazine, January 1936, p36.

Articles

Ralph published numerous articles on a wide range of radio- and science-related topics. Here is a list of known articles:
Article about window displays for radio retailers, *The Broadcaster and Wireless Retailer*, March 1926
'Some Experiments with Modern Valves', *World-Radio*, 17 October 1930
'Is there life on other planets', *'Ralph Stranger's Science Reviews'*, Bernard Jones Publications, Dec. 1935
'The Invisible World', *'Ralph Stranger's Science*

Reviews', Bernard Jones Publications, Dec. 1935
'The Elements of Radio', '*Ralph Stranger's Science Reviews*', Bernard Jones Publications, series starting Dec. 1935
'Sunspots Affect Your Wireless', *Modern Wonder* magazine, v 1 No. 18, September 18, 1937
'The Mystery of Wireless Echoes', *Modern Wonder* magazine, No. 20, October 2, 1937
'Millions of Tons of Gold in the Sea', *Modern Wonder* magazine, v 1 No. 21, October 9, 1937
'Mystery of the Cosmic Rays', *Modern Wonder* magazine, v 1 No. 22, October 16, 1937
'Radio Waves that Play Tricks', *Modern Wonder* magazine, v 2 No. 24, October 30, 1937
'The Mystery of the Atom', *Modern Wonder* magazine, v 2 No. 26, November 13, 1937
'Mass Listening Radio-Research', *Modern Wonder* magazine, v 2 No. 29, December 4, 1937
'Watch the Sunspots', *Modern Wonder* magazine, v 2 No. 30, December 11, 1937

'Wireless Research for Amateurs', *Modern Wonder* magazine, v 2 No. 31, December 18, 1937
'Through the Stratosphere at 186,000 Miles a Second', *Modern Wonder* magazine, v 2 No. 32, December 25, 1937
'Amateur Detectives of the Universe', *Modern Wonder* magazine, v 2 No. 34, January 8, 1938
'The Changing Planets', *Modern Wonder* magazine, v 2 No. 38, February 5, 1938
'The Mystery of Baritsu: a Sidelight Upon Sherlock Holmes's Accomplishments'*, *Baker Street journal*, Christmas 1958.
*Ralph was a fan of the Sherlock Holmes stories by Sir Arthur Conan Doyle and was particularly fascinated by *The Final Problem*, a short story published in the *Strand* magazine in December 1893. In the story, Holmes and his arch-enemy Professor Moriarty fight to the death on a narrow ledge at the head of Reichenbach Falls in Switzerland, with both Holmes and Moriarty appearing to die in the struggle. Such was the public's outcry at the loss of their sleuth hero that Conan Doyle 'resurrected' Holmes in *The Adventure of the Empty House*, pub. 1903. Judson set about trying to explain how Holmes could have defeated Moriarty at the falls and yet himself have survived. Judson revealed his theory in an article he wrote, '*The Mystery of Baritsu: a Sidelight Upon Sherlock Holmes's Accomplishments*' which was published in the Christmas 1958 edition of the *Baker Street Journal*. Baritsu, or more correctly Bartitsu, is a westernised form of Jiu Jitsu.

Ralph also wrote articles for the *Armchair Science* magazine, published by Armchair Science Ltd., and in December 1933 they asked him to write a series of articles dealing with the broadcasting side of wireless.

Short Stories in Science Fiction
Ralph also wrote a number of science fiction short stories, including a 15 part story 'The Lost Kingdom' published in *Modern Wonder* magazine in 1937. The following is thought to be a full list of his short stories:

***Amplion* magazine:**
The man from mars, 1926
Wonder Stories magazine:
The Message from Mars, Jun 1932, ed. Hugo Gernsback, publ. Stellar Publishing.
Letter (Essay), Jun 1932, ed. Hugo Gernsback, publ. Stellar Publishing
Modern Wonder magazine:
The Lost Kingdom [Part 1 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 11, July 31, 1937
The Lost Kingdom: Barsak Makes Trouble [Part 2 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 12, August 7, 1937
The Lost Kingdom: Off to the Antarctic [Part 3 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 13, August 14, 1937
The Lost Kingdom: Deep Sea Duel [Part 4 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 14, August 21, 1937
The Lost Kingdom: Shipwrecked [Part 5 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 15, August 28, 1937
The Lost Kingdom: On the Bed of the Atlantic [Part 6 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 16, September 4, 1937
The Lost Kingdom: The People of Mystery [Part 8 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 18, September 18, 1937
The Lost Kingdom: Prisoners in the Palace [Part 9 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 19, September 25, 1937
The Lost Kingdom: Explorers in Peril [Part 10 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 20, October 2, 1937
The Lost Kingdom: Doomed Beneath the Ice [Part 11 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 21, October 9, 1937
The Lost Kingdom: The First Broadcast [Part 12 of 15], Ralph Stranger/Gerald Bowman, v 1 No. 22, October 16, 1937
The Lost Kingdom: The Captives Return [Part 13 of 15], Ralph Stranger/Gerald Bowman, v 2 No. 23, October 23, 1937
The Lost Kingdom: Explorers at Bay [Part 14 of 15], Ralph Stranger/Gerald Bowman, v 2 No. 24, October 30, 1937
The Lost Kingdom [Part 15 of 15], Ralph Stranger/Gerald Bowman, v 2 No. 25, November 6, 1937
***Fantasy* magazine:**
The Cold Comet, Number 3, (1939, ed. T. Stanhope Sprigg, publ. George Newnes, 1/-, 128pp, pulp, magazine) Cover: S. R. Drigin

After a long, eventful and fascinating life, Ralph Judson died in 1972.

Another author in the family
In 1944, Ralph's daughter, Joyce Muriel Judson, married Kenneth B. Wilson. Her married name was Joyce Muriel Wilson and she too became a successful author. Adopting her father's pseudonym, Joyce Stranger wrote numerous best-selling animal fiction books. Sadly Joyce died in 2007.

Jonathan Wilson, Ralph's great-grandson (left) Andrew Wilson, Ralph's grandson (right) The author (centre). Taken at the National Vintage Communications Fair, 2012, photograph by Ian Sanders

My thanks to those who helped
Ralph's grandson and great grandson, Andrew and Jonathan Wilson, have been of great help supplying information and photographs for this article. A family connection is of huge value when writing a biography of this sort and I am very grateful to them, and to other members of the family, for their help.

My thanks also to Jessica Hogg of the B.B.C. Written Archives, Caversham, UK, for arranging access to Ralph's files and for her continuing interest and help with my researches. Martyn Bennett, Jane Clark, Jonathan Wilson and Andrew Wilson all helped proof read the text, for which I am most grateful.

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Sources consulted during the writing of this article are as follows:
Jonathan Wilson, great grandson of Ralph Judson
Andrew Wilson, grandson of Ralph Judson
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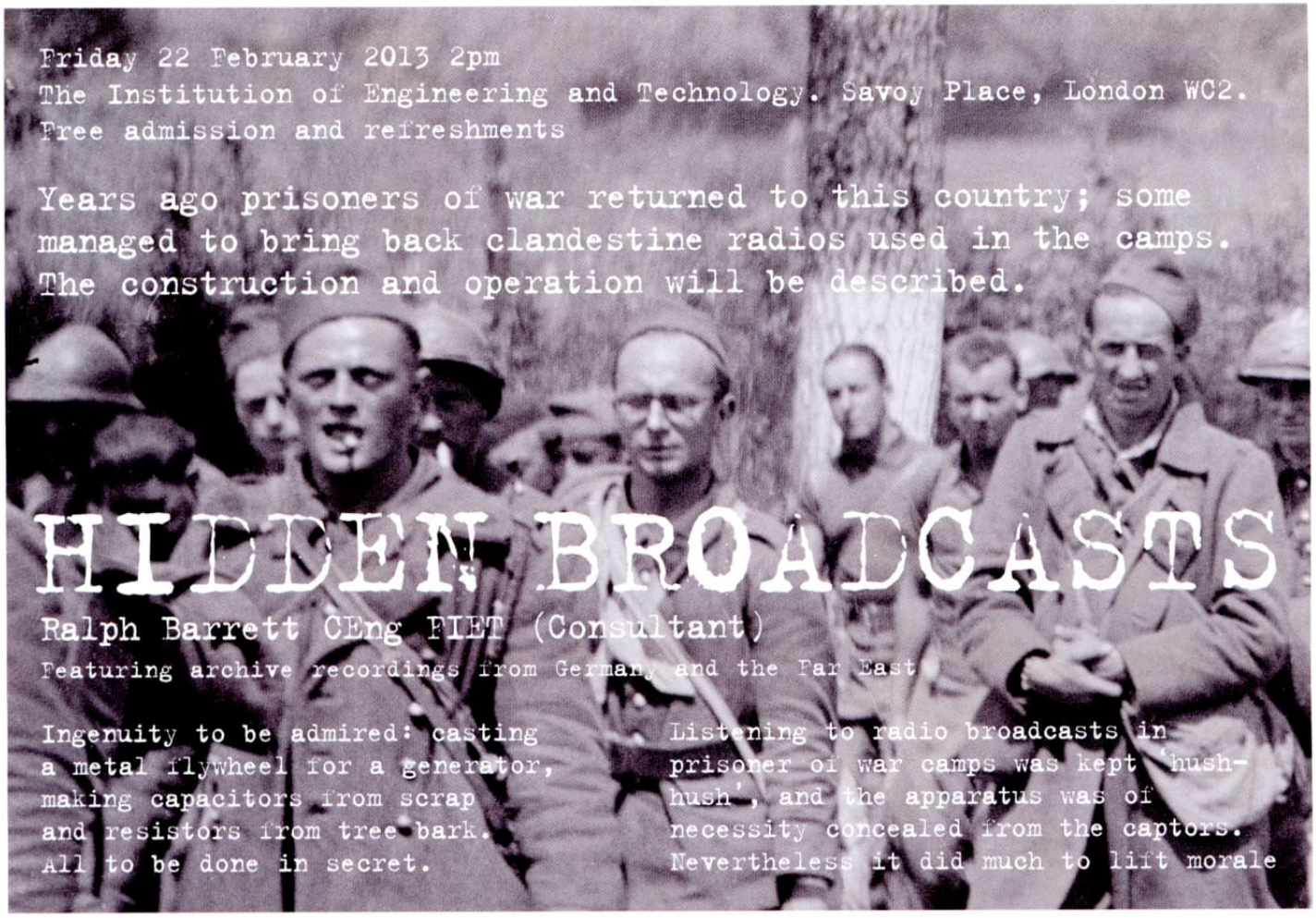
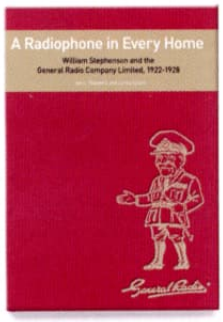
Worlds Press News, 1st February 1952.
Raphael and Beryl's marriage certificate, 23rd March 1918.
National Archives, Kew, Surrey, UK
London Gazette, 30th May 1922, 15th December 1944.
www.ancestry.co.uk
UK telephone directories
Tony Currie, *The Radio Times Story*, ISBN 1-903053-09-9, Kelly Publications, 2001
Manchester Evening News, Feb. 4th 1944
GRAMOPHONE, March 1930

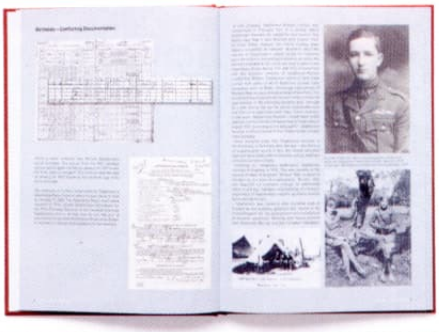


Out Now!

