The Bulletin

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11 May 2008

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at The Warwickshire Exhibition Centre

Now in our 15th year!

10.30 to 4.00 **£5 admission** (under-14s Free),
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Bulletin of the British Vintage Wireless Society
Incorporating 405 Alive
Volume 33 No.4 Winter 2007

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Separations and Printing by Hastings Print

Cover: front – AC Pilot Super Wasp (1929) and RCA 103 Speaker (1923)
Cover: rear – Cable and Electrical No.2 Crystal Set
Photographed by Carl Glover

Graphic design by Carl Glover and Christine Bone

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Ian Higginbottom and Peter Merriman

Contents

From the (festive) Chair

In October we attended the second BVWS Manchester radio meeting organised by John Marshman. A display of working 405 Line TV's dating from 1938 through to the early 1960's ran throughout the day which certainly supplemented the hall's heating! The new venue being much more suited to a radio meeting with on site car parking and plenty of space with a stage for future auctions and also very close to the M60 motorway. The event was very friendly with some surprisingly low priced items.

I must congratulate John on another Sterling effort. I particularly liked the later start and I am looking forward to another event in 2008 so keep an eye on the events page. Pictures of the event will appear in the Spring 2008 Bulletin.

No nominations for Committee elections have been received. Therefore no ballot papers have been included with this Bulletin.

This issue includes another posthumous article from the pen of Pat Leggatt. The article, "sharpen up your Reflexes" is unfortunately missing Pat's diagram but we think it still makes a jolly good read, and can be easily explained by looking at the circuit of the Ekco AD65.

Next year we will once again produce the 'BVWS Members Handbook' so look out for it with the membership cards in February.

A surprise opportunity to make the 'Move to the Country' has meant that my entire Murphy collection of hundreds of radios, TV's, consoles and radiograms have been moved into storage. This was no small task I can tell you. The move should happen in mid January 2008 and at that point I will not be contactable for a short while, so please make any communications via Graham Terry, Membership Sec. Only Royal Mail and E-mail will get to me with a delay.

You should have, by now found this years DVD if not, check your envelope now. It contains another interesting selection of material as described by Terry Martini later in the Bulletin. Of significant importance is the few seconds of 'off-air' television program material that would certainly never have been recorded. I hope you all enjoy it.

Please! Please! Please! Get your renewal form sent back to Graham Terry 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 2008 as you have over a month to return them.

It just remains for me to wish you all a Merry Christmas, and a prosperous New year. Mike…

Below: The auction at Wootton Bassett, December.

New vintage wireless society formed in Australia

BVWS Members may be interested to hear of the formation of a new Vintage Radio organisation.

The Australian Vintage Radio Society Inc. was formed earlier this year and is dedicated to the preservation of our radio, and radio related, electronic history.

The Society holds regular monthly meetings and provides a number of services for its members. These include a circuit diagram service, valve and component bank, training classes on a number of restoration subjects etc and a bi-monthly newsletter.

UK residents are most welcome to become members and further details can be obtained by visiting www.avrs.org.au.

Restoring an AC Pilot Super Wasp (1929) and RCA 103 Speaker (1923) by Gary Tempest

The radio did not seem in bad condition when I bought it some years ago. I was less discerning (putting it mildly) then but upon closer examination, it turned out to be in poor shape. The main problem was the cabinet, which had a de-laminated plywood back and loose corner joints as well as wounds and damage consistent with its age and not being cared for. The back and side assembly are secured to the base with wood screws from underneath. Once these were removed the panels needed very little assistance to come apart. It was obviously going to need new dowels and refinishing but what to do about the front panel? I couldn't do the rest and leave this in its shabby state including unused holes drilled in the past.

The speaker had a broken frame; a clean break through one side. It would need refinishing and a reproduction grill cloth. It was missing its cardboard rear cover and silk dust bonnet.

The Wasp Series Development

I obtained a photocopy of an article entitled PILOTS 'SUPER WASP' that's included in a soft cover book entitled *Discovering Vintage Radio*, by Peter Lankshear, published in 1992. Electronics Australia, a magazine (now sadly extinct) had published a series of articles by Peter on vintage radios, starting in 1974 and the book was a compilation of these. The article does a superb job of describing the development of the radio in the context of the time. I certainly couldn't improve on it and kindly I have been allowed to reproduce most of it here. The only omissions are text and diagrams that don't fit with the rest of my article. If anyone would like an e-mail of the original then please contact me. A friend, 'down-under', later found the book for me and all of the articles in the book are excellent, so if you see a copy then grab it. The article follows this short introduction.

The Wasp (K-101) of 1928: this set had a regenerative detector followed by two audio stages. It used five plug in coils to tune from 500 m to 17 m.

The Battery Super Wasp (K-110) of 1929: basically a Wasp with a screened grid RF stage preceding the detector. It used a second tuning condenser and a further set of five coils. Adding this extra stage seems so simple now but back then this was not the case; more on the difficulties later.

The AC Super Wasp (K-155) of 1929: shortly after the release of the battery version AC heated tubes became available. No time was lost in converting to these using a separate mains power supply (K-111). This and the former models were intended for headphone use by listeners interested in SW reception. Pilot recognised that some users would want to use it as a standard broadcast band receiver and produced a kit of parts for an audio Booster Unit (K-120). This was a single tube audio amplifier with input and output transformers. It could be powered from the K-111 power supply. This and a separate loudspeaker would have made the sideboard even more crowded.

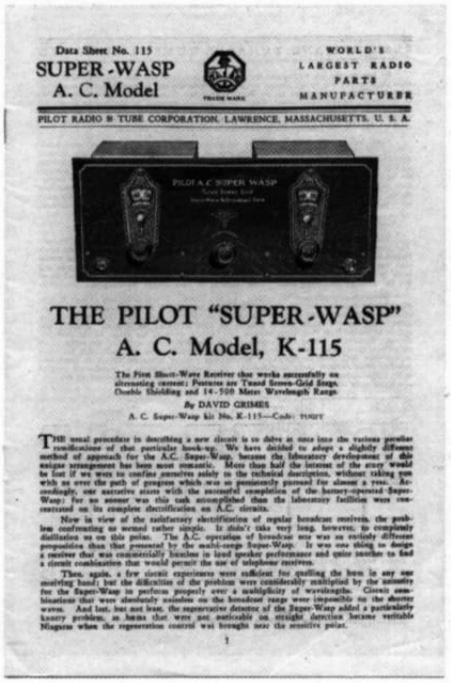
The Universal Super Wasp (early thirties): this last version did away with the awkward plug in coils and separate power supply. The coils were built in and selected by cam operated switches. Also included was a push–pull output stage to fully drive a loudspeaker but a headphone jack was retained. Exactly when this model came to market, if at all in any quantity, seems unclear. It possibly coincided with Pilot's first demise in 1933 (the company was resurrected and back in business again very quickly). All I have for it is a product reference and a copy of an article that appeared in the penultimate edition (1931) of *Radio Design*, Pilot's in house magazine. An Internet search failed to find a picture of an actual model or a model number.

All the above radios were kit sets although it was intended to produce factory-assembled models of the Universal Super Wasp.

Pilot's 'Super Wasp' (Original Article By Peter Lankshear)

Every industry has its landmarks - models which met a demand at the right time with the right price, performing well and setting the direction for future progress. One such radio was the Pilot Radio 'Super Wasp' short-wave receiver introduced early in 1929.

Until the late 1920's radio amateurs, who in 1912 had been banished to the region above 2.0MHz, had the short-wave spectrum largely to themselves. Some wealthy hams could afford receivers from the few manufacturers making short-wave equipment; but the great majority, in the best spirit of amateurism, made their own. In any event, receiver technology above 2.0MHz was very limited, The superheterodyne did exist, but that had a long way to go before it was to be suitable for short-wave reception. It was very expensive and RCA, the patent holders, would not issue manufacturing licences. Typical broadcast receivers had a couple of tuned triode RF stages, a grid leak detector and two audio amplifier stages. But for short-wave work, this type of receiver was quite unsuitable. It could not provide any worthwhile gain, its selectivity was completely inadequate and it was useless for unmodulated Morse transmissions.



Data Sheet No. 115

SUPER-WASP
A. C. Model

WORLD'S LARGEST RADIO PARTS MANUFACTURER

PILOT RADIO & TUBE CORPORATION, LAWRENCE, MASSACHUSETTS, U. S. A.

THE PILOT "SUPER-WASP"
A. C. Model, K-115

The First Short-Wave Receiver that works successfully on alternating current: Features are Tuned Screen-Grid Stage, Double Shielding and 14-500 Meter Wavelength Range

By DAVID GRIMES

A. C. Super-Wasp kit No. K-115—Code: TUGUT

THE usual procedure in describing a new circuit is to delve at once into the various peculiar ramifications of that particular hook-up. We have decided to adopt a slightly different method of approach for the A.C. Super-Wasp, because the laboratory development of this unique arrangement has been most romantic. More than half the interest of the story would be lost if we were to confine ourselves solely to the technical description, without taking you with us over the path of progress which was so persistently pursued for almost a year. Accordingly, our narrative starts with the successful completion of the battery-operated Super-Wasp; for no answer was this task accomplished than the laboratory facilities were concentrated on the complete electrification on A.C. circuits.

Now in view of the satisfactory electrification of regular broadcast receivers, the problem confronting us seemed rather simple. It didn't take very long, however, to completely disillusion us on this point. The A.C. operation of broadcast sets was on entirely different proposition than that presented by the multi-range Super-Wasp. It was one thing to design a receiver that was commercially lacking in loud speaker performance and quite another to find a circuit combination that would permit the use of telephone receivers.

Then, again, a few circuit experiments were sufficient for enabling the ham to any one receiving band; but the difficulties of the problem were considerably multiplied by the necessity for the Super-Wasp to perform properly over a multiplicity of wavelengths. Circuit combinations that were absolutely noiseless on the broadcast range were impossible on the shorter waves. And last, but not least, the regenerative detector of the Super-Wasp added a particularly knotty problem, as hums that were not noticeable on straight detection became veritable Niagaras when the regeneration control was brought near the sensitive point.

1

Regeneration essential

The regenerative grid leak detector was unchallenged for short wave work. By contemporary standards it was sensitive and selective, and it also provided- in the oscillating condition - a heterodyne or beat note for code reception. A single valve regenerative detector with tapped or plug-in coils, connected to a transmitting aerial could, and often did, constitute a practical receiver for hams. Where they could be afforded, one or two audio amplifier stages following the detector provided adequate level for headphone reception.

Shortcomings

Of course regenerative receivers have some limitations, which require 'trade offs'. The grid leak detector is a 'square law' device which, put simply, means that sensitivity falls off rapidly with decreasing signal strength, and no amount of audio amplification can compensate.
Attempts to improve matters by increasing aerial coupling leads to another problem. Resonances in the aerial and feeders damp the oscillating ability of the detector at certain frequencies. Increasing the amount of feedback to counter this effect results in difficult regeneration control. The ideal regeneration characteristics are a smooth, almost imperceptible onset of oscillation, with no de-tuning as the control is advanced.

Screen grids arrive

In October 1927, America's RCA introduced the UX-222, and Britain's Marconi-Osram released the S625. These screen-grid tetrode valves virtually eliminated grid-anode capacitance, and hence the need for neutralisation in RF amplifiers. Here seemingly was the answer to some of the short-wave receiver problems. However, attempts by amateurs to add tuned RF screen-grid amplifiers to short-wave receivers were not very encouraging. What was not generally appreciated was the need for thorough shielding, to prevent feedback and instability. The best that could be done was to use an untuned screen-grid valve between the aerial and the detector. This did not give much amplification, but did eliminate aerial loading. However, as the lack of aerial tuning resulted in strong signals cross modulating the isolating amplifier, the majority of short-wave users continued with simple receivers. By now, commercial interests and broadcasters were alert to the potential of short-wave communication.

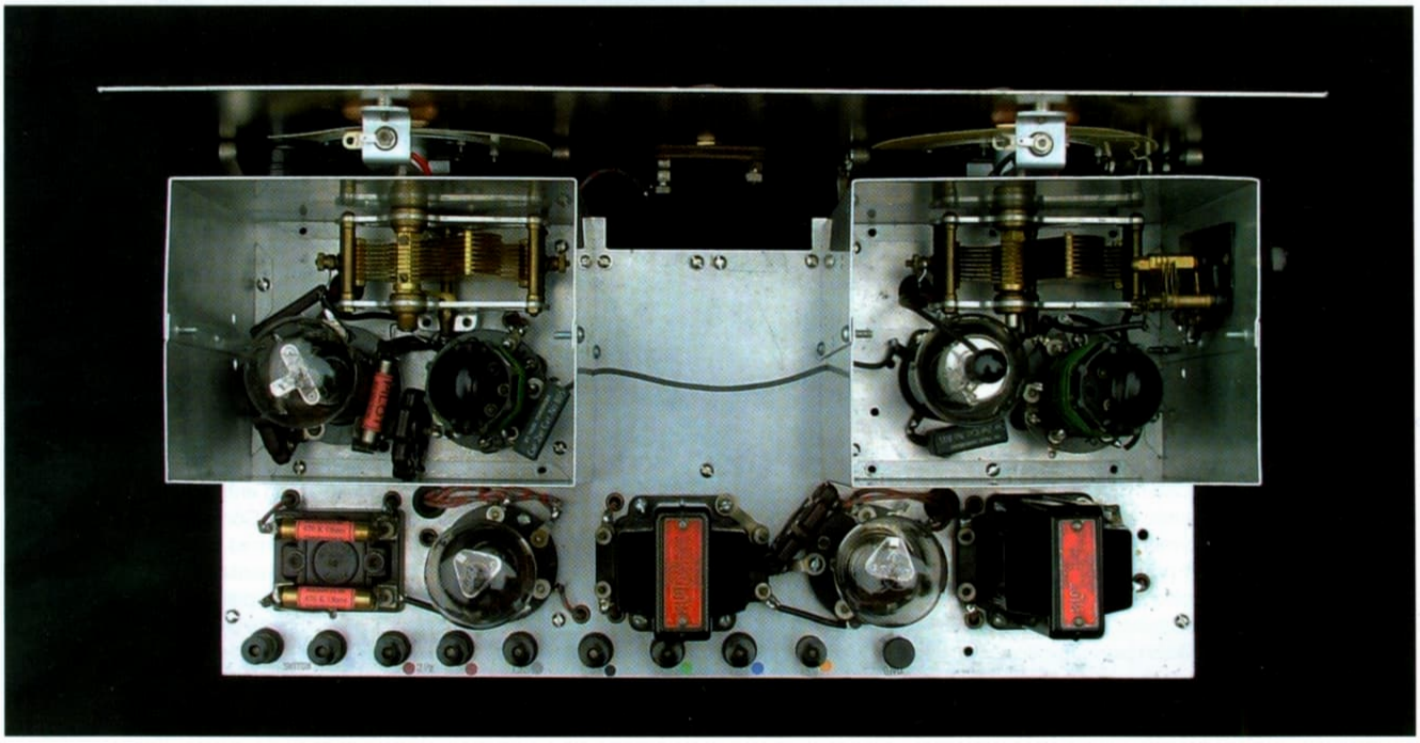
Enter Pilot

A major firm catering for the amateurs and home construction enthusiasts was the Pilot Radio & Tube Corporation of Brooklyn, New York. Pilot turned out a wide range of well made components, and sponsored a quarterly magazine called *Radio Design*, featuring projects for home construction. Needless to say Pilot marketed kit sets for all these designs. Towards the end of 1928, Pilot featured the 'Wasp' a conventional regenerative detector and two audio stage receiver using five plug-in coils to cover from 500 down to 17 metres. Using low loss coil formers, rigid construction and a metal panel, the Wasp proved to be a superior receiver of its kind and represented the best that could be achieved with the simple regenerative receiver. Clearly, the way to further development of the amateur short wave receiver lay with taming the RF amplifier. Pilot commissioned a team headed by Robert S. Kruse to come up with some answers. A consulting engineer in receiver design, Kruse was one of the leading short wave receiver designers of the day.

Wasp With more Sting

The results appeared early in 1929, as the 'Super Wasp' which was a well-screened version of the earlier Wasp, with the addition of a tuned screen grid front end. At each end of the Super Wasp's metal chassis, immediately behind the panel, aluminium

A rear view of the finished radio



Top of the chassis with the box lids removed.

shielding boxes complete with lids. One housed the RF amplifier while the other contained the detector. Along with a valve, each had its own tuning capacitor and plug-in coil. As tracking with ganged tuning capacitors had not been successful, each stage was independently tuned. Between the shields was the regeneration control capacitor, and at the rear of the chassis were the two audio amplifier stages.

An AC Super Wasp

A combination of wide publicity and good performance ensured the success of the Super Wasp. Not only was its introduction timely, but it performed well. The Super Wasp's arrival had coincided with the release of the 224, the mains operated equivalent of the UX-222. Immediately the 224 was released, the Pilot team set about modifying the Super Wasp for mains operation. Modulation hum and power supply filtering provided serious problems, but after the best part of a year's research the AC Super Wasp was produced - as what was claimed to be the first successful AC regenerative, short wave headphone receiver. With a 224 RF amplifier, and type 227 valves for the detector and audio stages, the AC Super Wasp was similar in concept to the battery set, but with additional filtering and RF bypassing.

Advances after 1930

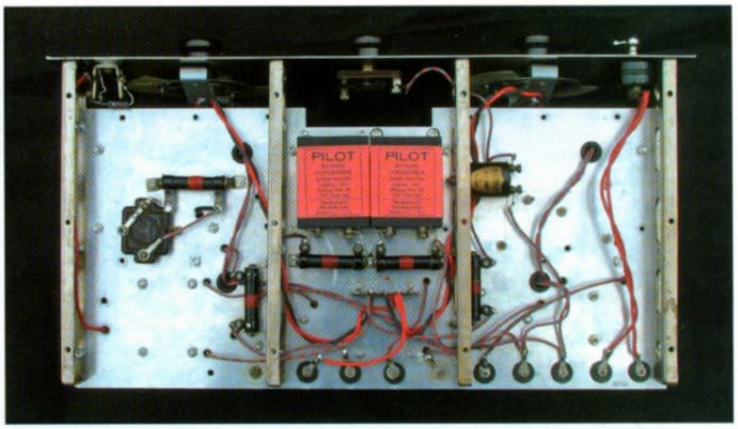
Pilot soon had competition. By mid–1930 National, with the assistance of the indefatigable Mr.Kruse, had produced the superbly made AC powered 'SW-5 Thrill Box'. However, compared with the AC Super Wasp's $34.50, the US price of the SW-5 was $114. This was the price of a large broadcast console, and would have been a deterrent to most enthusiasts.

The Pilot Super Wasp gave the home constructor an affordable instrument that was a considerable improvement on existing receivers, and was the precursor of the communications receiver. As such it was a landmark development, and well worthy of a place in any collection of vintage receivers.

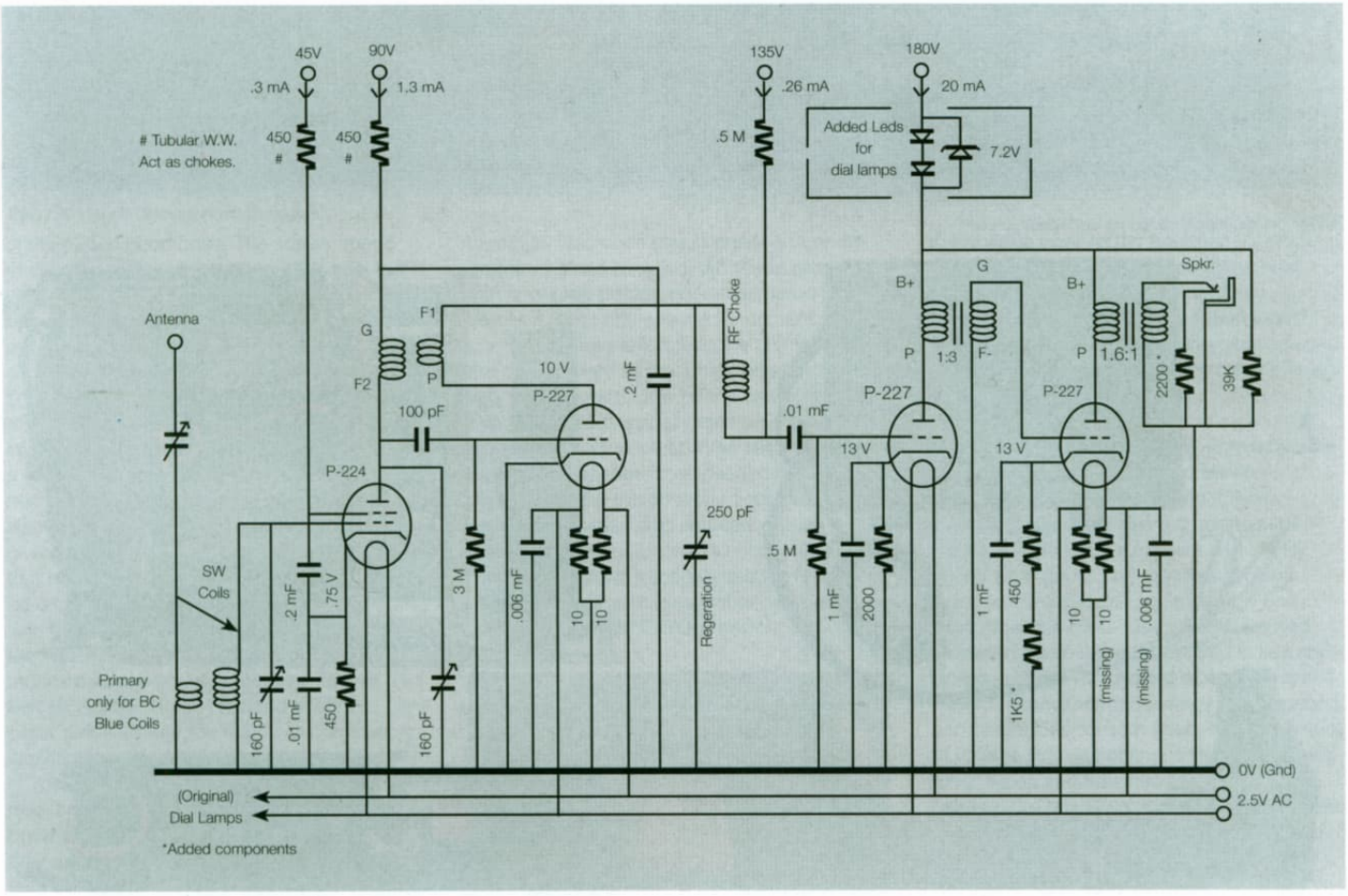
History of Pilot Radio:

For the definitive account of the early years, you need to consult Alan Douglas' book, *Radio Manufacturers of the 1920's* Volume 2. However, excellent coverage, including the later years up to 1960, is given in an article by John Watkins. This was published in the Bulletin in 1995 as

The original radio



The underside of the chassis



The Story of Pilot Radio. It's in Volume 20 Number 4 August and No 5 October. If you don't have access to copies then the articles are on the BVWS CD, "BVWS Bulletin: the first 20 years" issued in 2001.

Cabinet Restoration

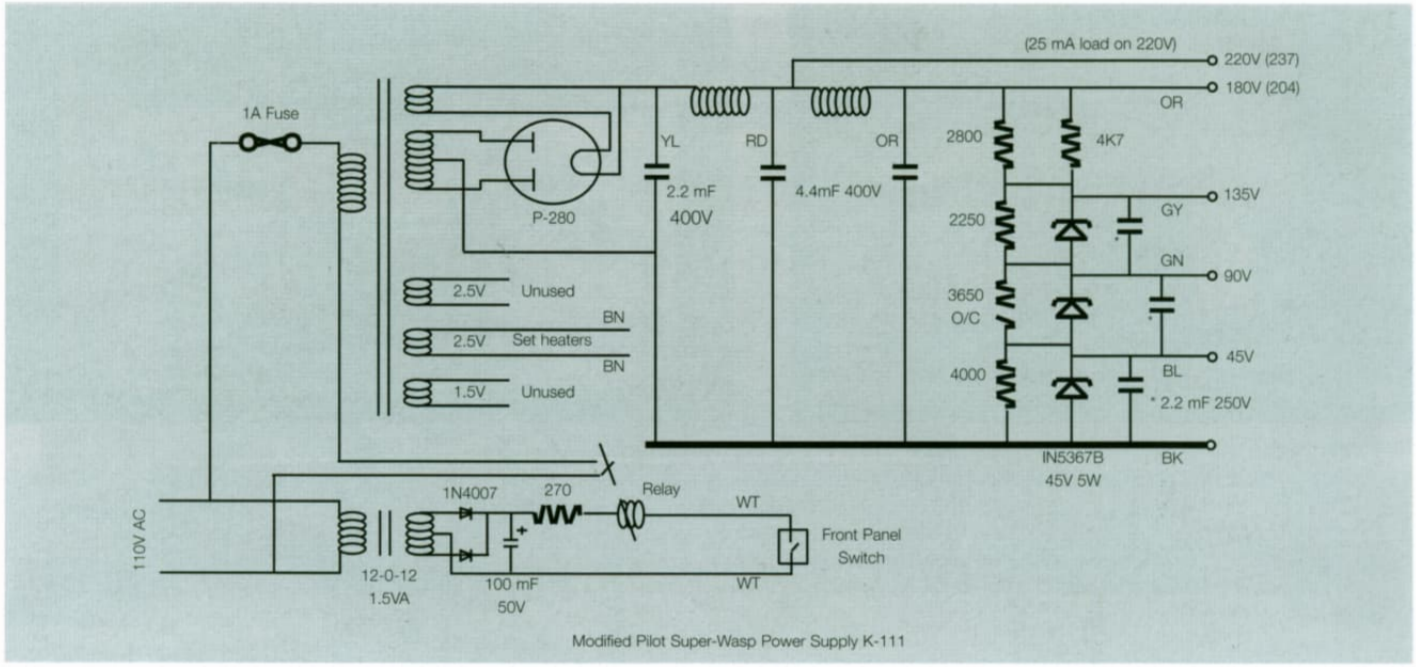
Once I had the cabinet in pieces the best plan it seemed was to route a new back panel from 20mm plywood. Apart from the de-lamination the original did not suit the chassis. As this was a kit set the cabinet may have been obtained from another maker. The holes in the back panel didn't line up with the chassis terminals, making connecting the power supply leads an exercise in manual dexterity. The replacement panel was glued, with new dowels, to the sides before refinishing with Mohawk toner and lacquer. This came out particularly well with very little final rubbing out needed. I can only put this down to being lucky with the temperature and humidity on the days I sprayed.

I came across something that may be useful to others with the steel hinges, lid stay and bevelled screws. These had been finished in what looked a chemical fashion and the remains of the brown coating could still be seen. However, this had broken down and rust had started to occur. I lightly abraded this and left all parts to soak in phosphoric acid (thin Jenolite) for some time. They came out looking remarkably evenly black rather like a 'blued' gun barrel. This seemed to me a bonus so I just sprayed the items with a couple of coats of matt lacquer and so far no problems have shown up.

Front Panel

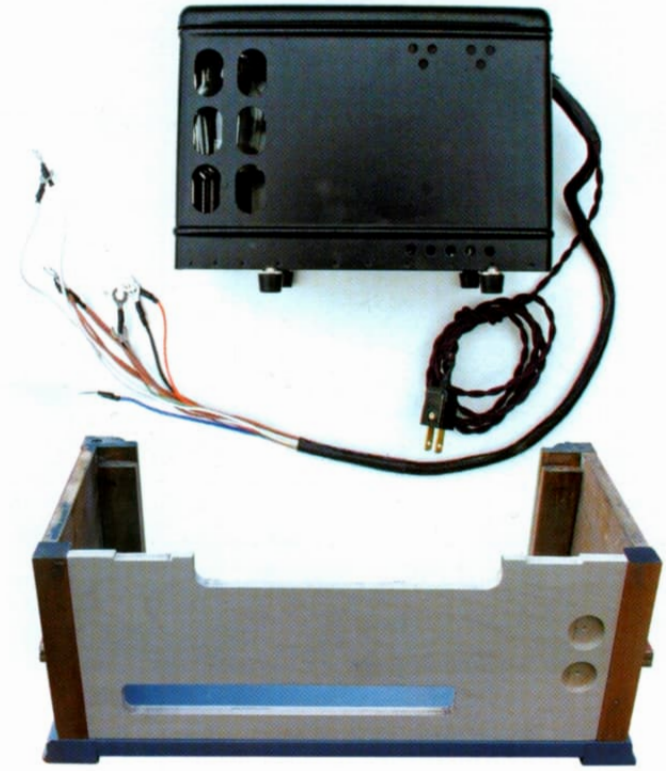
This was beyond my limited artistic talents to touch up although I did make an attempt, including filling in a large 'spare' hole. Finally I gave up and looked at what could be done to make a reproduction. I found that Epson do a Panoramic Photo Paper for my PC printer. This is effectively A4 wide by A3 long and runs through the printer nicely as long as you support it at the start. The paper is said, in accelerated life tests, to have a UV resistance of over 200 years, which should be enough!

The first thing was to scan the original front panel, which because of the length had to be done in two halves. Photoshop soon merged this into one image. Next I eliminated all the faux wood background and the gold edge lining, which I recreated from scratch. The logo and lettering were cleaned up, more or less pixel by pixel, or cloned from good letters elsewhere. This gave me a clear output that only needed a new, quarter veneered, wood background. I had some walnut veneer with nice grain, which was scanned into the computer. This was

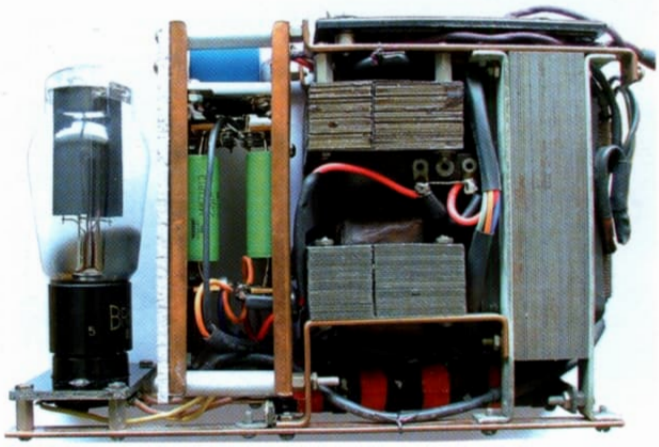


Modified Pilot Super-Wasp Power Supply K-111

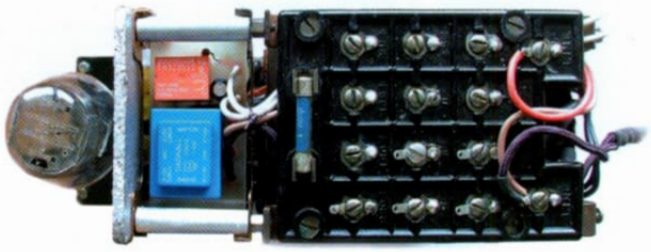
Below: power supply cased up and ready to use



Cabinet with new back



Power Supply inside view



Power Supply inside top view

cropped to create the bottom left hand quarter. It was now duplicated, with the sections flipped and merged to produce the wood effect for the whole panel. After 'staining' it was simply a matter of combining it with the first output to produce the final image ready for printing.

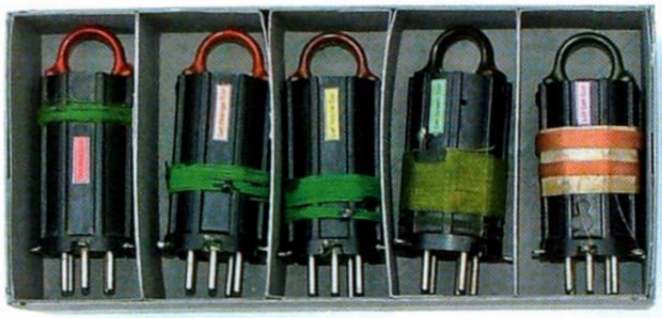
If you are not into photo software this may sound very clever but it isn't really, it just needs patience and experience with the program. It's always 'eye boggling' and time consuming, for something this big, particularly if you don't use the program often. The software is undoubtedly brilliant and I'm not blasé enough not to think it almost magic.

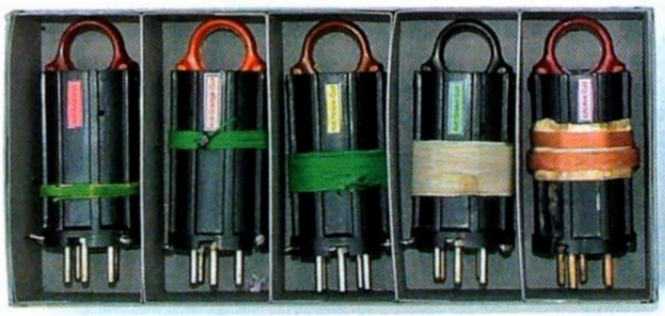
I didn't intend to glue this to the old front panel. Better to keep this as something to go back to if things didn't work out. I had a piece of mild steel sheet cut to size and then drilled and cut all the necessary holes. The panel was originally secured to the chassis with 8 round-head screws. This was a bad design as some went right through the nice edge lining. Also, I didn't want the screws exerting lots of pressure upon small areas of the film. This had happened to the original paint and it had cracked and flaked off around them. The solution was to turn the screws into studs by soft soldering 4BA countersunk screws into suitably prepared holes. The heads of the screws had to be reduced due to the limited panel thickness. After a final finishing, the front panel, along with other items, was sent for nickel plating.

I had imagined that gluing the photo image to it would be easy but it wasn't. Adhesives tried were Evo Stick contact, Servisol Spray Mount, and the one that was successful, 3M Spray Mount. I was going to lacquer it, with several coats of satin cellulose, once glued in place but found it was best done first. Even a single drop of spittle, as happened whilst I was tensely trying to cut out all the holes, ruins the bare film, necessitating going round again.

Front Panel Components

The dial mechanisms were disassembled, treated for rust and sprayed with silver Smoothrite. One was missing a proper scale and had a piece of card with a photocopy glued to it. Fortunately, on the Internet, I tracked down a couple of complete mechanisms and made, from all





The coils in their boxes (LW on the right)

of them, two good ones. The scales, made of celluloid, were badly warped as usual but using gentle heat were made reasonably flat. The mechanisms have a bulb holder but the bulb actually touches the scale so I wasn't going to continue using these. The assemblies have an existing hole, at the rear, which takes a 6 BA screw. It was easy to mount a small tag panel fitted with a yellow extreme brightness LED. These needed covering with yellow heat shrink sleeving to act as a diffuser. In use they give a cheerful fireside glow. I found some that had a maximum current of 50 mA; to be on the safe side, I wired them in series with the HT to the output valves. Their 180 V feed passes the optimum LED 20 mA (later modified as explained in the Amendment below). Across them I included a 7.5 V zener diode so that the radio will continue working should an LED go open circuit.

The dial escutcheons are pressed from brass and were laboriously cleaned, polished and lacquered. I did not want their edges cutting into the film and so super-glued 1.2 mm silicone rubber sleeving, just behind the edge. This nicely avoids contact, with a fingernail thickness gap.

The re-plated (in nickel) and lacquered speaker jack socket and "Off/On" switch were carefully refitted along with the Reaction control.

The Electronics

The Power Supply

Once extracted from its box the unusual construction could be seen. It uses a collection of metal strips and brackets, bolted to the substantial mains transformer, to mount the other items. It had once had a capacitor 'box', for the decoupling components but this had gone. In its place was wedged a piece of component board carrying a motley assortment of ceramic capacitors. I replaced this with tag strips, as seen in the pictures, and decent 'poly' items.

The dropper resistor, for the voltage tappings, was open circuit one tap from the bottom. I could have just left the resistor, that someone before me had soldered across it, but I had a 'what if' moment. If one section had failed then the chances are others might in the future: after all, this very thin wire was now nearly eighty years old. So I fitted physically small 45V zener diodes across the lower three sections, hidden underneath. They needed more current and the top section might fail anyway. This then was shunted with an additional resistor, chosen to hopefully keep the zeners 'alight' if the top section failed, commensurate with reasonable dissipation.

The front panel "Off/On" switch, with its single pole, is shown on the original schematic wired in series with the line feed to the power supply transformer. This means a pair of cable-form wires, to the radio chassis, with tags carrying line voltage. In the old days not much concern was given to safety and a few shocks probably added to the excitement for the amateur constructor. Nowadays this is simply not on, and the tags could be even more dangerous if an auto-transformer was used rather than an isolating type. I wanted the switch to work and so made a small printed circuit board, which was mounted inside the unit, having a miniature transformer and other components to drive a relay. Contacts on this now break the line voltage locally and only low voltage goes to the front panel switch.

The LED illuminated dial

Some of the wiring and insulation was now poor, so I ended up completely disassembling the unit. It was then rebuilt, with a new cable form, and the case sprayed satin black over the tatty black crackle finish.

The Radio Chassis

The best thing to do with this simple chassis was to take some pictures, draw some diagrams and completely strip it. Now everything could be cleaned and tested. All mica capacitors, transformers and the RF choke were good. The resistors I wasn't going to trust and so took the brass end caps off of the glass tubes. Once cleaned up new modern items were fitted inside and look good with PC created labels. The two 1 micro F capacitors had already been opened and ceramic capacitors fitted. Not being sure of voltage ratings I changed these, again for 'poly' types and tidied up (de-rusted and painted) the boxes complete with new labels.

The chassis was now rebuilt and rewired using the wire that was on it. This may not have been original but looked period.

Differences in the Chassis to the Pilot Circuit Diagram

The P-227 output valve had the wrong value cathode resistor (450 rather than 2000 Ohms). However, it was an original Pilot wire wound type so initially I didn't change it (but I did later). An omission was the 20 Ohm centre-tapped heater resistor and its .006 mF decoupling capacitor (those on the detector were present). On limited testing, adding one didn't seem to make a difference but more on this in "Data Sheet No. 115" below. Possibly the lower value cathode resistor was an attempt to get more output from a speaker rather than the headphones this set was designed for. Perhaps if I had been using these then the heater hum-bucking resistor would have had more effect. Hum is much more objectionable using headphones.

As to the hum-bucking resistors, the principle is that the resistor allows equal

The RCA 103 speaker

The rear of the RCA 103 speaker

The RCA 103 speaker motor

but opposite polarity AC to be on each filament pin. Any induction into the cathode and signal circuits should cancel as the two AC voltages are in opposite phase. But why two of them as on this radio?

Could our constructor, all those years ago, have tried to cut costs a little and used items from other radios he had built previously? This set had tuning capacitors close to 350 pF (type 1617) rather than the 160 pF (type 1611) that are specified. There is little chance of getting hold of the correct ones now so it was leave things as they were or try padding with say a fixed 330 pF. But there was another strange thing as the BC band tuned over approximately the correct range (200m to 500m) which means that these coils are incorrect but happily match the tuning capacitors. For the short waves, the larger value capacitors worked as I expected with a tuning range of about 3:1 rather than 2:1. So with the Green coils fitted it tuned 100 to 300m rather than, as on the coil boxes, 99 to 202m. Similarly the Yellow coils tuned 50 to 150m rather than 51.2 to 101m. I quietly left things as they were and moved on.

Coils and Boxes

Several of the coils had been rewound with modern fluorescent enamelled copper wire that to me looked awful. I had a short length of green silk covered, taken from a scrap coil, to rewind them with. Fortunately these were only the SW ones and so had few turns. The coil handles are made from a Catalin like material, to give them colour coding. This by now had darkened and so I added labels to make clear which was which. Again that "someone before me", must have had a coil winder and the skill to use it as there were also wave wound coils made to tune the LW.

I had chatted to another Super Wasp owner who was selling some parts on US Ebay. Kindly he scanned his coil boxes, which were missing with my radio. The e-mailed images were cleaned up in Photoshop, again very time consuming, to print top, side and end labels. One cold winter's day I settled down with some nice grey art cardboard and made the basic boxes. The clever origami, with the card folding back on itself and being mitred into the bottom, was copied from an expensive box of Christmas chocolates. The labels were then glued onto the boxes and when thoroughly dry wiped over with French Polish that gives an aged look.

The RCA 103 Speaker

This is of the balanced armature type, so called because an armature moves in a balanced fashion between the pole pieces of a horseshoe shaped magnet. Its movement is achieved by being surrounded by a coil of fine wire through which the audio output current of the radio flows. The armature is connected to the cone by a mechanical linkage.

This example has a frame moulded from Rep Wood, which is glue and sawdust. Who says Chipboard is a modern material?

The rear cardboard cone and dust cover were missing. The frame had one side broken clean through, several chips and a loose foot.

Once I had it stripped down to the bare frame then repairs could begin. A single screw, dowels and now defective glue secured the foot. I refitted it in like manner using Epoxy. I had imagined trying to include a pin, broken leg style, whilst gluing the side. However, I couldn't come up with a way of doing this, so simply just used the Epoxy again, leaving it clamped up until set. It has been fine since. After the repairs and lots of preparation the frame was re-sprayed with Mohawk toner and lacquer.

Fortunately the motor was in excellent condition and only required cleaning. There is a small choke, shunted by a capacitor, in series with the winding and a capacitor across it. This was 5nF and measured 7M Ohms at 100V, which with no DC from the Wasp I deemed satisfactory. These items are apparently to soften some of the strident high frequencies.

I had obtained a 'repro' cloth from Antique Radio Grill Cloths in the US. This is printed, rather than embroidered like the original, but still looks pleasing. Fitting is a little scary; it has to be taut, and correctly aligned with no glue getting to the front. Not recommended unless you have done a fair number of grill cloth replacements before; better to practice on something easier and cheaper first.

Some simple maths and trial and error was needed to make the protective cardboard cone for the motor. For this I used the same good quality art board that I used for the coil boxes. The silk (now polyester) dust bonnet looked daunting to make but it's simpler than it appears. Basically, it is just an unshaped tube with drawstrings in turnovers at each end. I'm lucky to have a wife who is a whiz with a sewing machine though.

I always think that somewhere, even if years in the future, someone else may be doing a restoration of the same item. So treating the Bulletin as an archive I have included details of making the cone and dust bonnet as an Addendum.

The Circuit

Aerial coupling is by means of a small variable capacitor that prevents overloading on strong stations and acts as a volume control. For SW plug in coils it gets directly connected to the "Antenna" tuned circuit. The BC plug-in coil has a primary winding and by internal strapping gets connected to this.

The detector plug-in coil has a tuned winding that is the anode load for the RF stage. It also has the all-important feedback winding connected in the detector anode circuit. With the variable "Regeneration" control set to 'zero' pFs, the feedback winding is simply in series with the RF filter choke to the first audio stage. Little RF current flows and no feedback occurs. However, as the control is rotated, then the capacity to earth sets up a progressively lower impedance circuit through the detector tube and the feedback winding. The RF current flowing induces current in the primary winding to provide regeneration. After the detector follow two stages of audio amplification which are conventional and typical of the period.

Data Sheet No. 115 (see picture on page 4)

I bought this on ebay, from down in Australia where the Super Wasp was and still is popular. It's a very clean copy with just a stain to the back cover. In Peter's input he touches on the "year of research" in curing the AC Super Wasp of modulation hum etc, but this Sheet spells out the development difficulties in greater detail. I found it most interesting; today with all our modern test gear (and non-inductive resistors and capacitors) it would be regarded as such a simple circuit that bosses would not believe, or accept, a year of costs and delay!

An early finding was that curing problems on one waveband did not guarantee success on others. "Circuit combinations that were absolutely noiseless on the

broadcast band were impossible on the shorter waves. Also the regenerative detector added hums that were not noticeable on straight detection but became veritable Niagaras when the regeneration control was brought near the sensitive point"

There was the usual residual hum and what we call inter-modulation hum today.

Of the first it was found that the construction of the detector tube itself was to blame. It had a heater where the return wire was outside of the surrounding cathode cylinder causing an unbalanced field. The cure was to develop a Pilotron P-227 tube where the filament was doubled back on itself, hairpin fashion, inside the cathode cylinder.

Hum of the tuneable variety could be heard with the antenna disconnected, in the 14 to 50 m bands, and the presumption was correctly made that unwanted oscillations were occurring inside the set itself. Two sources of oscillation were discovered, due to internal capacity between the heater and cathode, of the detector and last audio tube. Adding the .006 mF capacitors, from one side of the heater centre tapped resistors (inductive, being wire wound), killed these as did removing the resistors, but residual hum was greater without them.

Having eliminated these problems another hum source was found on the longer wavelengths. These were obviously caused by similar means but with larger inductances and capacities. Eventually it was found that this was due to the leads for the anode and screen of the screen grid tube. The cure was the inclusion of small chokes, these being the 450 Ohm wire wound feed resistors, and .2 mF bypass condensers.

Conclusions

To me this project turned out well, the radio and its boxes, along with the speaker look very handsome now. Yes! It's not original but it was probably destined for the shed or tip if I hadn't done something with it. I actually got faint hearted before starting and tried to sell it, but no one wanted it even at a low price. So in years to come it would have had no chance of a place in a warm home. Has it now? I hope so; against it is the size (ladies of the house don't like big sets) and unit construction and being 110V (a 220V PSU, K-111A was available). However, it is pretty and even non-radio friends have enthused over it. My wife had the ladies in for her 'sewing circle' and one was very interested and wanted to know all about it and the restoration. Her house was built in 1924 and she said "It would look perfect on my sideboard and I love old things". So when I can part with it, it may have somewhere comfortable to go and to a non-radio collector as well.

Looking at it, over time, the highlight of the restoration is the repro front panel. Although the gold lining and text is not true gold the colour matches excellently with the brass escutcheons.

The aerial coupling capacitor makes a very smooth volume control and on MW the performance is reasonably good. The LW coils are a bonus and during daytime R4 is received well. I find that TRFs, on this station, have less or none, of an annoying heterodyne whistle that most 'supies' now have. Of course re-broadcast material, of your choice, is one of the best options nowadays. I tried the SW coils and received stations but this is not something you would want to repeat often. You do get adroit at changing coils helped by the handles being at right angles to the chassis, such that initial orientation is easy.

The sound is clear and easy to listen to. RCA certainly did a wonderful job with the speaker. Not a lot of real bass of course and not having a boomy box none of the artificial kind either, but this probably helps in making hum less objectionable.

Most importantly I enjoyed the project. I had trials and tribulations (glossed over here) but kept going and was satisfied with the outcome. These early radios have challenges that don't occur with later models and the circuitry may look simple but often has interesting subtleties. They have differences not seen when circuits became more standardised in later sets. With this one there was also a lot of history, the way the design had developed and why the circuit was the way it is. The history was almost tangible and I loved the nostalgia I got whilst working on it and still do now in using the radio.

Amendment

I had e-mailed my draft of the article to Peter Lankshear for his approval of how I had inserted his 'copy'. Whereas I had not even considered the increase in 227 output valve anode current, due to the 450 Ohm (instead of 2K Ohm) cathode resistor, this is what he said about it:

Attached are the 1932 RCA figures for the 227 characteristics. You will note that no maximum anode current or dissipation figures are given, but 5 ma at 250 volts is the maximum anode operational rating given. This is only 1.25 watts but the heater dissipates 4.4 watts! The early efforts to produce the 227 were dogged by problems of anode overheating, largely from the massive heater. As you might be aware, the original indirectly heated triode valve attempts came with valves like the Kellog 401, essentially a 201A with a cylindrical anode enclosing the cathode and grid and largely intended to replace it. The story is on page 80 of Alan Douglas', *Radio Manufacturers of the 1920's,* Volume 2. The filament wattage was 3, but they were not successful. Because of the heat problem, the first generation of sets using the 227 circa 1927 used the 227 as a detector only, the amplifier stages being 226, essentially a 201A with a 1.5 volt 1 amp filament. The first 227's had bright nickel anodes, the next type had perforated nickel anodes, and then the anodes were for a while made of mesh. Finally they latched on to finned carbonised anode types. With a jump from 5 ma to 13 ma (2.34 watts) you can understand my feelings of caution about the 227 operation in your Wasp

I had a read of Volume 2 about the 401. Interestingly the heaters were brought out on a special top cap, with the cathode going to one of the original battery heater pins. The idea was that the valves could be used to retrofit existing receivers. The tube top caps would all be wired in parallel and connected to an additional low voltage transformer.

Peter's caution rang a bell, as I had to replace the tube during restoration. I had tested it and the anode current was fine but later on retest it was very poor. Had it gone like this due to overheating? So it meant taking the chassis out of the cabinet to see what could be done.

Fortunately, it was simply a case of just hiding a modern 1K5 Ohm resistor beneath the original 450 Ohm cathode resistor. The gain was slightly less but there was still more than enough volume for our dining room. However, it did make the LED pilot lamps less bright than I wanted and so I added a shunt 39K Ohm resistor to correct for this.

Addendum: RCA 103 Speaker

Cardboard Cone

Made from an A3 sized sheet of 0.5 mm art cardboard. This needs an outer radius of 21 cm and an inner of 7 cm. The maths give a figure of 222 degrees for the 'cut angle' (the wanted part with the waste segment cut out). However, it is simpler and safer to cut a portion of a complete circle that is larger than this (a full circle won't fit on the sheet size).

With the cone cut out it can be assembled into the speaker, with a large overlap. This needs to be marked and reduced down to 12.5 mm, that can be glued in situ with a glue stick. It should be an excellent fit but can be removed by distorting the cone.

Speaker Bonnet

Made from a piece of brown polyester 35 ½ inches by 10 inches.

Fold over ½ inch of material, on one long edge, and sew a seam for the inner drawstring (fitted later).

At the other long edge fold over 1 ¼ inches and run a line of stitches down ¼ inch from the cut edge. Now a ¼ inch back from this run another line of stitching. This seam is for the second outer drawstring (again fitted later). The extra material, beyond the drawstring, makes a rosette, which finishes off nicely and fills any hole.

Now sew the short edges of the material together, on the inside, to make a tube, without sewing across the drawstring seams.

Use a bodkin to fit the drawstrings. Recommended is PVC covered nylon lacing cord (approximately 3/4mm diameter).

Fit the front end first, getting the seam under the metal lip of the speaker motor, and tighten and tie off the string. Repeat for the rear end, pleating the material as you tighten the string. Finally adjust the rosette for best appearance.

NVCF!

photographs by Carl Glover


NOTICE
RADIO


NOTICE

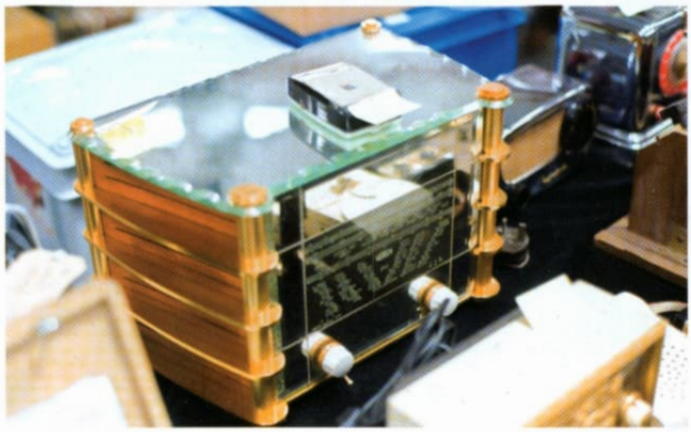

ZENITH
ZENITH


Hier spricht die NSDAP

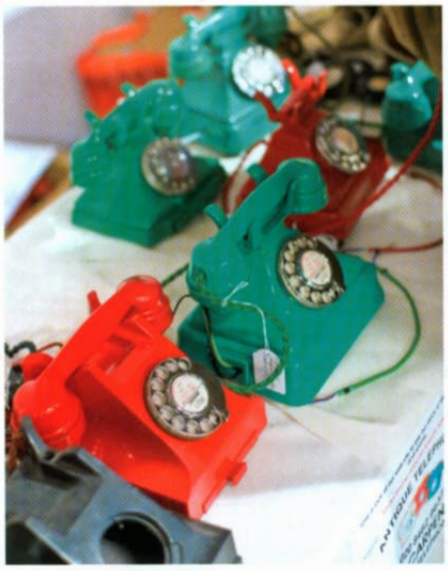

AMPLEX


SONY


Defide




TOILETS




PHILIPS


BUSH
RADIO


TOILETS


WIRELESS SET No 17 Mk II

Listening to the Wireless by Phil Rosen

As a young child, I suffered so badly with asthma that I was almost a total invalid, spending long hours in bed, indoors or at best being pushed around in a wheelchair. My only contact with the great world outside was our first wireless set which arrived and was installed one memorable day in 1937. The set was a KB model 444 'Rejectostat' a rather old–fashioned AC mains short superhet. It served the family faithfully for the next 20 years or so until, as a teenager I began to build simple TRF sets of my own.

KB Model 444 1932
Mains superhet. Wooden cabinet. British 7 pin valves. Working order. (The same radio as in my home when a boy in the 1930s)

For me, the wireless set was multi–functional: it brought news of the outside world to my bedside, it brought education (the schools programmes) since I was unable to attend a school of any kind until I was 14 years old. It brought music, entertainment and companionship in a way difficult to envisage with the media of today. Although we had a chimney stack and a good earth connection buried in the garden, our set seemed rather insensitive, so we only listened to the BBC National or Regional programmes. Radio Luxembourg or Radio Normandy were not for us.

The radio day began around 10am with the excellent schools broadcasts. One that sticks in my mind is 'Out and away with Uncle Jim'. He was a 1930s 'Doctor Who'. He had a time and space machine that took you back to the time of the Roman gladiators or out into interplanetary space. You learnt ancient history, geography or even space technology in a very immediate way. During the day there would be concerts of dance music or classical music (like Radio 3 today). So I was probably unusual as an 8 year old in having a great liking for the classics, while the diet of plays and book readings probably gave me a better English education than I would have had at the local school.

At around 4pm there was the Children's Hour. The contents were a clever mixture of entertainment and a bit of educational stuff. Items I recall were: 'Norman and Henry Bones, detectives', 'Wandering with Nomad' which was a nature programme, a summary of the latest news items done in a non–patronising way for children by Commander Stephen King–Hall, and of course the immortal 'Toy Town' series featuring Larry the Lamb, Dennis the Dachsund, Mr Grouser and all the other wonderful characters played by the uncles and aunties of the Children's Hour staff. The programme always finished with the words "Goodnight children everywhere". The wireless stayed on for the six o'clock news, preceded by the weather forecasts, the farmer's fat–stock prices and (on Saturday) the football results. None of my family was at all sports–minded but we found something fascinating about the names of the clubs: "Hamilton Academicals 2, Partick Thistle 3" and so on...

From 7pm onwards it was entertainment time. The BBC was just emerging from Director John Reith's puritanical straight–jacket, and almost every evening there were programmes to look forward to. 'Monday Night at Seven' was the earliest of these productions; a mixture of songs and comedy sketches. One regular character was Syd Walker the rag and bone man. each week he had to deal with some social problem he came across on his rounds. He always finished up his spot with "Well, what would you do chum?"

Bandwagon was the first of the great BBC comedy shows. It began in January1938. It starred comedians Arthur Askey and Richard Murdoch. They had a fictitious flat above Broadcasting House, had a cleaner, Mrs Bagwash and Lewis a pet goat. It was the first programme to spawn catchphrases such as "Aythangyow" (I thank you), "Hello Playmates", "Don't be filthy!" etc. Bandwagon was soon eclipsed by the most popular radio comedy show of all time: 'ITMA' with Liverpool comedian Tommy Handley as the legendary star and anchor man. With a worldwide audience of over 50 million it played a significant role in keeping up our morale in the darkest days of World War II. The weekly broadcasts on Wednesday or Friday evenings were a signal for everything to stop. Mum, dad and I huddled around our KB set with its tiny, glowing dial, giggling at the antics of 'Ali Oop' "excuse please Mister, you buy dirty postcards, very grimey, gor blimey!" Mrs Mop "Can I do you now sir?" Colonel Chinstrap (reporting an allied advance in Italy) "I say we're over the Po sir" and so on...

There were also many comedy imports from the USA: The Bob Hope show, The Jack Benny show, The Fred Allan show and shows featuring American stars who made their homes in England during the war such as Bebe Daniels and Ben Lyon in 'Hi Gang'. Other comedy shows broadcast during the war years included 'Happidrome' with some of the most appalling jokes heard on the radio. 'Variety Bandbox' was a mixture of music and comedy which became famous in later years as the show which 'discovered' Tony Hancock, Harry Secombe, Frankie Howerd and many others.

The Radio Times was little more than a thin black and white news sheet during the war years but we would scan it avidly to check on the dates and times of our favourite programmes. Considering the chaotic conditions under which the BBC was forced to operate during the Blitz the quality and variety of the broadcast material was astounding.

We were evacuated to a small Welsh village during most of the war. When one day our faithful KB started spluttering and howling with some strange malaise we had recourse to Captain Walker. He was a retired sea captain with a hook in place of one arm and a shed full of radio repair gear. I watched fascinated as he used his hook to steady the chassis, apply the solder with his teeth and effected a good repair which kept our set in action for a further 10 years or so. It was at this time, aged about 12, that I began to take an interest in the technical side of radio. During one of my interminable spells in hospital a visiting schoolmaster gave me a surplus school textbook on basic electrical technology. This pointed me in the direction of my future career in electronics. For much of my adult life I retained an interest in 'the wireless' as a nostalgic reminder of the huge part it played during my childhood years. After a chequered career as grocer's boy and cinema projectionist I eventually landed the job of electronics engineer for the Automatic Telephone and Electric Company, which for me was a bit like an old soak getting paid for working in a brewery!

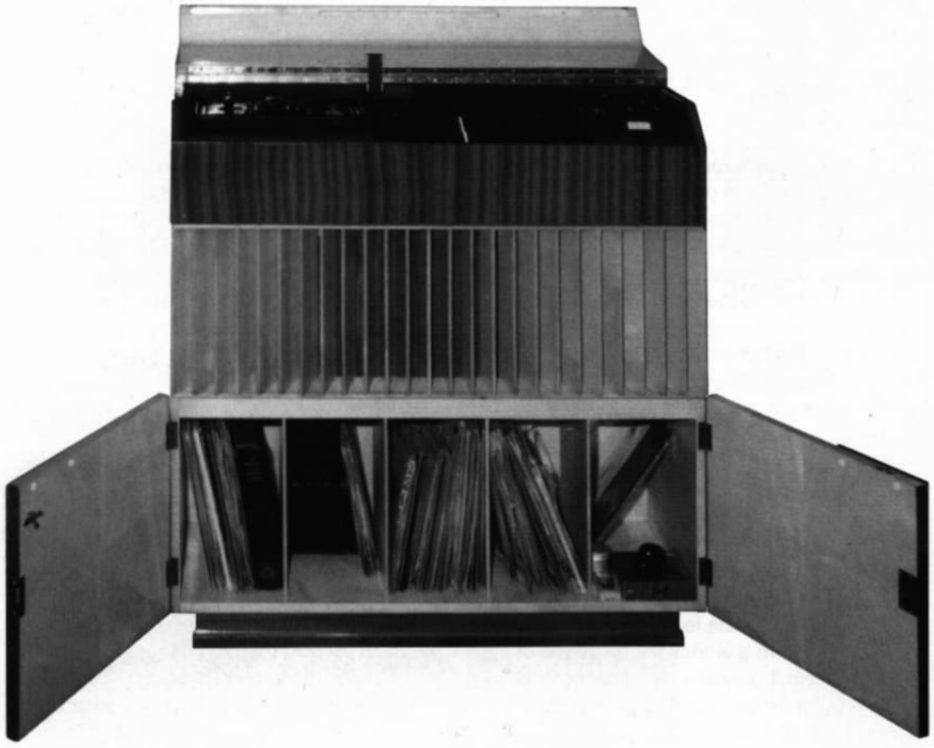
I retired 13 years ago at the age of 62 and casting round for a hobby to replace my working life, went back to my first love – the wireless. I now have a collection of some 110 domestic radios from the 1920s and 1930s and run a radio museum at Nottingham Wollaton Hall. Of course, I have managed to acquire a KB 'Rejectostat' set and this has pride of place in my collection – a reminder of how the wireless has shaped my life over the years.

The Decca Decola

by Malcolm George

(this article originally appeared in Radio Bygones and has been reproduced with kind permission)

Early in World War Two, the Decca Record Company were approached by RAF Coastal Command to help solve a problem concerning the identification of German submarines from the sounds that they made under water. The difference in sounds produced by German and British submarines was extremely subtle and required great skill to tell them apart. It was the task of the operator to distinguish between the sounds picked up by the hydrophones and determine whether the submarine was friend or foe. During submerged activities, submarines were powered by electric motors. Diesel engines were used for propulsion on the surface and also drove a dynamo to charge the large lead-acid storage batteries required by the DC electric



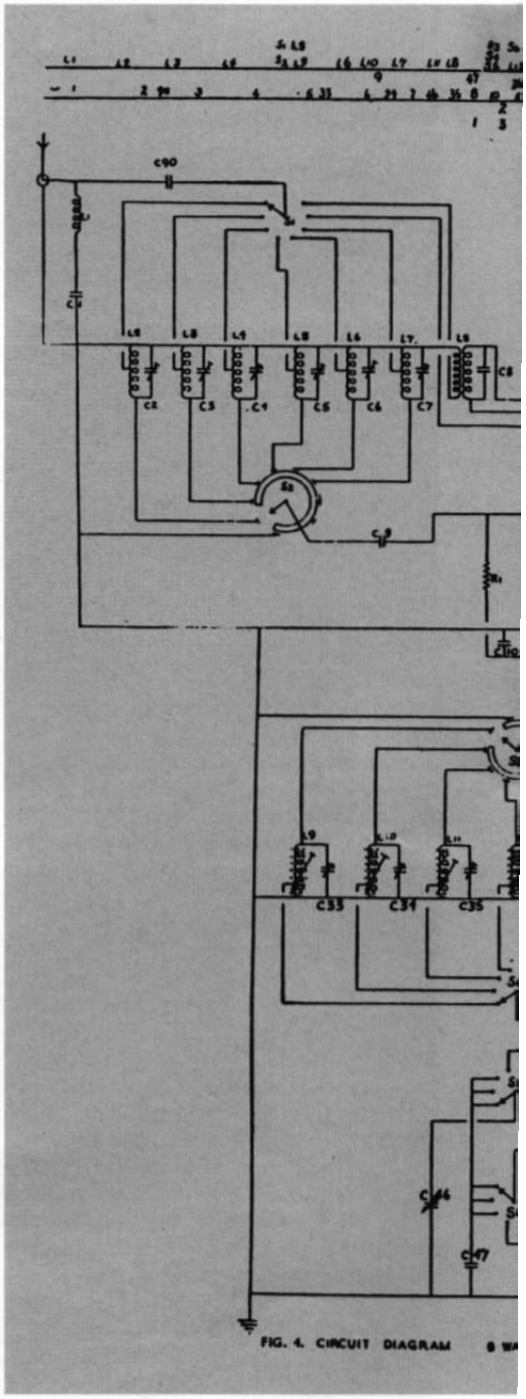


FIG. 4. CIRCUIT DIAGRAM

It was, as you can imagine, very important in this underwater conflict that correct identification was possible in order to avoid blowing up your own comrades. Training of the operators was therefore of paramount importance. They required samples of the different sounds so that expertise could be gained in the recognition of each type of submarine, both British and German. These samples were to be provided in the form of gramophone records, but recording technology was at that time not capable of capturing the delicate nuances of sound that provided the clues necessary to make these distinctions easy to identify. This was the era of the 78 rpm gramophone record that suffered from being able to record only a fairly narrow audio bandwidth and had a pretty poor signal to noise ratio, certainly not of sufficient fidelity for the task in hand.

The chief recording engineer at Decca was at that time a certain Mr Arthur Haddy (later to become Sir Arthur), and it was to him and his team of engineers that the task of resolving this problem fell. His solution included the reduction of background noise produced by the fairly gritty shellac based material used to press 78 rpm records by removing some of the larger components of the shellac mix. Importantly he developed more linear and wide-band recording amplifiers and designed cutting heads and amplifiers with significantly less distortion than had hitherto been achieved. To complement these improvements in recording techniques he also developed significant advances in the quality of reproduction. The overall result was that Decca managed to achieve a quality of recorded sound that was capable of producing results that provided unambiguous recorded samples for student hydrophone operators.

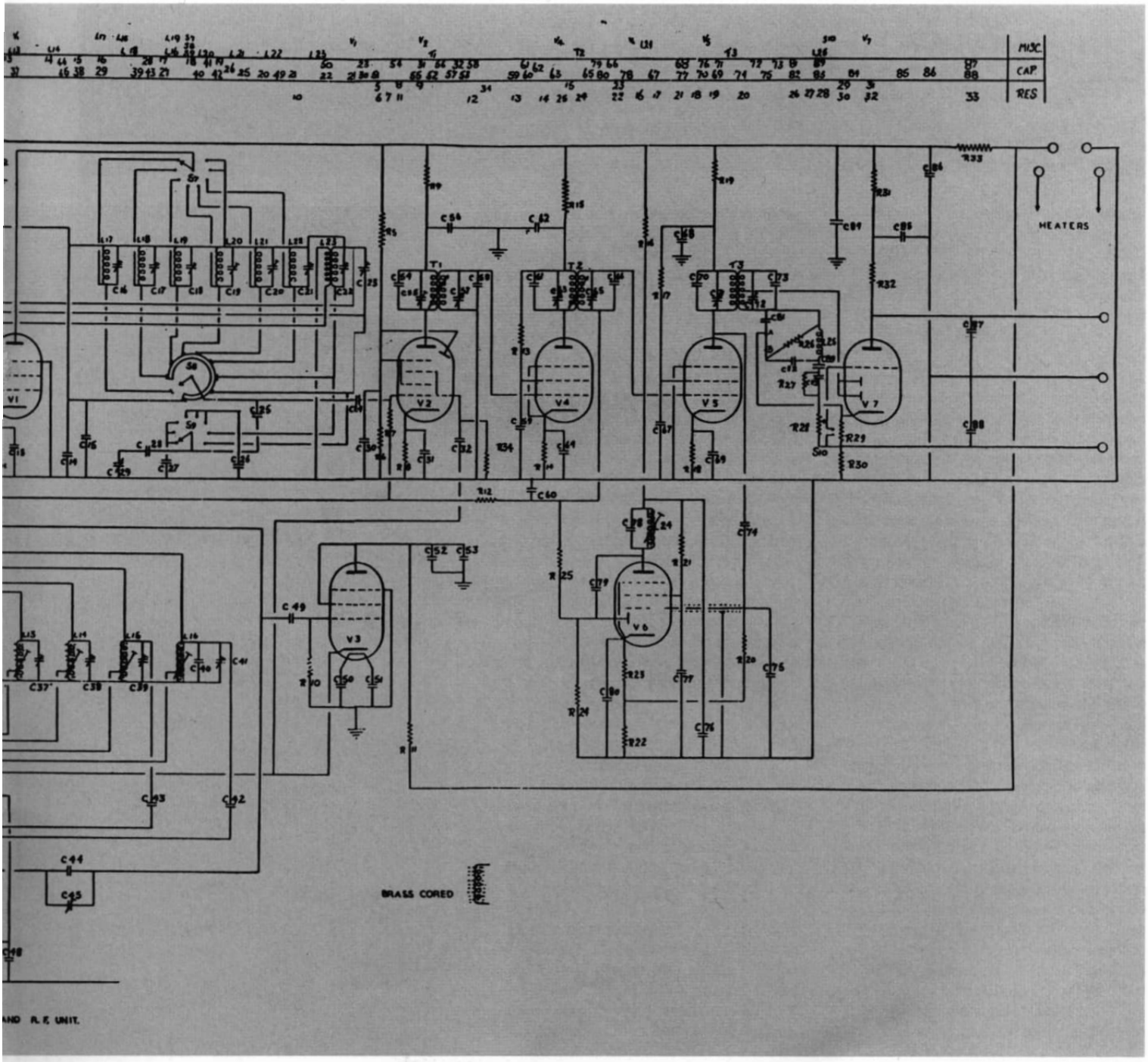
When the war ended the Decca Record Company applied the results of this

research and development, that had produced such good quality from the humble 78, to the domestic production of gramophone records and introduced a new term for the record lover. This was the famous "ffrr" logo that Decca adopted as their trade mark in 1945. "ffrr" stood for "full frequency range recording" and records produced using the techniques developed during the war showed a considerable improvement in quality compared to what had gone before. To complement their undoubted success, Decca decided to produce a range of really high quality record reproducers to enable the audiophiles to get the best from their records (the best being of course Decca ffrr recordings!). One of these instruments was to be called the "Decca Decola.". When first produced in about 1947, the Decola was fitted with a Garrard RC60 record changer and could only play the available 78 rpm records. Later models were fitted with a Garrard RC80m three speed automatic record player capable of playing the new 45 rpm records and LP's that were released onto the UK market in 1951.

One evening in the early fifties my father took me to the Shire Hall in Chelmsford to witness a demonstration of this new "High Fidelity" record reproducer. The term "High Fidelity" was quite new to us but was soon to be the accepted description of any combination of pick-up, turntable, amplifier, and loud-speaker that were considered well above the norm in respect of their ability to provide good quality sound reproduction. The Decca Decola was one of the first attempts to produce a stand-alone high quality record reproducer for the music enthusiast. As demonstrated, the "Decola" was a record player only and retailed at £259.17.6. If a radio covering six short wave ranges, long and medium waves were required, an extra £47.1. 8 was demanded. This meant that to buy a good quality radio-gram, you would have to part with nearly £307.00 including purchase tax. This is equivalent to £7268.00 to-day !

I am very interested in old radios and radiograms, so when a friend of mine told me that he had acquired on old Decca Decola and was thinking of putting it in his local household auction, I jumped at the chance of buying it from him.

As received, the Decola looked a very sorry sight indeed; the cabinet was "distressed" as I believe the antique fraternity would say, some veneer was missing from the top section of the cabinet, the bottom plinth was split and the whole cabinet was a dull glossless travesty of its former self. The electronics fared no better, absolutely nothing worked, the radio and amplifier sections were completely lifeless and the turntable of the automatic three speed



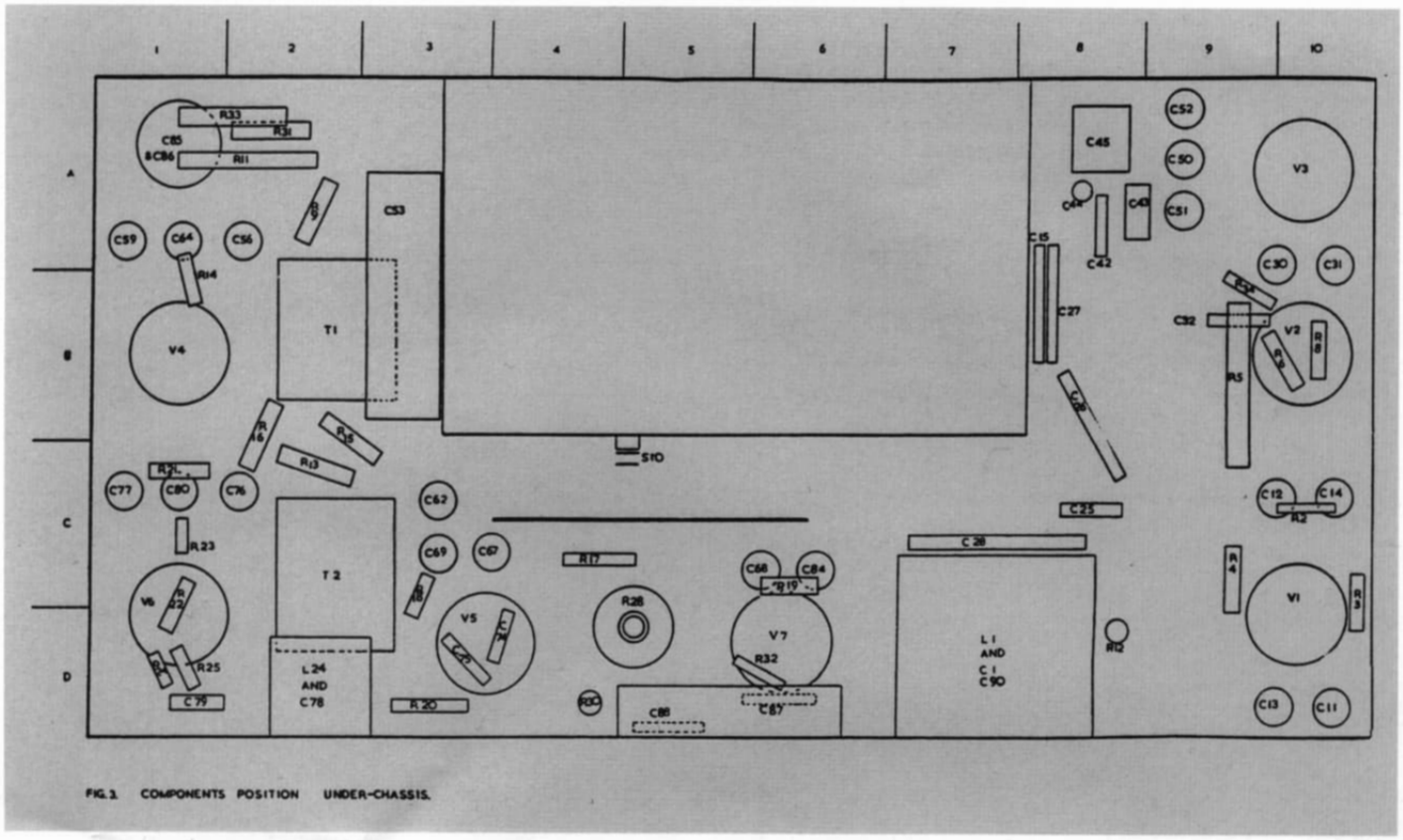


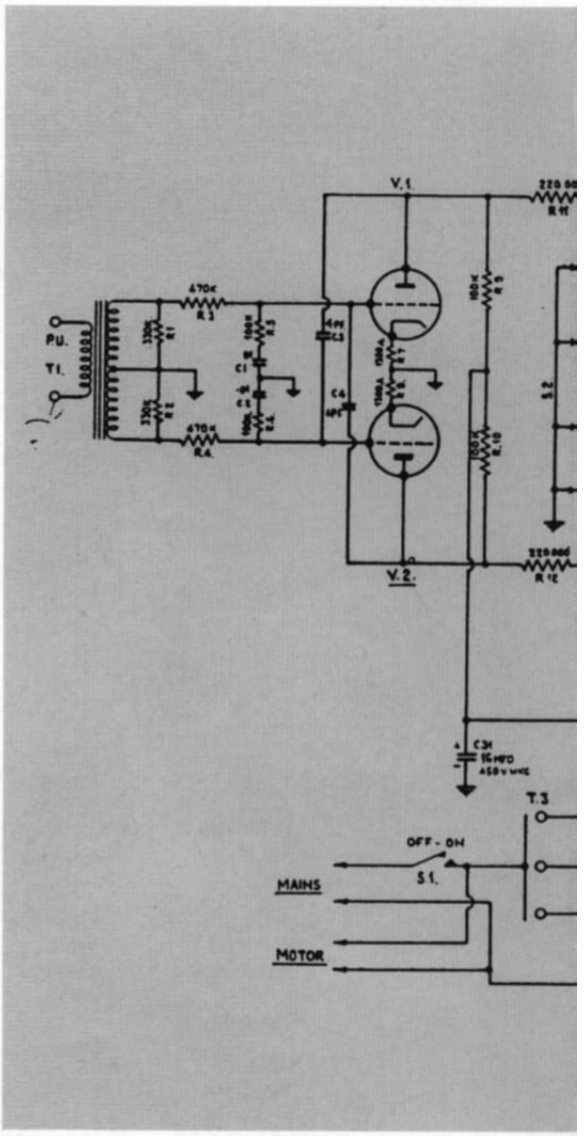
FIG.3. COMPONENTS POSITION UNDER-CHASSIS.

record changer would not rotate at all.

The cabinet is quite large and heavy (38"W x 41"H x 16"D) but conveniently breaks down into four main sections. The electronics are all accessible after removing the knobs and push buttons and hinging the top section backwards. (See photograph.) The three Goodmans 12 inch loudspeakers are housed in an open backed baffle unit the top of which supports the amplifier, power supply, radio tuner unit and record changer. After these items have been removed the baffle unit can be withdrawn by means of webbing lifting straps at either end. This baffle unit is mounted inside a cage-like slatted grille designed to radiate the sound through 140 degrees. The baffle is bolted to the bottom part of the cabinet that is designed as a storage space for some 250 records. All the cabinet parts can be separated quite easily so it is not a difficult job to deal with each of them independently. I will not give any great detail concerning the restoration of the cabinet except to say that each item was carefully stripped, repaired where necessary and refinished using cellulose lacquer applied with commercial spraying equipment. The final result was most satisfactory and the Decola looked exactly as it would have done in 1950.

As described earlier, all the electronics and the record changer are mounted on top of the speaker baffle and are connected to each other by means of several small and one large cable. All of these cables terminate in connectors and each electronic unit is fixed to the baffle by means of 2BA studs, washers and nuts. The entire system can therefore be removed from the woodwork and re-assembled on a workshop bench, making it much more accessible and easier to work on. The power supply seemed a good place to start and examination of the electrolytic capacitors soon showed that they were all suffering from considerable leakage current. All these electrolytics were changed for new ones which luckily I had in stock as a result of over-ordering on an earlier project. The power supply provides 535 volts dc for the PX25 output triodes, 510 volts dc for the preceding amplifier stages, 6.3 volts ac for their heaters and two separate 4 volt ac supplies for the directly heated PX25s. A 5U4G full-wave rectifier and large smoothing choke complete this un-complicated power unit which after very little attention worked well.