A Radiophone in Every Home - William Stephenson and the General Radio Company Limited, 1922-1928

by Ian L. Sanders and Lorne Clark, with foreword by Jonathan Hill. Published by Loddon Valley Press. ISBN 978-0-570773-0-0.





Between 1922 and 1927, during the life of the British Broadcasting Company (forerunner of today's British Broadcasting Corporation), literally hundreds of wireless manufacturing firms sprang up to take advantage of the new craze for 'listening-in'. In the fiercely competitive market of those pioneering days, many of these businesses were to disappear within just a few years. While much has been written on the history of the larger companies during this period of attrition, names such as Marconi, British Thomson-Houston, Burndept and General Electric – very little has been published about the smaller to mid-sized enterprises.

In their superbly illustrated new book, Ian Sanders and Lorne Clark tell the fascinating story of one of these smaller firms, the General Radio Company Ltd., and its enigmatic Canadian founder, William Samuel Stephenson, WWI air ace and WWII secret agent, thought to be the model for Ian Fleming's James Bond character. As well as producing an extensive range of radio receivers, the company also worked on the development of mechanical television.

This high quality publication is available for immediate despatch, price £19.95 (£17.95 for BVWS members) plus £4.95 P&P for UK, £7.50 P&P for EEC. BVWS members should quote their membership number in order to secure the discounted price. Payment via PayPal accepted. For North America/Asia Pacific enquiries and orders: loddonvalleypress.us@gmail.com or write: Loddon Valley Press (North America), 1175 Teresa Lane, Morgan Hill, California, 95037, USA. For UK/EEC/RoW enquiries and orders: loddonvalleypress@gmail.com or write: Loddon Valley Press, 16 Kibblewhite Crescent, Twyford, Berkshire, RG10 9AX, UK (note on paying by cheque: only sterling cheques drawn on UK bank, made payable to 'Loddon Valley Press' will be accepted).

Restoration of a RAP radio by Phil Moss

This R.A.P. radio is from a maker not known to me before. It has the distinct disadvantage of having no model number. The rear cover proudly announces R.A.P. Rented radio, and what to do if it fails. It covers long, medium and short waves, and is a conventional 5 valver A.C. only. A medium sized set it has four controls, and a pleasant veneered cabinet, with dark sides. The cabinet was in reasonable condition with some scratches and crazing of the varnish, but it will come up with cleaning and polishing to a reasonable finish. A good deal of dust was in it and the tuning drum looked as though there was mould on it, though it has not been damp, and it cleaned up well. More of its tuning arrangement later as it is novel. The knobs are also novel, and not very good: they are best described as inverted mushrooms: with a thin top which curves out. They were all broken, being intrinsically weak, and made of a very soft plastic. Clearly past being glued up, new ones were going to have to be fitted.

It came to me for repair, being wanted for sentimental reasons, as the owner's grandfather's set. I was told it only had the medium and short waves, and immediately pronounced it to be intended for foreign use: probably Far East. This immediately made me look clever, as I was told he had served in the Far East, and the set was with him. The fact it has three wave-bands including long wave is another matter!

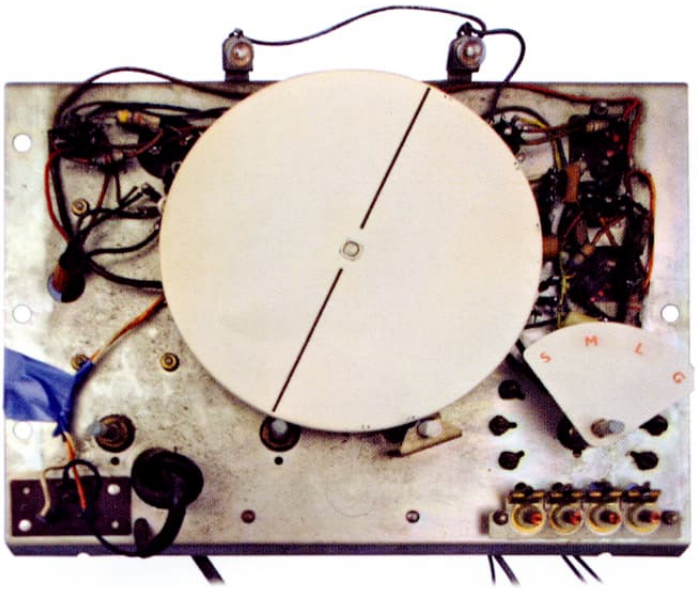
I tried the Vintage Radio Service Data CDs, finding only one R.A.P. radio listed. It isn't this one, and is AC/DC, and much older, though a self-oscillating heptode mixer is common to both.

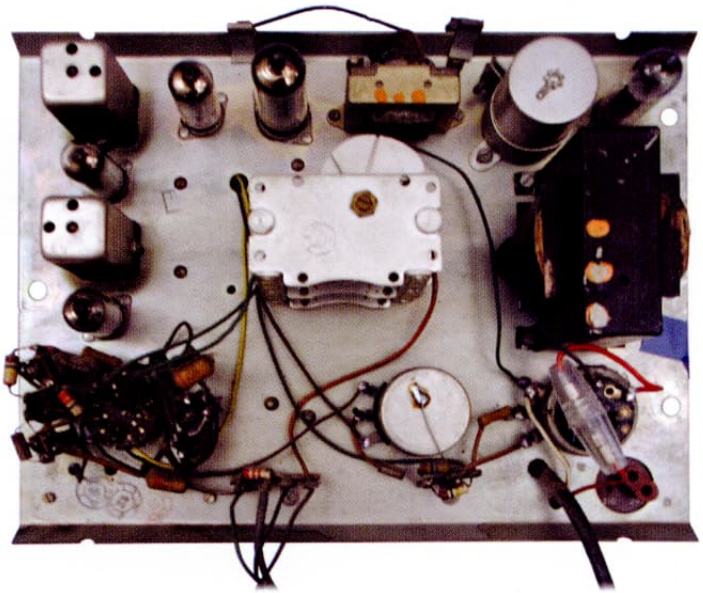
The set was said to be dead. Not entirely true, for on opening the badly put-on mains plug, loose lidded and missing the cable grip, I found no fuse. I also found a cable I had not seen before: red for line, blue for neutral, and white for earth. Question: to change or to leave? I decided that as it is authentic and good condition PVC, to leave it but attach a warning to the rear cover. The plug was replaced, and the resistance across the mains measured: 40 Ohms, which seemed low, but plausible. The set was removed from its case, an easy job, as the back is only held by clamps that need turning aside, and the chassis only has three screws. The chassis is interesting being a flat plate except for the horizontal edges being turned about 45 degrees, to make it rigid. The set is generally built to be very economical as I will note, in a number of ways. The valve line up is 6BE6 mixer/oscillator, 6BA6 IF pentode, 6AT6 double diode triode as detector/ AGC/audio pre-amp, 6BW6, the only B9A valve, output pentode, and 6X4 rectifier. It does not have a separate heater winding.

The set was turned on without further ado. On came the heaters, and an instant hum: despite being at 90 degrees to one-another, there was clearly considerable coupling between transformers. After suitable delay, some sound was heard. Long and medium worked. Short was dead. Turning the switch to medium and back however restored short wave operation, and it seemed reasonably lively at that. Indeed the set seemed to work reasonably. After a short time I felt the dual section electrolytic: it was unheated. The two dial lamps were dead, and I replaced them. Makes little difference: probably the worst dial illumination in the World!

The volume was predictably scratchy, and was cleaned with isopropanol. It was then fine, but not for long. The wave change switch and tone were treated the same. The switch was then fine, not loosing wavebands again. There was no DC on the volume, despite a Hunts coupling capacitor, though only subject to about 60 volts, due to the 470 kΩ anode load for the triode.

Having established is was approximately OK, though perhaps the output distorted rather too soon, a check of passive components was made. Despite all being cheap carbon composition types, only one had really drifted, and even then it was 27, not 22 K, not as bad as I would expect. Incidentally, I checked the unused one from my stock, and found it was almost identical in value, despite never having done any work! Fitted a 0.6W 1% metal film that was to hand. Three resistors gave pause for thought: a 47 K that read 100 R. This turned out to be a damper for the O.P. Transformer primary. A 33 K read 16, as did another: they are paralleled up and supply the screen grids of the first two valves. How this is cheaper than fitting one 15 K 1 watt resistor I cannot see. I also checked several capacitors, in the expectation that the wax-dipped ones would be either or both of off value and leaky. Wrong: only one was much off: 0.113 instead of 0.1 MFDS. This would not have caused me to change it, but in one direction it was very slow to build up resistance, and only got to 13 M Ohms, whereas the other way it was >20. I have had this before including ones which read negatively: I assume that the paper insulation degrades and becomes chemically active, causing the capacitor to become a voltaic cell. The resistance was still high, but the price of a new capacitor makes it not worth debating the point: out it went. This capacitor was only a decoupling cap so had no





noticeable effect. Next the HT voltage was measured, and found surprisingly low at 175, thought the AC to the rectifier was 270. Looks like a duff 6X4. The 6BW6 only had 4.8 volts on the cathode, again too low. Tried another: the volts came up, and the distortion went down. Another point, whereas the cathode volts crept up on the old valve after turn-on, the new one stabilised much quicker. The HT however was now only 130! A new 6X4 brought this up to a more reasonable 265. Also the mains transformer which ran suspiciously cool, now warmed up rather. Surprisingly, and to the set's credit, the tuning did not seem much effected by the change in HT.

Modifications

It was noted that there were no electrolytic decoupling capacitors for either of the audio stages. I added a 100 MFDS, 25V across the OP valve's cathode resistor. This increases gain and reduces the valve's output impedance, so appears to be a good idea. Whilst in modification mode, I added a mains fuse and in-line holder, between the incoming live wire and the switch. This modification is a habit of mine: now I can select a fuse which unlike the mains plug fuse, will actually protect the set: I fitted a T 160 mA. Whilst not authentic this is very sensible: this fuse will blow if there is a HT overload, long before the mains transformer goes, and will probably protect the output valve from a severe case of positive control grid syndrome. A slight further modification was to tape back the mains wires which ran across the shaft of the tone/on-off switch control, and were subject to friction. There was no visible damage but nowadays they would need to be double-insulated anyway. To get some more distance one was unsoldered, and unwound from the other. There is now proper clearance.

Now to the problem I noted on first looking at the set: it had appeared that the shaft of the wave-change switch was loose, suggesting one of the worst faults, as to replace it involves so many connections. Actually it was the tuning, and it was not a broken drive, but the loss from perishing of a rubber sleeve. The set has a very cheap and very effective tuning mechanism: there is no stringing. A plain shaft from the tuning knob has a rubber sleeve round it, now a Hellerman 4 mm, which drives the edge of a drum, with the edge turned down to form a lip at 90 degrees. The drum (once cleaned of its 'mould') is mounted on the shaft of the tuning capacitor, and has a black line across its diameter. And that's all there is. Simple and effective and no stringing to assemble: cheap and long-lived with only the need to replace the rubber eventually. If they had spent a little more, they could have added the turn the other way to fine tune type shaft, which would have been very useful. The tuning on short-wave is very critical. The only disadvantage of this mechanism is that it does limit the layout of the tuning scale somewhat, so it would not be usable for sets which require long scales for each wave-band. The wave-change switch has a metal triangle on its shaft with the wave bands and gram marked on it. The appropriate letter appearing in a little window at the bottom RH side of the glass.

As the set worked well no attempt was made at alignment of the RF and oscillator coils, but the IFs were checked. A couple of surprises: the IF frequency was 435 Kc/s, and the tuning was very sharp indeed. I set it to just over 500 mV audio output at the speaker: loud enough! And tried peaking the coils. The cores were held by laminate strips, with some play under pressure which resulted in detuning. Care was therefore needed. And the result of my work? About another 10 mV output. So they had not drifted at all.

On reassembling, I noted that the 6BE6 was not seated properly. A socket had been damaged and the pin was going down one side, not the centre of the receptacle. The leg of small round nosed pliers were used to open them and move to the correct position, and the valve went in fine. There had not seemed to be any intermittency problem due to this fault.

The cabinet was given a clean with a damp cloth. Off came most of the paint spots, and quiet a lot of dirt. It needs more done, but the owner can do that: it will look fairly good for a polish, without the need for re-varnishing. The knobs were to be the big problem, though. As only one was any good, new ones were needed, but the fixing was a concealed slide-on with the shafts only coming up flush with the cabinet. Eventually I opted for cutting off the fixings, and epoxying them into the back of new knobs. The only easily available ones were black instrument types, which I thought would not look that good. Actually I am happy with the result. They are skirted, and about 25 mm diameter, except the tuning which is considerably bigger, and the sharpness of SW tuning demonstrates that the larger one was need.

Conclusion

All the owner wanted was to be able to get Radio 4 on LW, as the main reason for its retention is sentimental. What he has got is a working set which whilst fairly basic has enough sensitivity and selectivity to be useful for broadcast reception at least across Europe on the short wave. And it looks reasonable too.

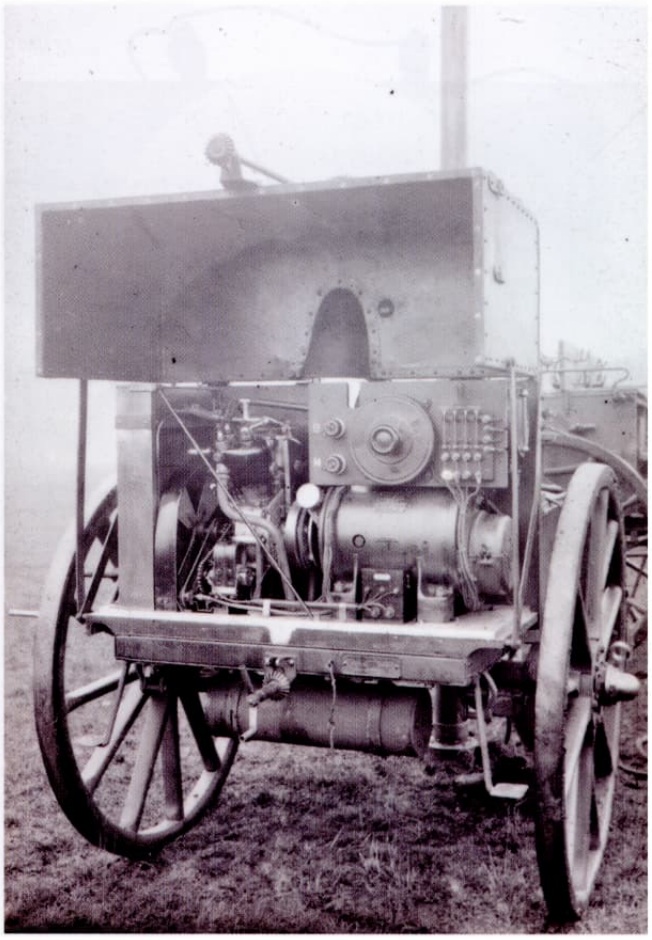
The owner is delighted I am happy to say, and may just have been recruited to the ranks of the Short Wave Listener.

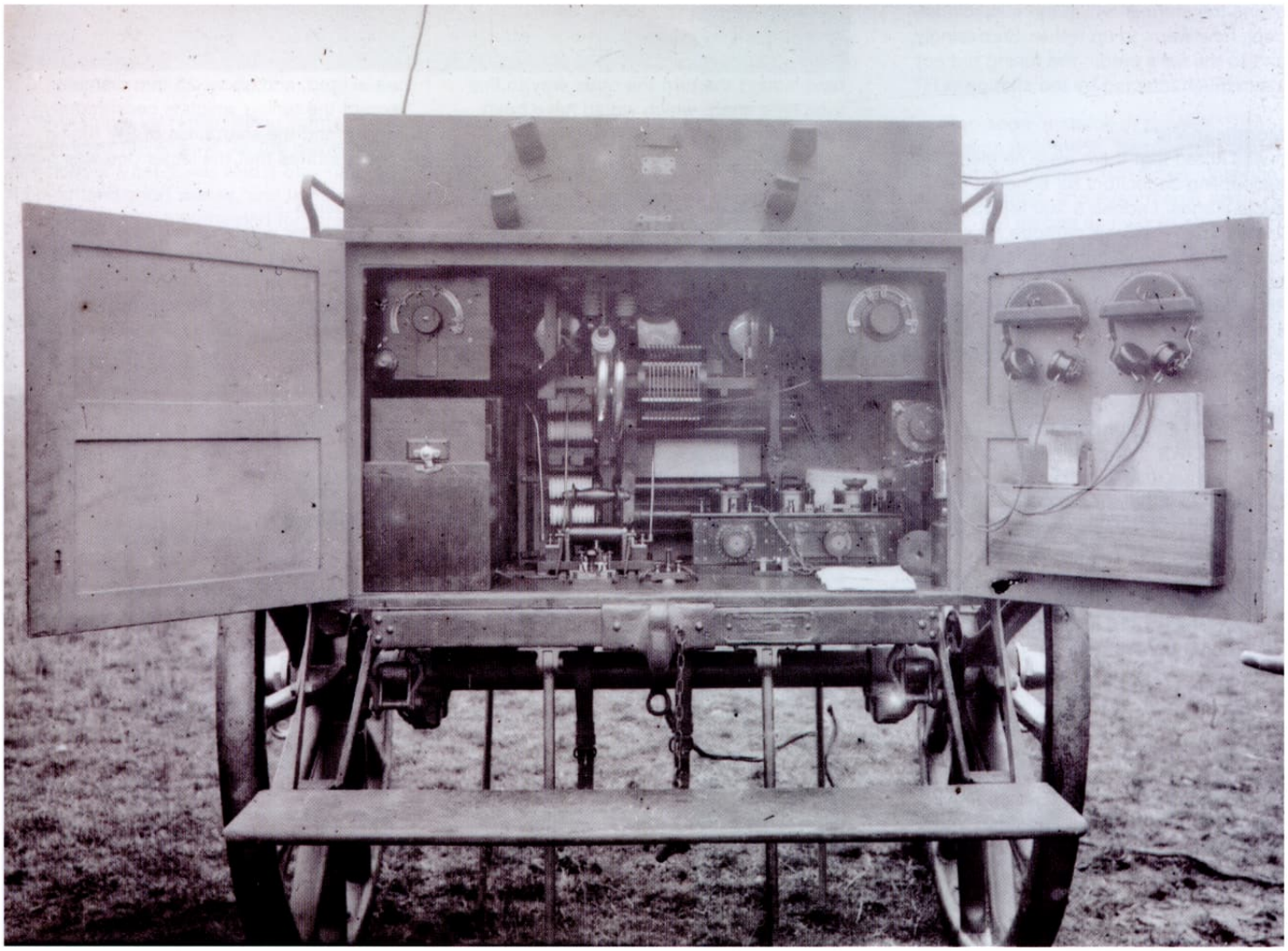
This article originally appeared in *Radio Bygones*, issue 100, April/May 2006