The amplifier is of push-pull design throughout, consisting of three pairs of 6J5 triodes and a pair of PX25s (see footnote) providing an output of 6 watts. The low impedance needle armature pick-up feeds a transformer having a centre-tapped secondary, loaded by a 330.000 ohm resistor on each half and followed by a bass boost circuit feeding the grids of two 6J5s. The grid/anode capacities inherent in triodes are neutralised by external capacitors connected between the anodes and grids in this and the next stage. In all three low power stages, negative current feedback is employed (cathode resistors un-bypassed) to correct any existing unbalance and non-linearity giving the whole amplifier a total harmonic content of less than one half percent. Between the first two stages is inserted a top-cut/bass boost network with independent switching for treble and bass. Each control has three positions giving nine combinations. After



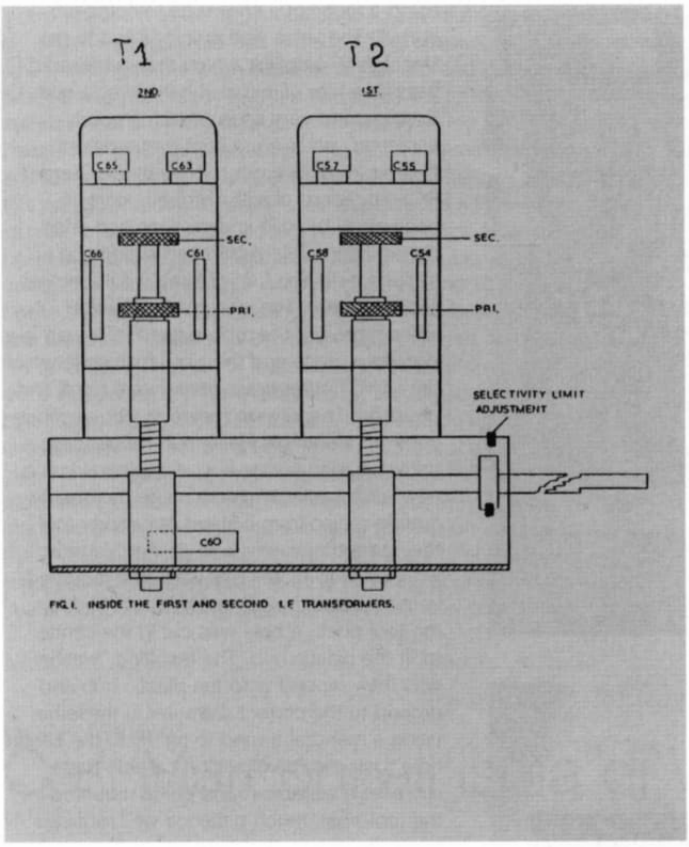


FIG.1. INSIDE THE FIRST AND SECOND I.F TRANSFORMERS.

stage two, volume is controlled by twin R/C circuits shunted across its output, anode to anode. The capacitive portions of this network provided some degree of loudness compensation at low volume levels. The final pair of 6J5s feed the parallel resistive inductive grid loads of the PX25 output valves. The inductive parts of the grid loads ensure accurate matching of the inputs without recourse to variable resistors etc. Its shunt impedance is negligible and its impedance at all frequencies above 30Hz is at least four times that of the resistors. A further precaution against damage to the output valves is taken by providing individual bias resistors and grid and anode "stoppers". The output transformer is quite large and heavy, being designed with minimum leakage inductance to provide efficient transfer of energy to the three parallel connected 15 ohm impedance 12" Goodmans loud-speakers.

All of the electrolytic and paper capacitors in the amplifier were changed and as they are still quite cheap, all six 6J5s were replaced with new old stock from ex-government sources. PX25 triodes are very expensive nowadays so these were tested on an AVO Valve Characteristic Meter and found to be OK. Feeding the primary of the pick-up input transformer with very low level audio from a music test source produced good quality sound from the loud-speakers. A more scientific test using a sine wave signal generator and examining the output on an oscilloscope while driving a dummy load proved that the amplifier was performing as well as ever both in terms of output power and frequency response.

The radio tuner unit that happily was fitted to my Decola is a high quality 8 wave band superhet covering the long and medium wavebands, and the bandspread coverage of the 49,31,25,19,16,and 13 metre short-wave bands. It

has a complement of 7 valves and some interesting features such as an additional RF amplifier (EF39), switched in only when the short wave ranges are selected, and a variable selectivity feature. This is controlled by a front panel knob labelled selectivity/ brilliance mechanically linked to the movable cores of the first and second IF transformers. In use, it enables close proximity stations to be separately isolated by reducing the IF bandwidth. It also acts as a sort of tone control for the radio as the tone controls of the power amplifier are by-passed when in the radio mode. The audio output is via a phase splitter using the triode section of an EBC33 in order to provide push pull drive to the third stage of the power amplifier.

My receiver unit produced no output at all but dc checks soon revealed that V4, the second IF stage had no anode supply. This was due to the anode feed resistor being open circuit due to a short circuited 0.1mfd decoupling capacitor. This was quickly sorted and radio signals were soon heard. Adjustment of the variable selectivity control however had some rather disturbing effects. If the control was turned to provide wide IF bandwidth, then the whole receiver went into uncontrolled oscillation and was totally unstable. Quite a long time was spent checking all the decoupling components in the receiver and adding additional 0.1 mfd capacitors to the most likely places, all to no avail. Eventually I discovered the problem, the IF amplifiers use high gain vari-mu pentodes type Mullard EF39. These are coated with a metallic covering which is connected to pin 1 and this acts as an RF screen. This screening on the second IF amplifier valve was in a terrible state with well over half the glass not covered by the coating. A replacement valve cured the problem but a close look at the other EF39's in the tuner revealed that they all suffered from loss of coating. It seems a shame to discard valves which in all other respects are OK just because they have lost this vital screening. I therefore asked a friend of mine who runs a small company specialising in metal coating of all types if he could help. I gave him a bald EF39 (having scraped the remaining coating off) and asked him to do his best even if, in the interests of science, the valve had to be sacrificed! A couple of days later he proudly delivered a brand new looking valve gleaming in its new coat of zinc. This he had applied using a technique known as "electric arc spray". The valve was quickly fitted to the Decola's IF amplifier which then performed without a hint of instability; this was a real success and very soon all of my poorly screened valves were sent for treatment.

Next to receive attention was the Garrard RC80m record player. Through years of neglect, all the oils and greases had dried out and completely gummed everything up to such a degree that nothing would move, slide or rotate. The motor was OK after lubrication, but the rubber tyred idler was in a very sorry state and the two small belts which drive two further brass idlers were slack and perished. These were replaced with sections cut from a suitable Hellerman rubber sleeve originally made for use as a cable marker. A new rubber idler tyre was made by roughly cutting a disc from a sheet of neoprene of the correct thickness and gluing this to a wooden face-plate. This was then mounted in a lathe and, by using a scalpel fitted to the tool post , a hole was cut in the centre to fit the plastic hub. The resulting "washer" was then slipped onto the plastic hub and ground to the correct diameter in the lathe using a mandrel turned to tightly fit the centre hole. Using strips of silicon carbide paper slid over a suitable round guide mounted in the tool-post, much patience was required to slowly reduce the diameter until correct. The diameter does not have to be exact, but must be about right otherwise it may not engage with the turntable, the motor shaft sleeve or either of the brass idlers when any of the three speeds are selected.

When the rest of the mechanism had been cleaned and oiled the unit worked well and properly played and changed all eight records placed upon its loading spindle. The problem was that all three speeds were wrong, all of them being some 4 % to 6% fast. Careful examination with the aid of a micrometer revealed that the Garrard Company had obviously had some production problems with the RC80m which they had not properly resolved. The diameters of the motor sleeve and the two brass idlers did not seem to have been calculated correctly. None of these components had been turned to the most practical and production efficient diameters needed to get the correct three turntable speeds. I had to use the skills of my friendly toolmaker to produce a new motor sleeve machined with two new diameters which would result in the turntable running at 78, 45, and 33.1/3 rpm respectively with an acceptable accuracy of 1%.

All that remained now was to test the Decca XMS type pick-up. This represented a significant advance in pick-up design, and used a replaceable moving iron armature fitted with a "permanent" sapphire or diamond tip. This armature, mounted on its own integral rubber bushings, moved within a coil subjected to the magnetic field produced by a small permanent magnet and generated a very small and low impedance electrical output. Apart from a poor connection from the coil to the pins on the pick-up connector and a fairly well worn stylus, all seemed otherwise well with my pick-up. I decided however to treat it to

a new stylus so as not to risk damage to any of my large collection of 78 rpm records. This was provided by a specialist firm in Ashstead who exchanged the worn sapphire tip for a brand new diamond one. All was now ready to put a record on the turntable and find out just what a Decola sounded like when playing a mint condition Decca "ffrr"gramophone record. The results were most rewarding and further listening to a selection of 78's and LP's revealed why this particular instrument was well respected in all the gramophone journals of the time. The Decola now lives alongside an HMV 541 in my lounge and is played quite regularly. I am lucky enough to own quite a few mono LPs that were produced in the 1950s. Even while I write this article, I am listening to La Boheme with Renata Tebaldi and Giacinto Prandelli on Decca LXT 2622 played on my Decola!

Footnote:- The price of replacement PX25 output valves is now quite staggering so I have adapted my Decola to use cheaper 6L6 beam tetrodes strapped as triodes. I have made up a small clip-on chassis with two octal sockets for the 6L6's and a pair of British 4 pin plugs that directly mate with the bases for the PX25's. This method of modification does not alter the original in any way and the return to "as manufactured" is as easy as removing the clip-on chassis and refitting the PX25s in their sockets. As the PX25's are directly heated and require 4 volts at 2 amps, it is easy to series connect their separate heater supplies (making sure that the phasing is correct) via a 1.1 ohm 5 watt wire wound resistor to feed the parallel connected heaters of the 6L6s. These require 6.3 volt at 0.9 amp each and their indirectly heated cathode resistors need to be 560 ohms in order to provide correct biasing. Each cathode resistor is decoupled with a 220 mfd electrolytic capacitor to maintain good low frequency performance. The original cathode components are left undisturbed as they are not now in circuit. The 535 volt HT supply for the PX25s is probably a little high for the 6L6s so a 680 ohm resistor can be added (within the power unit) in series with the anode supply and decoupled with an additional 16 mfd capacitor. The results of this modification do not seem to have reduced the quality of reproduction and the PX25s are still wrapped in cotton-wool ready to take over when absolute originality is required.

Acknowledgements:-

1. '*The Fabulous Phonograph*' by Roland Gelatt published by Cassel & Company - 1956.
2. Robin Tench of the Decca Record Company for providing technical information.
3. Ron Wright for his engineering expertise.
4. Steve Noble of rfi Screening for the metal coating of valves.
5. The Expert Stylus Company for supplying a new stylus.
6. Richard Harding for photography.

Book review

Con Marconi all'isola di Wight

by Carlo Bramanti

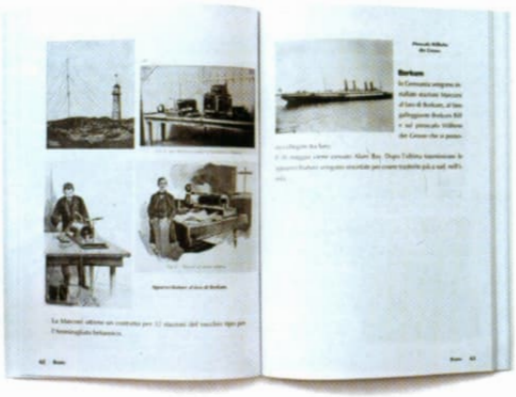
Vintage wireless expert and prolific Italian author Carlo Bramanti has recently published '*Con Marconi all'isola di Wight*' (with Marconi on the Isle of Wight) reconstructing in minute detail Marconi's important activities on the Isle of Wight in the period 1897 – 1901.

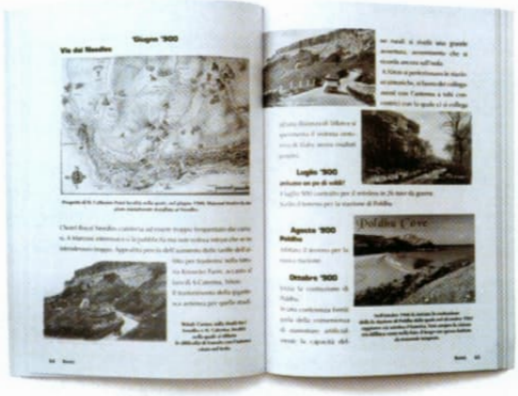
Richly illustrated, this volume is a valuable contribution even for those who do not read Italian. It also contains several interesting contemporary anecdotes; and for those wishing to find the places mentioned, there are up–to–date directions to follow.

Carlo Bramanti is a member of the BVWS and a committee member of AIRE, its Italian equivalent.

'Con Marconi all'isola di Wight', pp112, 12,50 Euros. Published by Sandit Libri, January 2007.

Available from Sandit s.r.l, Via IV Novembre 3/P, 24021 – Albino (Bergamo), Italy.





Audiojumble

photographs by Carl Glover


NEAL


THORENS TD 160
MOUNTING PLATES
TD 160 DAMPING


SEMO


MUSICAL FIDELITY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ROTTERD
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QUAD


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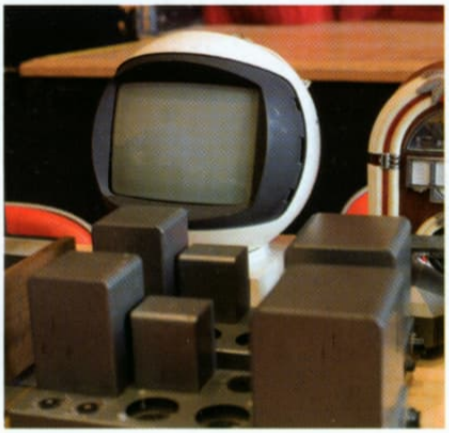


Sharpen up your reflexes by Pat Leggatt

Many designers in the early 1920s refused to be governed by the old adage 'two into 1 won't go'. They were taken with the idea that there was no particular reason why a valve should not simultaneously amplify both RF and AF signals, and accordingly they developed the so–called 'reflex' circuits or 'dual amplification' as Scott–Taggart liked to call it.

Marconiphone V2 and Ekco AD65. They have more in common than meets the eye.

The technique was invented in Germany in 1913, but the earliest practical example of reflexing that I have come across was the Marconi Company's rather unfortunate application of Captain Round's screen grid valve, the FE1, which he devised in 1920. Round was keenly aware of the unfortunate effects of feedback in a triode through the internal anode–grid capacitance, and he minimised this as far as possible in 1916 with his Q and V24 triode designs in which the anode and grid leads were taken through opposite sides of a cylindrical glass envelope, rather than closely adjacent through a 'pinch' at one end. His next step was to interpose a screening grid between control grid and anode, held at a positive potential so that the electron stream would be accelerated through to the anode, with the result that anode–grid capacitance became vanishingly small. This valve – a 'quadrode' as it was first called – offered high RF gain and almost complete freedom from self–oscillation.

Marconi's, however, seemed blind to the FE1's advantages as an RF amplifier and instead used it in their Type 91 amplifier in a rather eccentric arrangement as a combined triode RF amplifier, diode detector and triode AF amplifier. This did indeed incorporate reflex RF/AF amplification, hence my introductory description of the device.

The Marconi Type 91 amplifier effectively used the valve as what we would now call a diode triode. The filament and the two grids were connected as a triode amplifier for RF amplification, the filament and anode were used as a diode detector suitably biased for anode bend rectification, and the AF output from the detector was fed back to the 'triode' for AF amplification.

I suppose Marconi's were motivated by the economy of using a single valve for all three purposes, and certainly economy was the driving force for the reflex circuits for broadcast receivers a year or two later. To make one valve do the work of two was very attractive in view of the high cost of a valve and reduced load on the HT battery – in terms of today's money a valve cost about £30 plus £5 Marconi royalty, and an HT battery about £40.

Turning to the technicalities of reflexing, there is no reason why a single valve should not simultaneously amplify RF and AF signals: after all, a simple leaky–grid detector does this, producing detected audio at the grid and quite happily amplifying both this audio for eventual output and the RF for feeding back for reaction. So, to a first approximation at least, the RF and AF will not interfere with each other inside the valve, but steps must be taken to ensure that they are kept separate in the external circuitry.

The diagram shows a typical reflex circuit illustrating the technique, using a simple triode as was generally the case in early broadcast receivers. The first thing to note is that a separate detector is used – either a crystal or a second valve – since a valve biased for use is not really suitable as a signal amplifier. The aerial input is fed to the valve grid in the normal way, and the amplified RF appears across the tuned anode circuit: the headphones in series here are shunted by a condenser to provide a path for the RF currents to HT+.

The amplified RF is applied to a crystal detector and the AF output from this is fed to the primary of an LF transformer. The secondary of the transformer is connected in series with the bottom end of the aerial tuning coil, the transformer winding being bypassed with a condenser to provide a path to earth for the aerial currents. The audio signal from the LF transformer secondary is thus fed through the tuning coil to the valve grid, and is amplified by the valve. The audio signals at the anode pass readily through the anode tuning coil and through the headphones to HT+.

To sum up, in the aerial tuned circuit the bottom end of the tuning coil is effectively earthed, as far as RF is concerned, by the condenser across the LF transformer secondary and the tuning is unaffected: but the condenser is quite small, so audio signals in the transformer secondary are unaffected. Similarly in the anode circuit the top end of the coil is effectively earthed (actually to HT+) by the condenser across the headphones which is small enough not to affect the audio signals there.

It is perhaps worth mentioning that reflexing and reaction should not be confused. Reaction is an entirely different process whereby the same RF signal is fed back to the grid to reduce grid circuit losses, whereas reflexing involves feeding back a different signal, ie audio.

There are of course a number of possible variations. Reaction can be applied round

Article continued on page 56

Easy cabinet restoration by Colin Wood

A friend kindly gave me this Murphy A30C in December 2003. At that time I repaired the chassis which was in similar condition to the cabinet and left the cabinet restoration for a future date, which has arrived in September 2007.


1


1a


2


3


3a


3b


4


5


5a


6

Looking at the stripped out cabinet I thought this is going to be interesting? Images 1 & 1a clearly show large areas of missing walnut veneer to the top panel. First problem was how to remove the rest of the veneer without causing further damage? The top edge of the front plywood panel and both top side mouldings were flush with the veneer to be removed so sanding and planing were out of the question as both would destroy the glue line. Image 2 shows a plastic dish with piece of tea towel and a wood chisel. The dish was filled with water which was used to soak the towel. The wet towel was placed on a section of veneer to be removed taking care not to wet the exposed second layer and a very hot electric iron was pressed onto the towel causing it to hiss and steam. This was drastic action but sudden heat was wanted to penetrate the top layer of veneer only, (the remains of the old polish having been removed). After half a minute a strong smell of hide glue filled the air, the iron and towel were removed and the chisel was then used to prise up a small flap of hot sticky veneer allowing the veneer to be peeled away in strips. In less than twenty minutes the old veneer was piled on the bench. This old veneer will be saved for future use.

Image 3 shows the remains of the hide glue which posed the next major problem, how to remove it without damaging the glue lines. The front and sides were only standing proud of the surface of the panel by the thickness of the veneer but once again prevented sanding or planing. At this point, steam was also not an option as there would be a great possibility of lifting the second layer of veneer. Images 3a & 3b show the method used to remove the glue. A cabinet scraper was freshly sharpened and made short work of this difficult job. The scraper could with care be worked right into the corners making a superb job of cleaning them out. Image 4 shows the panel as left from the scraper ready for new veneer.

Image 5 shows the new veneer fitted. Image 5a shows a close up of one side joint when dry. Image 6 shows the basic tool kit. The sequence of gluing the veneer was to cut the new veneer ½" longer and ¼" wider than the size of the panel. Important: water was used to wet the face side of the veneer without soaking it. Turning the veneer over, a generous coat of hot hide glue was applied by brush. By applying water to the face side of the veneer it balances out the wetting

by the glue, hopefully stopping the veneer from curling up. It didn't matter that the glue started to set at this point. A generous amount of hot hide glue was brushed onto the panel to be veneered taking care not to splash the glue around. The new veneer was gently placed in position making certain that the front edge was tight against the front panel and that the veneer was centred with ¼" overlapping the side mouldings. A piece of grease proof paper larger than the electric iron's base was placed centre front and the warm iron was pressed onto the paper for a few seconds, the iron being only warm enough to melt the glue. Removing the iron and paper, the veneer was quickly pressed into tight contact with the panel using a suitable scraper; in this case a heavy duty plastic scraper was used with all sharp edges removed, scraping towards the front of the cabinet. As the excess glue escaped

7

7a

8

9a

10

10a

it was removed with a damp cloth. The front was worked across stopping two inches from each side and the joint was secured with gummed paper tape after making certain that it was tight, without gaps. The centre and back edge were then worked all the time using the damp cloth to wipe away excess glue. The back edge was then taped. A side joint was then completed by heating the veneer to just short of the joint, pressing it down with the plastic scraper, wiping away the excess glue then using a steel ruler and utility knife to trim the veneer to size. Great care was taken in aligning the ruler with the moulding, as to trim under size would have been disastrous. The cut was made in a number of light passes with the utility knife, ensuring the knife followed the ruler and not the grain. The waste veneer was discarded and the joint was heated and pressed down tightly with the plastic scraper, the excess glue was removed with the damp cloth and the joint was taped. The second side joint was completed in exactly the same way. This method of veneering is called "hammer veneering"; the plastic scraper is the hammer. Image 6a shows the few items of equipment used. The electric iron was bought new for £5; the glue pot cost £17. Before buying the glue pot (eBay), a clean small baked bean tin was wired into an old saucepan suspending it clear of the bottom of the pan, water was added to the pan and glue was added to the tin, this did exactly the same job as the glue pot and wiring the tin to the pan prevented the tin from bobbing up and down in the water. The hide glue must never be allowed to boil. It should be heated sufficiently so that when the glue brush is lifted the glue runs freely without blobs or splashing. The grease proof paper costs very little but makes working with this hide glue much more of a pleasure, the paper was marked so that the clean side was always uppermost keeping the sole of the iron clean; when the paper became sticky a new piece was used. Clean working practice and taking plenty of time makes veneering enjoyable.

Images 7&7a show the cabinet scraper in action again; the scraper leaves a beautiful surface if it is sharp and used correctly. The scraper is a cutting tool which will remove a layer of veneer with little difficulty, so much care is needed. Also, if it is allowed to chatter it will leave knife marks which show up badly in the finish if left. Image 8 shows the few

Article continued on page 58

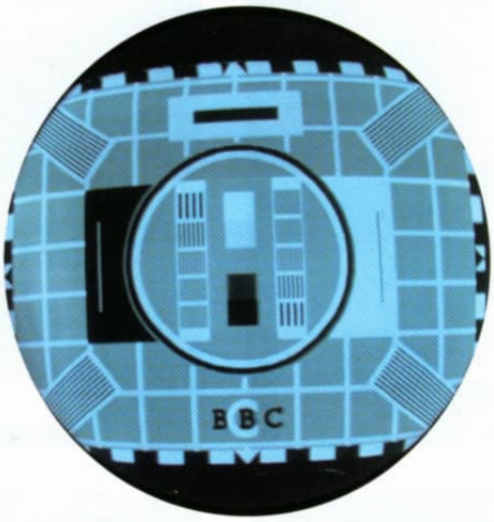
Reconstruction or reproduction? A TV22 for the 21st Century

By Ian Liston-Smith

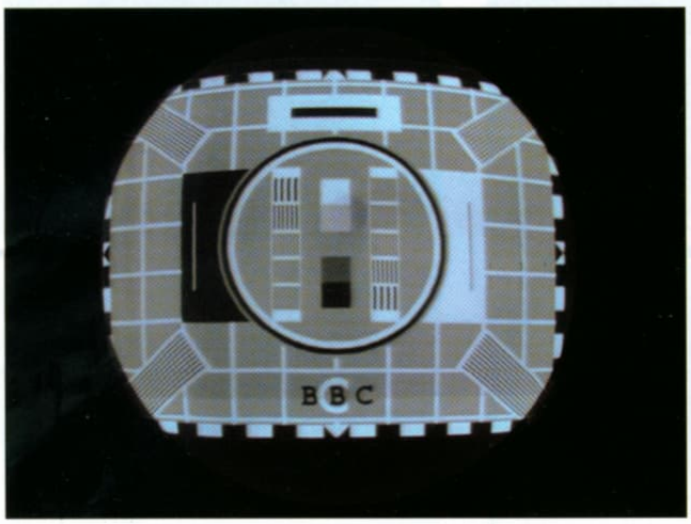
Part II

Part I described the dismantling, cleaning and rebuilding of the main and RF chassis and also the initial testing of this rebuilt RF chassis in another TV22. At this point the line-output transformer was out of circuit and being rewound by Mike Barker. The tube was also removed but heater-chain continuity was maintained with a wire-wound resistor.

A nice new TV22



Brighter picture from aluminized tube (scan coils not straightened yet!)



Non-aluminized tube with slight ion burn

The repainted mask

It was time now to switch on to fully check the television's reconstructed power supply, audio circuits and wiring connections with the rebuilt RF chassis in place. I connected the modulator and switched on and gradually wound up the volts via a variac.

Once all the heaters had warmed up, tone appeared from the speaker and a quick check of the audio waveform on the 'scope showed a good sine-wave with no significant distortion. Volume was smoothly adjusted by the volume control confirming that the audio circuits and connections to the RF chassis were wired correctly.

There was some vision-on-sound (as characterised by slight buzz from the speaker) but this was expected as the IF strip had not yet been fully re-aligned. This had already shown up in the earlier tests with the rebuilt RF chassis connected into my original and fully working set.

Where is that smoke coming from?

It was while confirming the correct HT voltages that I noticed whiffs of smoke appearing. Then the dilemma many of us will be familiar with; to switch off immediately or endeavour to see where it's coming from!

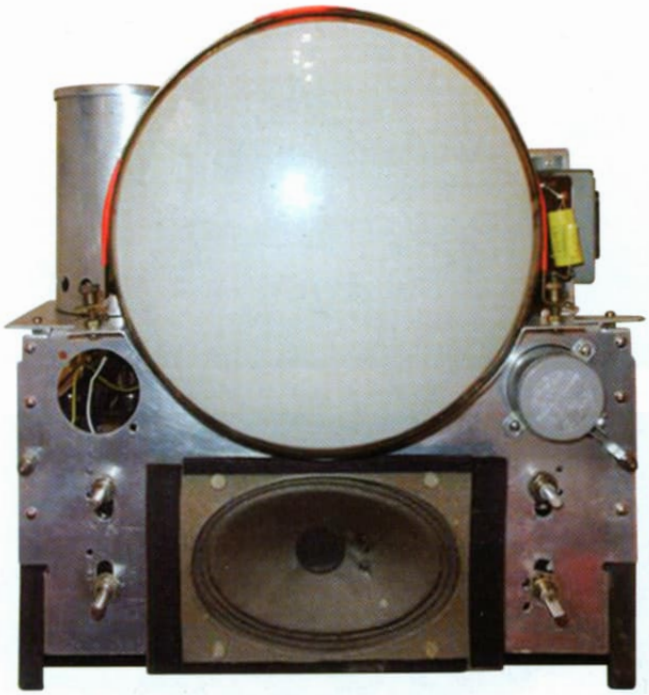
It didn't smell of burning insulation, more of hot resistor with a hint of meths, so I decided to risk pursuing the somewhat risky approach of keeping it switched on and locating the smoke's source.

Actually locating the smoke's source was much harder than expected as the smoke seemed to spiral up from various locations through gaps in the chassis, and the longer it took to locate, the more anxious I became.

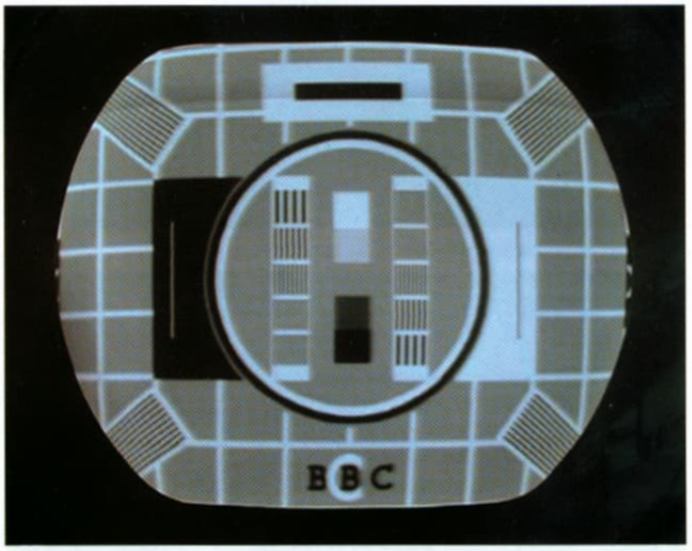
I had cleaned all the old wire-wound resistors with meths, and it turned out only to be a couple of them expelling some fumes as the heaters warmed up and the new electrolytic capacitors reformed. With a sigh of relief, I noticed that the smoke soon disappeared.

Then there was a "fupp", and from the corner of my eye I caught a small flash somewhere around V15/C74 (Trader Sheet 1091/T38). Time to switch off and put the kettle on...

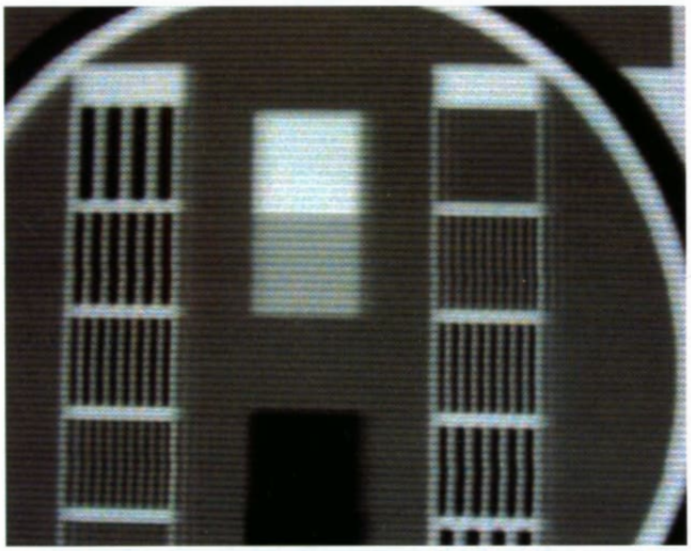
It later turned out that the flash was caused by an internal short in a faulty ECL80 at V15. Anyway, I could do no more without the rewound line-output transformer, so I put the project on hold.



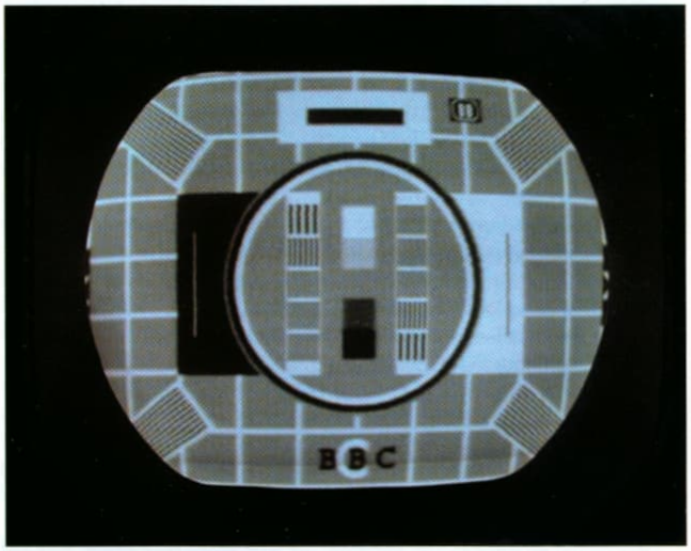
Chassis complete and ready for the cabinet



Rebuilt set and best tube now in cabinet and picture correctly adjusted (the apparent hum bar is an artefact of the photography)



Close-up showing frequency response and slight ringing



Radiated signal received across the room

New valves and line output transformer

While waiting for the line-output transformer to arrive, I bought a new set of valves. The transformer duly arrived from Mike, and I wired it into circuit and fitted the tube, new valves and focussing magnet assembly and switched on again.

Nice sound, shame about the picture. Nothing; nothing at all. The tube heater was on, an EHT spark could be drawn, there was a strong line whistle, but no raster. I checked and rechecked all my wiring, components and voltages against the service sheets. I even took measurements and compared them with my fully working TV22. Nothing seemed to be amiss.

One thing I was a little worried about was the focussing magnet assembly. It was originally very stiff with hardened grease, so I'd earlier somewhat recklessly decided to completely dismantle it and clean all the parts in petrol.

Unfortunately, after doing this I read in the Bush service sheets that disassembly should not be attempted as the magnets would become demagnetized. Although I'd taken great care, it was possible (though I felt unlikely) that this had happened, or - more likely - that I'd reassembled them incorrectly, with the tube's electron beam now going everywhere but the screen.

Swapping the tube

There was no alternative but to swap the tube and magnet assemblies with those from the working set. This would at least show where the fault lay. After swapping I nervously switched on again. Voila! A picture! A bit dim, but stable and with reasonable definition.

I put the "non-working" tube and focussing assembly into the good set. After much fiddling about with the deflection coils, sliding the tube up and down in the focussing-magnet, adjusting the slotted cams for centring and adjusting the ion trap, I obtained a good picture.

It was not as bright as this set gave with its own aluminized tube, and there was a small ion burn in the centre of the screen, but the magnets and deflection coils were obviously perfectly ok. It appears that I had just not aligned these parts properly when I remounted them on the rebuilt set.

Repainted and polished knob

The film begins...

Those were the days!

You can even read the print!

Realignment

Now it was time to realign the RF/IF strip. Mike Barker gave me a hand with this at his workshop as I didn't think my RF signal generator was stable enough at some of the higher frequencies to accomplish this easily.

First a note about the IF cores; as I'd removed the wax from them (see Part I) they were now pretty loose – too loose for reliable setting. I found the best way to give them some friction was to rub the core threads on candle wax. This gives enough friction to keep them in place while making the adjustments. When the final settings are made, dabs of clear nail varnish over the open ends will set them in place. This seal is easily broken if realignment is ever needed later.

After nearly an hour of adjustments, we had eliminated most of the vision-on-sound buzz and the sound-on-vision picture distortions. All but the two lowest frequency gratings were still quite fuzzy so the IF bandwidth was too narrow, but our stomachs were rumbling, the pub was calling, so we called it a day. I would try to finish the alignment later in my workshop.

Some days later I assembled all the test equipment to carry out the final realignment myself. I labelled all the inductors to make it much easier to identify them. It's too easy to lose your place and start tweaking the wrong ones!

I won't go into detail about this final alignment procedure, but it seemed to go very well – all the measurements dipped and peaked as they should and my RF signal generator and counter proved to be adequate.

By the time I'd finished, there was a significant improvement and the 2.5 MHz gratings were now almost visible. I somewhat tentatively decided to gently tweak the two vision IF cores to see if I could improve the definition at the higher frequencies. I achieved a slight improvement at the cost of a little gain, which was more than made up for by turning up the contrast control.

After careful focus adjustment, the 2.5 MHz gratings were now visible and according to Malcolm Everiss's website (www.domino405.co.uk) this is as good as most sets of this period could display. In addition, to remove the colour sub-carrier, the standards converter's filter does reduce the contrast slightly at this frequency. So it seems that mine is about is good as it gets.

Side-by-side comparison

I left the brighter tube in the rebuilt set and left the one with the ion burn in my original, and then made all the adjustments for the best possible picture on each, while feeding both via an RF splitter from the modulator.

It is not clear from the photographs, but there are subtle differences between the two displays. The rebuilt set's picture has a very slight smearing on the whites, although the focus and frequency response is at least as good as my original TV22.

I felt the job was not completed until I had either rectified the "fault" or satisfied myself that they were both up to specification.

Swapping the RF chassis over made no difference, although this did confirm that my carefully realigned chassis did have the edge over the original when it came to gain and frequency response. I swapped them back. I checked the video waveforms going to each cathode with a 'scope and they appeared identical.

Then a brainwave; swap over the video signals to each picture tube. But would this work? I reckoned that as long as both chassis were connected the same way through the mains isolating transformer (extremely important if you don't want 240 volts between them both!) and they were both fed from the same modulator, it should work.

I firmly connected the chassis together and swapped the leads from the screw terminals at the back feeding the tube cathodes. It worked perfectly; the "fault" was still there on the brighter tube in the rebuilt set, thus confirming that the video signal feed was not a problem.

Could I go one step further and feed both tubes in parallel from the same video signal? I'm no television expert, but it seemed

A beautiful object

that the cathode feed was probably of sufficiently high impedance to allow two tubes to be driven from one video output.

Well yes, that worked too, and it turned out to be a very potent method of showing the differences in the tubes. Any differences (apart from geometry) now had to be due to the tube - or possibly EHT supplies. By paralleling the tube cathodes and feeding them in turn from the video outputs of each chassis and adjusting the contrast and brightness, it was obvious that the differences were due only to the picture tubes.

There was nothing I could do about this without comparing it with a new tube - which is impossible. As it was only just noticeable on a test card, I decided it was acceptable and possibly normal anyway.

The rebuilt set has slightly better picture linearity but, again, this is only just noticeable on the test card. (Test Card C is a cruel test for a TV22!) The very slight picture curvature at the top of the screen on my original TV22 appears to be due to the exact mechanical form taken by the line-scanning coils and therefore probably varied very slightly from set to set.

The close-up photo of Test Card C shows a slight ringing on the trailing edges of some of the frequency gratings. According to "Correcting Television Picture Faults" this is almost always due to misalignment of tuned circuits, but goes on to say the amount permissible must be so slight as to be imperceptible at the normal viewing distance. It is indeed imperceptible at the normal viewing distance.

All the internal and external control adjustments work in exactly the same way on both sets with each having the same effect at about the same point of rotation. This confirms that all circuits are functioning identically in each set.

There is now very little to choose between them. The original is a later TV22 mk II which uses a PL81 line-output valve which gives a slightly higher EHT of about 8.5kV and therefore a slightly brighter picture. The slightly lower EHT in the rebuilt set using a PL38 line-output valve is now compensated for by the somewhat brighter aluminized tube.

Not having played with one of these sets before, I noticed the flyback lines appearing on darkish scenes on my original TV22. This model has no flyback blanking, and relies upon the brightness control not being too far advanced. But I still wasn't sure how noticeable they should be. It turns out that there is no significant difference between the two, so I can assume that they are both working correctly.