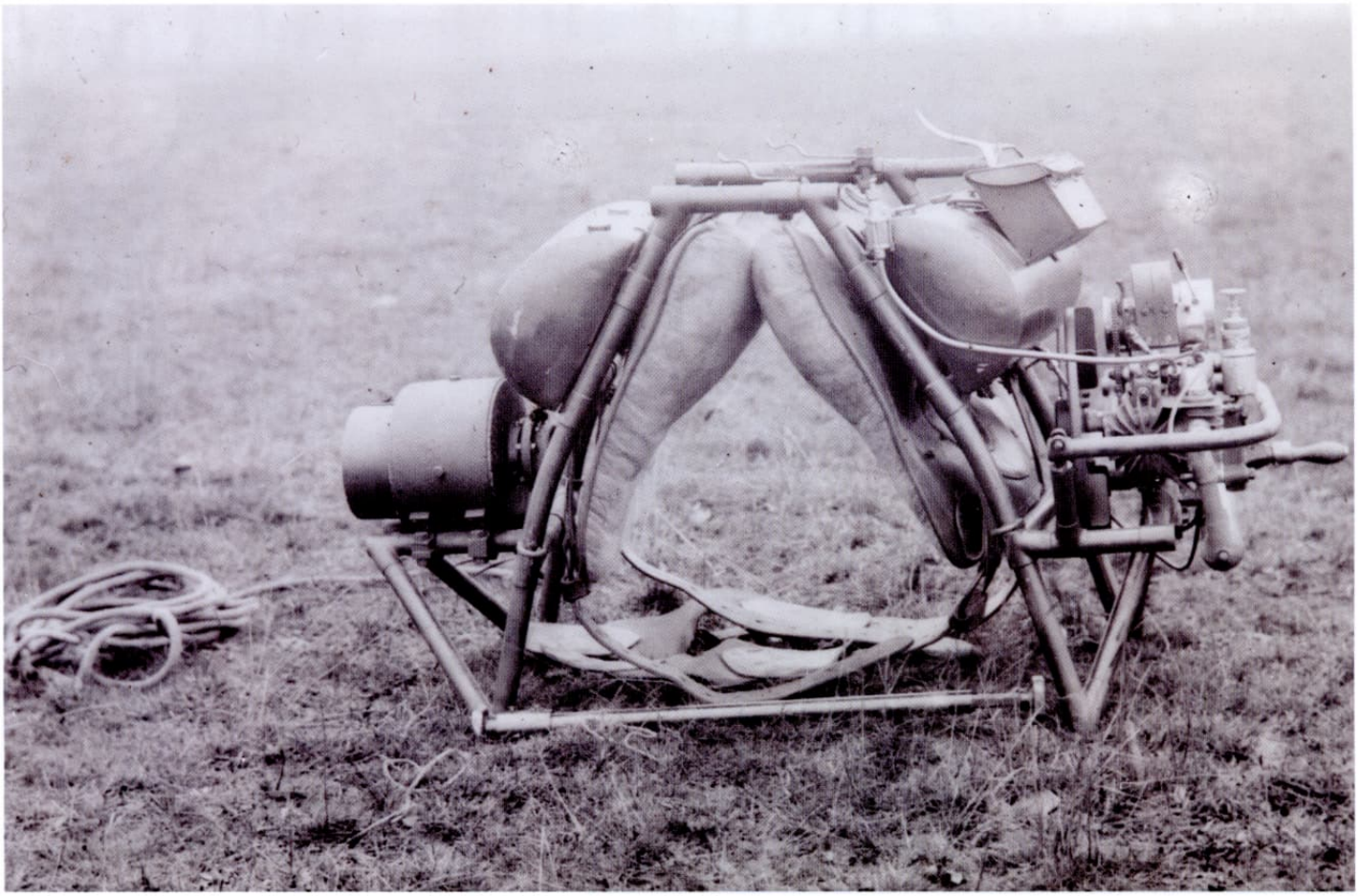
Early communication equipment

Gift to BVWS archive of original lantern slides

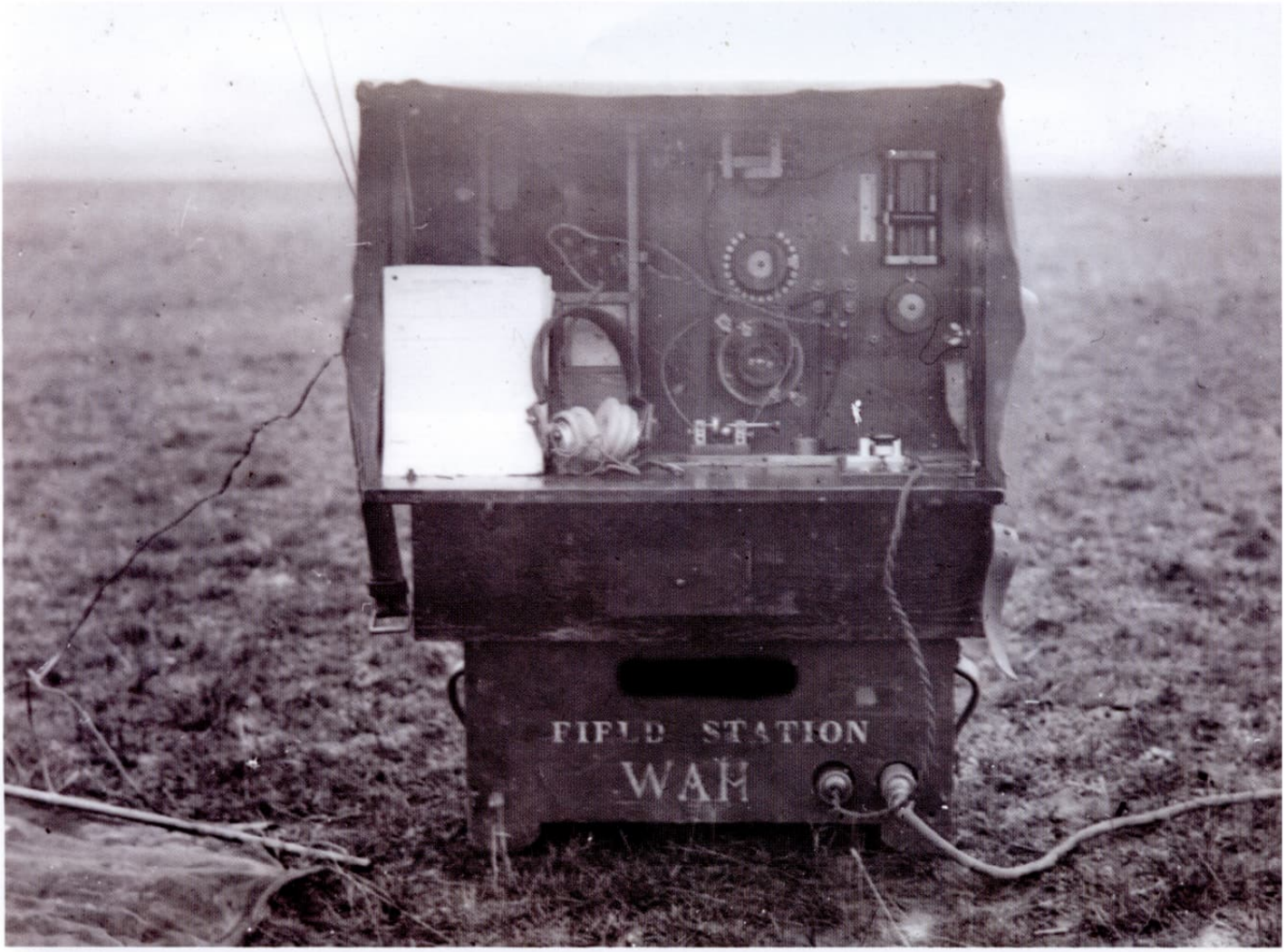
BVWS member John Anthony Dutton has kindly donated a set of magic lantern slides for reproduction in The Bulletin and the BVWS archive. As far as we know, these images have not been reproduced anywhere before.

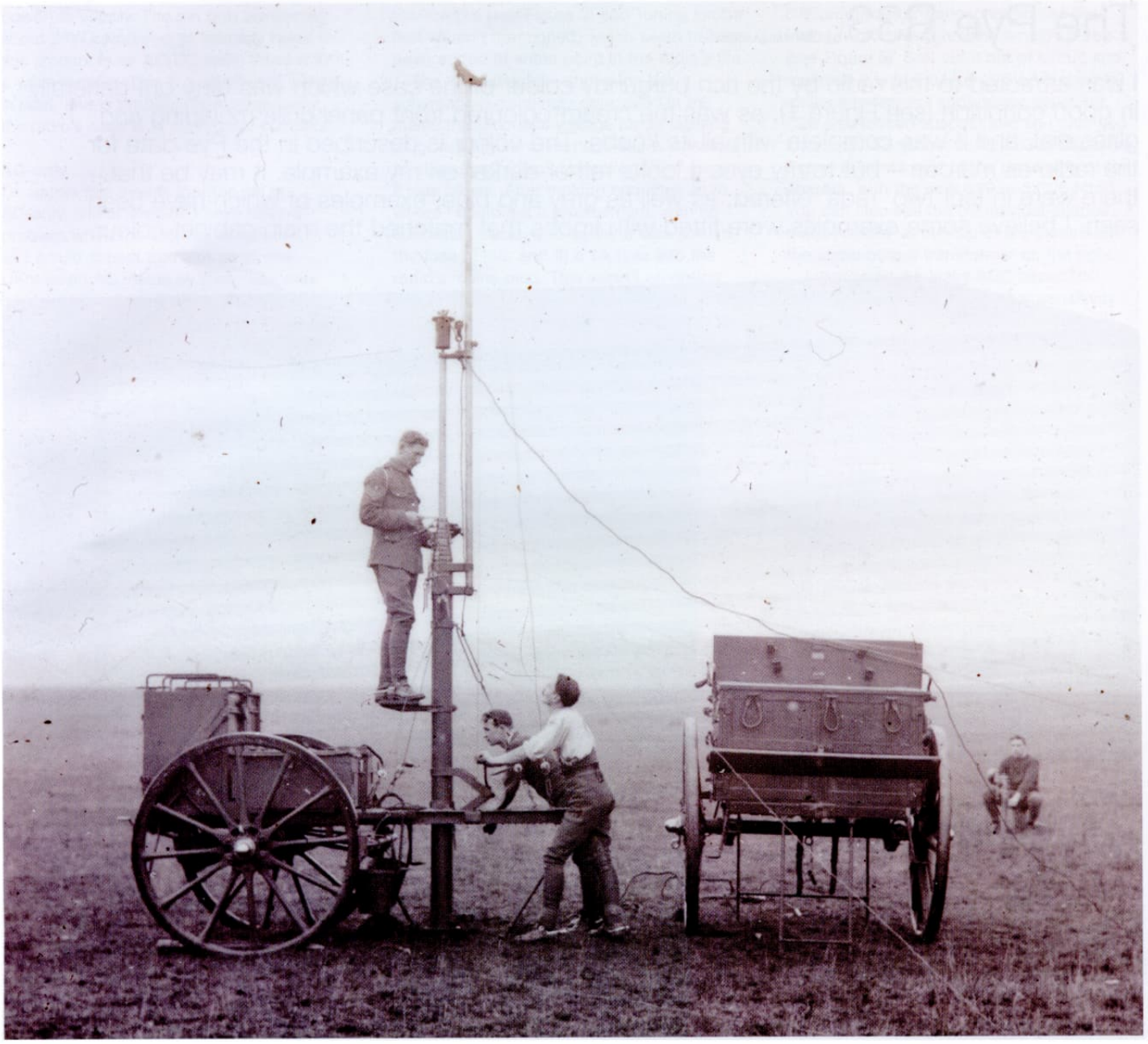


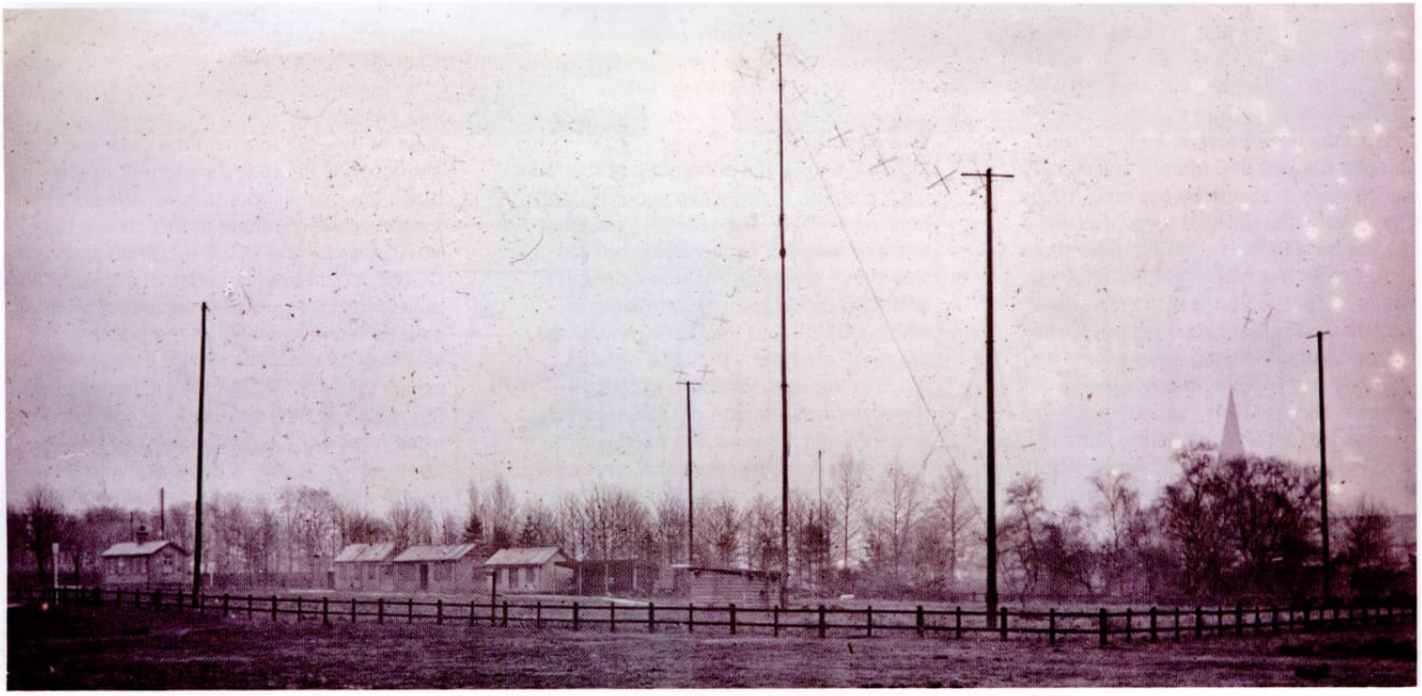




Above: Field Station rotary spark gap and motor for Field Station below







The Pye R33 by Stef Niewiadomski

I was attracted to this radio by the rich burgundy colour of the case which was dirty but generally in good condition (see Figure 1), as was the cream-coloured front panel grille moulding and glass dial, and it was complete with all its knobs. The colour is described in the Pye data for the radio as maroon – but to my eyes it looks rather darker on my example. It may be that there were in fact two 'reds' offered, as well as grey and blue, examples of which have been seen. I believe some examples were fitted with knobs that matched the main cabinet colour.