Picture geometry

Obtaining the best possible picture geometry concurrently with maximum brightness and focus is a true trial of patience! Every mechanical adjustment influences all the others. Then the electrical adjustments also interact with one another too. But with patience the picture geometry eventually obtained is pretty good.

A test card is the only way to adjust the picture accurately. I have Test Card C on DVD and amongst other things, this is designed to have an "average" brightness. In practice, on a real programme, the brightness varies from scene to scene. And even without resorting to adjusting the brightness control, the picture size does change very slightly as scenes change.

At first I thought this was poor EHT regulation caused by a deficient line output transformer, EY51 or metrosil, but after swapping all three devices with known good ones, no significant difference was obtained. Since the effect is present on both sets, this is presumably an "undocumented design feature", a minor compromise ultimately brought about by the set's price.

Although the Bush service sheets give precise instructions on positioning the picture, I eventually decided to adjust it for a very slight overscan once placed in the cabinet. This ensures that during dark scenes, and over the usable range of the focus control, the edges of a 4:3 picture are always kept just hidden behind the mask.

Cabinet

The cabinet had no cracks or chips but a few scuff marks and paint specks which I polished out with BakoBrite (Polishing Paste No.5). However, it was a little grubby as you'd expect after years of use in a smoky living room followed by years of storage. My usual approach for cleaning bakelite is to thoroughly wash with warm water and a little mild detergent, using a toothbrush and wooden cocktail stick to get into the crevices – and a TV22 cabinet has a lot of crevices!

I have read advice somewhere suggesting that bakelite shouldn't get wet; on the other hand I've also read descriptions of bakelite being soaked overnight in strong detergent. I wouldn't advise the later as at the very least the surface patina will probably be removed. I've never managed to damage bakelite by simply washing it – it's very resilient stuff. There seems no point polishing it without removing the dirt first.

However, washing will usually leave bakelite slightly matt once it's dried, which is what happened with the TV22 cabinet. Once it was dry, I started with a light covering of brown shoe polish. The surface of good-quality bakelite is not absorbent (there are exceptions if the filler gets exposed) so it will hardly take the polish colour. But the dark polish did fill the deeper scratches which didn't disappear after the BakoBrite treatment. This was followed by two coats of beeswax furniture polish with a good buffing between applications.

The volume and brightness knobs also needed attention, as did the "Bush" logo on the case. Warm soapy water and a toothbrush did the cleaning, but also removed some of the already loose paint in the lettering.

I removed the rest of the paint with a sharp cocktail stick and stiff toothbrush. I've seen the lettering in faded gold and also in cream, so perhaps both colours were used during manufacture of the TV22. I had cream model paint to hand which I roughly painted over the embossed lettering. Once dried it is easily rubbed back with BakoBrite to leave the clearly-defined lettering.

Rubber mask

The rubber mask was in the usual state for these sets with the paint crazed and in places missing. I've also seen these masks in various colours ranging from cream to green. I don't know if they were manufactured in slightly different tints, or if this range of colours is due to fading or repainting on different sets. The best guide I guess is to make it the same colour as the screen phosphor which is a pale cream-green.

I couldn't find spray paint of any type that even came close to the required colour, so I had to try my own method. I bought tester pots of emulsion paint from Homebase's range of "Just One Coat". The "Hint of Green" and "Pale Green" looked a suitable pair if I could mix them in the right proportions. I watered the paint down a little, added a bit of PVA glue to help adhesion and applied the mixture with a very soft artist's brush. Five coats of the mix were needed to get a smooth finish, but the results are acceptable and the diluted paint left no brush marks.

An off-air signal

I don't know how many readers can actually remember watching these sets "for real", but I suspect that their performance, even in

a good signal area, could only ever be described as "adequate". These were not top of the range models, neither did they pretend to be, although by all accounts they were fairly reliable.

According to the television price list from the April 1951 edition of Practical Television magazine reproduced on Jon Evan's website (http://thevalvepage.com) they were the cheapest sets available that year, so no doubt their performance was an inevitable consequence of their price.

However, this got me thinking... How would it function when receiving a real 405-line off-air signal? When we feed these restored sets with clean signals directly from a modulator, it's hardly giving a realistic reproduction of what the 1950's viewer would have seen.

I set about rigging up a Band I dipole to my Domino modulator's RF output and another dipole to the TV22 aerial input, the two being separated across the room. The Domino has a pretty high output so easily radiated up to 10 feet when set up this way, although of course this is not strictly legal.

I hope my experiment of a few milli-watts reflected around a room doesn't really recreate what it was like to watch a real off-air signal with an outdoor aerial! I found that the slightest change in signal strength produces quite large changes in contrast and caused severely jagged vertical edges, frequently to the point where line sync was lost. This no doubt reveals the shortcomings of the RF section, particularly lack of AGC, and the basic design of synchronization circuits. Nevertheless, I did find that it was possible to obtain an acceptable picture with careful adjustments.

An old BBC television engineer explained to me years ago that the ratio of the amplitude of the synchronization pulses to the amplitude of the vision signal was chosen so that - in the early sets at least - just as the synchronization was lost, the picture would have been so noisy that it wasn't usually watchable anyway. So the loss of sync described above isn't as bad as it sounds.

In the primary service area with a good aerial, the picture would have been fairly stable most of the time, but aircraft flutter, or any change in propagation, particularly at the edges of the service area would no doubt have created picture disturbances that we wouldn't tolerate today.

The fringe version would have addressed some of these problems, but varying signal strengths caused by anomalous propagation I think would have made an evening's viewing a frustrating experience. No doubt more expensive and later models were less susceptible to some of these effects.

Was the rebuild worthwhile?

In Part I of this article I said I wondered if the thorough cleaning of the irreplaceable old components and use of many new ones would make any discernible difference to the performance of a TV22. Well, I really think it has...

My rebuilt set does not suffer from the odd crackle or vertical twitch that my first set still exhibits (I must get around to fixing this!). But more significantly, the picture geometry and brightness does not alter at all after the first four or five minutes, compared to about 15 to 20 minutes it takes for my original one to settle down. Although this is not conclusive proof that the rebuild is responsible (it could be valve related), it just seems very likely. Although it won't get daily use, the long-term reliability should be much greater too.

The reassembly of this project was rather like building a kit, but without the step-by-step instructions. And although it took the best part of nine months to complete, it's satisfying to know that I now have one TV22 that probably works as well as it did when it left the factory.

Lessons learnt

Coming from a more-or-less non-television background, this project forced me into a steep learning curve. I apologize therefore if you were hoping for a detailed analysis of circuit operation or a step-by-step faultfinding guide in these articles.

When I was working on the basic restoration of my first TV22 last year which I briefly outlined in Part I, there was help from experienced members on the television section of the UK Vintage Radio Repair and Restoration Discussion Forum (www.vintage-radio.net/forum) and BVWS members, for which I am very grateful.

I know some say that wholesale component replacement does not teach anything about circuit operation or fault finding. Well that's probably true if you don't consider the function of each component as you progress.

However, I feel I did learn quite a lot about the effects of RF and IF alignment, EHT generation and regulation and the mechanical/electronic aspects of focussing the tube's electron beam.

Nevertheless, after carrying out such a radical rebuild, there are plenty of other things I learnt, although with hindsight most of them are pretty obvious:

- Collect as much documentation as possible before embarking on such a project
- Take plenty of close-up photographs before dismantling
- Keep a notebook with sketches of how bits are assembled and note any circuit inconsistencies as you find them. Confirm them in the collection of documentation from the different sources
- When reassembly starts, check and recheck everything as you go
- Don't rush things! If things aren't going to plan just come back later
- Don't be tempted to realign unless you know that's where the problem really lies
- There are at least two different line output transformer designs used in the various versions of the TV22 mk I and II (and also probably in the TV24), but as far as I can tell they are interchangeable
- The line output transformers have a reputation for unreliability, mostly due to rusty laminations causing them to overheat. But don't assume they are faulty just because they look "unhealthy"
- To get the picture properly adjusted, follow the setup instructions very carefully. If everything else is working properly you will be rewarded with a very satisfactory picture
- The slightly higher EHT generated from the version with the PL81 line-output valve does give a noticeably brighter picture
- Although the circuits of the RF chassis in TV22 mkII and TV22A are not quite identical, they probably are interchangeable, despite what I said in Part I
- Last but not least safety. It's not really practical to unplug from the mains each time you need to measure or adjust something, so I always use a mains isolating transformer. This will still provide enough current to kill, but I feel a little safer working on equipment isolated from the mains. But I always keep one hand behind my back when reaching inside.

The TV22 may well not give the best picture of televisions from the period nor be of the most innovative design. Nevertheless, this set allowed tens of thousands of people to watch television in their own homes for the first time. As an icon of Britain in the 1950s, it is surely one of the most worthy of preserving in a working and reliable condition for future generations.

So... is the rebuilt TV22 a restoration, reconstruction or reproduction? I don't know. But whatever it is, I think it's time to sit back and use it to watch a good old British film, "The Blue Lamp"!

Adjusting contrast and brightness

This may seem too trivial to need explaining, but these two controls are somewhat interdependent and there is a correct way of setting them. So, for those like me who have not seen a procedure clearly described, and to minimise any random twiddling, I summarise here two descriptions of how to do this using Test Card C or the Tuning Signal (or if necessary, presumably any stationary scene that contains all ranges from peak white to black). It applies to any television set once it has warmed up:

"Television Engineers' Pocket Book" method

- Turn contrast and brightness to minimum
- Increase brightness until faint glow is seen, then gently reduce brightness until glow only just disappears
- Increase contrast until peak whites show clearly and light greys are correct shades
- Adjust brightness until blacks and dark greys are correct shades
- Readjust contrast for best contrast between whites and light greys

"Correcting Television Picture Faults" method

- Turn contrast and brightness to minimum
- Remove aerial plug from receiver
- Increase brightness for a blank raster, then reduce brightness until raster just disappears
- Reconnect aerial plug and slowly increase contrast control until an evenly illuminated picture is obtained
- If necessary, slightly readjust brightness control for evenly illuminated picture

The Paramount
A Battery 3 Valver

By R.J.Grant

This set was originally purchased from a surplus electronics shop in Harlington near Heathrow West London, in the late 1980s along with two other 1930s Radios. The shop was one of those very interesting surplus shops popular in the 50s and 60s full of mainly obsolete military equipment, aircraft electronics and instruments and a few odd domestic bits and pieces; always worth a visit once a month or so. Just when I thought I'd found a new one of those extinct surplus shops I so much enjoyed browsing though during my youth, it also became extinct when it closed down a few weeks later.

Above: Front View.
Below: Rear View.

The set was complete but not working and needed its battery wiring sorting out. I checked the transformers and found the grid winding of one of them was open circuit. As the cabinet was in reasonably good condition the set just sat in my collection as a static example for a few years until I got around to doing something about the open circuit transformer. It re-kindled interest in reaction battery sets. After some fun with a couple of early 30's two valvers, the types given away with cigarette coupons, I decided it was time to give this set a dusting and another look.

The set appears to be built from a kit from the early thirties, as deduced from the components used, mostly of Ormond manufacture. The inter-stage transformers are both of other makes, one Telsen and the other an un-named type, just has "Made in France" written on it, both probably replacements as there's evidence of other screw holes in the vicinity.

This set is much more integrated than the earlier sets, fully self contained with the batteries inside behind a sliding back and the frame aerial made it almost portable, although there is evidence that this set was powered from a battery eliminator as it has one of its HTs decoupled with a resistor and a 2mfd capacitor, not usually necessary with batteries and a dial lamp where battery drain would be un-economic.

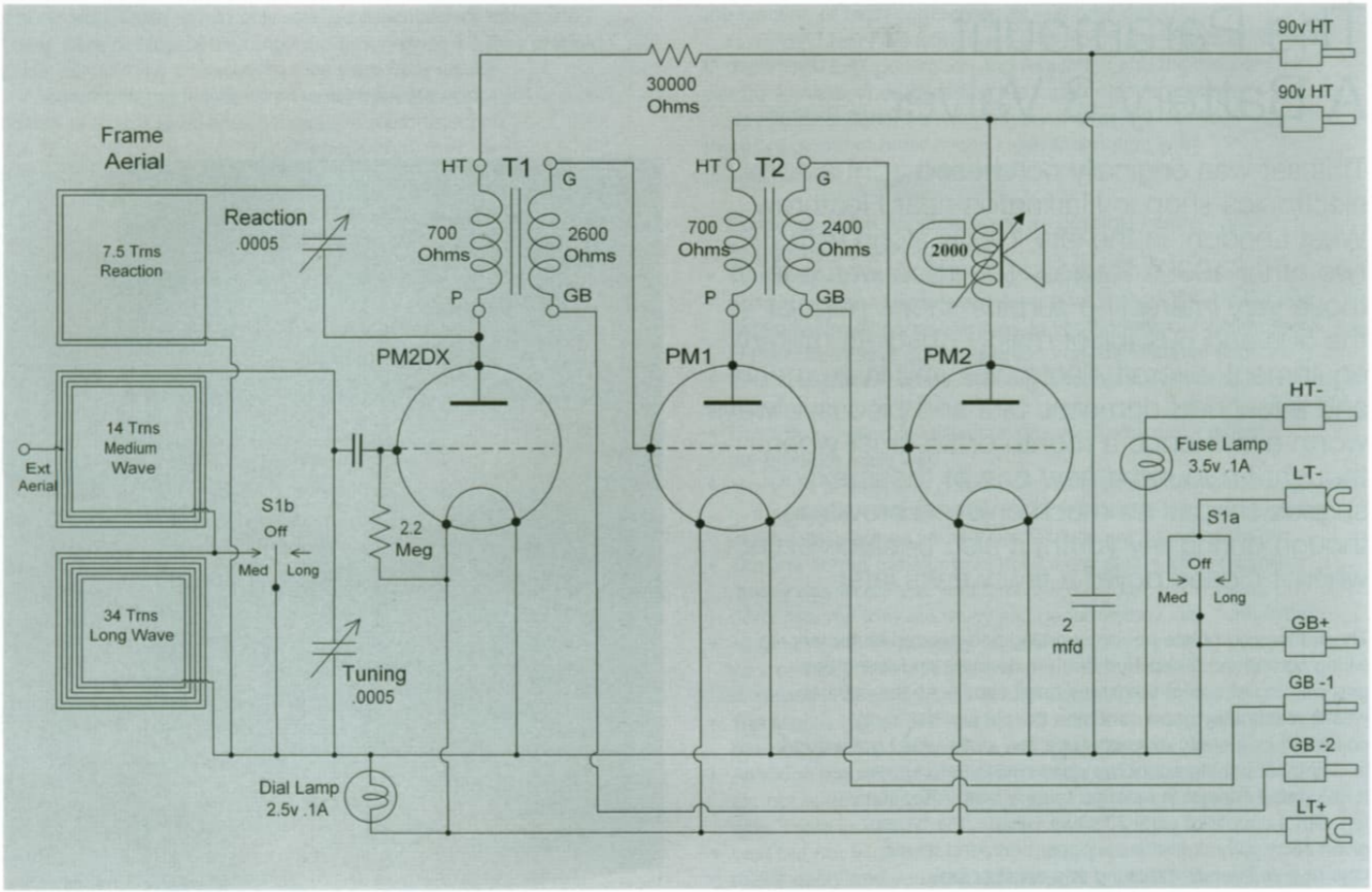
The valve line up is the typical PM2DX RF det, PM1HL AF amp and a good old PM2 output.

The general construction consists of a lacquered wooden cabinet with an internal wooden component box and a sliding back. With the back removed the inner wooden chassis can be completely withdrawn and remains a completely self contained unit. The frame aerial is wound with cotton covered wire round the outside of this vertical box and includes the reaction winding. The front panel houses the speaker in the top half and the controls in the lower half. The lower half of the front panel is lacquered as it's exposed through an opening in the bottom of the cabinet giving access to the control knobs. The panel immediately behind the control knobs is badly worn and badly touched in by a previous repairer but not bad enough to require re-doing, a few user marks like these means it was once well used and adds a bit more interest.

The inside of the chassis box is divided in half by a removable battery shelf, this slides into two slots on each side and has a metal carrier for the grid bias battery, this shelf separates the speaker from the rest of the set.

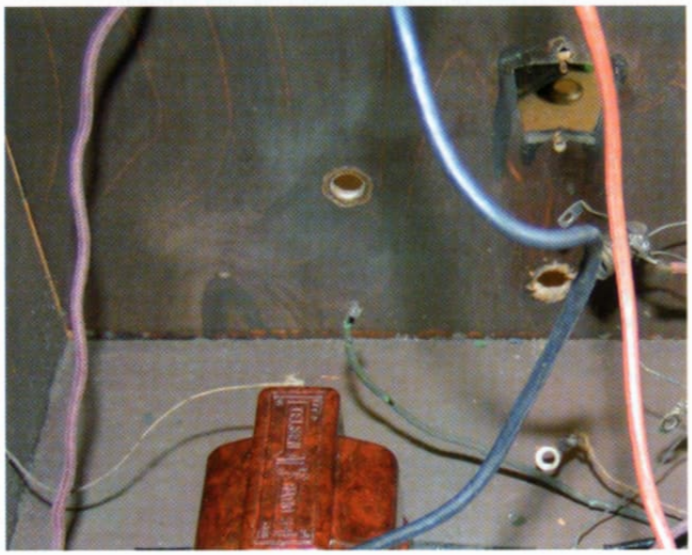
The valve holders are chassis mounted types that can be, and have been fitted upside-down and are screwed to the bottom of the inner wooden chassis along with the rest of the main components and all very grubby. These are held in place with a mixture of screws most of which were rusty, some steel, some brass, some round head, some countersunk and all different sizes, adding to the evidence of home construction.

The open circuit transformer was tackled first. The base plate



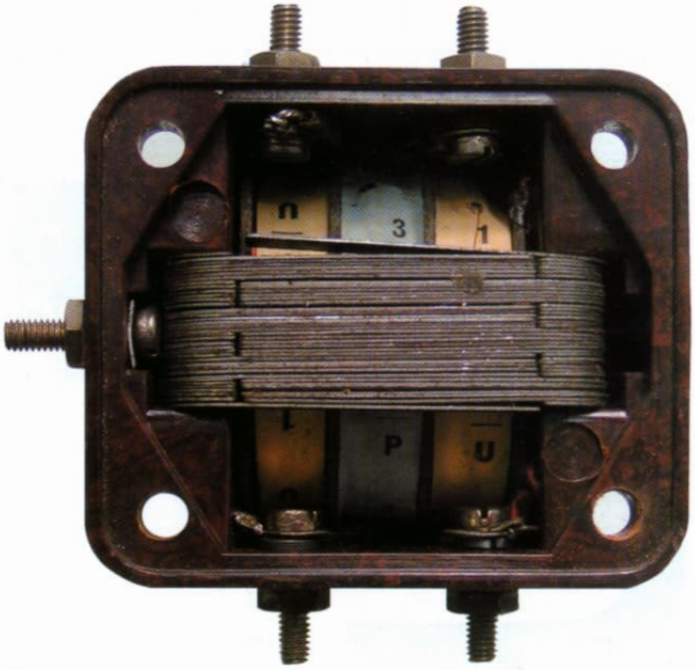
Above: The Paramount circuit Below: The front panel

Below: In the beginning

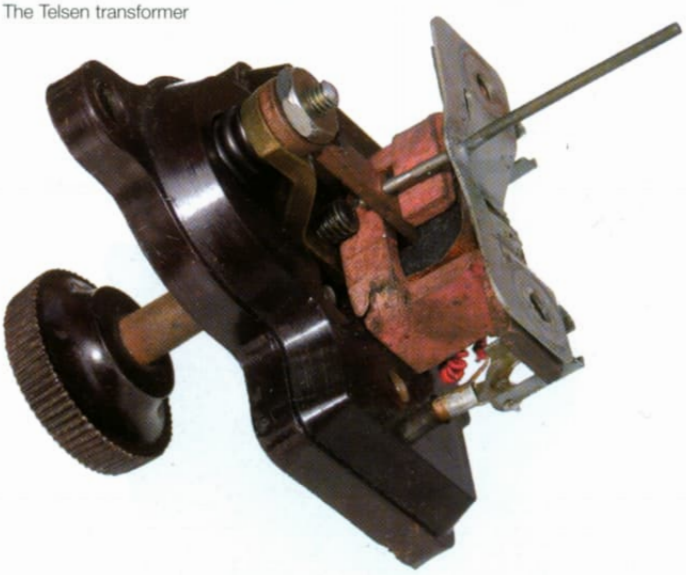


rivet flanges were drilled off on the underside of the transformer and base cover plate removed. The terminal nuts and bolts were then removed freeing the solder tags and lead-out wires. The transformer was then pulled free from its Bakelite shell. The core laminations, nice and clean with no rust, were removed alternately, the bobbin now clear for stripping and re-winding. The bobbin has three sections, the outer two being the grid winding and the middle single section the anode winding, this was ok and left alone. The two outer sections were connected by the winding "finish" lead-out wire from the left outer section jumping over the middle section and connected to the winding "start" of the right, while making a sketch of the wiring I noticed that they were just twisted together and inserted into a piece of oilcloth sleeving, this connection was separated to find out which of the two halves of the grid winding was open circuit and they both checked ok; the residue from the sleeving had turned into a sticky goo and had contaminated the naked un-tinned and unsoldered joint making it open circuit.

The Tuning Scale

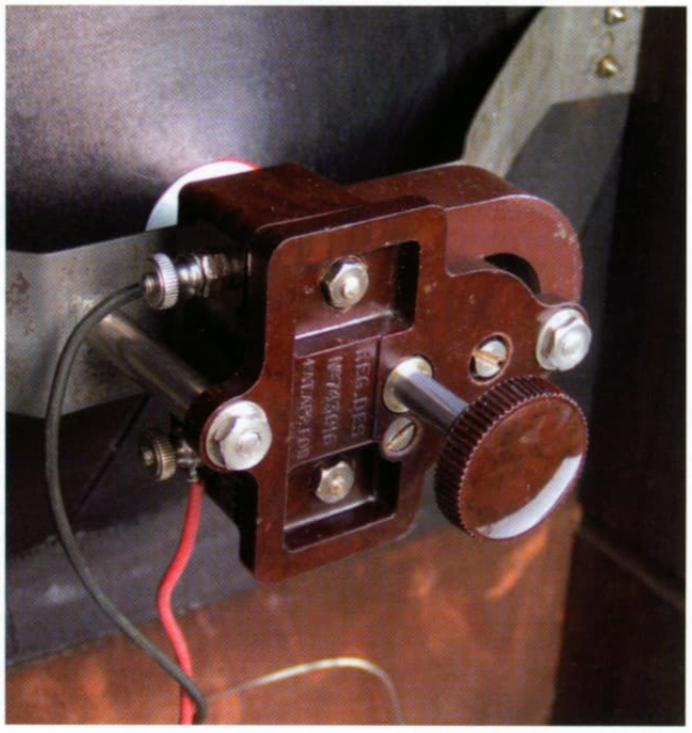


The Telsen transformer

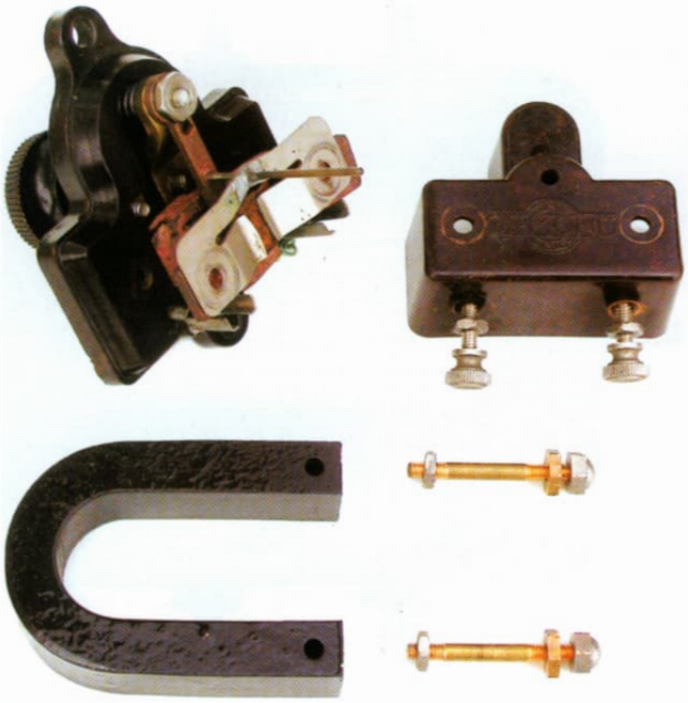


The Speaker Drive unit, Magnet removed Below: the speaker Drive Unit refitted

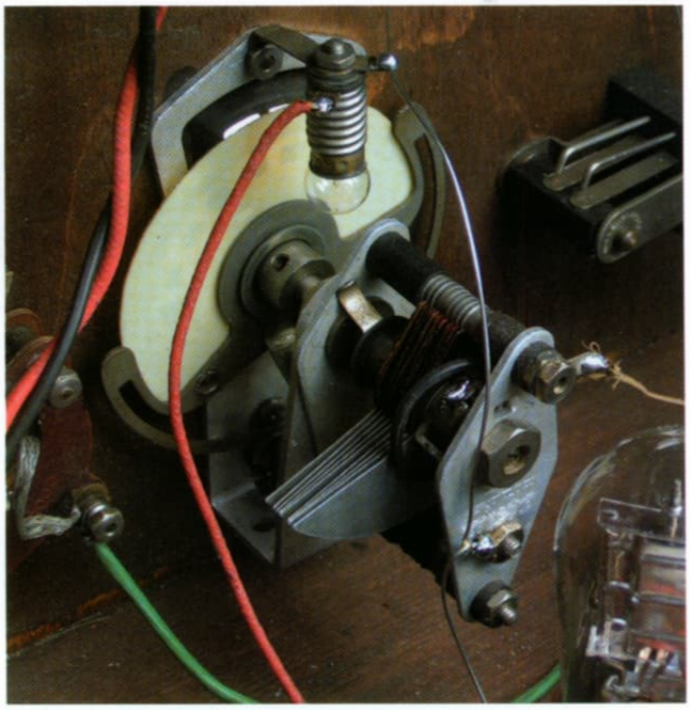
The Transformer Central joint



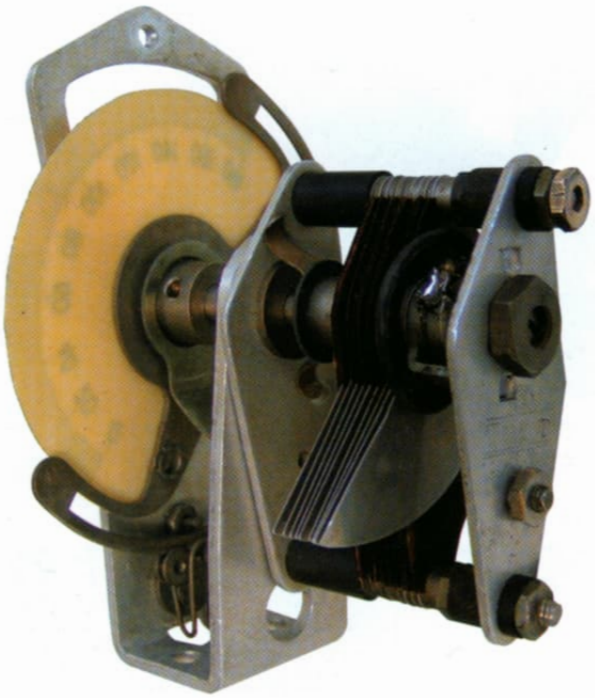
This residue cleaned off quite easily with a drop of solvent and when reconnected restored the continuity of the grid windings. The joint was tinned and soldered for good measure then re-sleeved. The other two of the "finish" lead-out wires were in a similar condition and both treated the same as the grid winding. The "start" winding connections nearest the centre of the core and inaccessible appear to be ok and I wasn't going to unwind them to find out; perhaps isolated from the outside air, the contamination didn't happen. This stroke of good luck relieved the necessity to rewind the bobbin, a very tedious task. The transformer Bakelite shell was cleaned and the terminal screws and nuts were de-oxidised and their nickel plated finish re-polished. The exposed windings were re-insulated with tape and the transformer re-assembled. The original nickel plated base plate rivets were already a reasonably tight fit in the Bakelite shell but were secured with a touch of super glue as the underside flange was now missing. The underside base plate cover was held in place with a blob of Blue-Tac stuck on the inside as it's



The Speaker Components



The Tuning Capacitor refitted with dial lamp



The Tuning Capacitor

Ready for Batteries

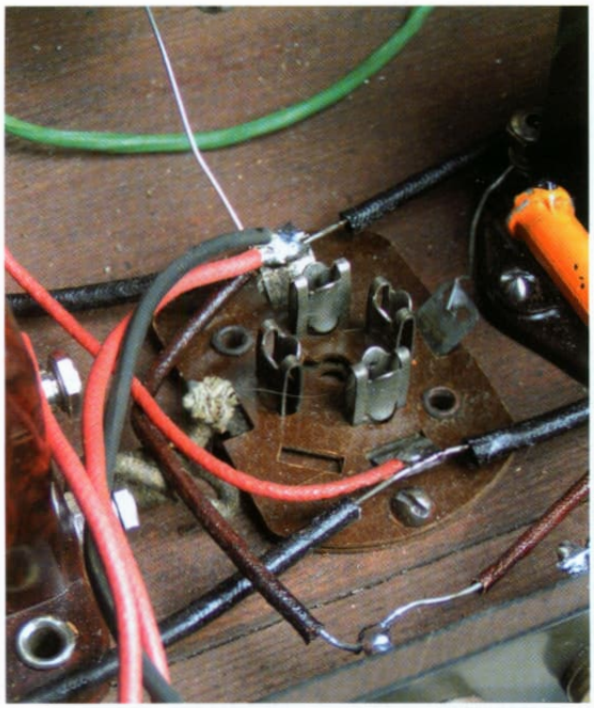
not going anywhere once the transformer is screwed down. The rest of the components were removed for cleaning. The tuning capacitor assembly with its slow motion drive was dismantled to get at the inaccessible bits and to thoroughly clean the aluminium frame and replace the moving vane connecting wire where the rubber had perished and fallen off.

While the components were out of the wooden chassis the inside was given a good clean and the small tear in the speaker cone repaired, this just required paper patches gluing to both sides and the back patch inked black to match the rest of the cone.

The de-coupling capacitor was a little swollen so its innards were removed and replaced, just pitch holding it all in its Bakelite case. A wood screw was screwed into the middle of the pitch filler and original capacitor to give me something to get hold of and the whole of the innards pulled out quite easily with a pair of pliers. A new 2mfd paper capacitor was soldered across the terminal solder tags inside the case, I didn't replace the filler as it's unseen when the capacitor is refitted.

The speaker drive unit, also made by Ormond, is mounted on a flimsy metal strip bolted to the front panel with four 6BA nuts and bolts and is spaced from the cone by two pillars. When the balance adjuster was turned a grating noise could be heard inside the drive unit and needed investigating.

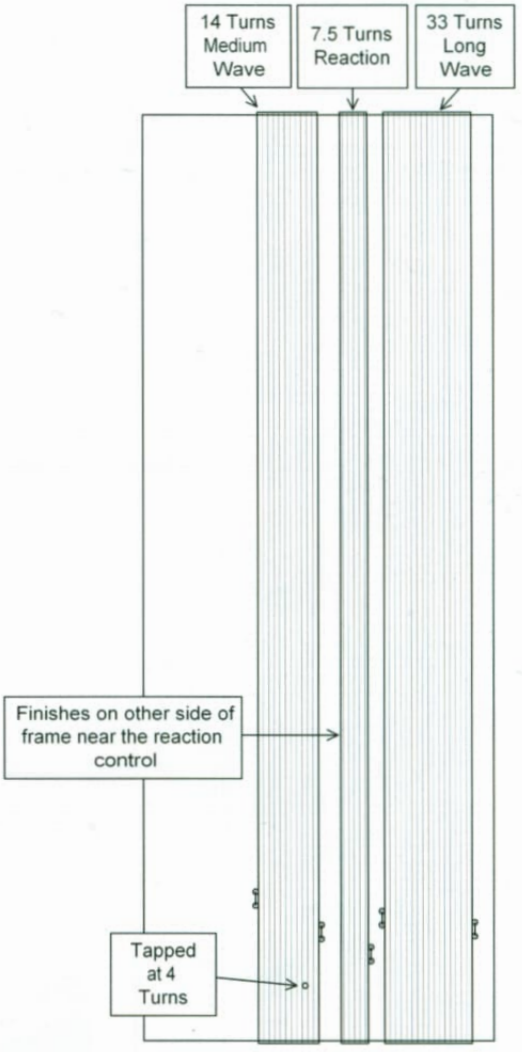
The drive unit was removed and dismantled. This required the drive pin unsoldering from the brass boss in the middle of the paper cone, this had been soldered by a previous repairer as the clamp nut appears to be cross threaded and irretrievably stuck without gripping the pin. Two domed nuts retain the drive cover, the terminal screws need to be loosened to release the cover which then slides off the forked connectors inside. The grating noise was made by the cone driver pin adrift from the armature; it had snapped off flush leaving a few millimetres of its threads in the armature. This few millimetres of pin was unscrewed and discarded and the rest of the pin re-threaded for 5mm or so with a 10 BA die and re-fitted to the drive unit. The drive unit then reassembled. This procedure was achieved so easily and quickly that I forgot to take some pictures, so the photos of the drive are of an identical unit



The Inverted Valve Holder

The Aerial Coils

Batteries in and ready to go!



The paramount Frame Aerial

I was restoring at the time and was going to test in this set (this one only needed cleaning and its magnet re-painting).

The very tatty battery wires were all odd bits of domestic appliance flex, some rubber now perished and some cotton braid over rubber. All of these required replacing. I had in stock some stripped down rubber mains cable of about the right type. Surprisingly all the wander plugs and spade terminals were present although all different types and all cleaned up quite nicely and were re-fitted. All that's required now is a final look round, re-insert the valves in their sockets, a set of batteries and it's fire–it–up time. On switch–on the dial light lit, and lots of mush from the speaker as the set burst into life gave the impression it was raring to go: alas no signals though. After the replacement of the PM2DX RF det valve I did get three or four stations on its frame aerial alone. The station separation was poor, as expected for this type of set, but the volume level was quite high, much higher than expected.

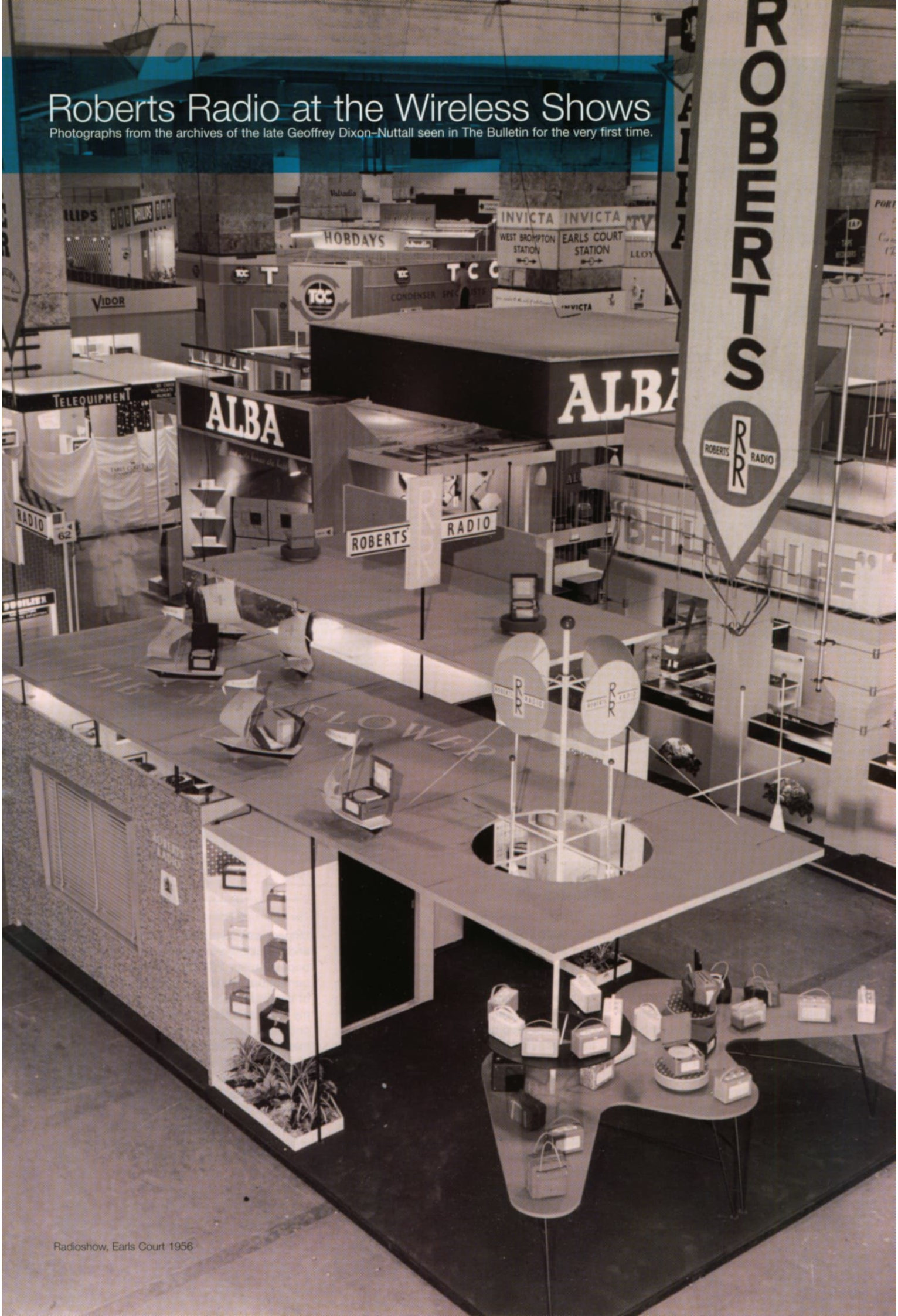
Applying a standard garden–length aerial (mine is 75 feet) made all the difference and there was no stopping it. Lots of stations all along both bands and loud and clear., The moving iron speaker gave reasonably good results and I spent the next couple of hours tweaking the balance between the reaction and the tuning point, pulling in some of the more distant stations.

Station separation was improved by adding a tuning capacitor in series with the aerial or just using a short piece of wire for the aerial on the strong stations. Performance was also improved when this set was used with a selection of fixed and variable wave traps and aerial tuners popular in the 1930s and provided the perfect opportunity to play with some of those bygone accessories I've had in my collection for a long time, I also used one of the old pocket watch style test meters in keeping with the 1930s but at only 1000 Ohms per volt sensitivity it tended to sink any signals and was only useful for testing the batteries.