The model was described in Electrical and Radio Trading for March 1964, which I presume pretty much dates the introduction of the radio, though I've seen some debate that it may have been as early as 1961. Despite the fact that many transistor radios were available by the early 1960s Pye clearly thought that there was still a market for a modern-looking valve radio.

The radio has many features that we would expect to find in a transistor set, including a printed circuit board, ferrite rod aerial and a plastic case. I think it's a shame that there's no provision for an external aerial, which I expect was as much a marketing as an engineering statement at the time, indicating that listeners no longer had to find a suitable piece of aerial wire before listening to their favourite station. However it's definitely a valve set, using three U-series valves, and a metal rectifier for mains rectification. In Pye's own words "the printed circuit used in this receiver replaces wire used in earlier receivers. This method of circuitry offers uniform chassis wiring, fewer wiring troubles and simplifies circuit tracing and servicing".

The circuit

Figure 2 shows the schematic of the radio: it's a medium / long wave superhet with an IF of 470kHz. The UCH81 frequency changer stage is conventional but the way the IF amplifier, AF signal detector and AGC diode are integrated into a single UBF89, and the use of an UCL83 triode AF amplifier / pentode output stage in the audio section, shows its place towards the end of U-series valve development. To meet the needs of the radio manufacturers the valve developers were very conscious that they had to 'integrate' the functions needed in a radio into the minimum number of valves, and needing the fewest external components.

Power supply

Probably the most interesting feature of this radio is the power supply design. Normally when you encounter U-series 100mA heater valves you assume that the radio is AC/DC and contains no mains transformer. In the case of the R33 this isn't the case and the set contains an auto-transformer to step down the mains input to a voltage suitable for the valves' heaters, in this case a total of 76 volts for the UCH81, UBF89 and UCL83, connected in series of course. An auto-transformer has no secondary winding: voltage taps are made on the primary winding. As such this sort of transformer doesn't isolate the primary (mains) side from the radio's chassis, as does a 'conventional' transformer. The big advantage of this arrangement is that there is no need for a heater-dropper resistor, which is a major waste of power and generator of heat inside a typical transformer-less radio.

The use of a metal rectifier also helps reduce the power needed by the heater chain, as there is no rectifier valve (which is normally the biggest consumer of heater

power) to supply. The set only consumes about 24W compared to typically twice this amount in an AC/DC radio fitted with a valve rectifier. This is a significant saving in heat, and is probably one reason why the radio's case is in such good condition.

AC-only

Of course this means that the set is AC-only, which shouldn't have been a problem when the set was introduced as I would expect that almost all the UK was on AC mains by then. This may have restricted sales of the R33 to some potential export markets, but Pye could cover these with other sets in their range.

Metal rectifiers have a reputation for being unreliable in the long term, being very sensitive to moisture penetration through the surface finish. The rectifier used in this set is a contact-cooled Westinghouse EC2/U563 (250V half-wave at up to 60mA) which seems to be well encapsulated and has lasted well so far.

Switch on

At first the radio seemed to work fine on medium and long waves, but I thought it wasn't very sensitive. After a while it stopped working and I was sure I could detect a nasty electrical burning smell, so a rapid switch off was in order. I removed the chassis from its cabinet following the instructions in the service notes, but found a couple of self-tapping screws beneath the Volume (see Figure 3) and Tuning knobs that weren't mentioned, which seem to have been added at some point in the radio's life.

The 1A mains fuse shown on the schematic is cunningly concealed in the mains transformer's voltage range tapping plug, see Figure 4. Perhaps this is a feature of other Pye radios? I checked this fuse and it was blown. After making enquiries as to where I could get a replacement, with no success, I decided to solder a wire across the fuse holder and fit a 1A fuse into the radio's mains plug. This wasn't an option available to the original makers and users of the set, hence the original position of the fuse. The gap between the two ends of the Pye fuse looks to be rather small: I'm not sure this would meet safety rules today.

I fitted a new two-core mains cable, with a P-shaped fixing clip to prevent it from being pulled out of the back of the radio. We have an advantage these days that we can be sure that a mains plug can only be inserted into its socket one way round, and this makes 'live chassis' radios much safer to work on, and to use in the home. Before touching the chassis of such a radio I always measure the AC voltage between the chassis and mains earth – this should be just a few volts if the chassis is correctly connected to mains neutral.

Before re-applying power I looked around for a possible source of the burning smell and the cause of the blown fuse. The only candidate I could spot was C29, the 0.05µF capacitor connected across the mains, which was showing a nasty bulge (see Figure 5). So I cut it out of circuit and replaced it with 0.047µF 275V AC class X2 mains interference suppressor capacitor. C26 also looked suspect and so I changed it for a BVWS yellow 0.01µF 630V capacitor. Figure 6 shows part of the underside of the chassis, with the new C29 and C26 fitted. You can also see the trapezoidal-shaped metal rectifier at the top of the picture and the audio output transformer on the right.

I wondered if a leaky AGC capacitor could be the cause of the poor sensitivity so I removed C5 (the AGC capacitor) and replaced it with a BVWS yellow 0.01µF 630V capacitor as I had it to hand. From a voltage point of view this was overkill as the original capacitor was only rated at 30V. This didn't make any difference but when I sprayed the wave change switch with switch cleaner the volume level magically came up and as I tuned around the radio was now much more sensitive. This was a great relief as I didn't want to start tweaking the IF transformers.

The PCB was generally in good condition with some discolouring around V3, caused by the heat from this valve conducting through its pins and into the PCB material via its socket's soldered connections.

The 6"x4" elliptical speaker had a couple of splits which rattled as the volume was turned up. I decided to try a few drops of superglue dabbed across the splits (see Figure 7) and this method did the trick – the

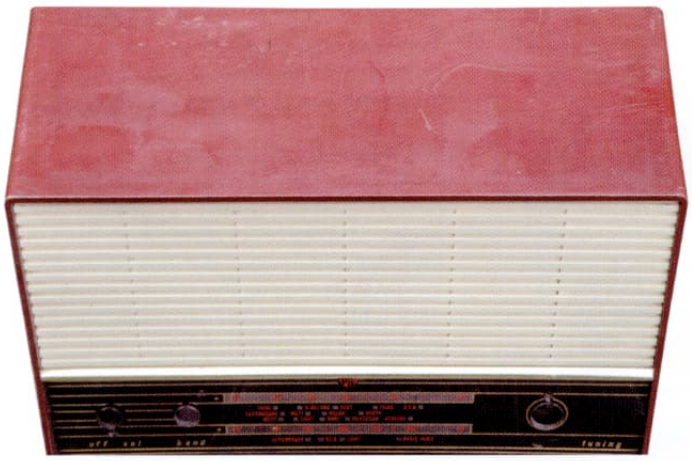


Figure 1: The cabinet of the R33 was grubby and the colour was flat, but generally it was in good condition.

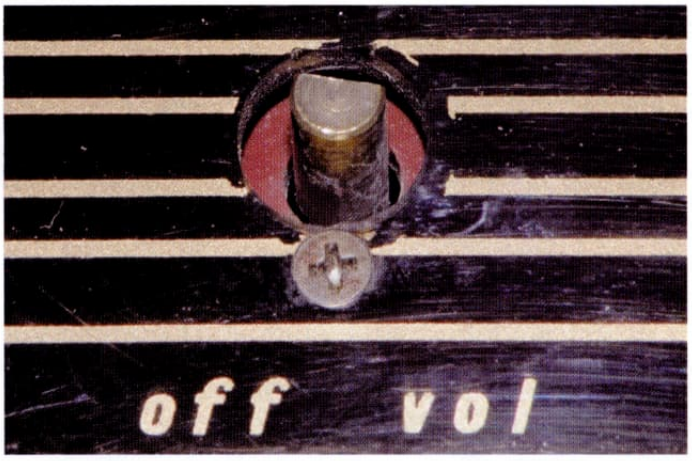
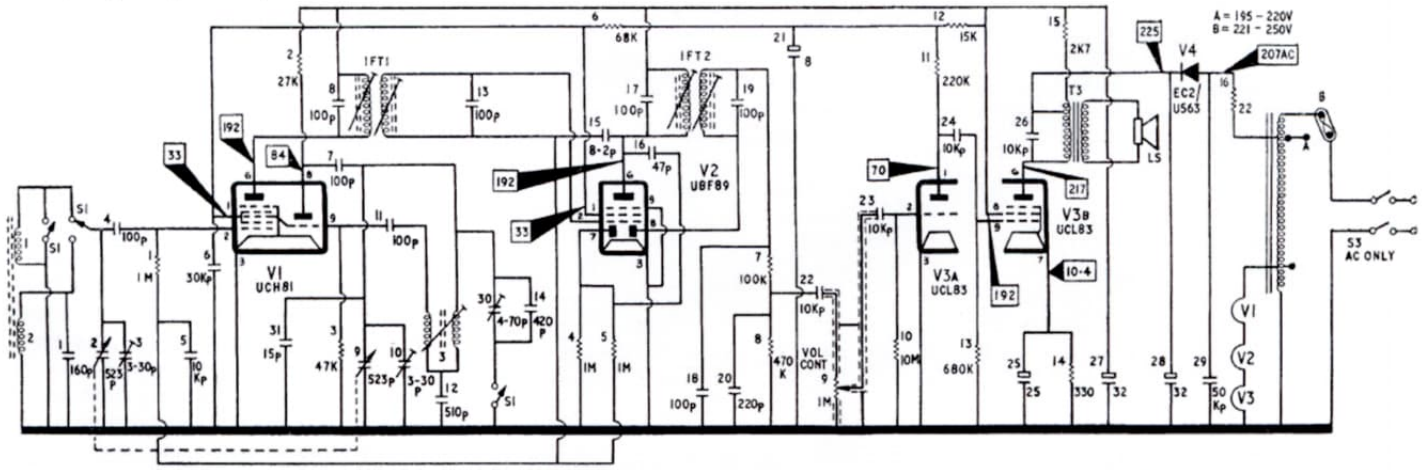
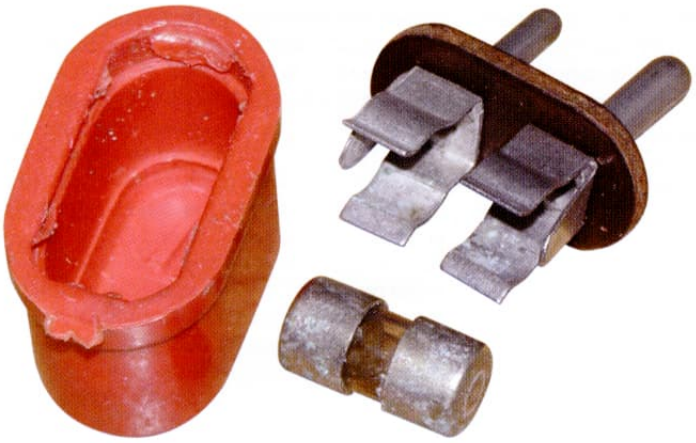


Figure 3: The self-tapping screw hidden beneath the Volume knob, not mentioned in the service notes.



Voltage readings taken with gang closed, receiver switched to MW, under no-signal conditions using Avo 8 or similar 20,000 ohms/volt meter. Wavechange switch is shown in LW position (fully anti-clockwise)

Figure 2: The schematic of the radio. Note the autotransformer supplying the valves' heaters and the metal rectifier (V4) for the HT supply.



Top left - Figure 4: The 1A mains fuse is cunningly concealed in the mains transformer's voltage range tapping plug.

Left - Figure 5: The original 0.05μF capacitor connected across the mains, which was showing a nasty bulge.