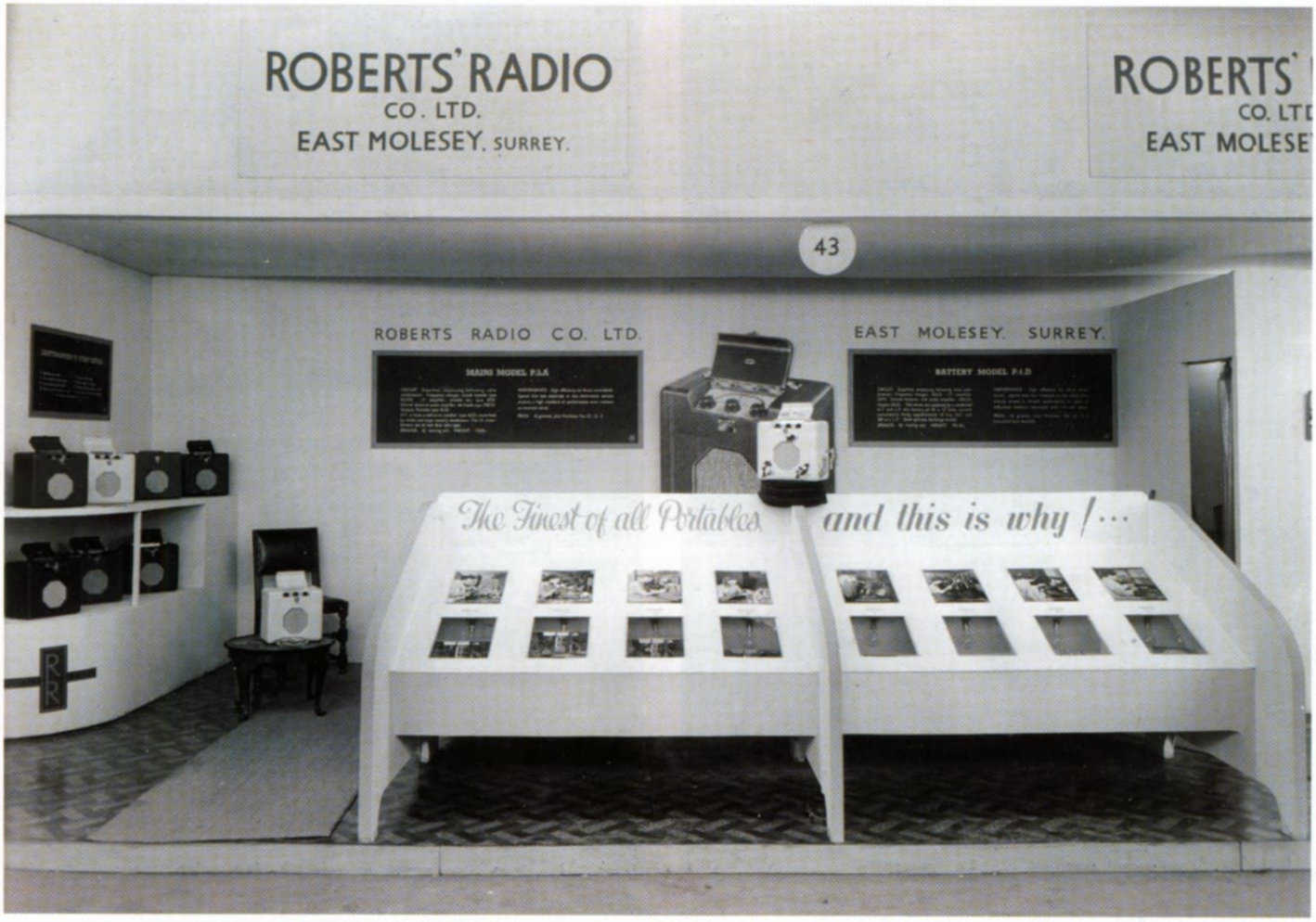
There's lots of "tinkering" to be done with these old battery sets and they really take you back to the days when radio was still a new technology.

Roberts Radio at the Wireless Shows

Photographs from the archives of the late Geoffrey Dixon-Nuttall seen in The Bulletin for the very first time.



Radioshow, Earls Court 1956



Radiolympia 1948 – first post–war radio show

Radio Show Earls Court 1962

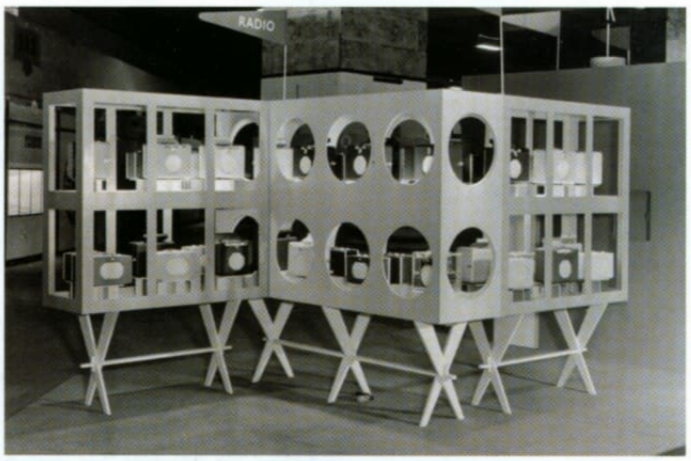
Radiolympia 1948

Radio Show, Earl's Court 1954

Radiolympia 1950

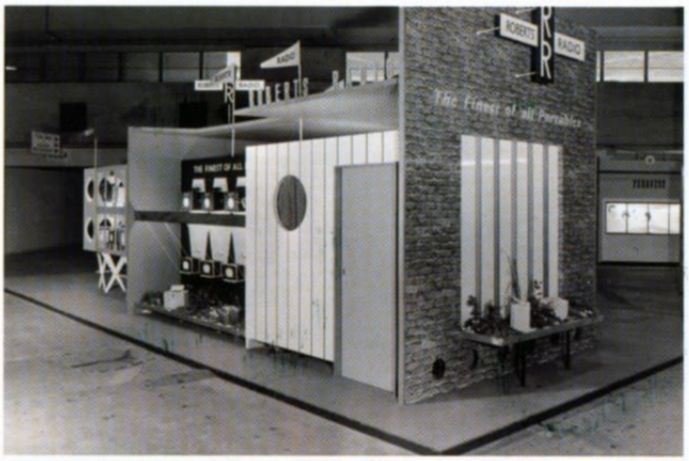
Radiolympia 1950

Radio Show Earls Court 1961 (this particular radio has a solid gold case)



Radio Show Earls Court 1953

Baghdad Trade Fair 1954 (note clear perspex sets)



Radio Show Earls Court 1953

'Cetex' Earl's Court 1982

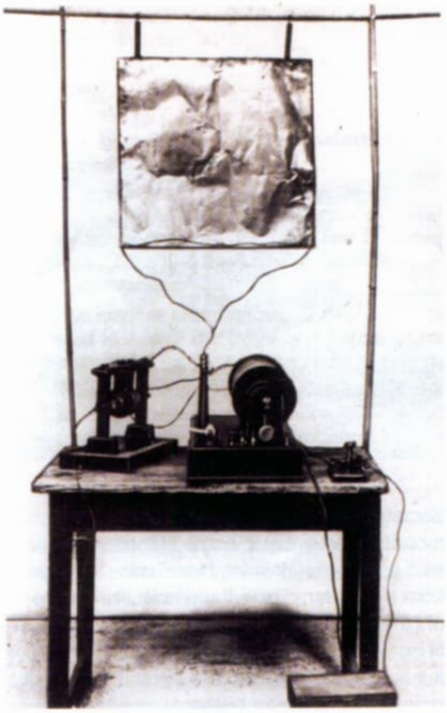
Radio Show, Earls Court 1954

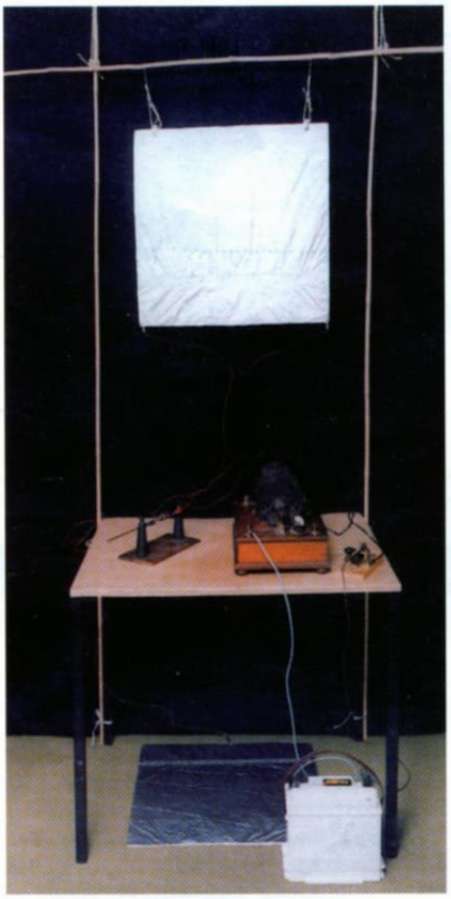
Popov versus Marconi

by Ralph Barrett (article originally printed in the GEC Review, Volume 12, No.2, 1997)

Below: A replica of Marconi's original transmitter which he used in experiments at the Villa Griffone in 1894

Right: Ralph's model of the Villa Griffone transmitter. The ground plate shown under the table would have originally been buried underground.





Above: Model of the Villa Griffone Receiver

This article is based upon a demonstration lecture entitled "Popov versus Marconi' which was presented in the Telford lecture theatre at the GEC–Marconi Research Centre, Chelmsford, UK on the 12th November 1996.

The aim of the presentation was to examine the claims of priority of the invention of radio communication, Popov or Marconi and by the construction of working models – to verify the operation and limitations of the apparatus and the early experiments.

Popov

Marconi

Background

After studies at the University of St Petersburg, Alexander Popov (1859 – 1905) joined the staff of the Navy Torpedo School at Kronstadt, and soon became head of the Physics Department. The library had foreign journals, which stimulated his interest in the work of Heinrich Hertz and the demonstrations of Oliver Lodge.

Guglielmo Marconi (1874–1937) was a contemporary of Popov, a non–academic who called himself the 'ardent amateur of electricity'. He pursued experiments in his father's mansion. Villa Griffone, near Bologna, and also read of Hertz and Lodge in journals sent from England.

In 1895 both men constructed radio equipment using a 'coherer' as a detector (see appendix 1). Popov's apparatus was designed for recording atmospherics and was used as a storm detector; Marconi's apparatus was for detecting man–made signals.

Russia and Italy were both to put forward the claims of their nationals as the inventor of radio.

The Demonstration System

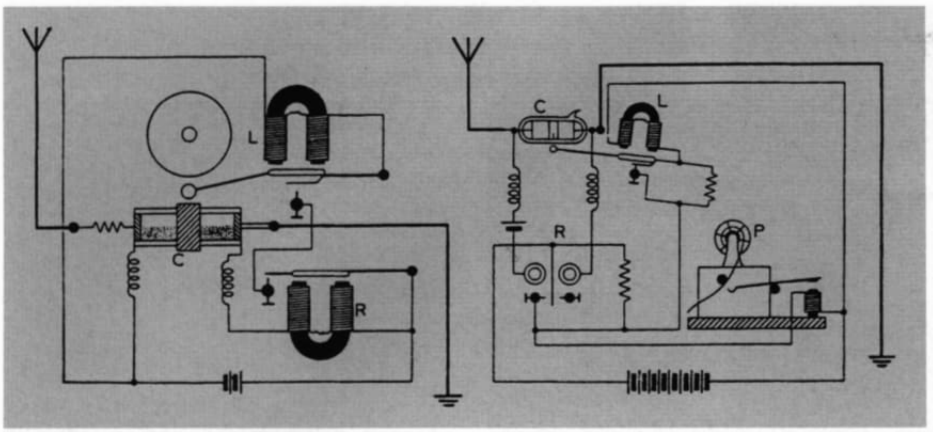
The Coherer

Marconi did much work on the coherer and found that metal particles of 96% nickel and 4% silver gave very sensitive operation. Inside a glass tube he made a wedge–shaped gap between two silver electrodes, measuring 1mm at the closest part. With the gap about half filled with metal particles, rotation of the tube would alter the space occupied by the particles.

Our work on a coherer for the demonstration soon hit on the use of a coin, which contained a large amount of nickel; the filings produced with a fine–cut file made very satisfactory particles. These were placed in a glass tube of 4mm inside diameter, between brass plugs creating a wedge–shaped space.

The Aerial

Marconi discovered very quickly the importance of using an elevated aerial, consisting of a metal plate connected to one side of the coherer; the other side attached to a plate buried in the ground. After tests in the attic at Villa Griffone it was taken to the garden. The transmitter had a similar 'aerial and earth' connected to a Righi–type spark gap (a gap immersed in oil), thought to produce a more vigorous spark), energised by a 10 inch induction coil. Some years later a replica was made for the Marconi Company in Chelmsford.

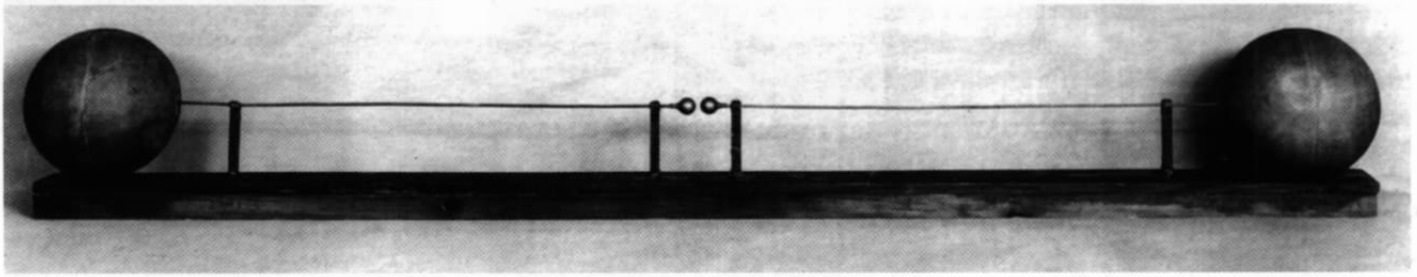


Far left: Circuit diagram of the Popov receiver.

Left Circuit diagram of the Marconi receiver

(Diagrams courtesy Electronics and Power, p77, The Institution of Electrical Engineers, 1964.)

Below: Hertz's original dipole operating at 50MHz (courtesy of the Deutsches Museum, Munich)



The Transmitter and Receiver

The Transmitter spark gap consisted of two brass spheres set to a separation of 1cm to produce continuous sparks. A 10 inch induction coil powered by a 12V car battery and a Morse key completed the transmitter.

Marconi was satisfied with a working range of 3km. Our models worked well at about 10m, which was the maximum distance available within the lecture theatre.

The circuits of the models followed those of the original designs. The Marconi receiver uses a Post Office type relay and Morse printer; resistors are connected to the contacts to avoid spurious sparks, and radio frequency chokes isolate the relay and battery. Popov's circuit shows the bell and bell hammer to jog the coherer into its pristine state of sensitivity, together with the single battery.

Practical Considerations

Marconi found that a separate coherer battery was important, and the voltage was kept low because a large coherer current would cause self–coherence. In the model of Popov's receiver with the single battery, a delay in decohering was apparent. Had this receiver been intended for the detection of information (which it was not, as Popov was concerned only with the detection of lightning strikes at the time) this would have reduced the speed of Morse operation. In order to keep the coherer current low, a sensitive relay is necessary. Marconi found a Post Office relay could be made to operate at 1mA, whilst Popov used a Siemens–Halske relay.

For my reconstructions, a relay with a simple horizontal armature was found to be the best and, after replacing the spring by a small balancing weight, the operating current could be reduced to 4mA.

The Popov receiver, with its 'exploring rod aerial' followed his circuit faithfully, and is contained in a metal box as described by Victor Gabel in 1926 in the '*Wireless World*' journal. A picture of the original apparatus, minus its case, is described as the 'world's first radio'. It is preserved in the museum of St Petersburg Electro–technical university. Popov demonstrated his receiver on 7th May 1895 to the Physico–Chemical Society in St Petersburg. He used it in conjunction with a Hertz 'vibrator' (radiator). The original Hertz dipole, with the 30cm spheres can be seen, together with other Hertz relics, in the Deutsches Museum in Munich. Its length is 3m and its frequency is 50MHz.

For the sake of portability, our dipole was 1/4 scale, with a frequency of 200MHz. In our arrangement it is placed vertically. The dipole is activated by an early motor car spark coil with hammer break trembler, and a Morse key. After his demonstration, Popov wrote a paper entitled 'Apparatus for the Detection and Recording of Electrical Oscillations'. He ends with: "I may express the hope that my apparatus may be used for the transmission of signals over a distance with the help of rapid oscillation as soon as a source of such oscillations with sufficient energy will be discovered".

However, this idea was misguided and his application to the detection of powerful lightning discharges was to follow, using a 'lightning conductor' aerial. Marconi nevertheless had realised that what was needed was not a more powerful transmitter, but a more sensitive receiver, hence he improved and optimised the coherer.

Our model of Popov's receiver has been tested on a high, long wire aerial with a measure of success (the occasional tinkling caused by a distant storm).

The Inventor of Wireless Communication

The question of priority has to be based on printed publications of the contenders, or on researched historical evidence.

We know that Popov demonstrated his apparatus again to the Physio–chemical Society on 24th March 1896, but no actual records survive. Later, some of those present said the words 'Heinrich Hertz' were received from a Hertzian dipole transmitter. It was one of nine items on the agenda; it must have been very short, and it did not appear in the minutes of the meeting. If we admit this priority claim on the basis of historical research, we must also note Marconi's achievements at Villa Griffone in late 1894 and early 1895.

There is no record in print by Popov before Marconi's patent of 2nd June 1896. There is only indirect evidence that Popov demonstrated transmission of intelligence by means of radio waves on 24th March 1896; but there is comparable evidence of Marconi transmitting intelligence at an even earlier date at Villa Griffone.

According to these criteria I conclude that Marconi can be named as the inventor of radio communication.

Appendix I
Oliver Lodge and the Development of the Coherer

In 1890, Edouard Branly, Professor of Physics in the Catholic Institute of Paris, had found in his laboratory that a spark, producing radio frequency energy, would bring together particles of metal in a tube container. He called it a 'radio conducteur' tube. This minute closing together, cohesion, caused by electrostatic attraction, produces lower electrical resistance, which can be detected by a current in a secondary circuit.

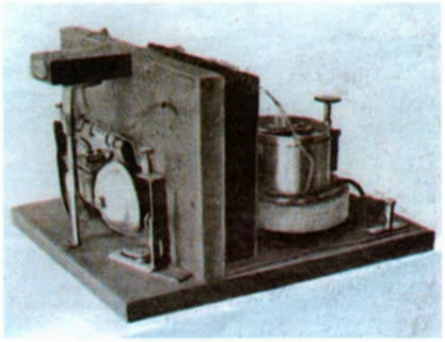
The world had heard of the death of Heinrich Hertz on the first of January 1894. It was 1st June1894 – the Friday evening discourse at the Royal Institution in London. Lodge was Professor of Physics at the University of Liverpool, and was well equipped to give this lecture, because he had tried experiments seeking the theoretical electromagnetic waves of Maxwell.

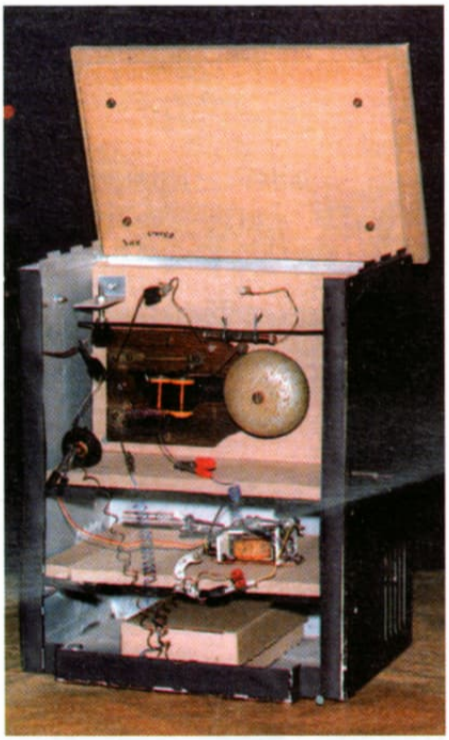
At the Royal Institution Lodge showed

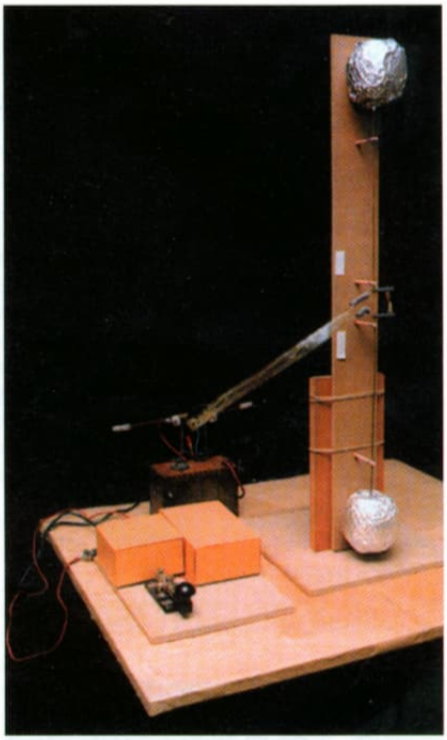
Below: Popov's original receiver with case removed.

Right: Model of Popov's receiver, with coherer (top), relay (below), and battery (underneath).

Far right: Model of Hertz's dipole operating at 200 MHz.







transmission over short distances and through obstacles, in the manner of Hertz. But unlike Hertz, who detected the waves by the formation of minute sparks, viewed in the dark through a magnifying eyepiece, Lodge used a novel method of detecting the waves. He used a Branly 'radio conducteur' tube, which he named the 'coherer'. He made no attempt to transmit intelligence; the transmission was simply an oscillation burst in a Hertz dipole radiator. He used an electric bell and, with a battery in series, the bell continued to ring until a tap shook the coherer, producing decohesion of the particles. A later design did this by clockwork.

Lodge presented another lecture on the 14th August 1894, in Oxord, for the British Association for the Advancement of Science, entitled: 'Experiments illustrating Clerk Maxwell's theory of Light'. Lodge used various methods of detection: an electroscope proposed by Boltz; a Branly tube coherer, and a coherer of his own design – a spiral of iron wire making a point contact on an aluminium plate. Lodge transmitted through walls, the Hertz radiator being in the Clarendon laboratory, and the receiver being some 60 yards distant in the Clarendon lecture theatre. Reception was displayed by a Kelvin marine galvanometer with reflecting mirror. It should be noted that Lodge did not send a message.

Lord Rayleigh said at the time: 'If you follow that up there's a life's work in it'.

In a subsequent comment, Lodge said: 'He was quite right, but I didn't follow it up effectively. I was too busy with teaching work to take up telegraphic work or any other development work'.

It is tempting to suggest that the preceding is enough to credit Lodge with the invention of radio. If Lodge had been born Russian, he would have be known as the inventor of radio!

Appendix II
The day of the Radio 7th May 1945

The claim of Popov was brought to a head on 7th May 1945 when the Bolshoi Theatre in Moscow was packed by a distinguished audience to celebrate the 50th anniversary of the invention of radio by Popov. On stage were scientists, marshals, admirals, commisars and leaders of the party, and Popov's daughter. It was announced that 7th May – 'The Day of the Radio' – would be celebrated annually.

It would have been more logical to select the 'Heinrich Hertz words' demonstration of 24th March 1896, except there was no printed record of it. Faced with a choice of a well–documented weak claim or a later, undocumented strong claim, the authorities decided on the earlier occasion: 7th May 1895.

If a well–attended lecture featured a demonstration where a message was transmitted (the words 'Heinrich Hertz'), why was there no mention in the minutes? Why did not Georgievsky, Lebedinsky and Rybkin, who were all present at the lecture, not mention it in the 1925 memorial edition of '*Electrichestvo*' to which each contributed an article?

My opinion is that some endeavour was made to transmit intelligence on 24th March 1896 but that because of imperfect coherer operation, it failed – perhaps because of the single battery in use, causing self coherence and creating a problem in receiving Morse code.

Why did the Soviet authorities so vociferously proclaim, in 1945, that Popov had invented radio? Probably the aftermath of the war, when Stalin's forces had triumphed, won with vast technological assistance from the Americas and Britain. For example, the famous WS19 tank radio: thousands were made in the USA, Canada and Britain, with Russian annotations, for use in Soviet tanks.

A nationwide campaign was undertaken to enhance the reputation and achievements of Russian scientists. Popov was not alone; scientists, physicists and engineers were paraded as pioneers in their field such as television and the aeroplane. In the post–communist era in Russia we can abandon the protestation of priority, after an earlier era, when leaders thought it necessary to put the personality cult of politics into the field of modern invention.

Acknowledgements

The kind permission of the Institution of Electrical Engineers, London and the Deutsches Museum, Munich for the reproduction of certain photographs is gratefully acknowledged.

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Ultra Tiger Restoration by Colin Wood

In June 2006, I was kindly given this Ultra Tiger AC, TRF radiogram by a friend. The cabinet was in poor cosmetic condition and had a very loose back leg. To the front, a small piece of fancy veneer was missing and the eye was immediately drawn to the bare patch, it being in such a prominent position. The set had obviously suffered years of neglect but I was thankful to receive it. The set was put to one side to await restoration as time permitted.

Scraping under way

Lid ready for polishing

Repaired corner joint

Block removed to allow screw access

Joint cleaned up

Leg firmly secured

Conspicuous by its absence

Taped ready for filler

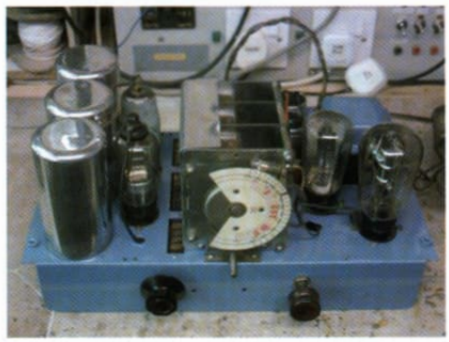
Filler applied

What a relief?

A start was made in February 2007 by removing the chassis for inspection. The chassis was in very poor condition having been previously messed around with; it was also covered above and below by what appeared to be a filthy coat of oil? The two original electrolytic smoothing condensers were missing and the open chassis holes

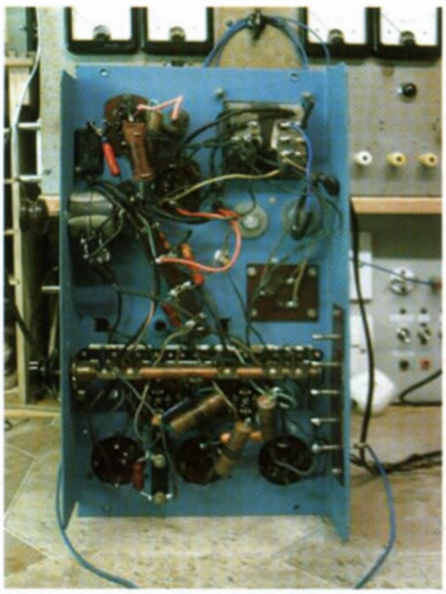
Rubber materials

were bridged with a single electrolytic which had expired. Below chassis someone had been busy snipping leads, removing a few more components. This wasn't going to be a quick fix and it would still look rough if it was patched up to get it working. Never having totally stripped a chassis this was going to be a big undertaking



The chassis

but couldn't be avoided. Many detailed drawings were made as the components were slowly removed finally leaving a bare chassis which was then cleaned and painted. As the chassis was rebuilt the missing components were replaced and the rest were tested and replaced as required. There was no indication as to



The chassis from below

Oiled ready for shellac

Fully restored

the original chassis colour so blue was used applying it with compressor and spray gun. Many happy hours were spent with the outcome of a working chassis. For an excellent write up on a similar chassis please refer to "A Tiger Restored" by David H. Butler; The Bulletin. Vol. 29 no.2 Summer 2004.

Work started on the cabinet in August 2007. The cabinet must have been standing in full sunlight for years as one side was missing a lot of finish; the rest being badly bleached. The lid was badly ring marked and scratched, one corner joint had separated. The lower cabinet was missing a small piece of veneer and also had a very loose back leg. The grille cloth was torn. Not as bad as first thought?

Images 1 and 2 show the finish being stripped with a cabinet scraper leaving the lid ready for French polishing. The scraper made a lovely job of this. Image 3 shows the lid corner joint after gluing with hot hide glue, the joint was held open by forcing a match stick into it then working the glue well in, the excess glue was removed with a damp cloth as the joint was closed and secured with tape until the glue hardened. Images 4, 5 and 6 show the loose leg which could only be released by removal of one of the glue blocks which covered the two screw heads. The joint was cleaned up and the leg was secured using hot hide glue together with two heavier gauge screws; a new wood block was made and again using hot hide glue it was rubbed into position until it "sucked" leaving it to dry. As the wood block was fitted care was taken to ensure it was tight against the leg. The wood block positioned on the other side of the leg was packed out with tightly fitting veneer glued with hide glue. When the glue had dried the joint was tidied up and the new wood block was stained.

Images 7, 8 and 9 show the patch left by the missing veneer. This was the most difficult part of the restoration. An e-mail together with an image was sent to a veneer company in London in the hope of obtaining a sheet of suitable veneer, a reply is still awaited. Fellow Society member and friend, Martin Scobie very kindly offered a perfect solution by suggesting filling and then colouring using artist's acrylic paint. Initially, car body filler was used but for some unknown reason the paint refused to adhere, wiping away very easily. This was worrying so the filler was removed and replaced with wood based filler which accepted the paint. Tape was secured around the patch, filler was applied working quickly and using a thin plastic scraper the excess filler was gently scraped away using the tape as a thickness gauge; this worked very well leaving little filler to sand down to bring the surface flush. The tape was removed once the filler had dried and with a lot of care the cabinet scraper was initially used to bring the filler down flush with a light sanding only to finish the patch. The filler is a lot harder to sand than veneer and this created a high risk of sanding right through the veneer surrounding the patch hence the use of the cabinet scraper. At this point the job went downhill rapidly. My wife Bronwyn let me have her acrylic paints to play with. Being hopelessly colour blind caused over a day's frustration as colours were mixed and tried. The Internet was surfed to find basic colour mixing techniques and with this information progress started to be made. Bronwyn offered to do this part of the job for me but that would have been too easy. The point was reached whereby the colour was near but not quite right and the urge to throw the whole lot in a skip was growing ever stronger when Bronwyn took pity and handed over a PITT artists pen containing waterproof Indian Ink, the whole patch was touched in with the pen and suddenly the job was done. Image 10 is the result of much patience and frustration, the rest will be easy.

Image 11 shows the cabinet ready for French polishing, the lid fitted loosely for the camera shot. Due to the contrasting colours of the veneers, staining was omitted. If stain had been applied all the veneers would suddenly look the same colour, this tip was found out the hard way on a previous project. Before starting to polish, the whole cabinet was given a light coat of raw linseed oil; this is a truly magic moment as the colour really comes to life. The cabinet was then buffed with a clean soft cloth to remove excess linseed oil and left to dry for a full day. Oil soaked cloths were then carefully disposed of as they can self ignite if left in a pile. Image 12 shows the cabinet after four coats of undiluted button polish (shellac) have been applied by fan brush without rubbing down between coats. Once the fourth coat had been applied the polish was left to dry overnight before being given a good flatting with 240 grit and 400 grit wet or dry used dry. Whilst flatting; great care was taken not to rub right through the finish at the edges; the brush applied finish was decent in this case so the edges were left well alone to be on the safe side. The cabinet was well dusted off and French polishing proper could be carried out using a rubber. Image13 shows the basic rubber materials used. The rubber was made in the traditional manner using a soft cotton outer cover and skin wadding for the inner. The wadding was soaked in polish that had been thinned with an equal measure of methylated spirit, (highly flammable) squeezed out then wrapped with the cotton cloth ensuring there were no creases in its base. The rubber was then gently pressed onto a sheet of paper, old TV times or magazines are great for this as the pages are shiny, adjusting the polish content until only a damp patch of polish showed on the paper. This testing was repeated each time polish was added to the rubber; polish being added to the rubbers inner after removing the outer cloth. To have used a rubber that was too wet would have caused tramlines with the possibility of ripping up previous layers of polish hence this simple test. Pressing gently, small circular movements of the rubber were used concentrating on the edges; care being taken to ensure the edge wasn't acting like a scraper allowing runs onto joining surfaces which are easy to miss and extremely difficult to remove.

article continued on page 66

The David Read collection of magic lantern slides

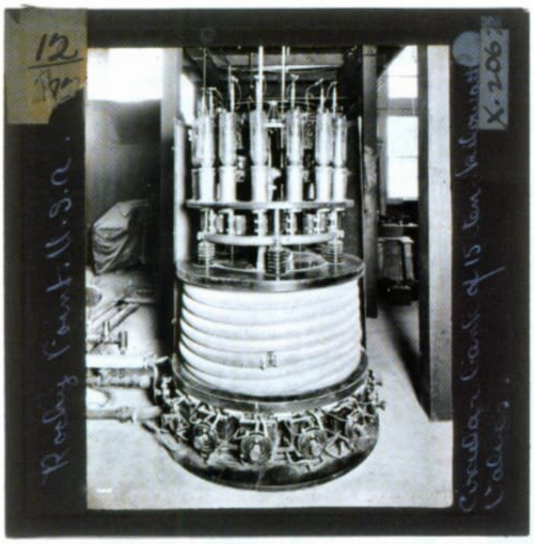
Some years ago I was offered a quantity of glass lantern slides depicting historically important items of early wireless equipment as well as many interesting images from the early days of broadcasting. These glass lantern slides were once Science Museum property and depict historically important objects in the museum's collection as well as views of broadcasting studios and equipment. They were no doubt swept out by a new broom after their purpose of illustrating lectures at the museum was better done by a later method such as 35mm film transparencies on a carousel. Now, however, it is likely that these relics of an earlier age no longer form part of special exhibitions or teaching programmes.

Many of the images first appeared in Science Museum catalogues, handbooks, and other publications when broadcasting and the technology was new. For example certain items of equipment, such as the Early Telephone Arc, were illustrated and described in the "*Catalogue of the collections in the Science museum, South Kensington, with descriptive and historical notes and illustrations*" by R. P. G. Denman covering both line and wireless telegraphy and telephony and published by H.M. Stationery Office in 1925.

After I acquired the slides, I put them on one side with the intention of examining them at leisure. Then, some time later when the bulletin quality had been transformed, I offered them to Carl Glover for private use in the Society since these images can only have been seen in publications that are very hard to find and a significant proportion of our membership might not have seen them.

I am pleased to say this has happened, and as nearly every one has a caption marked on the glass slide itself, additional text is not necessary. Moreover, whilst the print quality in the publications in which such images first appeared was often not very good, today we can see these old glass plates printed in the BVWS Bulletin with a quality that is second to none.

David Read


12


12/7
Marconi – Reisz
Microphone & Amplifier


12
X.1822
The Aerial & Steel masts.
(Oxford St. Station)

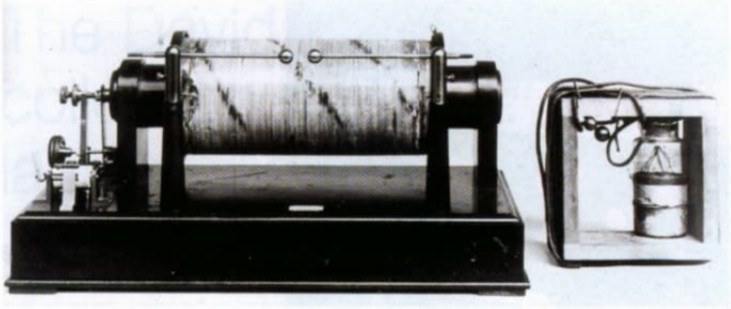

14
188
X. 3179
First Transmitting Coil.

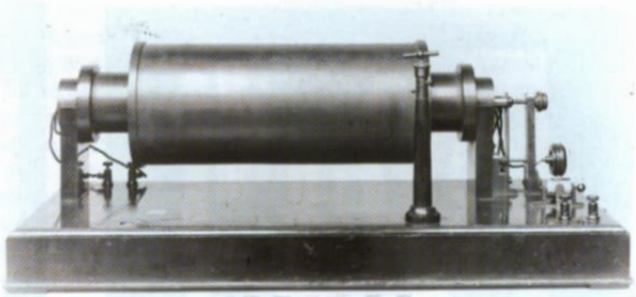

14
186
X.3177
Lodge & Hertz Oscillators.


12/9
X.1812
No 4 Studio at 2L.O.


12/10
X.1813
No 5 Studio (talk studio) 2L.O.


14
195
SM 2176
X.3186
Early telephone arc.





First commercial transmitting coil

DVD 2007

Terry Martini M.I.E.T

I am very pleased to be associated again with this year's members' DVD release and to also be able to tell you a little more about the four films included as part of the compilation. The first two are sourced from my own collection, and I am very pleased to be able to include them, for the benefit of all members.

The first of our films, "Voice of Victory" was made in 1944, for Hallicrafters in association with the Signal Corps of the United States Army. The film was in all probability shown at cinemas around the US at the time to drum up army recruits, particularly radio amateurs, who are featured quite heavily in the film, as doing their bit on the production lines for the 'war effort'. The equipment featured is the Hallicrafters, SCR 299 transmitter, originally produced for the amateur market, and is of some substantial construction. The equipment is not one I am familiar with personally but other members may have had experience of it. The film centres on the SCR 299 as adapted for army life for operations during the Second World War. It takes us through the design and manufacture in some detail and the rough treatment it underwent in the field trials that followed. The film is a little slow in pace to start with and if you can put up with the army general at the end it does make an interesting film on a manufacturer that is not so often seen in this country. I wonder if any of these SCR 299s ever ended up on our shores?

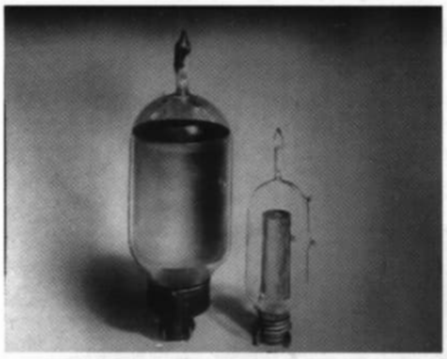
Our second film, entitled "Passport for Youth" was commissioned by the London County Council and is undated, although it is almost certain to have been made either just before or just after the Second World War. The film was made by E.G and K.R Hacker and was one of a number of 16mm films I stumbled upon in a pile, when on holiday in Devon some years ago, at a local flea market. The Hackers' appear to have been quite well known filmmakers in their day although I have not been able to find out an awful lot more about them. Before you ask, they are not related in any way to Ron and Arthur Hacker of Hacker Radio, as far as can be established. In fact it was our Chairman, Mike Barker who reminded me of the film recently after having had a private screening some years back, when I was still based in London and with my subsequent move to Scotland in 2005, I had forgotten all about it.

The film makes for an interesting social document and is very much of its time. Probably shown to school leavers, it is definitely the 'State' telling you what you should be doing when you leave school and how to set about doing it if you were not sure. The film centres in part, around the Battersea Working Men's Institute, London, an institution now long gone, and the sort of evening classes you could enrol in. No equal opportunities here though. Strictly cooking and dressmaking for the girls and shoe making and engineering for the boys. The film and accompanying soundtrack is quite entertaining in places and is quite typical of the period.

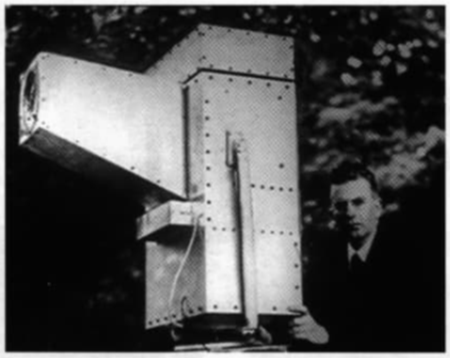
Of particular interest to members will be the short sequence on the wireless classes and the repair of an HMV 905, pre-war television. There is also a short 'off screen' sequence which is unfortunately muted, but appears to be taken from a BBC television transmission from the time. I have not been able to identify the programme transmitted or the actors featured so if any member can solve the mystery it would be appreciated.

The film has been restored from three separate 16mm film prints that were part of the original find. This was because of the poor condition due to age, and probably repeated screening and rough handling at the time.

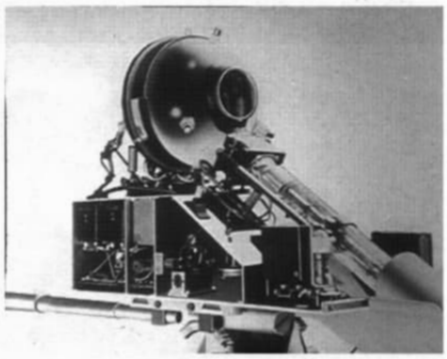
Being spoilt for choice so to speak, it allowed me to edit together the best preserved, and least worn, sequences from all three prints, back into a complete film. Out of the three prints, two were mute, with the other containing an intact optical sound track, and despite some very vintage splices in the film, which generally show up as loud clicks and thumps, has responded very well to dubbing as part of the subsequent restoration. A copy is also being returned to The London Metropolitan Archives for wider



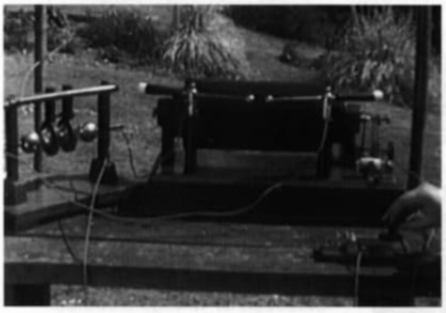
The History of Television



The History of Television



The History of Television



Mirror in the Sky

Mirror in the Sky

Passport for Youth

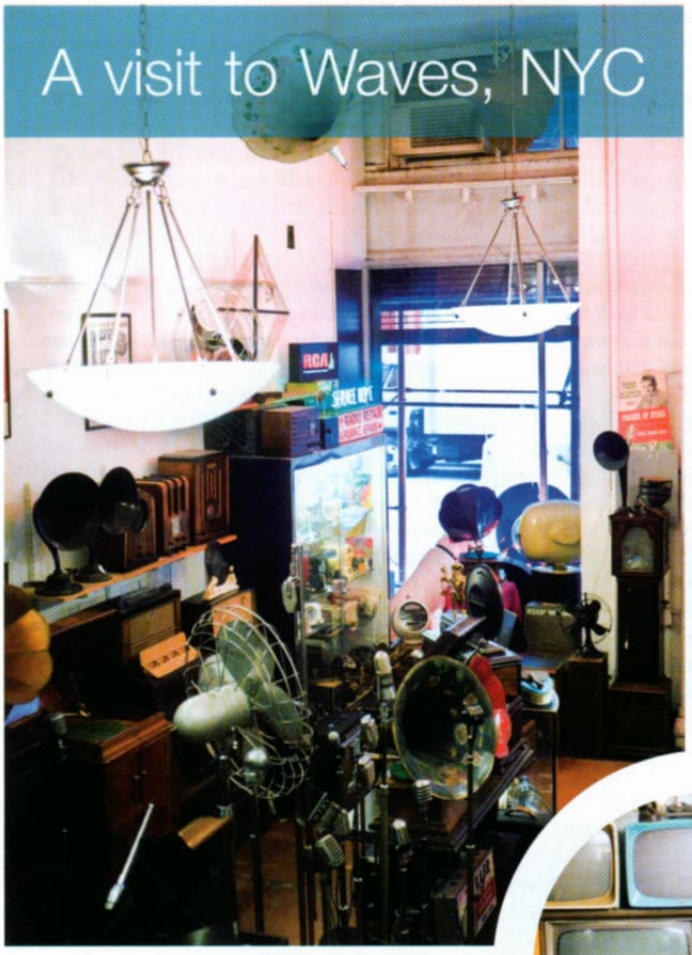
Passport for Youth

Voice of Victory

Voice of Victory

article continued on page 66

A visit to Waves, NYC



Established in 1978, Waves has been a landmark for the vintage radio, TV and audio enthusiast, offering the finest and largest selection of vintage electrical apparatus in New York City. As you can see from the pictures the shop has a lot of tightly–packed equipment for sale.

It is run by Bruce and Charlotte Mager, who are both friendly and knowledgeable.

Waves is located at 251 W. 30 street between 7th and 8th Aves. Shop hours are from 11 to 6 Monday–Friday and 11 to 5 on Saturdays. Tel. 212-273-9616, email: WavesLLC@gmail.com website: www.wavesllc.com/

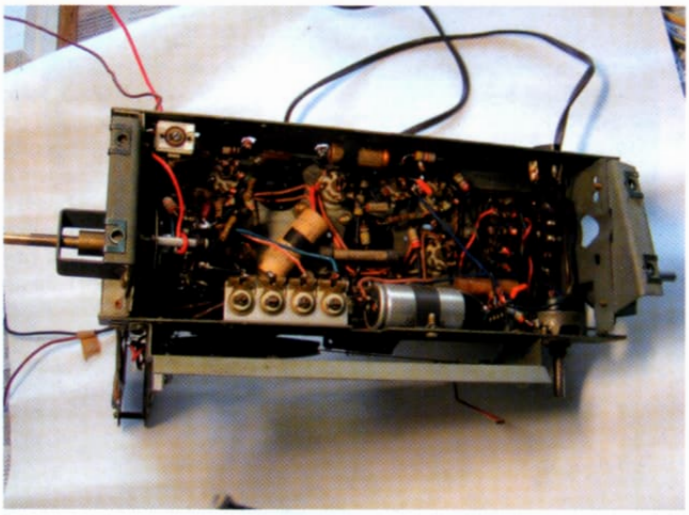
Rescuing a Pye P75 Radio (trader service sheet 1135)

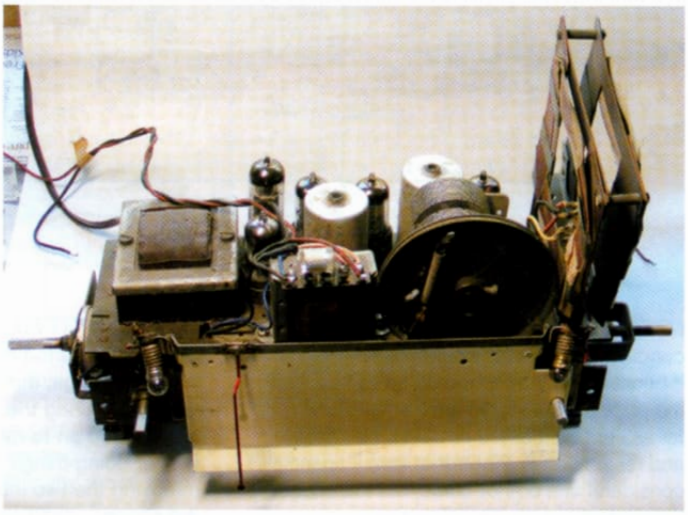
by Graham Dawson

I recently acquired this radio from a friend who had been given it by his sister after clearing out the loft of their house. He said he didn't want it, and if I did not want it either, the next place it was going was the tip.

I already have a Pye P75, which I bought at auction at Harpenden some years ago as nobody else bid for it and it was in nice clean condition. This set was far from being in "nice clean condition", but it was complete with back and knobs and I decided to get it going again if possible, without spending a lot of time on it.

Cabinet before re fitting chassis





My philosophy with post war sets which are fairly common, is smarten them up and repair to a good working order, but not to try and make them look like they had just come out of the manufacturer's box. A set which has had a long working life and over 50 years old to me should not look pristine inside and out, but be tidy and a little bit grubby and generally look what you would expect for its age. The cabinet on this set was scratched and slightly chipped, but had no water or woodworm damage, nor was it coming apart anywhere, so I decided to clean it and treat with scratch cover after removing the tuning scale and speaker baffle. The speaker cloth was yellow with fat and nicotine and after removal from the board did not succumb to repeated washing and although not holed or worn it still looked dirty so I decided to replace it with a new piece of darker cloth I had used on a Bush restoration some time ago. Purists may not approve, but there we are. The Celestion speaker speech coil was rubbing on the centre pole piece, but freed itself after some energetic work powered from another set. The tuning scale was just dirty, and came up well after gentle washing in soap and water. The cabinet was brushed out and scratch cover applied after cleaning with white spirit. It came up quite well and hid most of the damage.

Now to the chassis. This was dirty on top and a valve was missing, but underneath revealed no sign of any repair having been carried out. All was original and in working order as far as a few measurements showed, so the next step was to test the remaining valves and source the missing EBC 41 from my stock. The valve line up is conventional 50s superhet with B8A based valves. All the pins were dirty and I scraped them before testing, also applying some WD40 to the holders to help with pin to base contact resistance on replacement. All the valves tested nearly 100% indicating that the set had probably died of some other fault and then been stored away. I was aware of two wax paper audio coupling capacitors each 5000pf, but decided to try the set and replace them later along with anything else that might have failed.

After fitting 2 new dial lamps I applied power, keeping the Avo on the HT line as the rectifier warmed up. I healthy 200 volts appeared and all valve voltages looked about correct, but no sound from the speaker; in fact no hum when touching the output valve grid, even though the cathode bias was correct, so it was working. Then I realised the valve anode and supply were the same, so no volts dropped across the speaker transformer primary. I was about to declare the transformer shorted turns when I spotted the tone correction capacitor lurking under the tag strip. I snipped the wire off and measured it as being dead short; the transformer being a healthy 500 ohms. Back on with power and, after 30 seconds, crackling which turned into signal when tuned to a station.

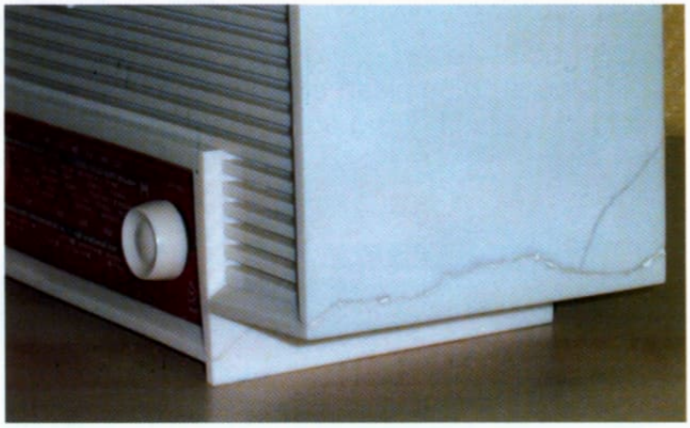
Although removing the faulty capacitor and replacing with a new one brought the set back to life, on a strong signal there was a howling oscillation. This set has negative feedback from the output transformer secondary to the first audio stage input, to quote the Trader service sheet "to improve tone" which is perhaps another way of saying to reduce distortion.

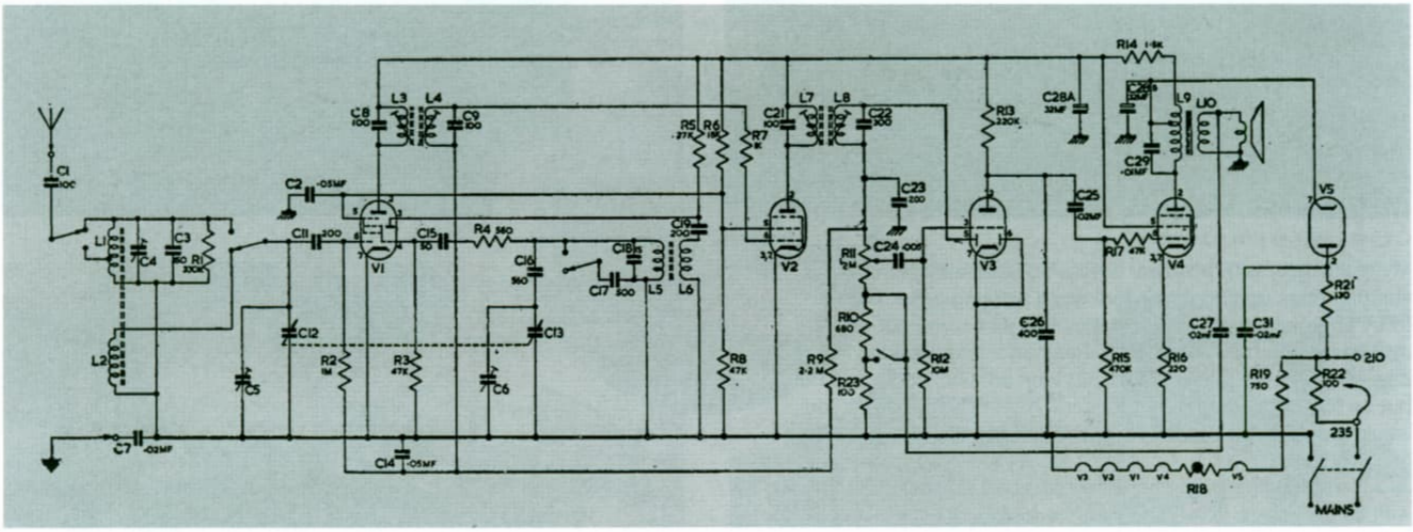
The wiring looked original and one of the wires from the transformer secondary was too short to change over. Because the output transformer primary is part choke in the HT line, these connections could not be reversed either, which leaves the

article continued on page 58

Ferranti M55 by Paul Stenning

This set was offered at the NVCF in Birmingham a few years ago for £10. By the end of the day it had not sold so I offered £5 for it, which was accepted. The reason a set of this type sold so cheaply is evident in the photo – the cabinet is badly cracked on one side. There are also stress cracks on the top, probably caused by heat.





Many collectors would write off a set in this condition. No dealer would consider repairing it because the cost of repairs would exceed the price the set would fetch when done. As far as I am concerned however, the repair and restoration is a labour of love – financial considerations do not come into the equation. Although the set will never be in as-new condition, and the repairs will probably be visible, I think the set is too attractive and distinctive to scrap. And anyway, one of these sets in excellent condition would probably cost more than I am prepared to pay (I rarely pay more than £20 for a set).

The set receives MW and LW, and was probably made in the mid-1950s. It uses the 8-pin U40 series valves (UCH42, UF41, UBC41, UL41 and UY41). I had previously removed the UL41 for possible use in another set, but found it was faulty when tested. This was no surprise – no one would intentionally sell a set with a good UL41 for a fiver!

Disassembly

Due to the nature of the damage I decided to deal with the cabinet first – so if this were not successful I would not have wasted any time and effort on the chassis.

For a change, this set had all the original screws securing the back! The knobs are just pushed on to metal shafts – not a good way of doing things on AC/DC sets. After removing the two internal screws securing the chassis, it still wouldn't come out. The speaker is mounted on the chassis, and is also screwed to the cabinet. Once these screws were removed the chassis and speaker lifted out as an assembly.

As I was placing the chassis on the bench, a screw and washer dropped out. These had previously been securing the tuning capacitor, and I was surprised to find that the other two screws were also loose. The only reason these hadn't fallen out was because some components were in the way. I refitted the screws before putting the chassis to one side.

I did notice that the chassis appears to be plated, and is still in very good condition. There were some sad looking wax-paper capacitors that would need changing, but I couldn't see anything else amiss.

Cabinet

The tuning scale is supposed to be glued into the cabinet, but mine was loose. With this removed it was time to clean and attempt to repair the cabinet. I noticed some wax dribbles on the base of the cabinet, confirming the unhealthy state of the wax-paper capacitors.

Before attempting a repair, I cleaned the cabinet carefully with foam cleaner. To remove the wax I found that WD40 was the most effective.

Upon closer inspection, I found that the cabinet is made from a slightly translucent material. When the cracks are closed it appears as a dark line, even when the mating surfaces are clean. I assume this is due to the light being able to pass part way into the material and the cracked or broken edges casting a shadow. It was therefore clear that whatever repair I attempted would be visible – which wasn't really a surprise!

I positioned the broken sections together dry, and secured them with masking tape. I also stretched a couple of bands of insulating tape around the cabinet – this is fairly stretchy and gives enough tension to hold the broken

sections tightly together. On the inside of the cabinet, I applied superglue along the length of the joints. This is easier and more controllable using the version that comes with a small applicator brush. The glue can be seen to draw into the joints, so further glue was applied. This was repeated three or four times until the joints were full. The cabinet was then left to dry for an hour before the tape was removed. It was then left until the following day to allow the glue to dry fully.

Although the superglue bonds should be fairly strong, I decided to apply further strengthening to the inside. The areas around the bonds on the inside of the cabinet were carefully roughened slightly with fine wet-and-dry paper. The area was then coated with a layer of Araldite and allowed to dry for a further 24 hours.

So the result is a cabinet that is secure, but the damage is as visible as it ever was! I considered spray-painting it, but decided that this would spoil the original appearance of the rest of the cabinet. The damage is on one side near the bottom, and is not that visible with the set on a shelf with other sets on either side, so I decided to leave it as it is.

Chassis

Before doing anything else, I replaced the six wax-paper capacitors in the set. One is connected across the mains (after the rectifier surge-limiting resistor) so was replaced with a Class X2 suppression capacitor. Another was connected across the output transformer primary - this was replaced with a 600V component. Since it is visible on the top of the chassis I used a vintage grey RS type. The others were replaced with modern 400V components.

I then replaced the mains flex with a modern type. The on-off switch felt a bit sluggish, and a check with a meter showed it was not closing. A shot of contact cleaner got it working. I also applied some to the waveband switch and the volume pot.

I removed the remaining valves and tested them with my valve tester. The UBC41 had some grid leakage (within limits) and low emission on the triode and both diodes. Rather than throwing it away, I put it to one side to try in the set later. The other valves were OK, so were refitted together with good UBC41 and UL41 valves.

A meter check across the mains lead showed open-circuit. After a few further checks this was traced to the dropper resistor. However the resistor itself was OK, the problem was that two wires appeared never to have been soldered. I think it is more likely that the joints were originally soldered but had suffered from heat, but whatever the cause, the solution was obvious – resolder them!

I checked the main smoothing capacitor with my capacitor reformer – it was fine. The coils on the ferrite rod aerial were loose, so they were fixed back into position using the wax, removed from one of the faulty capacitors. The original positions were evident from the remains of the sealing paint applied during manufacture.

Time for a test – and it worked OK. The only minor problem noted was a slight rattle from the speaker. I then tried the set with the original UBC41 – no difference.

I had an old UL41, which was very low emission according to the valve tester. I had tried it in a couple of other sets previously, but it did not perform very well. I tried it in this set and it worked fine, so I left it fitted. It will obviously need replacing eventually, but since the set doesn't get used heavily it'll do for now. It seems that this set is more tolerant of ageing valves than most.

The cone of the speaker was coming away from the frame in a couple of places, as was the coil support behind the cone. I refixed both of these with EvoStick glue, but the speaker still rattled slightly at higher volumes. This could be completely solved by applying slight pressure to the rear of the cone in one area. It seemed that the cone was slightly distorted, but I could not think of an easy way to solve this. I therefore fixed it with a bit of a bodge – I inserted a rolled up lump of tissue paper between the cone and the frame, to apply the required pressure to the cone. To prevent it from falling out, I fixed it to the frame with some EvoStick

Reassembly

After the chassis had been running for a couple of hours, I was happy that all was well, so it was time to reassemble everything.

The tuning scale was secured back into the cabinet with some EvoStick, before the chassis was slotted back into place. The set was tested again at this stage, in case the screws fixing the speaker to the cabinet had applied any twisting to the speaker frame and affected my "bodge", but all was well.

I finished reassembly, including the knobs and back, then gave the set another test run for a couple of hours. While it was playing I removed a couple of sticky patches from the cabinet (due to the adhesive tape I had used to hold it together while repairing it), then polished it with some spray household polish.

Final comments

This was not one of my most successful restorations – especially the cabinet repair – but I feel it was the best I could do under the circumstances. I could have painted the cabinet, but this would have lost the original appearance and resulted in a rather flat look to the set.

I could also have located and fitted a replacement speaker, but it may have been difficult to find one the correct size. The original works fine with my "repair", so it is good enough for this set. If the set had had an undamaged cabinet I would have gone to more effort to find a speaker. A set like this will never be worth much – not that I am planning to sell it!

Despite the visible damage to the side, the set looks good on display surrounded by other radios, and it also sounds good when it has its opportunities to play.

Sharpen up your reflexes continued from page 26

the valve in the usual way; and a valve detector can be used in place of the crystal. Some early broadcast receivers with reflex circuits include the well–known Marconiphone V2, which used a valve detector; the BTH VC valve/crystal set; and the famous Scott–Taggart ST100 using a crystal. A surprisingly late use of reflexing is found in the round Ekco AD65 3–valve (plus rectifier) superhet of 1934, and in the AD76 of 1935, in which the IF amplifier valve doubles as an LF stage. Interestingly the same reflexing of a superhet IF stage appears in the 1924 BTH 3–triode portable battery superhet type VR3 Form PA.

So the reflexing arrangement was a fine idea with notable benefits, but were there any difficulties? Yes there were. Firstly with signals fed back from output to input there was obviously a possibility of instability breaking out. As mentioned, it was important to keep RF and AF signals well separated in the external circuitry, but this was not always easy in manufacturing terms in view of the shortcomings of bypass condensers in early days and because of the necessity for careful component layout and sometimes screening.

Another less obvious difficulty arose from the risk of intermodulation within the valve. Although it is indeed possible for a valve to amplify two different signals simultaneously, independence of the signals will only be complete if the valve characteristic is perfectly linear. If the characteristic is not perfectly linear – and of course it never is – one signal will modulate the other to some degree. For example a large audio signal negative peak could move the working point of the valve down towards the bottom bend where amplification is less, with the result that the RF output to the detector falls and the audio output is reduced to less than expected. This amounts to negative feedback, with consequent reduction of receiver sensitivity. Whether or not this effect occurs depends largely on the phase of the audio signal fed to the valve grid, and sometimes the connections of the LF transformer were such as to produce this undesirable result. The bias on the valve grid should ideally be adjusted to achieve optimum linearity, although set designers generally settled just for returning the valve grid circuit to LT negative.

But overall the economies of reflexing were well worthwhile and the technique was very popular for several years in the UK. In the more prosperous USA the cost of valves and batteries was less of a problem and reflexing was never used, to my knowledge at any rate.

Please note: the diagram referred to in this (posthumous) article has never been located

Making a back without breaking your own

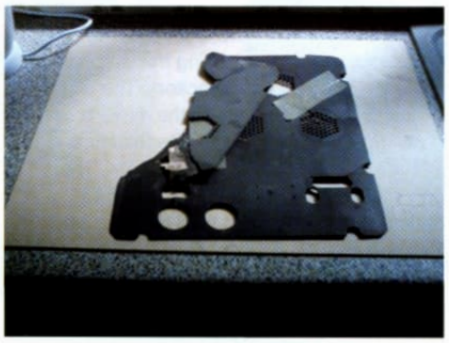
by Colin Wood

I was recently asked by a friend if I could make a couple of wireless back panels. Unfortunately when I made the Philco Peoples Set's backs I didn't have a camera. I made twenty Philco backs as an experiment; ten are perfect and ten are much better than nothing! The blanks for the Philco backs were machined on my large universal woodworker using the rebating head. These were done in two tens and produced beautiful copies. Material is MDF 3mm £4.20 8 x 4 sheet locally.

This particular back is for a Philips, type unknown but not important as I just want to show my technique which should cover most backs.

I made the drilling guide from 1/8" thick mild steel. A drilling pattern was first produced using the computer, printed then attached to the steel blank using sellotape. A centre punch was sharpened to a fine point and each hole centre was very carefully punched. The blank was mounted on the drill press in the vice and a small diameter pilot hole was drilled followed by the full 3/16" dia. hole. Time consuming but well worth the trouble. The Philco backs have over 650 holes so I taped ten backs securely together and drilled right through the pack after taping the guide as per the images.

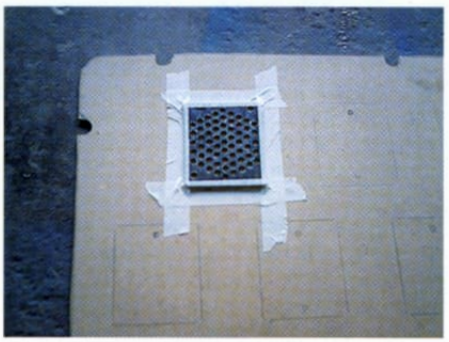
Using original back for marking out



How do wireless backs end up in this condition?

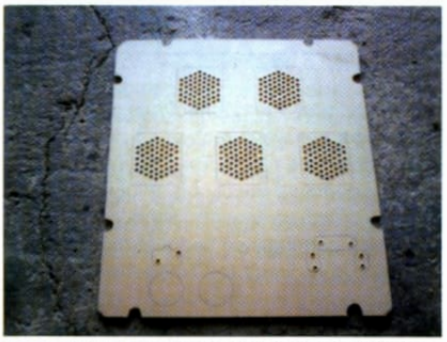
Drilling guide 1/8" mild steel

Cutting using Hegner scroll saw. Wear respirator!

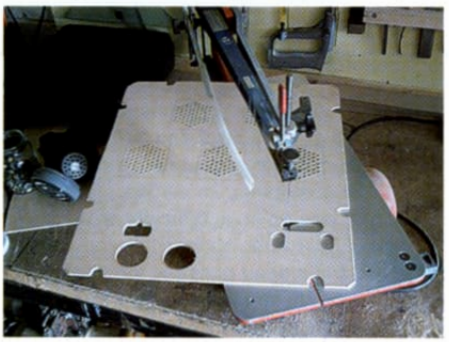


Blank roughed out and drilling guide attached using tape

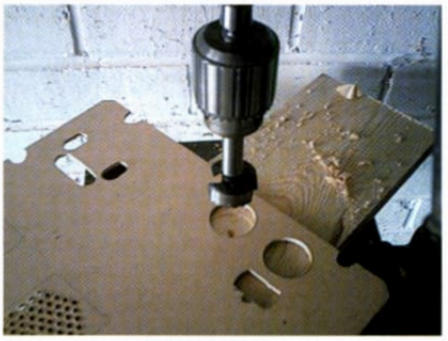
Drilling in progress. Let the drill do the work, don't force!



Two hours later progressing well, note access holes also bored for Hegner



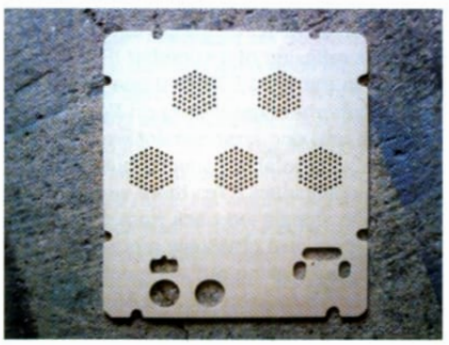
Completing cut outs, plastic pipe is blower to clear dust



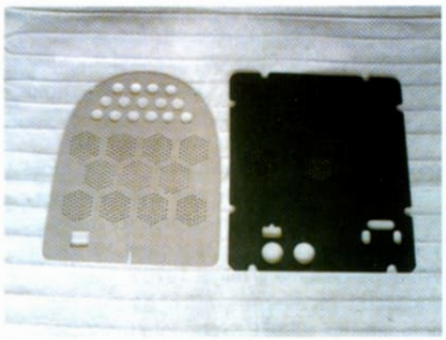
Big holes require big bits. 1" Forstner bit

Trimming to finished size using drum sander. Wear respirator!

Cleaning up using random orbit sander. Wear respirator!

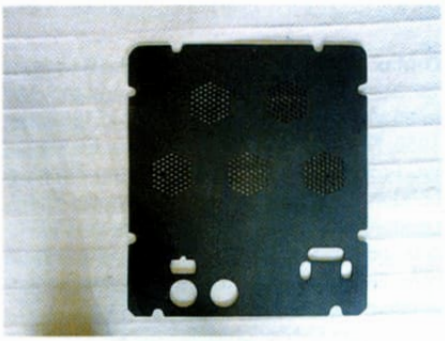


Three hours of dusty work later



Spray can of gloss black car paint used, two quick coats, let it soak in to give matt finish. Includes Philco back

Philco back made earlier using same technique



Finished

Two quick coats of paint should dry like this

Philco back, finished

The drilling Guide, two additional corner holes were used for mounting on the Philco backs. Ten at a time!

Easy cabinet restoration continued from page 28

items required for French polishing. My wife Bronwyn, gave me two of her fan brushes, one is used for applying hide glue the second is used for applying French polish. The polishing rubber is made up of an outer layer of soft cotton material and the inner is made from skin wadding, this being the traditional way of making a rubber.

Image 9 shows staining and polishing under way. Four flowing coats of polish (button shellac) were applied with the fan brush, working quickly avoiding splashes and runs. Each coat was allowed to dry for fifteen minutes before applying the next coat without rubbing down between coats. With the fourth coat of polish applied the job was left to dry overnight then it was well flatted with 240 grit and 400 grit wet or dry abrasive paper used dry. The job was dusted off then more polish was applied over a two day period using the rubber, the rubber was used over and over building up the layer of polish, as one panel became unworkable the next panel was worked and so on. The result of all this polishing is an aching arm and a beautiful high gloss finish.

Images 10 & 10a show the new silk grille cloth being fitted. This was a difficult job because the raised front surface is in full view when fitted to the cabinet which meant that gluing had to be carried out in the rebate. This was a slow job, using hot hide glue and pressing the cloth down tightly with grease proof paper to prevent the cloth sticking to the fingers. Fine silk was chosen due to the close fit of the grille in the cabinet. When the glue had dried the set was put back together and Bronwyn liked it so much it now has pride of place in our front room.

Veneering and French polishing can be carried out with a minimum outlay in expenditure but the gains are tremendous. Anyone can do it as it is difficult to make a lasting mistake due to the nature of the products, hide glue can be softened with heat and polish can be rubbed down to start afresh, why not give it a go, it must be easy if I can do it. The hardest part is making a start. I'm happy to help if possible and can be contacted by e-mail: c.wood340@ntlworld.com

Rescuing a Pye P75 Radio (trader service sheet 1135) continued from page 54

interesting speculation of whether the set had been wired wrongly from new. To prove the point I reversed the feedback connections and the howl stopped, which means it was definitely wrongly wired at some time. Although gain was reduced, the sound quality was better, showing that the feedback was doing its job. Out of interest I looked at my other P75 and the wiring was exactly the same, so either the lead out wires from the transformer secondary winding had been wrongly connected to the tag strip, or the primary was reversed. Either way it looks like it left the factory in this state.

The crackling was the fixed and moving plates on one gang of the tuning capacitor, which were touching intermittently as you tuned. Some careful bending of the end plate with an insulated tool cured that. Now it was possible to test the set on all 3 bands after cleaning the wave change switch with a little WD40. Results were surprisingly good, indicating a fair sensitivity across the band, and lots of activity on short waves with an aerial. I have always found these 1950s sets with a frame aerial to be particularly sensitive, especially on medium wave. The Bush DAC90A has a similar valve line up and aerial and this set compares well with it. In fact a line up on the signal generator showed it to be almost spot on after 50 odd years, which says a lot for the components and construction. I did replace the audio coupling capacitors with new polyester .01s and the tone correction capacitor which had gone short across the transformer. Also a decoupling 25uF on the EBC41 which was low capacity, but the main smoothing electrolytics are as good as new, doubtless helped by a slowly warming up EZ41. I have not cleaned off the waxy dirt on top of the chassis, as this gives the set some character and in no way compromises the performance. What would most people expect after 50 years ? A good little set again after 2 days work and a few inexpensive bits, so I am glad I saved it and it didn't go to the tip.

A brief resumé of British (and several overseas) finished goods & component manufacturers (as at May 2005) part 15 by Dave Hazell

Q-Max. Q-Max (Electronics) Ltd, 10 Little Turnstile, London, WC1 (in 1947) and moved to 95 Villiers Road, London, NW2 in 1950. By 1959, Napier House, High Holborn, London, WC1 (office?). In 1973, at 44 Penton Street, London, N1. In 1978, at 40-41 Furnival Street, London, EC4. Maker of coils for radio Tx/Rx sets, complete amateur sets, also chassis hole cutters and insulators. Particularly for amateur constructors. In 2003, located in ?? and making Q-Max chassis hole punches.

Quad. The Acoustical manufacturing Co Ltd, Huntingdon, Cambs (in 1976). Maker of HiFi, since 1951. Originally founded by Peter Walker, in 1936. QUAD stands for "Quality Unit Amplifier Domestic". The company was bought in 1995 by the Verity Group (who also owned Mission and Wharfedale). In 1997, it was again sold to the International Audio Group, who also own the Leak and Wharfedale brand names.

Quantel Ltd, 18 West Mills,Newbury, Berks (in 1975). Digital broadcast TV equipment. Became a UEI company.

Quartz (The) Crystal Co Ltd, 63-71 Kingston Road, New Malden, Surrey (in 1950) In 1961 & 70, QCC Works, Wellington Crescent, New Malden, Surrey. Maker of crystals.

R & A. Reproducers & Amplifiers Ltd., of Frederick Street, Wolverhampton, Staffs. (in 1947 & 66). Formed in 1930. Manufacturer of loudspeakers. Not to be confused with Radio & Allied Industries Ltd. Still going in 1958 & 65.

RACAL
Racal Ltd, was founded in 1950's by Raymond F Brown (born 1921) and George Calder Cunningham, in London and soon after, to Isleworth, Middx. Racal Engineering Ltd was formed in 1951. In 1954, it moved to newly built premises at Western Road, Bracknell, Berks (its HQ until Thomson-CSF bought what was left of Racal in 2000). Ernest T Harrison (born 1926) joined the company in 1951, as Secretary and Chief Accountant. He became Chairman and MD in 1966, replacing Raymond Brown OBE, upon his appointment as Head of Defence Sales for the British Government. He ran the company, which was eventually called Racal Electronics plc, until its takeover by Thomson-CSF (Thales) in 2000. Prior to that, Racal set up Vodafone (in Newbury) but this was split off as a separate company in the 1990's.

In 1978, Racal took over Fairey Electronics of Barnstaple, Devon – previously part of the Fairey group.

In 1984, Racal took over Chubb, the locks and security company. It sold it on some years later.

Racal Acoustics Ltd. Formed in 1978 by the merger of Racal Amplivox Ltd and S G Brown Communications Ltd (both subsidiaries of Racal plc).

Racal-BCC Ltd, Western Road, Bracknell, Berks (in 1969). Maker of radio comms equipment (e.g. military backpack radios).

Racal Communications Equipment Ltd, Chesford Grange, Woolston, Warrington, Cheshire (in 1977). Manufacture of HF comms receivers. In 1979, at Brants Bridge, Broad Lane, Bracknell, Berks.

Racal Communications Ltd, Western Road, Bracknell, Berks (in 1973). Maker of communications receivers. In 1973, also a plant at Ramsgate, Kent.

Racal Communications Systems Ltd, Western Road, Bracknell, Berks (in 1978). HF/SSB telecommunications equipment.

Racal-Dana Instruments Ltd, Duke Street, Windsor, Berks (in 1978).

Racal Group Services Ltd, The Elms, Broad Street, Wokingham, Berks (in 1973).

Racal Instruments Ltd, Duke Street, Vansittart Estate, Windsor, Berks (in 1970). Maker of test equipment. Formed in 1959.

Racal Instruments Ltd, Airmec Division, Bennet Road, Reading (in 1969). Airmec division also at Seaton, Devon (in 1969).

Racal Instruments Ltd, Dukes Ride, Crowthorne, Berks (in 1965 & 67).

Racal Instruments was the subject of a management buyout, following the takeover in 2000, of the remains of Racal plc by Thomson-CSF of France (renamed Thales after the takeover). Subsequently, in 2003, the "Wireless Solutions Group" of Racal Instruments was sold to Aeroflex of the USA.

Racal-Milgo, of Reading (in 1969). A joint venture set up in 1968, in datacomms (modems) between Racal and Milgo Electronic Corp, of Miami, USA. Racal bought Milgo in 1976.

Racal Mobilcal Ltd. Formed between 1966 and 1970, to make and market HF mobile radiotelephones.

Racal Recorders Ltd, Hardley Ind Est, Hythe, Southampton (in 1979). Maker of data recorders. Previously Racal-Thermionic – in 1978.

Racal-Redac Ltd. Produced C.A.D. software for PCB layout design (REDAC = Racal Electronic Design and Analysis by Computer).

Racal Research Ltd, Newton, Tewkesbury, Glos (in 1970).

Racal-Thermionic Ltd, Hardley Ind Est, Hythe, Southampton (in 1978). By 1982, Racal Recorders Ltd.

Thermionic Products (Electronics) Ltd, in 1969, changed their name to Racal-Thermionic Ltd, Shore Road, Hythe, Near Southampton, Hants.