Above - Figure 7: A few drops of superglue dabbed across the splits in the speaker cone fixed the rattles even at full volume.

speaker cone no longer rattled even at full volume. This speaker gives good quality sound, helped by the generous size - 11¾" x 5¼" x 7¼" - of the cabinet. Figure 8 shows a rear view of the chassis fitted back into the cabinet. Though not shown here the back panel is also a matching plastic moulding, rather than the brown cardboard stampings used in most valve radios.

Polishing the case

The case was dirty and dull, so I started with a good wash with soapy water, being careful to avoid wetting the dial markings, which can be delicate in some radios. After establishing that the colour was incorporated through the thickness of the plastic, and not just a surface coating, I gently attacked the case with Greygates polishing paste No 5, bought on eBay. I first worked in small areas, bringing the shine back, and then gradually worked all the areas together to get an overall even finish. Some deeper scratches would have needed a lot of polishing out, and once the cabinet looked shiny again they were not so noticeable, so I left them. Figure 9 shows the re-assembled and polished R33 ready for a few more years of service.

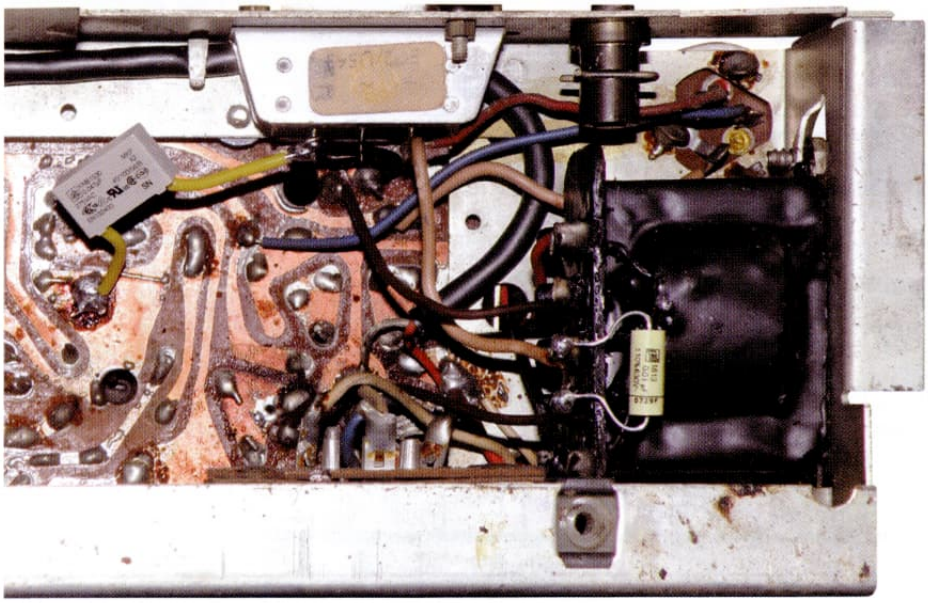
Other Pye Sets of the era

It's interesting to put the R33 in context of what Pye were offering at the time, especially since they were definitely in a period of transition from valves to transistors. Pye produced five radios with model numbers beginning with 'R' in a relatively short period.

The model R31 'Caprice' AM/FM AC/DC radio was introduced in August 1959. It used what had by that time become the standard 100mA series heater valve line-up of UCC85 / UCH81 / UBF89 / UABC80 / UL84 / UY85 for AM/FM radios. Then came the R37 'Rancher' of August 1960 using the same chassis as the R31, but with a squarer, more modern looking cabinet, rather like the R33.

The R34 was a four waveband (long, medium and two short wavebands, selected via 'piano key' switches) AC-only mains with a conventional mains transformer and 6.3V valves. Although the set was AM-only, rather unusually it included an EM84 'magic eye' tuning indicator. A Siemens full-wave metal rectifier was used in the power supply, thereby saving the heater power of a valve rectifier.

Figure 6: Part of the underside of the chassis, with the new C29 and C26. You can also see the trapezoidal-shaped contact-cooled metal rectifier at the top of the picture, and the audio output transformer on the right.



The Pye R32

Pye was an early pioneer of transistor radios, albeit under the PAM name, maybe as a way of disassociating itself from the venture should things go wrong. The PAM 710, using Pye V6/R3, V6/R2, V6/R3M and V10/30A transistors, and introduced in March 1956, is regarded as being the first British portable transistor radio. By 1957 Pye must have concluded that transistor radios were here to stay and were offering their own branded portable transistor radio, the P123BQ.

In 1960, amongst its valve sets, the rather odd R32 appeared This was a medium / long wave 'table' transistor radio using seven 'black circle' transistors: presumably these were Pye/Newmarket's own brand, and a couple of 0A70 crystal diodes. Henry Irwin mentioned Pye 'yellow' and 'white' circle transistors in his article in The Bulletin for Autumn 2008. Rather strangely the transistors are labelled V1-V7 on the R32 schematic - old habits die hard. The valve era 470kHz intermediate frequency was retained, and although a ferrite rod aerial was used the radio had the ability to connect up an external aerial and earth. The transformer-coupled push-pull output stage drove a very respectable 7"x5" loudspeaker.

The radio looks very much like a valve

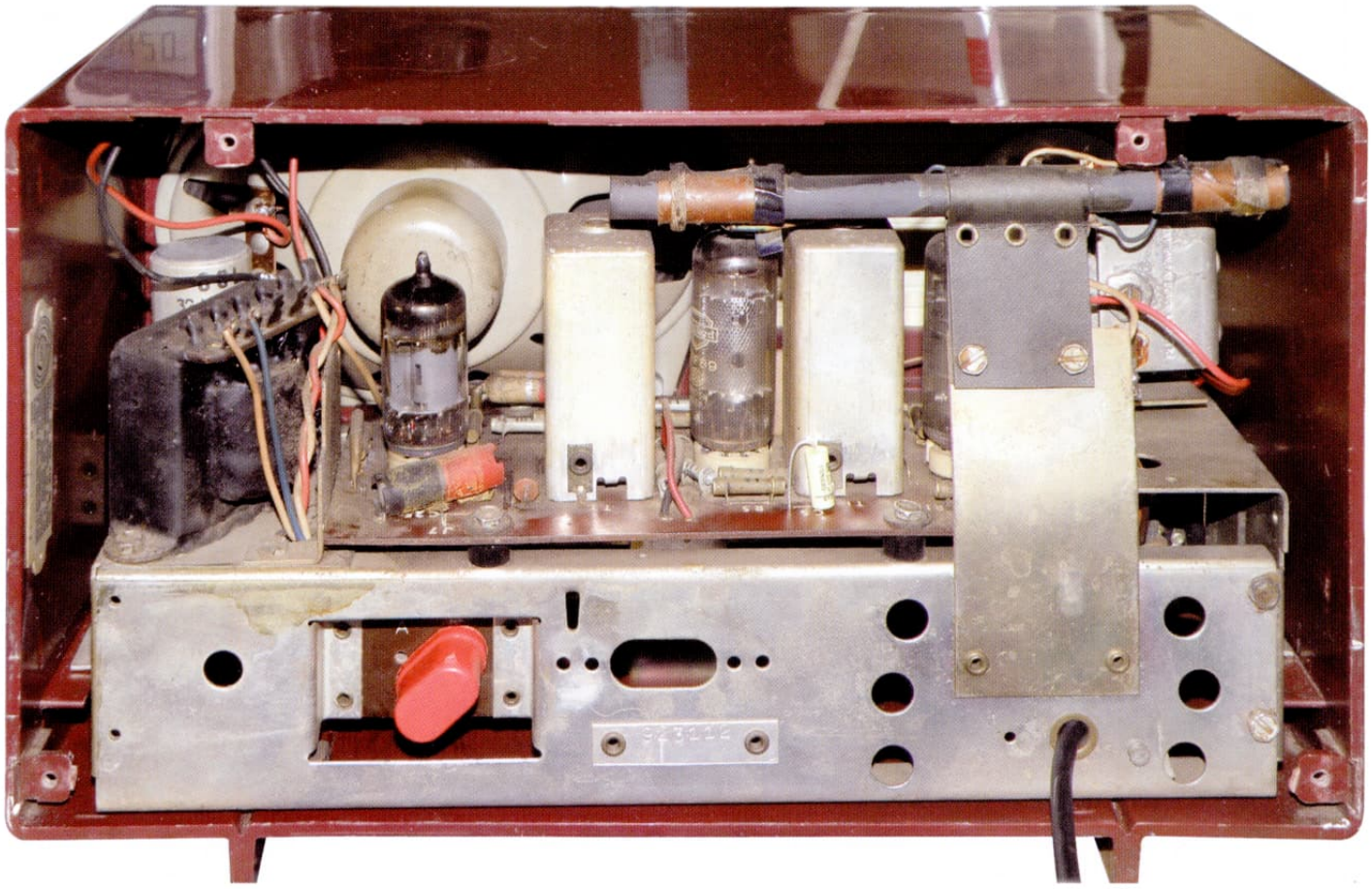


Figure 8: Rear view of the R33 with the chassis back in the cabinet. The mains autotransformer is located at the left hand side of the chassis.

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TERMS OF GUARANTEE. Pye Ltd., guarantee to replace or repair within twelve months from date of installation, any component in the Pye receiver covered by this guarantee, which, in the opinion of the Company, is faulty or below standard through interior construction or material. Components expressly excluded from this guarantee are valves, cathode ray tubes, transistors and batteries. Failure to observe the undernoted conditions renders the guarantee null and void.

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2. Pye Ltd., do not accept liability for any faults arising in their receivers caused by accident, mis-use, neglect, tampering with or unauthorised modification of the receiver, or any attempt at internal adjustment or repair by any person other than an accredited Pye Service Agent.
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FOR YOUR INFORMATION

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Should the Agent decide to return the receiver to us at Cambridge, or the nearest Service Depot, the guarantee covers replacement of parts only. A charge will be made to cover the cost of handling, labour, packing and carriage. No responsibility can be taken for damage in transit.

If an estimate of the cost is required before repairs are commenced, this should be made quite clear when the Agent returns the receiver to the Service Depot.

A detailed description of the symptoms noted is of considerable help in ensuring that the receiver is serviced satisfactorily. All correspondence must quote the Serial Number of the receiver. All receivers returned for service must be sent carriage paid.

This guarantee is not valid unless the Record Card is completed and returned to Pye Ltd., Cambridge, within seven days of the date of purchase of the receiver.

PYE LIMITED . RADIO WORKS . CAMBRIDGE . ENGLAND

Ref. No. 720832/1671

model R33

A.C. TABLE RADIO

INSTRUCTIONS FOR INSTALLING AND OPERATING

PYE LIMITED - CAMBRIDGE - ENGLAND

Operating instructions for the Pye R33

table set with its generously sized wooden cabinet. It was powered by a PP10 (a tall, thin battery about 10" long) or a pair of PP9s, and couldn't be powered directly from the mains, so I suppose it's a sort of portable radio, or at least a transportable. Although its transistors make it more power efficient than an equivalent valve radio the fact that it needed a battery must have made it more expensive to run than a mains powered set.

Conclusions

A couple of years ago a discussion on the R33 was initiated on the UK Vintage Radio Repair and Restoration forum by Heather Robertson, a curator at Glasgow's Museum of Transport and Technology. The museum had an R33 in its collection, suspected that it was somehow significant, but they were struggling to find out in what way. See: www.vintage-radio.net/forum/showthread.php?t=44732 for the discussion.