RCA. Radio Corporation of America. Formed in 1919. Originally created from the assets of the American Marconi Company and with the involvement of GE (USA) and Westinghouse (USA), in response to US government wishes. Initially, RCA sold radio equipment made by GE and Westinghouse. RCA was lead by David Sarnoff for many years, he died on 12th December 1972. When he became ill (circa 1970?), his son Bob took over the role of running the company. In 1929, RCA bought the Victor Talking Machine Company and renamed it RCA-Victor. Victor already had a large stake in The Gramophone Co, of the UK. GE and Westinghouse withdrew from involvement in RCA in 1932, following US government concern over monopolies. RCA made consumer electronics, valves, TV camera tubes, HiFi equipment, records, CRTs, film sound equipment, owned NBC. They pioneered the shadowmask colour CRT and the NTSC compatible colour TV system, developed the CMOS range of transistors and CMOS digital logic chips (in 1968). In the 1950's, they operated RCA Institutes Inc, training people through correspondence courses, in TV, radio and electronics. Similar to EMI Institutes – same origins. The RCA consumer valve division (Harrison, NJ) was closed down around 1976. In the mid-1980's, they lost a lot of money on their "Selectavision" home video disc system and were taken over by GE (US) – how ironic. The consumer electronics operation was sold soon after this, to Thomson of France, the semiconductors business to Harris Corporation and the camera tubes and security/CCTV business to Burle Industries. GE retained NBC. The RCA brand is still (in 2003) used by Thomson for their consumer electronics products sold in the USA.

Until their takeover by GE (USA), RCA (Great Britain) Ltd, was for many years located at Lincoln Way, Windmill Road, Sunbury on Thames, Middlesex.

RCA International Division, Central & Terminal Avenues, Clark, New Jersey, USA 07066 (in 1966).

RCL. RCL Components Ltd, Ash Road, Wrexham Industrial Estate, Wrexham, Clywd, LL13 9UN. Maker of capacitors (now defunct?). Tel: 01978 661201

RFT. Radio Fernsehen Technik. In 1965, East Germany's manufacturer of TV sets, radios and cameras (also RFT branded valves).

REE Telecommunications Ltd, Market Square, Crewkerne, Somerset (in 1960). Maker of test and public address equipment.

REMO. Brand name Rectifier Modules International Ltd, Remo House, Rye Street, Bishops Stortford, Herts. Established in

1970. Manufacturers of TV EHT doublers and triplers in the 1970s and 80s.

R.T.C. A capacitor brand which seems to have been born from the Hunts capacitors business (after the Erie take-over). RTC made the infamous paper and film axial capacitors with the brown moulded outer casing. I do not know what the initials stand for.

RTE. Set up by Mullard in 1935 at Balham, London. Became Mullard Equipment Ltd in 1945 and MEL in 1964. Industrial and military electronics.

Radar – see Waveforms Ltd.

Radford Electronics Ltd, Ashton Vale Estate, Bristol 3 (in 1962 and 1970). Founded by Arthur Radford. Maker of Radford HiFi amplifiers and audio test equipment. In 1973, Radford Laboratory Instruments Ltd, same location. Also (in 1974 and 1978), Radford Audio Ltd, same address. In 1985, Radford Audio Ltd, 10 beach Road, Weston-S-Mare, Avon. In 1973, Radford Acoustics Ltd, Bristol 3 In 1978, Radford Laboratory Instruments Ltd, 4 High Street, Nailsea, Bristol - taken over by Wilmot Breeden Electronics Ltd in 1979 – rebranded as Wayne Kerr Radford. In 1974 – "no connection with Radford HiFi Ltd".

Radiall Microwave Components Ltd, Romar House, The Causeway, Staines, Middx (in 1974). Coaxial and multi-pin RF connectors, etc. Radiall S.A., Paris - a French company.

Radiation. Radiation Ltd, Radiation House, 255 North Circular Road, London, NW10. In 1960, maker of New World gas cookers and Parnall vacuum cleaners and tumble driers. By 1967, the Radiation electrical division included Jackson and Sunhouse. Taken over by Tube Invetsments in 1967.

Radiatron Ltd, 76 Crown Road, Twickenham, Middx (in 1969). Also Radiatron Components Ltd (formed in 1969) – distributor of Elma control knobs, etc.

Radio & Allied Industries Ltd, Langley Park, Slough, Bucks. Established in 1955, it acquired the business of Sobell Industries. Arnold Weinstock was one of the creators of this company (he was Michael Sobell's son-in-law). In 1958, a new company called Radio & Allied Industries (Holdings) Ltd was set up, with a registered office at Langley Park, Slough, Bucks. It had a factory on the Hirwaun Industrial Estate, near Aberdare, South Wales – this continued as GEC (Radio & Television) Ltd, then GEC-Hitachi and later Hitachi (still going in 2002). In 1956, it took over McMichael Radio Ltd. On 1st January 1958, the sales departments of McMichael and Sobell were combined. Masteradio Ltd was acquired in 1960. From 1962, GEC sets were also made by R&AIL, following their merger with GEC.

Radio Communication Company. International radio communications, Merged with Marconi Marine in 1928.

Radio Conderser Co, Camden, New Jersey (circa 1940's). Maker of variable capacitors.

Radiochron Ltd, Oaklands Works, Cricklewood, London, NW2 (in 1937). Maker of the "Radiochron" clock radio.

Radio Communications Co Ltd. Incorporated in 1918. They were competitors to Marconi in international wireless communications equipment. They used "Polar" and the Polar Bear as a trade name for their products. The HQ was at 34-35 Norfolk Street, Strand, London, WC2. They later made domestic radio sets. Circa 1927, RCC was taken over by Marconi.

Radio Communications Company, 16 Abbey Street, Crewkerne, Somerset (in 1963 & 64). VHF radiotelephones, base stations and mobile units, walkie-talkies. Is this the same company which amalgamated with The Marconi Company in 1928?

Radio Heaters Ltd, Wokingham, Berks (in 1958). Maker of "Radyne" RF induction heaters – as used in CRT re-gunning.

Radio Instruments (R.I.). Radio Instruments Ltd, Madrigal Works, Purley Way, Surrey (in 1931 and 47). A maker of radios/ radiograms and TV sets. Also of RF coils, valveholders, transformers, chokes and pickups. Established in 1922. By 1928, their was a relationship with Varley Ltd, as there was a joint product catalogue for their radio set components.

Radiohm – see East Grinstead Electronic Components Ltd.

Radiometer A/S, of Copenhagen, Denmark (in 1968). Test equipment.

Radiometers Ltd, Eagle House, Jermyn Street, London, SW1 (offices), with a factory at Dunbar Works, Dunbar Street, London, SE27 (both in 1937). Maker of valve testers.

Radiomobile Ltd, Cricklewood Works, London, NW2 (in 1947) and Goodwood Works, North Circular Road, London NW2 (in 1955 and 1977). Maker of car radios. Originally set up as S Smith & Sons (Radiomobile) Ltd, by The Gramophone Company Ltd (an EMI subsidiary) and Smiths Motor Accessories Ltd, to market car radios made by The Gramophone Co. Each company held a 50% interest. In 1966, Radiomobile Ltd – a division of Smiths Industries Ltd (still at Goodwood Works). Still making car radios and radio-cassette players in the 1970's. They appear to have also owned World Radio Ltd – maker of Motorola car radios in the UK, under licence). In 1975, Radiomobile Ltd, Goodwood Works, North Circular Road, London, NW2 (a subsidiary of Smiths Industries Ltd) – they opened a design office in Maylands Avenue, Hemel Hempstead, Herts, circa 1971. Now defunct?

Radionette – a radio manufacturer founded in Norway by Mr Jan Wessel in 1927. In 1965, they were at Trondheimsveien 100, Oslo 5. Around 1972, it was taken over by Tandberg Radiofabrik A/S. Tandberg went bankrupt in 1978. Jan Wessel's son designed a switch mode power supply which in some parts of Europe is called the Wessell converter.

Radionic Products Ltd, Stephenson Way, Three Bridges, Crawley, Sussex (in 1965). Manufacturer of "Radionic" electronic construction system, as used to teach electronics in schools and colleges and for breadboarding. Some connection with Philips?
Radio Rentals Ltd. Started by Percy Perring-Thoms (born 1899, died July 1964) with a shop in Brighton, where he hit upon the idea of renting radio sets. The business grew and expanded over a large area. He relocated the business to London. In 1936, his company, Radio Rentals, went public. In 1939 they began renting TV sets and in 1945, also acquired Mains Radio Gramophones Ltd of Bradford (established 1929), which became their manufacturing company. The name changed to Baird Television Ltd around 1960 (Radio Rentals having acquired the Baird brand – probably from Camp Bird, in 1960). In 1958, they acquired Hyman Lazarus Cabinets. In 1962, they acquired retail shops with the takeover of the Dawes group. Dawes group had about 100 shops in the Manchester and Cheshire area, trading under the Dawes and Vernon Cooper names.They acquired Recordacall (telephone answering machines) in 1962. The company sold TV and radio sets to the retail trade through Baird TV Distributors Ltd (in 1964, at Empire House, High Road, Chiswick, London, W4). They merged with Rentaset in 1964. At the time of his death, Mr Perring-Thoms was Chairman and MD of Radio Rentals Ltd. Thereafter, C E M Hardie was appointed Chairman and Radio Rentals became the holding company for the group. The combined rentals business was then formed into one company Radio Rentals (UK) Ltd, with J C O'Regan as its MD. W W Warnes, MD of Baird Television was elected to the board of Radio Rentals. J W Robinson was to become the MD of Radio Rentals when the merger with Rentaset was completed. In 1968, Radio Rentals Ltd had four subsidiary companies:
Radio Rentaset Ltd. The rental business, trading as Vista and Radio Rentals. It also controlled Baird TV Distributors, which supplied TV sets to other rental companies outside the group.
Radio Rentaset Sales Ltd. Controlling the Dawes retail division and sales of TV sets to trade customers.
Radio Rentaset Products Ltd. Controls all manufacturing activities of the group, including: Baird Television (TV set manufacture), Telerection (aerials), Metal Developments (aluminium and steel lighting columns) and Monk Metal Windows (steel and aluminium window frames) divisions and Goodmans Loudspeakers Ltd (22% of Goodmans was owned by Plessey).
Radio Rentaset Services Ltd. TV and radio relay systems, CCTV and telephone answering machines (Recordacall).
In 1968, Radio Rentals also owned one third of RCA Colour Tubes Ltd.

The company was set up in 1966, in conjunction with Radio Corporation of America, to make shadowmask colour TV tubes at Skelmersdale, Lancashire. By 1968, Baird Television had additional satellite factories at Shipley and Batley. The main factory at Bradford was also expanded. Radio Rentals Ltd was taken over by Thorn in 1968 and was renamed Thorn Television Rentals Ltd (including DER & Multibroadcast). In 1965, Radio Rentals (UK) Ltd, Works Centre, Beresford Avenue, Wembley, Middx. Radio Rentals Ltd, a division of Radio Rentaset Ltd including Television Rentals Limited. Divisional office, City House, 1, Maid Marian Way, Nottingham, tel 46071 and PO Box 268, 4-8, Maple Street, London, NW1 tel EUSton 7232/9 (when was this?)

Radio Rentals Wired Systems Ltd, Shrivenham Road, Swindon, Wilts (in 1968). CCTV equipment hire.

Radio Rentaset Ltd, operating since at least 1936. Mr J C O'Regan was its director (he joined the group in 1936) and died in 1968. Is this correct? "Rentaset" merged with Radio Rentals in 1964.

Radio Resistor (LAB). The Radio Resistor Company, 1 Golden Square, London, W1 (in 1938). By 1961, at 9-11 Palmerston Road, Wealdstone, Harrow, Middlesex. In 1939, at Quadrant Works, Cumberland Road, Stanmore, Middlesex. By 1956, at 50 Abbey Gardens, London, NW8. In 1974, at 5 Platina Street, London, EC2. Established in 1935. RR used to manufacture (or just package and sell?) fixed and variable resistors, sold under the "LAB" brand name. They were also a distributor for other component manufacturers, such as Erie Resistor and Cutler-Hammer (in 1938). . By the 1980's they were at St Martin's Way Industrial Estate, Cambridge Road, Bedford. They were bought by Electrocomponents (the parent of RS Components) in 1973 and were by then only a distributor of other manufacturers' products. The name ceased to be used in the 1980's.

Radio & Television Trust Ltd. In 1959, it was controlled by Crompton Parkinson Ltd and Airmec Ltd, was their only operating subsidiary. Later in 1959, Truvox acquired Crompton-Parkinson's interest in R & TV T Ltd. In 1959, R & TV T also took over British Communications Corporation in January 1960. Acquired Thermionic Products (Electronics) Ltd in 1961.

Radiospares Ltd. Established in 1936 by J H (Herbert) Waring and P M (Paul) Sebestyen. Originally operating from a lock-up garage, then at 44 Birchington Road, London, NW6. In 1946, they relocated to 19-23 Fitzroy Street, London, W1. In 1954 they moved to larger premises at 4-8 Maple Street, London, W1. In 1956, the MD was P M Sebestyen. In 1969, they relocated again, to PO Box 427, 13-17 Epworth Street, London, EC2. Component wholesaler, originally only to the radio & TV trade (also schools & colleges). In 1967, Radiospares Ltd became a public company – the public holding company was known as Electrocomponents, with Radiospares Ltd as a subsidiary. In 1971, Radiospares Ltd changed its name to RS Components Ltd. The original founders retired in 1973 and 1970, respectively. In the 1970s, they marketed a range of electronic kits under the Doran brand. Still going strong, but no longer involved in the TV & radio spares market.

La Radiotechnique-Compelec, Paris. A French company of Philips in 1965 & 68. Marketed "Miniwatt" and "Dario" valve and transistor products in France.

Rainbow Radio Manufacturing Co Ltd, Mincing Lane, Blackburn, Lancs (in 1946, 50 & 64). Maker of fringe area TV amplifiers, radios (model 426 in 1946), "Bowjection" projection TV, TV (RF) signal distribution equipment and TV test equipment. A 1950 ad in "Trader" claims "makers of good radio for 20 years".

Range Electronics Co, Cormorant Works, Lett road, London, E15 (in 1958). Manufacturer of the "Trecoscope" oscilloscope.

(The) Rank Organisation. The name is due to J Arthur Rank, a staunch Methodist, and a member of a Yorkshire flour milling family - already wealthy from his connection with the business (later known as Ranks Hovis McDougall). He began making religious films in the 1930's and in 1936, bought control of Pinewood Studios Ltd (which had recently opened). Pinewood film studios was based around Heatherden Hall, Iver, Bucks and was designed and built, circa 1935, by millionaire Charles Boot, who owned a construction company - now called Henry Boot plc. Also in 1936, with others, Rank set up a company in order to buy General Film Distributors Ltd (which is where the famous "man with the gong" logo originated). In 1941, he went on to take control of Gaumont British Pictures Corporation (controlled by the Ostrer brothers and which already owned Bush Radio) and the Odeon Theatre Group (a cinema chain). Odeon was established by Oscar Deutsch. In 1953, J Arthur Rank formed a company – Film Development and Research Ltd, to prevent his businesses from being controlled by a foreign company and transferred both his and his wife's interests to it. In 1955, one of the Rank companies, Odeon Theatres Ltd, changed its name to The Rank Organisation Ltd. By the 1950s, cinema attendance was in decline, so Rank diversified into bowling alleys, bingo, ice rinks, dancing, catering and hotels. It also developed its manufacturing operations.

In 1952, after the death of his elder brother Jimmy, J. Arthur Rank went back to the family flour business. He stayed on as Chairman of the Rank Organisation until 1962, but left the day-to-day running of the company to ex-accountant John Davis (later Sir John), who was Oscar Deutsch's accountant at Odeon Cinemas. Lord Rank died aged 83 in 1972.

Amongst others, The Rank Organisation included Aldis Brothers, a major stake in Southern Television Ltd, G-B Kalee Ltd, A Kershaw & Sons Ltd, Taylor Taylor & Hobson, Cinema-Television (Cintel), Murphy Radio, Butlins, The Pullin Group Ltd, Hilger & Watts Ltd, Wharfedale Wireless Works, H J Leak & Co, Arena (of Denmark), Andrew Smith Harkness Ltd, A C Vallance Ltd, motorway serevice areas, and Strand Electric Holdings Ltd. In 1956, Rank set up a joint company with Haloid Corporation (subsequently renamed Xerox Corporation of America), to manufacture and market their photocopiers in all areas other than North America. The company was called Rank Xerox. This proved to be a very wise decision and it bolstered Rank's profits for many years. J Arthur became Lord Rank in 1957 and died in 1972. In the 1950's he groomed John Davis as the man to run Rank when he stepped down from day-to-day control. In 1971, John Henry Davis (by then chairman of The Rank Organisation), was knighted. The Rank Organisation began pulling out of technology companies in the early 1980's and is now purely a clubs and gaming company (would J Arthur have approved?). In the early 1990s, Rank acquired Mecca Leisure Group plc. In two stages (1995 and 1997), Rank sold its entire holding in Rank Xerox Ltd, for £1.5 billion. Between 1995 and 1999, Rank also sold its film distribution business and Rank Precision Industries. In 2000, it sold Odeon cinemas and Pinewood studios. In 2005, it is known as Rank Group plc (after the formation of a new company - The Rank Group plc, which was established on 22nd December 1995, and subsequently - in 1996 – became a holding company for all shares in The Rank Organisation plc).

The Rank Organisation Ltd. Head Office at Millbank Tower, Millbank, London, SW1 (in 1969 & 70).

A C Vallance Ltd. Film processing.

Andrew Smith Harkness Ltd. Acquired by Rank in 1952.

British Optical & Precision Engineers Ltd (BOPE). Formed by Rank in 1947 as a public company to acquire the businesses of British Acoustic Films Ltd and G-B Kalee Ltd (both former subsidiaries of Gaumont-British). At the same time, it also acquired the remainder of the shares in Taylor, Taylor & Hobson Ltd not already held by British Acoustic Films Ltd. Also in 1947, it acquired A Kershaw & Sons Ltd (projector manufacturers). BOPE was later renamed Rank Precision Industries Ltd. Later on, the company took on the (non-consumer) electronic operations of Rank Bush Murphy and Cintel.

English Numbering Machines Ltd, Queensway, Enfield, Middx (in 1971) – a Rank company by 1971.

H J Leak & Co Ltd. High Fidelity equipment manufacturer. Taken over by Rank in January 1969.

Murphy India Ltd. In 1969, an associate company of the Rank Organisation. Several Bush and Murphy radios sold in the UK were made in India – almost certainly by Rank's Indian subsidiary. This continued up to at least 1981 (I have an Indian made Murphy radio from that time).

Rank Bush Murphy Ltd (RBM) established in 1963, with the merger of Bush Radio Ltd and Murphy Radio Ltd. The electronics and General Radiological operations of Murphy Radio were integrated with the professional and industrial side of Bush, in 1963, to form the RBM Electronics Division. In 1963, RBM was allocated a factory at Camborne, Cornwall by the Board of Trade, for the manufacture of television sub-assemblies to feed its Plymouth factory. In 1965, the service departments of Murphy Radio and Bush Radio were amalgamated at Bessemer Road, Welwyn Garden City (also included Murphy mobile radio – Rank Telecommunications) – under the service manager, J A Hutton. In 1966, RBM introduced the pocket sized "MITRE" transceiver – Miniature Individual Transmitting Receiving Equipment (their equivalent to the Pye "Pocketphone" 2-way radio.

Rank Radio International Ltd, established in 1973. Set up to combine, Bush, Murphy, Dansette, Leak, Arena and Wharfedale operations into one company. Head Office, Power Road, Chiswick, London, W4. PO Box 596, Power Road, Chiswick, London, W4 (previously the Bush Radio/ RBM HQ). Included Rank Bush Murphy, Rank Arena, Rank Wharfedale, Heco (a German loudspeaker manufacturer), Dansette, H J Leak, etc. Main TV Factory at Northolt Avenue, Ernesettle, Plymouth, PL5 2TS, tel PLYmouth 364311 (originally the Bush factory, built circa 1948). In 1976, RRI closed the Leak electronics factory at Bradford, after four years of losses.

Rank Radio International Service Centre, Watton Road, Ware, Hertfordshire (from circa 1972 to 1982). Premises shared with Rank Cintel and Rank Telecommunications (formerly Murphy radiotelephones).

RRI announced (circa 1978) the formation of a joint venture company with Toshiba of Japan – Rank Toshiba Ltd. This was to take over the former Bush factory in Plymouth and manufacture TV sets (using mainly Toshiba technology).

In 1982, RRI pulled out of the consumer TV and Radio business and sold its interest in Rank Toshiba to Toshiba, who closed the Plymouth factory for a while, then reopened it with a single Trades Union and rather better working practices. The RRI (TV and Radio) parts operation was sold to Currys and relocated to High Wycombe. When Dixons took over Currys, the Rank TV spares activity was sold to HRS of Birmingham. Rank sold the Bush brand (alledgedly for £1 million), to a small company called Interstate Electronics Ltd, which renamed itself Bush Radio Ltd. Rank sold the Murphy brand to a subsidiary of Great Universal Stores Ltd (J J Silber ??).

Rank Cintel Ltd, Worsley Bridge Road, London, SE26 (in 1960 64). Formerly Cinema-Television Ltd.

Rank Film Laboratories Ltd, North Orbital Road, Denham, Uxbridge, Middx (in 1972 and 78). Cine film processors.

Rank Pullin Controls, Phoenix Works, Great West Road, Brentford, Middx (in 1966 & 78). Mobile radiocoms equipment and test and measurement equipment. The successor company to Measuring Instruments (Pullin) Ltd.

Rank Precision Industries Ltd, Bessemer Road, Welwyn Garden City, Herts (in 1969) – the former Murphy Radio site (same phone number WG 23434. Maker of broadcast TV equipment (Cintel) and radiotelphones (Murphy). Relocated to Ware, Herts, in June 1970.

Rank Precision Industries Ltd, G.B.-Kalee Division (Studio), Woodger Road, London, W12. Manufacturer of the Gaumont-Kalee flutter meter.

Rank Film Equipment (in 1974). Rank Kalee wow and flutter meter. P O Box 70, Great West Road, Brentford, Middx.

Rank Aldis – projectors and "Aldis" lamps (originally Aldis Brothers, of Birmingham).

Rank Audio Visual Ltd. Established as a separate company in 1960, to take over the non-scientific instrument business of Rank Precision Industries.

Rank Audio Visual Ltd, Woodger Road, Shepherds Bush, London, W12 (in 1967). In 1970, at P O Box 70, Great West Road, Brentford, Middx. Producer of the Rank studio flutter meter, distributor of film and cine equipment, etc. Also UK distributor for Akai of Japan (in 1971).

Rank Kalee, Studio Dept, Woodger Road, London, W12 (in 1962). Maker of flutter meter.

Rank Records Ltd (in 1959). Records (LPs & 45s) sold under the "Top Rank" brand.

Rank Research Laboratories, Phoenix Works, Great West Road, Brentford, Middx (in 1978).

Rank Strand Electric Ltd, 29 King Street, Covent Garden, London, WC2 (in 1969) and with R&D unit at Brentford, Middx. By 1972, PO Box 70, Great West Road, Brentford, Middx (including Rank Film Equipment). Theatre and TV studio lighting.

Rank Taylor Hobson, P O Box 26, Guthlaxton Street, Leicester (in 1979). Metrological equipment (also used to make very high quality CCTV lenses). In 1968, Taylor Hobson division of Rank Precision Industries Ltd, Leicester House, Lee Circle, Leicester.

Rank Video Laboratory, 142 Wardour Street, London, W1 (in 1973). Film-to-tape transfers, duplicating, etc. In 1978, known as The Rank Video Centre.

Rank Wharfedale Ltd, Bradford Road, Idle, Bradford, Yorks (in 1972).

Rank Xerox Ltd., PO Box 17, Bessemer Road, Welwyn Garden City, Herts (in 1974). The former Murphy Radio Ltd site. In 1956, Rank formed a jointly owned company with the Xerox Corporation (USA): Rank Xerox Ltd. This was to manufacture and market photocopiers (utilising the Xerography process), in all territories except North America. Rank sold its share to Xerox in the 1990s.

Strand Electric Holdings Ltd. Theatre & TV lighting equipment. Acquired in 1968.

Top Rank leisure clubs (and retail shops, selling and renting TVs in the 1960s – including Bush made sets branded "Top Rank").

Raymart. (British?) maker of coils and variable capacitors for radio sets in the 1930's.

Raymond Electric Ltd, 26 Wadsworth Road, Perivale, Middlesex (in 1946). In 1950 & 52, at Brent Crescent, North Circular Road, London, NW10. Maker of TV and radio sets. Connected with Beethoven?

Raytheon. In 1955, The Raytheon Manufacturing Company, Newton, Mass; Chicago, Ill; Atlanta, Ga & Los Angeles, Calif. In 1965, their semiconductor operation was at Mountain View, California (it was previously Rheem Semiconductor Corporation, until being acquired bt Raytheon in 1961). In 1974, at 130 Second Avenue, Waltham, Massachusetts 02154. Maker of valves, CRTs, semiconductors and consumer electronics (in their Chicago factory). They also made industrial electronics (e.g. radar), and took over A C Cossor Ltd, circa 1961.

RCA Photophone Ltd, Lincoln Way, Windmill Road, Sunbury-on-Thames, Middlesex (in 1955). Established in the UK in 1929, to handle the Photophone sound system for films. Previously at Shepherds Bush, London. UK subsidiary of the Radio Corporation of America. UK distributor of RCA Hi-Fi products. Previously, RCA Photophone were mainly involved in cine film soundtrack equipment. In 1956, the name changed to RCA Great Britain Ltd.

Reading Windings. Reading Windings Ltd, 169 Basingstoke Road, Reading (in 1961 & 70). Acquired by Radiospares Ltd, in 1955. A transformer manufacturer, based (would you believe!) in Reading. They were bought by Electrocomponents in the 1970s and made a lot of the wound items in the RS catalogue. They were closed down (?) by RS in the 1980's.

Record Electrical Co Ltd, Broadheath, Altrincham, Cheshire (in 1946). Maker of "Record" electrical test equipment.

Recording Devices Ltd. In 1959, at 95 Villiers Road, Willesden, London, NW2 and offering the Stuzzi "Magnette" portable tape recorder. Still selling "Stuzzi" tape recorders in 1961.

Redac Software Ltd. By 1971, a Racal company. Produced C.A.D. software for PCB layout design, also thick-film microcircuits, MOS design and circuitry design. Later known as Racal-Redac Ltd.

REDIFFUSION

In 1928, J W C Robinson was the MD of the company which became Rediffusion (Broadcast Relay Service Ltd). The word Rediffusion was used as a company name in 1931, when negotiating with local authorities to expand the relay service. In 1938, Rediffusion acquired Gambrell Radio, of Wandsworth, London. Gambrell's products included marine radio and equipment for Rediffusion's relay service network. The trade mark "Redifon" was first used on Gambrell's military products, during World War 2. In 1946, the company name was changed to Redifon Ltd. In 1947, British Electric Traction Company Ltd acquired a stake in Rediffusion and in 1967, BET acquired a controlling interest in Rediffusion. After BET acquired full ownership of Rediffusion in 1983, it began to dispose of all the Rediffusion companies, to transform itself into a services company (scaffolding, plant hire, office cleaning, commercial laundry, etc.). Rediffusion cable TV was sold to Robert Maxwell, the TV manufacturing operation was closed down, TV rental/sales shops to Granada, Flight Simulation to Hughes. In the mid 1990's BET plc itself was taken over by Rentokil plc. By 1949, Redifon was supplying flight simulation equipment to airlines. In 1951, the flight simulation division relocated to Crawley, Sussex and began trading as Redifon Simulation. In 1946, Rediffusion Ltd (a subsidiary of Broadcast Relay Service Ltd), of Carlton House, Lower Regent Street, SW1, made Redifon RF heaters. Broadcast Relay Service Ltd, owned Small Electric Motors Ltd, Eagle Works, Churchfield Road, Beckenham, Kent (est. >30 yrs), in 1946.

Paul Adorian was MD of Rediffusion Ltd, since 1966. He joined the company in 1932. He was also chairman of Redifon Ltd and Redifon-Astrodata Ltd (a joint venture, formed in 1965, with Astrodata Inc, of California) and a director of British Electric Traction Company Ltd (Rediffusion's parent). He retired in 1970, aged 65. He was succeeded by Hugh Dundas, who has been with Rediffusion since 1961. Hugh Dundas was appointed managing director of Rediffusion Ltd, circa 1971.

In 1968, Rediffusion bought The Rank Organisation's sound and television cable networks and the associated TV rental business.

Associated-Rediffusion Ltd. The first ITV programme contractor (London – weekdays), was a joint venture with Associated Newspapers (Daily Mail, etc.). Later, In 1955, they converted the Wembley Film Studios for TV use (in Wembley Park Drive). Associated Newspapers pulled out and Rediffusion took full ownership and the name changed to Rediffusion Television Ltd. In 1965, Rediffusion Television Ltd, Television House, Kingsway, London, WC2 (with main studios in Wembley, Middlesex). In 1968, Rediffusion Television merged with ABC Television, to form Thames Television Ltd, who assumed the London weekday franchise in July 1968.

Central Rediffusion Services Ltd (in 1961).

Doric Radio Ltd, Fullers Way South, Chessington, Surrey (in 1975). Formed to sell on Rediffusion made CTVs to the retail trade.

Rediffusion Consumer Electronics Ltd, Southern Region, Relay House, Sandy Lane, Oxford (in 1984).

Rediffusion Consumer Electronics Ltd, St Helen's Auckland, Bishop Auckland, Co Durham (in 1976). TV factory (in 1982, there was also a unit at Billingham, Cleveland). Closed down circa 1984.

Rediffusion Consumer Electronics Ltd, Bridgefold Road, Rochdale, Lancs (in 1976). Spares and service for Rediffusion TVs and CATV equipment, etc. Closed down circa 1984.

Rediffusion Consumer Electronics Ltd, Fullers Way South, Chessington, Surrey KT9 1HJ, tel 01397 5411 (in 1976 & 1980). Development centre for Rediffusion TV sets. Closed down circa 1984.

Rediffusion Engineering Ltd, 187 Coombe Lane West, Kingston-on-Thames, Surrey (in 1970). Development labs for cable TV systems and HQ for overseas broadcast TV & radio services.

Rediffusion Industrial Services Ltd (in 1968 & 70), Astronaut House, Hounslow Road, Feltham, Middx. In 1969, Supplier of PA, CCTV, intercom, telephone and background music systems. In 1969, UK agent for IVC VTRs (USA). In 1976, at Rediffusion House, 214 Red Lion Road, Surbiton, Surrey.

Rediffusion International Ltd (in 1971), provides administrative and technical services to the overseas Rediffusion stations.

Rediffusion Reditronics Ltd, La Pouquelaye, St Helier, Jersey, CI (in 1977 & 80). Maker of sound systems. Also made CATV equipment for Rediffusion in the UK. They were previously known as Television Research Ltd (TVR).

Rediffusion Reditune Ltd, Cray Avenue, Orpington, Kent (in 1972). In 1965 & 68, just Reditune Ltd – same address. Reditune background music systems.

Rediffusion Research Ltd, 187 Coombe Lane West, Kingston-upon-Thames, Surrey (in 1968). Cable TV development.

Redifon Telecommunications Ltd, Broomhills Road, Wandsworth, London, SW18 (in 1972 and 78). Maker of radio transmitters, communications sets, etc.

Rediffusion Vision Ltd, Carlton House, Lower Regent Street, London, SW1 (in 1964) and at Fullers Way South, Chessington, Surrey (in 1968). Factory at: Two Bridges Factory, Shaw Road, New Hey, Near Roachdale (in 1964).

Rediffusion Vision Service Ltd, Fullers Way South, Chessington, Surrey (in 1968 & 69).

Redifon Ltd, Broomhill Road, Wandsworth, SW18 (in 1970). Military and commercial radio equipment. Name later changed to Rediffusion Radio Systems. In 1988, a management buyout from BET plc took place and the name Redifon Ltd was adopted. In 1991, Redifon acquired SPT International Ltd and the company became Redifon SPT Ltd. In 1994, Redifon SPT acquired by Thomson-CSF of France and renamed Redifon Ltd. In 1995, Redifon and MEL are merged to form Redifon MEL Ltd, Crawley. With the Thomson takeover of Racal plc in 2000, the merged entity becomes Thales and Redifon MEL becomes Thales Communications Ltd.

Redifon Air Trainers Ltd, Bicester Road, Aylesbury, Bucks (in 1970). It was originally called General Precision Systems Ltd and the name was changed in 1967, shortly after their acquisition by Rediffusion.

Redifon Electronic Systems Ltd, PO Box 2, Manor Royal, Crawley, Sussex (in 1973).

Redifon Ltd, Flight Simulator Division, Gatwick Road, Crawley, Sussex (in 1966 & 69). Later became Rediffusion Flight Simulation Ltd (by 1973). Later still, Rediffusion Simulation Ltd. In 1988, BET plc (Rediffusion's parent company) sold it to Hughes of the USA. In 1994, Thomson-CSF acquired Hughes Rediffusion Simulation (they already owned Link Miles, bought from Singer). Thomson merged the two companies, forming Thomson Training and Simulation.

Redifon Ltd, Radar Simulation Division, 25-27 Kelvin Way, Crawley, Sussex (in 1968 & 69).

Redifon Telecommunications Ltd, Broomhill Road, Wandsworth, SW18 (in 1978).

Rediweld Ltd (in 1959).

Redpoint Ltd, Lynton Road, Cheney Manor, Swindon (in 1970). In 1973, Redpoint Associates Ltd, same address. A maker of heatsinks.

Redring Electric Ltd, Peterborough. Maker of immersion heaters, electric cooker heating

rings, electric showers, etc. Formed (in the 1970s) into a separate company from AEI/GEC/Hotpoint's activities. Became part of a management buyout from GEC/ Marconi – Applied Energy Products.

Reelek Appliances Ltd, Reelek Works, Baldock, Herts (in 1958). Maker of Reelek vaccum cleaners.

Rees Mace Manufacturing Co Ltd, 39a Welbeck Street, London, W1 (in 1926). Maker of radio sets and loudspeakers, in 1928. In 1950's, Rees Mace Marine – manufacturer of communications receivers, with a factory at Oulton Broad, Near Lowestoft. Taken over by Pye, circa 1950? The Pye TV factory, which opened in the 1950's, was located at Oulton Broad – same place?

Regentone Products Ltd, Eastern Avenue, Romford, Essex (in 1950 & 52). At Regentone Works, Worton Road, Isleworth, Middlesex in 1933 (its original location?). The company was established in 1924. In 1944, at 3-4 The Broadway, Edmonton, London, N9 – a maker of the wartime utility radio – manufacturer's code U24. Maker of radio & TV sets (entered TV market in 1949). Regentone acquired RGD around 1952. The Regentone MD in 1950 & 54 was William Harries (also of RGD following the takeover). The Harries Group included United Components Ltd, the manufacturing company for Regentone & RGD products. The Argosy brand was acquired by 1957. Also in 1957, a new company - Combined Radio & Television Services Ltd, Bridge Close, Oldchurch Road, Romford, Essex - was formed to handle service and parts for the Regentone, RGD and Argosy brands. In 1960, the Regentone group was owned by Lloyd's Packing Warehouses (Holdings) Ltd. The Regentone, RGD and Argosy brands (and physical assets?) were bought by STC (circa 1962) and merged with Kolster-Brandes Ltd at Footscray, Kent, to form the Consumer Products Division of STC Ltd. CR&TS was relocated to Footscray. In 1964, a Regentone "Varilite" dimmer switch was shown on page 511 of Sep. edition of "Radio & Electrical Retailing" magazine. In 1964, the "Trader" yearbook states: Regentone Radio & Television Ltd, Eastern Avenue West, Romford, Essex. The STC Consumer Products Division (basically, Kolster Brandes) became known as ITT Consumer Products later in the 1960's. The Regentone brand was dropped by STC quite soon after they acquired it but RGD continued into the 1970s.

Relay Exchanges Ltd, TV Aerial Contracts Division, Relay House, Percy Street, Swindon, Wilts (in 1964). Relay Exchanges Ltd, in 1960, controlled 16 relay companies, six Rentaset companies, four retail concerns and three manufacturing companies, including Goodmans Industries. The company name became Rentaset Ltd, prior to its merger with Radio Rentals Ltd, in 1964. Later, Radio Rentals Ltd, were at that location, after their merger with Renatset group in 1964.

Reliance. Reliance Manufacturing Co (Southwark) Ltd., Sutherland Road, Higham Hill, Walthamstow, London, E17 (in 1948 & 50). Maker of wirewound and composition potentiometers. Established in the 1930's? In 1964 & 66, Reliance Controls Ltd, Sutherland Road, London, E17.

In 1968, Reliance Controls Ltd., Drakes Way, Swindon, Wilts. Maker of variable resistors. By 1970, Reliance Controls Ltd was a subsidiary of Booker Bowmar Ltd (a company jointly owned by Booker McConnel Ltd – 45%, and Bowmar Instrument Corporation of Fort Wayne, Indiana – 55%). In 1971, Reliance was bought from Booker Bowmar, by The Carrier Corporation, of California, who already owned Spectrol Electronics Corp, of California. In 1972, Reliance was merged with Spectrol, to form Spectrol-Reliance Ltd, same address. The Swindon plant closed in the 1990's. Now part of the Vishay group.

Reliance Cords & Cables Ltd, Staffa Road, London, E10 (in 1964 & 67). In 1950, Reliance Electrical Wire Co Ltd, same address. By 1967, they were also involved in the installation of audio and carrier telecomms cables. Taken over by BICC in 1969 (when it was Reliance-Clifton Cables Ltd).

Rendar. Rendar Instruments Ltd, of Victoria Road, Burgess Hill, Sussex (in 1959 & 67). Rendar was a subsidiary of Wright & Weaire Ltd. Two W & W designers, Messrs Harold E Renard and Dare, set up a separate W & W subsidiary company known as Rendar, to make high quality connectors. It seems that Rendar were originally at W & W's Tottenham premises but later relocated to Burgess Hill in West Sussex.

Manufacturers of connectors, particularly the British Post Office version of the ¼" jack plug, known as the 316 series. Circa 1967-70, their logo was a seahorse, with the text "Instruments for Land, Sea & Air". They also made the "Safebloc" connector for powering up equipment with no mains plug fitted and control knobs. Later, in 1968, they became part of the Wilmot Breeden Electronics group (which also included Wayne-Kerr, Wright & Weaire and British Ferrograph) and relocated to Bognor Regis, Sussex. Circa 2000, they were bought by Schurter of Germany and the Rendar name has been replaced by Schurter.

Rentaset. Founded by J W C Robinson, who, in 1932 established his own relay and rental companies which later became the Rentaset group. Merged with Radio Rentals Ltd in 1964. J W C Robinson was the Chairman of Radio Rentals in 1967.

Repanco. Repanco Ltd, of 203-219 Foleshill Road, Coventry (in 1964 & 71). Repanco were manufacturers of radio frequency coils and LF transformers. They also produced radio kits. Earliest trace 1958.