On the outside the R33 illustrates the transition in materials from the wood and bakelite of the 1950s to the plastics of the 1960s. It also shows the change in style towards angular shapes and bright colours, where the consumer was given a choice. On the inside the set is still 'hollow state' but a metal rectifier points the way towards semi-conductors. The ferrite rod was already the aerial of choice for transistor (and many valve) radios, and the PCB showed what was quickly becoming the ubiquitous method of mounting and interconnecting the components inside any piece of electronic equipment. I doubt whether listeners cared whether their radio 'ran' on valves or transistors, and what quiet revolution in design was going on inside or outside the case, though no doubt the colourful case was a welcome change from the drabness of the 1950s.

I presume that the radio listeners of the day no longer wanted a radio/aerial combination that gave the ultimate in sensitivity so that they could search for exotic distant stations. More likely they were expecting to listen to their regional BBC stations, fighting off the teenagers looking for pop music on Radio Luxembourg, which was regarded by the establishment in the UK as a pirate radio station (and was illegal to listen to by the letter of the law). Of course at just about the date the R33 was introduced the 'real' pirates started to appear in the guise of Radio Caroline, and others, which in 1967 lead to the BBC being dragged screaming, rather belatedly, into the 1960s.

Audiojumble and Nagra display, Tonbridge

photographs by Carl Glover


US ARMY TEST SET I-49
Resistance Bridge


Leak
Audio


Volume
Audio Image
left level
right level
Function
flat
normal
on
monitor
tape 1
filter
mute
off
tape
tape 2


AVO


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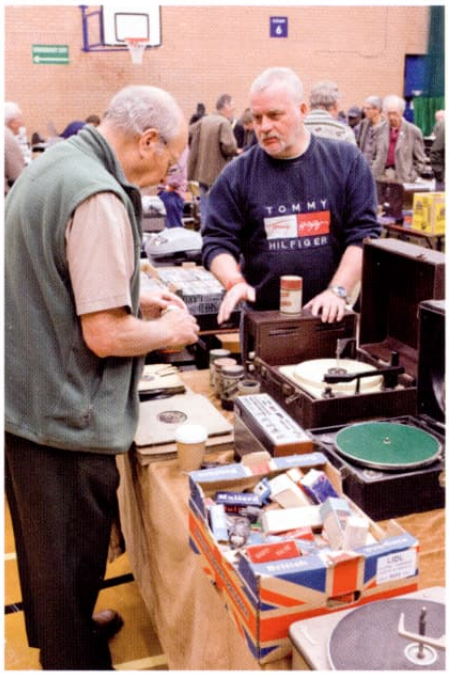
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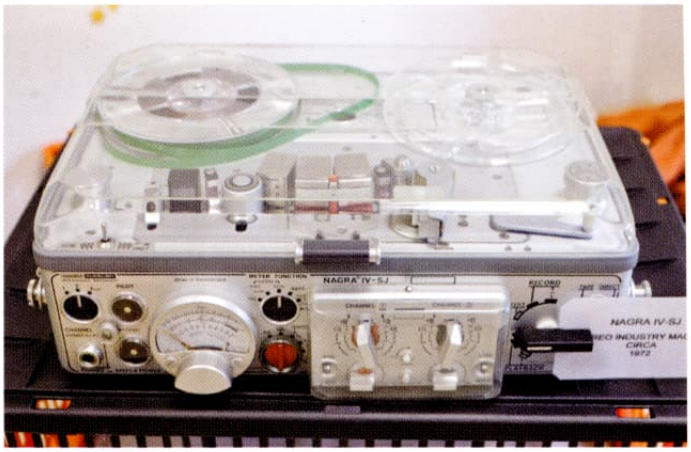
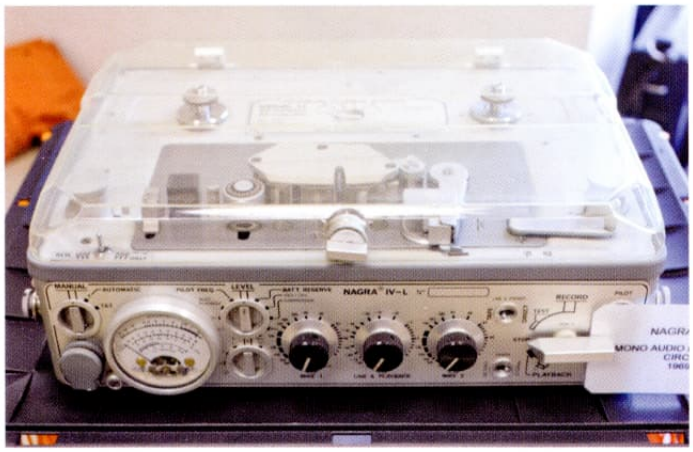

NAGRA IV-SJ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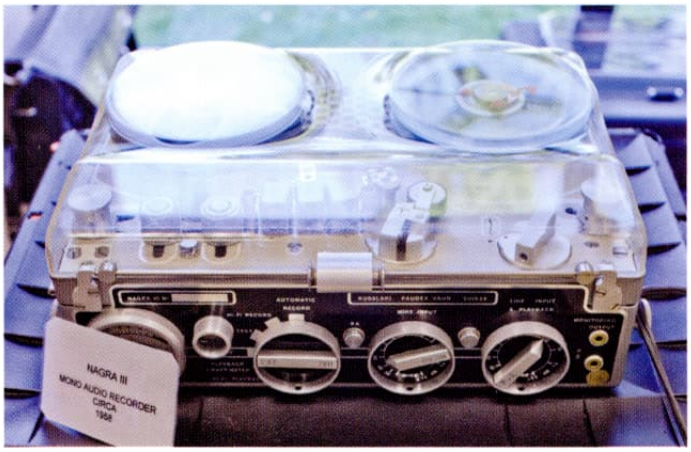

NAGRA III
MONO AUDIO RECORDER
CIRCA
1958


AGFA
NAGRA T
AUDIO TC


TDK
SONY


NAGRA T
AUDIO TC

Letters

Dear Editor

I was most intrigued with Gerald Baker's letter about Six-Sixty valves and a picture of my new pin-up on the reverse of the playing cards. I'm sure you will have had many responses to his letter along the lines that the Six-Sixty Radio company was used as a retail brand for second quality valves that, according to the National Valve Museum website www.r-type.org/index.htm "were Azide PM valves and the process produced considerable numbers that failed the strict quality control process but still worked. Philips or Mullard sold the full specification devices but as valves were of great expence (sic) in the 1920s the seconds brand had good sales."

My interest in vintage radio started as a teenager in the early sixties (no pun intended) when my uncle gave me all his radio stuff from when he was building sets in the late twenties/ early thirties. Amongst his bits and pieces are two boxed Six-Sixty valves, and knowing he was "careful with money" it doesn't surprise me that he was trying these Six-Sixties. I have attached some photos which give proof that these valves did indeed exist in the twenties. Thanks for another excellent Bulletin,

Nigel Coulter

Dear Editor

In response to Gerald Baker's query concerning Six-Sixty valves. These were manufactured by the Electron Company, which was formed in May 1923. Their first valve was the 'Six-Sixty'. This was a general-purpose dull emitter with a 1.5–2.0V, 0.3A filament. It had a tubular bulb with a top seal and appeared in 1924. In the following year the company produced the SS2 types. One of these had a green paint disc on the bulb and was a low impedance valve intended for use as a detector or a.f. amplifier; the other had a red disc on the bulb and was a high-impedance type suitable as an r.f. or r.c.c. amplifier. Both valves had 2V, 0.3A filaments.

In 1926 the company entered into a ten-year agreement with Mullard for the exclusive supply of valves and from then on ceased manufacture. Mullard purchased all the shares of the company in 1928 and changed the name to Six-Sixty Valve Co. Ltd. Mullard made a further ten-year agreement in 1935 and sold the company to Ever-Ready Ltd.

Altogether there were over 100 different types of valves, all made by Mullard, and with type numbers preceded by SS.

Keith Thrower

Dear Editor

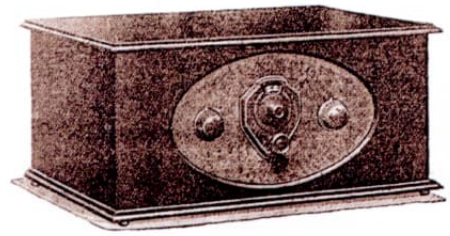
In answer to Gerald Baker's query in the Autumn 2012 Bulletin, the Six Sixty valve brand was owned by the Electron Company with an address initially in the Charing Cross Road in London, then at Rathbone Place, Oxford Street. The company was established in 1923 making a limited range of triodes under the Amrex brand before introducing the Six Sixty brand.

In 1926 the company entered into an agreement with Mullard for the supply of valves and ceased making its own. In 1928 ownership of the Electron Co. passed to Mullard and the company name changed to the Six Sixty Radio Co.

As Mullard was by then a whooly–owned subsidiary of the Dutch company NV Philips, all Six Sixty valves would be of Mullard and Philips origin, but with their own numbering and distinctive boxes. As an example of Six Sixty numbering, the Mullard PM2 is the Six Sixty S.S220P.

A Six Sixty manual of 1932 gives details of 45 valves and promotes other products including a cone speaker, cone speaker paper, two valve testers, a portable radio turntable and other componenets. An ingenious system for the conversion of battery operated radios to AC mains operation is also featured. The kit includes a power supply, valve socket adapters and a set of Six Sixty valves to suit the radio being converted. There is a list of over 60 radios from Amplion to Vulcan and the price for the complete kit ranged from £8 to £11.

In 1935 a new ten year agreement was made with Mullard and all the shares of the Six Sixty Radio Co. were sold to Ever Ready Ltd. This company



owned Lissen, a valve, radio set and component manufacturer, and from this date Six Sixty and Lissen valves were discontinued. Ever Ready branded valves appeared, sourced from Mullard, and continued to be available until the 1950s.

Philip Taylor

Dear Editor
'Later' Brownie Wireless Receivers
I am looking for any information, advertisements, articles, photos, etc, of the "later" Brownie Wireless Company "Dominion" valve receivers, produced between about 1928-1933 for a research project. Some examples of these sets are shown here. Any help would be most gratefully received and, of course, the source will be appropriately acknowledged.

Ian L. Sanders
author@crystal-sets.com

Dear Editor
It all seems like a distant memory now ... those Diamond Jubilee celebrations. Here are a couple of photos of the small radio and television 'Jubilee' display I put on for our street party on Sunday 4th June 2012. The aim was to display sets that might have been in use at the time of the Coronation. The only working television I had at the time was a 1956 Ekco TMB272, but I felt that it was, at least, "of the period". It proved to be extremely popular with visitors, none of them have seen a working 405 line set in many years, if at all. It worked reliably throughout the day, displaying early (1930s) Popeye cartoons, much to the delight of the younger visitors. The R.A.P. set with its glass back and chrome chassis was also very popular.

Lorne Clark

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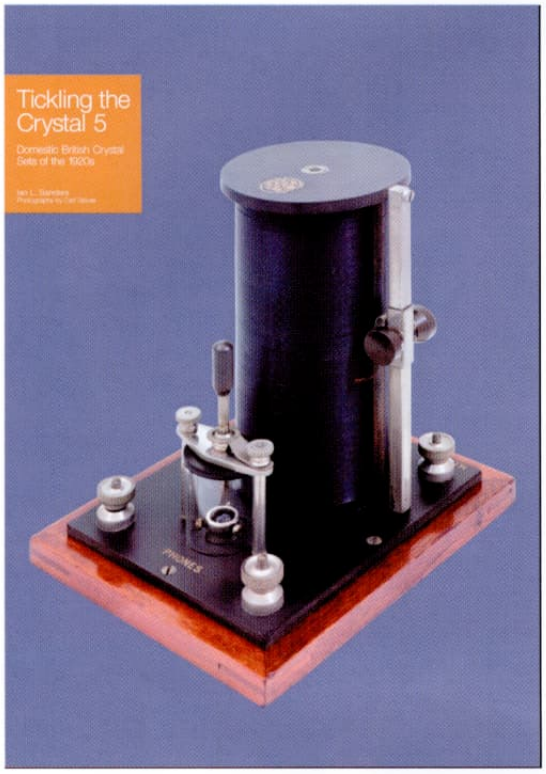

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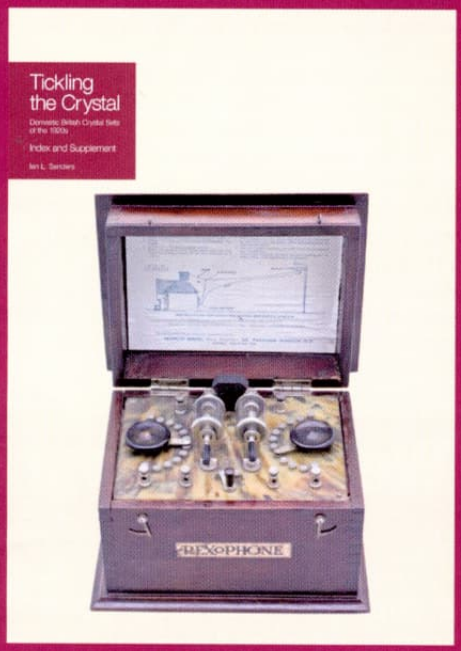


80 pages of GPO No. era British crystal sets. including comprehensive index listing sets in all five volumes of *Tickling the Crystal*

Price is £11.95, £9.95 to BVWS members.
(+ £2.50 p&p UK) £3.50 EEC (rest of world £5.50)
Cheques payable to British Vintage Wireless Society

Mike Barker, Pound Cottage, Coate, Devizes, Wiltshire, SN10 3LG
chairman@bvws.org.uk

24th February
Harpenden Swapmeet

Harpenden Public Halls, Southdown Rd. Harpenden.
Doors open at 10:00, tickets for sale from 09:30, Auction at 13:30.
Contact Vic Williamson, 01582 593102

MARCONI'S NEW STREET WORKS 1912 – 2012
Birthplace of the Wireless Age

With the centenary of the New Street Works now here ex-Marconi engineer and historian Tim Wander has spent the past two years putting together a history of the famous factory. The book is *now available* direct from the publishers priced at £12.99 – see www.authorsonline.co.uk or www.amazon.co.uk search for 'New Street' or 'Tim Wander'.

At nearly 400 pages and with over 130 photographs the book charts the history and development of the site and tells the stories behind the world beating and world saving technologies that were developed there. New Street was the birthplace of many technologies that have shaped and changed our modern world including radio, broadcasting, television, radar, satellite communications and even the computer and the technology behind the mobile telephone. But most of all the Marconi New Street centenary book tells some of the stories of the men and women who worked there from the 1930's onward. Over a hundred people have contributed to a unique oral history - everything from a paragraph or humorous anecdote through to a career history. With careful editing they have been woven together to form a permanent record of the factory and the people who served there.

Many of the photographs in the book are previously unseen and span the entire history of the New Street site and include some taken earlier this year inside the main factory showing the dreadful state of decay and dilapidation now rainwater has got into the site though the vandalised roof.

For more information on New Street, 2MT Writtle and Tim's forthcoming books on Marconi's early work please see:- **2mtwrittle.com**

News and Meetings

GPO registration Numbers

Martyn Bennett is the custodian of the BVWS GPO Registration Numbers list. As many members know, the project of assembling this list was started in the early days of the BVWS and was carried on by the late Pat Leggatt. Members are strongly urged to help build the list, whenever they get the opportunity, particularly as it is something that will help with the identification of vintage wireless in years to come. The list is by no means complete and the GPO no longer have a record of the numbers granted to wireless manufacturers. The BVWS Handbook contains the current listings - one in numerical order and one ordered by name. Please let Martyn have any additions, or suggestions for corrections, by mail or over the phone.

Martyn Bennett, 58 Church Road, Fleet, Hampshire GU13 8LB
telephone: 01252-613660 e-mail: martyb@globalnet.co.uk

2013 Meetings

10th February Audiojumble
22nd February 'Hidden Broadcasts – clandestine radios in POW camps' by Ralph Barrett 22 February at 2pm. Institution of Engineering and Technology, Savoy Place, London WC2. Admission Free.
24th February Harpenden
7th April Golborne
May 12th NVCF
1st June BVWS Garden Party
2nd June Harpenden
July 7th Wootton Bassett
15th September Murphy Day
29th September Harpenden
6th October Audiojumble
3rd November Golborne
1st December Wootton Bassett

The British Vintage Wireless and Television Museum: For location and phone see advert in Bulletin.
Harpenden: Harpenden Public Halls, Southdown Rd. Harpenden. Doors open at 10:00, tickets for sale from 09:30, Auction at 13:30. Contact Vic Williamson, 01582 593102
Audiojumble: The Angel Leisure Centre, Tonbridge, Kent. Enquiries, 01892 540022
NVCF: National Vintage Communications Fair See advert in Bulletin. www.nvcf.co.uk
Wootton Bassett: The Memorial Hall, Station Rd. Wootton Bassett. Nr. Swindon (J16/M4). Doors open 10:30. Contact Mike Barker, 01380 860787
Golborne: Golborne: Golborne Parkside Sports & Community Club. Rivington Avenue, Golborne, Warrington. WA3 3HG contact Mark Ryding 01942-727428
Mill Green Museum: Bush Hall Lane, Mill Green, Hatfield, AL95PD
For more details with maps to locations see the BVWS Website: www.bvws.org.uk/events/locations.htm

THE BVWS SPARES DEPARTMENT

NEW!

DeoxIT D5 Contact cleaner / lubricant £15.00 aerosol can
Not cheap – Just the BEST. Available at all BVWS events!

New manufacture high quality metallised polyester film capacitors
To replace all old paper types in vintage equipment
Ideally sized for re-stuffing

All capacitors are 630 Volt working
All prices are for packs of 50 components and includes Postage and Packing

0.001µF	£20.50	0.022µF	£20.50
0.003µF	£20.50	0.047µF	£25.50
0.0047µF	£20.50	0.1µF	£23.00
0.01µF	£20.50	0.22µF	£28.00

Only available in packs of 50 by post.
Available in smaller quantities at all BVWS events

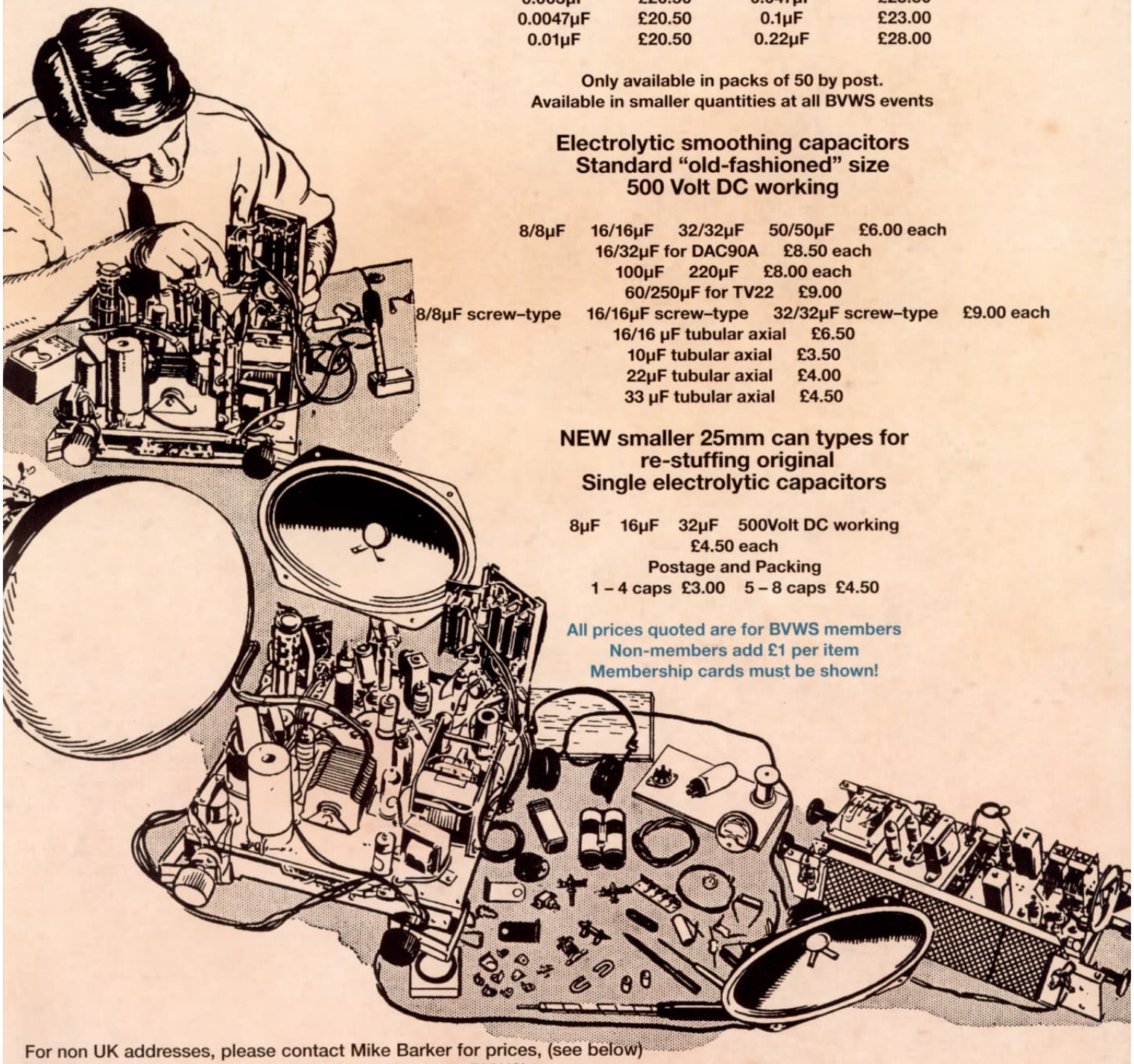
Electrolytic smoothing capacitors
Standard "old-fashioned" size
500 Volt DC working

8/8µF 16/16µF 32/32µF 50/50µF £6.00 each
16/32µF for DAC90A £8.50 each
100µF 220µF £8.00 each
60/250µF for TV22 £9.00
8/8µF screw–type 16/16µF screw–type 32/32µF screw–type £9.00 each
16/16 µF tubular axial £6.50
10µF tubular axial £3.50
22µF tubular axial £4.00
33 µF tubular axial £4.50

NEW smaller 25mm can types for
re-stuffing original
Single electrolytic capacitors

8µF 16µF 32µF 500Volt DC working
£4.50 each
Postage and Packing
1 – 4 caps £3.00 5 – 8 caps £4.50

All prices quoted are for BVWS members
Non-members add £1 per item
Membership cards must be shown!



For non UK addresses, please contact Mike Barker for prices, (see below)
All orders should be sent (with payment made out to BVWS) to:
Mike Barker, Pound Cottage, Coate, Devizes, Wiltshire, SN10 3LG
Cheques payable to British Vintage Wireless Society
Please allow 14 days for processing, but usually quicker!
The above Capacitors are supplied as a BVWS member benefit.
Anyone found to be reselling these items for profit will be expelled from the Society

BVWS wireless supplies