REPS - A brand name for UK made tape recorders in the 1950's & 60's. In 1958 & 64, Reps (Tape Recorders) Ltd, at 118 Park Road North, South Acton, London, W3. In 1982, Reps (Tape Recorders) Ltd, 11-13 Regina Road, Southall, Middx.

Research & Control Instruments Ltd, 207 King's Cross Road, London, WC1 (in 1959 & 61). UK agents for Philips test and measurement equipment. By 1965, MEL (formerly Mullard Equipment Ltd) were the UK agents at this address.

Resista. Brand of high stability resistors, distributed in the UK (in 1965), by G A Stanley Palmer Ltd, Island Farm Avenue, West Molesey Trading Estate, East Molesey, Surrey.

Reslo. Reslosound Ltd, 359 City Road, London, EC1 (in 1948 & 50). Maker of loudspeakers and microphones. Still going in 1969, at Romford, Essex (by 1960, part of the Derritron Group). In 1964 & 73, Reslosound Ltd, Reslo Works, Spring Gardens, London Road, Romford, Essex (still a Derritron subsidiary).

Revo Electric Co Ltd, Tipton, Staffs (in 1946 & 64). Maker of "Revo" lighting equipment, tabletop cookers and domestic appliances. In 1948, they also made electrical switches for use by others, in domestic appliances.

Rexine. Registered trade mark of Imperial Chemical Industries Ltd (ICI), for the nitrocellulose coated fabrics made by its Leathercloth division (HQ at Hyde, Cheshire in 1958).

Reynolds Universal Manufacturing Co Ltd, 410 Dudley Road, Edgbaston, Birmingham, 16 (in 1947). Maker of radios, radiograms and amplifiers.

Reyrolle (A.) & Co Ltd, Hebburn, County Durham (in 1960). Manufacturer of Reyrolle 110, 50 & 25V low voltage plugs and sockets.

RGD – Radio Gramophone Development Co Ltd, Pale Meadow Print Works, Hospital Street, Bridgnorth, Shropshire (in 1944 & 47). Established in 1929 by W R Parkinson. Primarily a radiogram manufacturer, but also made TVs. Originally (certainly in 1938) at Newton Row, Birmingham 6. In 1938, RGD advertised their "Antistatic all-wave aerial kit". The Bridgnorth factory (when the RGD radio & TV business relocated to Regentone at Romford?) was taken over by Automatic Telephone & Electric Co Ltd and became AT&E (Bridgnorth) Ltd. When ATE took over the Bridgnorth factory, W R Parkinson became the technical director. Mr Parkinson retired from AT&E (Bridgnorth) Ltd in 1965. By the early 1970's, Decca Radio & Television had acquired the Bridgnorth factory. RGD was taken over by the Regentone company circa 1952. In 1954, located at Eastern Avenue West, Mawneys, Romford, Essex. The MD in 1954 was William Harries (also of Regentone), whose son Fred became a director in the same year. The RGD and Regentone brands were acquired by STC (KB), circa 1963. Brand name continued in use into the 1970's.

RIC Components Ltd, 20-21 Church lane, Willesden, London, NW10 (in 1964). Capacitor manufacturer. RIC Capacitors Ltd, Budds Lane, Romsey, Hants (in 1968). In 1989, the firm was merged with PED Capacitors Ltd, to form Cambridge Capacitors Ltd. (PED = Pye Electro Devices Ltd). Still at Romsey.

Rich & Bundy Ltd. In 1934, a manufacturer of transformers and chokes.

Richard Allan. Richard Allan Radio Ltd, of Bradford Road, Gomersal, Cleckheaton, Yorkshire (in 1976). In 1950, Bafflette House, Batley, Yorks. In 1964, at Taylor Street, Batley, Yorkshire. Manufacturers of loudspeakers and transformers.

(J.) Richardson Electronics Ltd, 43B Hereford Road, London, W2. In 1968, a valve HiFi amplifier manufacturer, with a novel output stage stabilisation circuit.

Rifa, Fac, S-161 11 Bromma, Sweden (in 1977). Capacitor manufacturer. An Ericsson subsidiary at one time? Later EVOX-RIFA. Evox Rifa's roots go back to the 1940s. The Swedish company Rifa was established in 1942 and the Finnish company Evox in 1947. Finvest Oy acquired both companies in the 1980s and merged them to form Evox Rifa in 1992. In the spring of 2000 Finvest decided to emerge and divide into four companies. One of these is Evox Rifa, which was listed on the Helsinki Stock Exchange 1st of November 2000. Evox-Rifa now owns BHC Components, of Weymouth (formerly Daly Condensers).

Rigonda. Brand name used on Russian made radios, radiograms and TV sets sold in the UK in the late 1960s and 1970s. The UK importer was V A Afif Ltd, 13-17 Tabernacle Street, London, EC2A 4SQ. Brown Brothers Ltd was a major wholesaler of these products.

Ripaults Ltd, Southbury Road, Enfield, Middlesex (in 1950 & 64). Cables and automotive wiring harnesses. In 1950, they made aerials, cables, flexible cords, sleeving, battery leads, cableforms and connectors/tags/terminals.

Rists Wires & Cables Ltd, Newcastle, Staffs (in 1964). Cable manufacturer – also automotive and aircraft wiring harnesses. Rists became a subsidiary of Lucas Industries Ltd.

Rival Lamps Ltd. Weybridge, Surrey (in 1964). Lamp manufacturer for the radio & electrical industries.

Rivlin Instruments Ltd, Doman Road, Camberley, Surrey (in 1965), Maker of precision wirewound resistors.

RM Electric Ltd. Majestic Works, Second Avenue, Team Valley, Gateshead 11 (in 1944 & 47). Wartime utility radio makers code U25. Maker of radio chassis, battery eliminators, power resistors, transformers, coils and chokes. Also made finished equipment, such as record players, under the "Strad" brand name. In 1956, they were acquired by Masteradio Ltd. and relocated to 21 Seaton Place, London, NW1.

Roband Electronics Ltd, Charlwood Works, Lowfield Heath Road, Charlwood, Horley, Surrey (jn 1963 & 69). Maker of oscilloscopes, digital display multimeter and power supplies. In 1965, they set up a marketing agreement with Livingston Laboratories Ltd.

Roberts Radio Co Ltd., 35-37 Creek Road, East Molesey, Surrey (in 1944 & 47 & 61). In 1962, at Molesley Avenue, West Molesley, Surrey. Founded by Harry Roberts and A N Other - Leslie Bidmead?? - in 1932. Originally at Hills Place, London, W1 and 41 Rathbone Place, London, W1. In 1975, launched Roberts Video (sets with Philips chassis). Taken over by Glen Dimplex in the late 1990's and the business was relocated to Mexborough, Yorkshire. Still going – the only producer of UK made radios. Also acquired the Dynatron brand from Philips in the 1980s. Harry Roberts died, aged 59, in 1969 – he was also closely involved with BREMA.

Robinson (Lionel) & Co Ltd. In 1947, at 3 Staple Inn, Holborn, London, WC1. Manufacturer/supplier of resistance wires and insulating beads.

Robinson Rentals, Bedford (in 1962). A TV rental company (started in 1954 by David Robinson) which also offered agencies to independent local dealers - bought by Granada in 1968, for £8 million. Granada's rental operations commenced in 1962. E K Cole joined as Advisory Chairman in 1962. He had resigned from British Electronic Industries in 1961. In 1968, Robinson Rentals Ltd, P O Box 31, Ampthill Road, Bedford. Circa 2001, Granada TV Rental and Thorn (Radio Rentals) merged to form "Box Clever".

Robophone Ltd, Unit D, Menin Works, Bond Road, Mitcham, Surrey (in 1967). Telephone answering machine manufacturer.

Robuk Electrical Industries Ltd, 559-561 Holloway Road, London, N19 (in 1960 & 64). Manufacturer of tape recorders.

Rock Electrical Accessories Ltd, 6 Commerce Road, Brenford, Middx (in 1982). Manufacturer of electrical accessories (plugs, lampholders, etc.). Later merged with Ashley.

Rogers Developments Co., 106 Heath Street, Hampstead, London, NW3 (in 1948). On 1st July 1950, they relocated to Rodevco House, 116 Blackheath Road, Greenwich, SE10. In 1957 and 1970, Rogers Developments (Electronics) Ltd, "Rodevco Works", 4-14 Barmeston Road, Catford, London, SE6. Maker of HiFi and audio test equipment. Founded in 1947 by Mr J D Rogers. On 31st October 1975, the firm ceased trading and went into liquidation. By March 1976, a firm called Swisstone Electronics Ltd had bought the premises, stock, plant and key personnel of the old company and offered repairs to Rogers products. Subsequently (by 1982), Jim Rogers had formed J R Loudspeakers (W.World, Mar 82, p72).

Rohde & Schwarz GmbH & Co KG, 8000 Munchen 8, Muhldorstrasse 15, Germany (in 1980). Test equipment maker (including broadcast type). Associated with Aveley Electric Ltd in the UK. One of their famous products was the "Polyskop" wobbulator.

Rola Celestion. Formed in 1947 by the takeover of Celestion Ltd, by British Rola Co. British Rola Ltd, was originally the UK subsidiary of a US loudspeaker manufacturer and located at Ferry Works, Summer Road, Thames Ditton, Surrey (and at Pans Lane, in Devizes – in 1945). Still at Ferry Works, Thames Ditton in 1965. Set up in 1934 - The British Rola Co Ltd, Minerva Road, Park Royal, London, NW10 – loudspeaker manufacturer. In July 1946 British Rola took over Celestion Ltd (another speaker manufacturer, founded in 1924) based at Kingston-upon-Thames (WW June 1946) – the Celestion website says 1947! In its early days, Celestion also made valveholders and radiograms. The firms retained separate development departments for a while. British Rola Ltd and Celestion Ltd went into receivership in 1948 (says a contemporary edition of Wireless World). The combined company was renamed Rola Celestion Ltd and this company name continued until at least 1979, when it reverted to Celestion Ltd. Manufacturers of cabinet and OEM loudspeakers (including the Ditton range). In 1968, the company relocated to Foxhall Road, Ipswich, Suffolk. In 1949, Rola Celestion was taken over by Truvox Ltd. Rola-Celestion (see WW Dec 52, p18) began making Truvox horn PA speakers. In 1970, the company was merged with a clothing manufacturer (!) and the group was renamed Celestion Industries plc. In 1979, the firm was renamed Celestion International Ltd, same address in Ipswich. In 1992, Celestion International Ltd was separated from the clothing group and sold to Kinergetics Holdings (UK) Ltd, whose majority shareholder was Gold Peak Industries of Hong Kong (parent company of the "GP" battery maker)! Also in 1992, KH acquired KEF Loudspeakers. In 2004, the combined UK company is called KH Manufacturing Ltd.

Rola Group (of Australia). A manufacturer of radio and TV components, magnetic wire and professional tape recorders. Taken over by Plessey in 1965.

Rolls Razor Ltd, Cricklewood, London, NW2 (in 1955 & 58). Maker of electric shavers and washing machines. Established by John Bloom. Went into receivership in 1964.

Romac Radio Corporation Ltd, The Hyde, Hendon, London, NW9 (in 1947 & 50). Maker of radios. Anything to do with Holts-Romac Ltd – the car accessories company?

Ronden Manufacturing Co Ltd, 36 Boleyn Road, London, N6 (in 1955). Radiogram maker.

Ronette pickups and crystal mics (Ronette Piezo-Electric Industry NV, Amsterdam) – UK distributor – E & G Distributing Corporation, 33 Tottenham Court Road, London, W1 (in 1952) in 1958, Trianon Electric Ltd, 85 Cobbold Road, London, NW10.

Ronson Products Ltd, Leatherhead, Surrey (in 1964). Established since at least 1946. Maker of lighters, shavers, hairdryers, etc. Went bust in the 1970s. Brand name has been resurrected.

Ross Courtney & Co Ltd, 25 Ashbrook Road, Upper Holloway, London, N19 (in 1964) – a subsidiary of Southern Areas Electric Corporation Ltd. By 1965 (an 1972), they were at Terminal House, Elthorne Road, Upper Holloway, London, N19. Maker of metal pressed parts, electrical terminations, etc.

Rothermel. R A Rothermel Ltd, Rothermel House, Canterbury Road, High Road, Kilburn, London, NW6 (in 1937 & 47). Maker of pickups, headphones, microphones and electronic test equipment. In 1938, they were the UK agents for the Brush Crystal Co, USA.

Rotunda Ltd, Denton, Manchester (in 1960 & 64). Manufacturer of electrical insulating tapes. Later, taken over by BICC?

Rovex Scale Models Ltd, Westwood, Margate, Kent (in 1964). Maker of Scalextrix and Triang model railways. Owned by Lines Brothers (Triang toys, Pedigree prams, etc). Lines Bros took over Meccano Ltd in the mid-1960s, but went bust later on. In 2004, the successor company is called Hornby Railways (at the same location).

Royal Worcester Industrial Ceramics Ltd, Tonyrefail, Glamorgan, S. Wales (in 1965). Maker of ceramic insulators, bushings, etc.

RS Amplifiers Ltd, 3-4 Highfield Road, Shepperrton, Middx (in 1945). Maker of P.A. equipment.

RSC Radio Ltd, 39a Welbeck Street, London, W1 (in 1944). A maker of the wartime utility radio – manufacturer's code U35.

RS Components Ltd – see Radiospares.

Ruco Products (Radio) Ltd, 197 Lower Richmond Road, Richmond (in 1954). Maker of "Rucograms" – radiograms.

Rudman Darlington (Electronics) Ltd, Wednesfield, Staffs (in 1954). Maker of the "Reflectograph" range of tape recorders. Multicore Solders Ltd acquired the rights to make these in 1958.

Russell (Gordon) Ltd, Broadway, Worcs (and later at Park Royal, London). Furniture maker turned radio cabinet maker – particularly for Murphy Radio in the 1930's and 40's.

Russell & Co (Furniture) Ltd, cabinet manufacturers (in 1964).

Russell Hobbs Ltd. Founded in 1952 by William Russell and Peter Hobbs. In 1955, they introduced their first fully automatic electric kettle, the K1. In 1959, at 1 Bensham Lane, Croydon, Surrey, when they made a timeswitch unit as well. In 1968, they were at Wharf Estate, Ealing Road, Alperton, Wembley, Middx. By 1967, it was part of TI Domestic Appliances, who sold the Russell Hobbs operation to Polly Peck, in the 1980s. When Polly Peck went bust, Pifco Ltd (of Failsworth, Manchester) bough the Russell Hobbs operation. In 2001, Salton Inc (USA) bought Pifco Ltd.

Rustrak Instruments, Lower Bevendean, Brighton 7, Sussex (in 1962). Maker of chart recorders. In 1965, West Instruments, The Hyde, Brighton 7, Sussex, a division of Gulton Inc.

Ultra Tiger Restoration continued from page 48

The centres were then filled in using circles and straight rubber movements. Great care was taken to keep the rubber moving all the time it was in contact with the surface. The rubber was worked on a panel going over and over building up the thickness of the polish without overworking before going to the next panel, by the time the last panel had been worked the first panel was dry; this allowed continuous polishing given the size of this set. With all the panels worked up over a two day period and allowed to dry the rubber was then charged with even thinner polish and used to really bring up the high gloss finish. With this amount of methylated spirit in the rubber there was an even greater risk of ripping up the previous layer as the action of the spirit softens it, the rubber was used almost dry and with plenty of pressure applied keeping it moving all the time it was in contact with the surface. Each panel was treated in turn bringing up a glass–like finish.

Images14, 15&16 show the finished radiogram which is a joy to own. Having now completed some ten French polishing projects it is amazing how easy the process becomes. The first project took ages to complete as every mistake that could be made was made but with patience it turned out with a finish similar to this Ultra and the second project was completed much quicker.

Restoration Materials: Barnside, 194 Wellington Road, Bury, BL9 9AH. Tel: 0161 764 2741, www.restoration-materials.co.uk have a fantastic selection of finishing materials which can be ordered online or from their catalogue. For anyone with Internet access, typing in "French polishing techniques" brings up some excellent sites. If I can help, please contact me by e-mail. c.wood340@ntlworld.com

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DVD 2007 continued from page 52

public access as it would appear these are the only surviving film copies in existence.

The youngsters featured in the film are all long retired now; I wonder though how many went into electronics, engineering or even shoe making after taking one of the courses featured at the time, in this film. Some of the library music may also be familiar to members and the use of Barnacle Bill, better known as the Blue Peter Theme, features towards the end. Who can put a name to the other pieces used throughout the film?

The Mullard technical films have featured regularly in the society's DVD issues and it may come as no surprise that yet another smashing film is included this time. 'The Discovery of Television" was originally released, in 1966 and transmitted by the BBC, in the same year. It has not to my knowledge been officially shown since. The author has seen a number of very poor video copies of the film over the years, but thanks to BVWS member, Bob Smallbone, who kindly loaned a 16mm print of the film to me to telecine from, a near pristine digital copy can now be seen for the first time. The film contains a magnetic soundtrack and is of quite good quality. The footage features interviews of some of the original EMI, Baird and BBC engineers whose names will be well known to many of us, such as H.A McGee, H.J Barton Chapple, J.E.I Cairns and D.C Birkenshaw. All of course pioneers in the early days of television. The film was generally well received at the time and was considered to be technically and historically accurate. It has though apparently received some criticism in more recent years over its portrayal of John Logie-Baird.

The final offering, and again my thanks to Bob Smallbone for providing the film footage, is entitled "Mirror in the Sky". Originally released in 1955, as part of a series of films entitled 'The History of Modern Science' it tells the story of Appleton and the Ionosphere and its effect on wireless signals. Although not perhaps quite as entertaining as some of our other footage, it is an interesting film never the less. The original, intended audience appears to have been of an educational nature.

Unfortunately, this DVD is likely to be the last, unless further interesting film or video footage comes to light. Despite past appeals for material, little has been forthcoming. I would however particularly like to record my thanks to Jonathan Hill, Andy Emmerson and Phil Marrison whose own past contributions have made many of the DVDs so far, possible. Gentlemen take a bow...

I am quite certain there is still plenty out there. And should any member wish to offer any material, (subject to copyright and clearance) whether film based or on video, I can handle a number of different formats. You are welcome to get in touch with me via my contact details on the committee page to discuss further, in confidence if you so wish.

Letters

Dear Editor,
Did the Green Ekco A22, which supposedly appeared at the 'Britain can make it' Exhibition in November 1946, actually exist? I have a show visit report in front of me, which says it was black!

I have been purchasing a lot of vintage Wireless Magazines of the 30s and 40s lately and in the December 1946 issue of *Practical Wireless*, came across a show visit report written rather bizarrely by the Marquis of Donegall – not a usual member of PW staff as I recall. I quote as follows.
'We now come to the main Radio and Gramophone Section where most of the exhibits are displayed singly on pedestals. First we come to the circular Ekco. It is a three waveband table model, and I put it down in my notes as black plastic cabinet with white illuminated dial. I don't propose to quarrel with the catalogue, which chooses to call it a green table radio receiver. However that may be, what I am talking about is the Ekco A22 model. I like its moving lit-up station finder, but I should think that its loudspeaker is rather on the small side'.

How strange, was it black or was it green? A green coloured one would surely have been sufficiently special to have been definitely noticed and commented on. The case for it being black is reinforced by his summary comments to the effect that designs were too boring and conventional. i.e.....'I did not see a single exhibit that would make a man – or for that matter, his wife,...exclaim: 'Now that is really something, we must get one of these. It's chic – would absolutely make the sitting room'. ....Perhaps it is too much to ask that designers should have made more use of the beautiful shades of Plastic which are such a feature of the rest of the Exhibition...'.
Now that doesn't sound as if there was a beautiful green Ekco at the show, does it? So what did the Marquis of Donegall actually see? There are several possibilities, two of which are as follows:
There never was a green Ekco model A22. The company listed it as green but only in fact produced a black one for the show.
There was a green Ekco at the start of the show but it had been removed (stolen?), by the time he did his rounds, and a black one put in its place.

So what is to be made of this?. The Marquis was an ex war correspondent and trained observer, and from remarks made elsewhere, it is clear that he knew his radios! Doubtless BVWS readers will have their own ideas! Anyway, this is still (just) the 'silly season' as I write and I submit the letter in that spirit. Hoping it provides both a pleasant and harmless diversion, which makes for true holiday enjoyment.

Yours sincerely,
Jim Duckworth

Dear Editor,
Many, many years ago, nearly half a lifetime, a generous friend gave me a single–valve Gecophone receiver.

On the cover: GECOPHONE/REGd No. 5393/BBC TYPE APPROVED BY POSTMASTER GENERAL and inside the lid: B.C 3050/INST. No 765/LICENSED UNDER VARIOUS BRITISH PATENTS. Martyn Bennett's article inspired me to take it out from the bookcase and to trace the circuit diagram.

The LT battery is +ve earth, and the whole thing is in highly original condition; there is no question of any alterations ever having been made.

The filament rheostat has an ingenious ramp at one end which lifts the wiper arm clear of the winding, thus serving as a switch.

The only component marked with its value is the grid leak. Carefully incised and filled in with white wax are the symbols 2Ω. Presumably 2MΩ was intended; the value measured today was 0.635MΩ.

The valve at present in the set is inscribed: TRIOTRON/HD2/2 Volts/Made in Austria/1269 the cold resistance of the filament is about 0.5Ω.

I have a Marconi–Osram D.E.R. with a metal base and a BBC licence mark. Would that be more correct?

Yours sincerely,
Eliot B. Levin

Dear Editor,
Some time ago, you published my letter suggesting a compendium of useful data because the source publications containing it were becoming rare. I offered to contribute if there was any interest among members.

So far I have received zero indication of interest. Mr Tempest's article on coil winding prompted the thought that the enclosed may be useful to members who make wound components (see tables at bottom of facing pages).

LL (Bill) Williams

Dear Editor,
LL Williams has written an interesting article about valves (Vol 32 No 3 p16). In half a dozen pages he has taken us on an excellent and informative tour of the wonderful world of

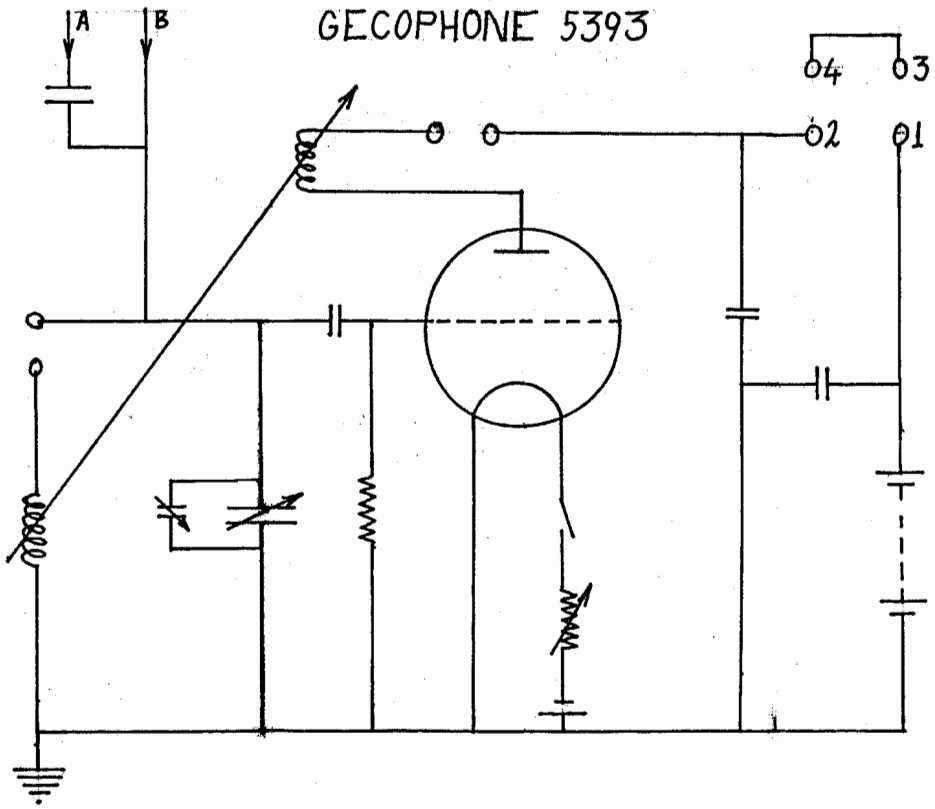
	Turns per cm length of single-layer coil					*Turns per sq. cm. section of solid coil*					*Dia-meter (in) (bare)*	*Cross-section (sq. mm)*	*Dia-meter (mm) (bare)*	
S.W.G.	D.S.C.	D.C.C.	E. & S.S.	E. & S.C.	*Enamel*	D.S.C.	D.C.C.	E. & S.S.	E. & S.C.	*Enamel*				S.W.G.
12	—	3·3		3·4	3·6	—	11·1	—	11·7	13·3	0·104	5·48	2·64	12
13	—	3·7		3·8	4·1	—	13·8	—	14·6	16·8	0·092	4·29	2·34	13
14	—	4·2	—	4·3	4·7	—	17·5	—	18·7	22	0·080	3·24	2·03	14
15	—	4·7	—	4·7	5·2	—	22	—	23	27	0·072	2·63	1·83	15
16	5·8	5·2	5·6	5·3	5·8	33	27	32	28	34	0·064	2·07	1·63	16
17	6·6	5·8	6·4	6·0	6·7	43	33	41	36	45	0·056	1·59	1·42	17
18	7·7	6·7	7·5	6·8	7·8	60	44	56	46	60	0·048	1·167	1·22	18
19	9·2	7·7	8·8	7·9	9·2	84	60	78	62	85	0·040	0·811	1·02	19
20	10·1	8·4	9·7	8·6	10·2	102	70	94	73	103	0·036	0·657	0·92	20
21	11·2	9·2	10·8	9·4	11·4	127	84	116	88	130	0·032	0·519	0·81	21
22	12·7	10·1	12·1	10·4	12·9	161	102	147	107	167	0·028	0·397	0·71	22
23	14·6	11·6	13·9	12·5	15·0	210	134	193	156	220	0·024	0·292	0·61	23
24	15·7	12·3	15·3	13·3	16·2	250	151	230	178	260	0·022	0·245	0·56	24
25	17·1	13·1	16·9	14·6	18·1	290	172	280	210	330	0·020	0·203	0·51	25
26	19·2	14·1	18·7	15·7	19·9	370	198	350	250	400	0·018	0·1642	0·46	26
27	21	14·9	20	17·2	22	430	220	420	300	480	0·0164	0·1363	0·42	27
28	23	15·9	22	18·5	24	520	250	500	340	580	0·0148	0·1110	0·38	28
29	24	16·7	24	19·6	26	600	280	580	380	670	0·0136	0·0937	0·35	29
30	26	17·6	26	21	29	700	310	700	450	840	0·0124	0·0779	0·32	30

vacuum in glass.

I would question his assertion about high voltage DC power systems. Tests with thyristors started in 1967 and by 1975 solid state devices were universally used for conversion between DC and AC. Curiously these solid state converters are still known as valves. These references* on the web contain a lot of useful information on the subject. The Wikipedia article is well written and contains references to many primary sources. ABB are probably the world's leading manufacturer of HVDC systems and their website contains some interesting articles on the subject, including descriptions of the earlier mercury arc technology.

Yours sincerely
Jeffrey Borinsky

*http://en.wikipedia.org/wiki/High-voltage_direct_current
*http://www.abb.com/hvdc



Dear Editor,

I found the article in the latest Bulletin on "almost nothing" by L.L.Williams most interesting and informative, one especially interesting topic being the section on bi-grid valves.

Mr.Williams refers to three applications peculiar to these valves, but it may be of interest to be reminded that there were two more that originated in America.

The first was the use of the pioneer R.F. tetrode (type 22) as a space charge audio voltage amplifier. In the first year or two after its introduction, it was popular practice for home builders to use the outer grid as the control grid, with the inner grid connected to a few positive volts. This was easy to do with the type '22 valve in existing equipment using the standard UX four pin socket, as all that was necessary was to connect the suitable positive supply to the top cap of the valve. The outer grid of the '22 automatically became the signal grid.

The second American bi-grid application was the introduction of what were known as "Dual Grid " power amplifiers. These were the types 46 and 49 valves which remained in the catalogues for many years. There was a third registered. This was the type 52 but it is not certain that it ever was marketed. The 46 had a husky 2.5 volt 1.75A directly heated filament for mains operation whilst the 49 had a 2 volt 120ma filament for battery power. The 52 was obviously intended for automotive operation as it had a 6 volt filament.

With the two grids connected together the valves became high mu zero bias triode class B amplifiers with a pair of type 46 capable of 20 watts with 400 volts H.T. A pair of 49's could deliver 3.5 watts with a 180 volt H.T. supply. With their outer grids connected to the anodes, they became low

	Turns per cm length of single-layer coil					*Turns per sq. cm. section of solid coil*					*Dia-meter (in) (bare)*	*Cross-section (sq. mm)*	*Dia-meter (mm) (bare)*	
S.W.G.	D.S.C.	D.C.C.	E. & S.S.	E. & S.C.	*Enamel*	D.S.C.	D.C.C.	E. & S.S.	E. & S.C.	*Enamel*				S.W.G.
31	28	18·2	28	22	31	780	330	780	490	940	0·0116	0·0682	0·29	31
32	30	18·9	30	23	33	880	360	880	540	1,080	0·0108	0·0591	0·27	32
33	31	19·7	32	24	35	990	390	990	590	1,240	0·0100	0·0507	0·25	33
34	34	21	35	26	39	1,170	420	1,190	670	1,490	0·0092	0·0429	0·23	34
35	36	23	37	29	42	1,300	510	1,380	860	1,750	0·0084	0·0358	0·21	35
36	39	24	40	31	46	1,520	560	1,610	980	2,100	0·0076	0·0293	0·19	36
37	42	25	44	—	51	1,790	620	1,910	—	2,500	0·0068	0·0234	0·17	37
38	46	26	49	—	56	2,100	690	2,400	—	3,200	0·0060	0·01824	0·15	38
39	51	28	55	—	66	2,600	770	3,000	—	4,300	0·0052	0·01370	0·13	39
40	54	29	58	—	72	2,900	810	3,400	—	5,100	0·0048	0·01167	0·12	40
41	60	—	62	—	79	3,600	—	3,800	—	6,200	0·0044	0·00981	0·11	41
42	64	—	66	—	86	4,000	—	4,300	—	7,300	0·0040	0·00811	0.10	42
43	68	—	73	—	96	4,600	—	5,300	—	9,200	0·0036	0·00657	0·09	43
44	73	—	79	—	106	5,300	—	6,200	—	11,300	0·0032	0·00519	0·08	44
45	79	—	86	—	119	6,200	—	7,300	—	14,200	0·0028	0·00397	0·07	45
46	86	—	96	—	141	7,300	—	9,200	—	19,800	0·0024	0·00292	0·06	46
47	94	—	109	—	171	8,800	—	12,000	—	29,000	0·0020	0·00203	0·05	47
48	108	—	—	—	206	10,800	—	—	—	43,000	0·0016	0·00130	0·04	48
49	—	—	—	—	280	—	—	—	—	79,000	0·0012	0·00073	0·03	49
50	—	—	—	—	328	—	—	—	—	107,000	0·0010	0·000507	0·025	50

mu class A triodes intended as drivers for the companion class B pair. In neither application were these valves used as tetrodes.

However, neither the 46 nor the 49 proved to be popular in domestic receivers. In the days before negative feedback, class B amplifiers created noticeable crossover distortion when operated at low levels, and the 46 pair was capable of producing so much power that this was a common experience. Until the arrival a few years later of the 6L6 beam power tetrode, the 46 had some popularity for high powered public address work and small transmitters. A study of Riders circuit manuals shows only a handful of battery powered receivers using type 49 valves as there was competition from the less expensive type 19 double triode class B amplifier.

The 49 would have quietly faded into oblivion but for an odd twist that brings us right back to space charge operation. Around 1934, the American magazine "*Popular Mechanics*" published details of a simple little one valve headphone receiver that used only four AA dry cells for a "high" tension supply and a single dry cell to light the valve, which was none other than a 49 used as a space charge detector. The "Hikers One" was a practical receiver that was a godsend to impecunious hobbyists who found conventional high tension batteries very expensive. I don't know that the "Hikers" received much attention in America, but an enterprising New Zealand electronics supplier worked on the original, to produce the "Improved Hikers" which used an affordable 9 volts H.T. with 1.5 volts on the inner grid and a No6 dry cell for the filament.

The rest is - as they say - history. A whole generation of New Zealand lads built Hikers sets by the hundreds and the 49 was saved from oblivion. There were quite possibly more 49's used in New Zealand than in the originally intended service, especially as there emerged a "Hikers Two" with an audio amplifier using a second 49, this time in the low mu triode mode but with 18 volts H.T., and with sufficient power to drive an old magnetic speaker.

I was one of these lads who was bitten by the radio "bug" as a result of my building a "Hikers", and went on to make radio my life's work. It is unlikely that I would ever have belonged to the BVWS had it not been for an obscure little dual grid valve.

Attached is a photo of my own restored Hikers One.

To avoid any confusion: the term "No.6 cell" was used by several manufacturers internationally for the large general purpose dry cell used for many applications including bells, manual telephones etc. (and was identical in size to the porous pot in its ancestral 1 pint LeClanche cell.)

Yours Sincerely,
Peter Lankshear,
Invercargill,
New Zealand.

Dear Editor,
Talking Output Transformers,
Letters Vol 32, No 3
This phenomenom is not uncommon. It usually occurs in sets with single ended class A output stages which have a large DC component of anode current. To prevent magnetic core saturation due to DC magnetisation an air gap is deliberately introduced into the iron core. Instead of interleaving the laminations as would be done if there were no DC current, the laminations are separated into a stack all 'U's and a stack of all 'T's or of course all 'E's and all 'I's.

The required air gap is created by inserting a strip of thin card or other non–magnetic and non–conducting material between the ends of the lamination stacks. The material between the two stacks is compressible allowing the two core sections to move under the influence of audio frequency magnetisation. Quality transformers are vacuum impregnated after core assembly or potted and they don't talk much.

Yours Sincerely,
LL (Bill) Williams

Dear Editor,
The first part of the A-Z listing of BBC2 trade test colour films in the Summer issue is most useful. Allow me to add to the record that 'A Dream of Norway' (1960) was screened by channel 4 in the early 1990s as I recall, and although the commentary was penned by Paul le Saux, it was spoken in the film by Howard Marion Clawford.

Yours Sincerely,
Terry Bennett

Below: Spotted in a street market in New York, USA. Motorola 'Golden View' television from 1949. It was one of the most popular 7-inch televisions in the late 1940s and early 1950s. It came in console, tabletop and portable cabinets.

Minutes

Minutes of the BVWS Committee meeting held on the conference telephone on Thursday 20th September 2007, 7.30 pm.

Present: Mike Barker (chair), Graham Terry, Guy Peskett, Paul Stenning, Terry Martini, Jeremy Day.

1. Apologies for absence: Jon Evans, Carl Glover, Ian Higginbottom, Martyn Bennett.

2. The minutes of the meeting held on 26th June 2007 were approved. Matters arising:- Item 2, still no success in finding a CAD engineer to make drawings of CRT masks. Item 7, the second batch of 0.1µF capacitors has arrived and dual electrolytics have been ordered. Item 12, Geoffrey Dixon-Nuttall's collection is now in the auction store, the family have agreed that the Roberts radios be disposed of as a single lot. Photos of radio Olympia and other Roberts displays will come to the Society. They will be photographed and then displayed in the VWTM.

3. The Membership Secretary, GT, reported that the membership stood at 1569 including 86 complimentary and 6 honorary. The list of complimentary members continues to be reviewed.

4. The Treasurer, JD, reported that the Societies account balances stand at £29,063 (deposit) and £4,126 (current). There is a current deficit of £2,503 on the year.

5. MB reported for the Editor that the Christmas Bulletin was one third full.

6. NVCF 2008. The date has been fixed at 11 May to avoid clashes with the major French meeting and the Scientific Instrument Society spring fair. The contract has been signed and returned to the Warwickshire Exhibition Centre. A display of Mechanical Music will be staged.

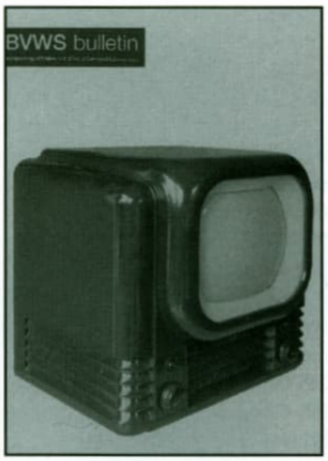
7. Christmas DVD. TM reported that there is plenty of material but most of it is BBC copyright. The Society does not have any expertise in copyright law but neither, it seems does the BBC. MB is trying to clarify the position. Definitely available for the DVD are a Hallicrafters film about the manufacture of a transmitter and a short film about Amplion speakers. It is hoped the main item will be a 50 minute Mullard film about the rise of television. TM will seek permission from Philips. A social documentary "Passport to Youth" is also being considered as it contains 'off-air' television footage which is thought not to exist anywhere else.

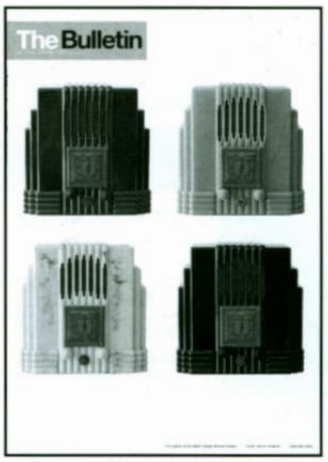
8. JD questioned the holding of more of the Society's committee meetings on the conference telephone as he favoured the stronger interactions in face to face meetings. MB questioned the number of meetings which now runs at six per year. It was decided to reduce the number of meetings to four per year with the proviso that the Chairman would call a meeting at any time if neccessary. The conference phone would be available to those prevented from attending.

9. MB initiated a discussion of a memorial for Geoffrey Dixon-Nuttall whose passing had been noted in the autumn Bulletin. It was proposed that an annual award be made for the best Bulletin article specifically dealing with Restoration. The Pat Leggatt award would in future be made for the best Historical article (in line with Pat's interests). This was agreed.

10. AOB
(i) MB announced that he would be moving house in January. The BVWS database will remain at Swindon with Graham Terry.
(ii) GP announced that a 250 page document prepared by the Army in 1921 to assist Marconi in royalty claims had been photographed and put onto CD. It is hoped that extracts will be published in the Bulletin in due course.
(iii) JD reported that at the last meeting of the council committee responsible for the Harpenden Halls attended by Vic Williamson it was announced that the hire charge would increase by 3.5 %.
(iv) The winner of the Duncan Neale award 2007 was discussed and agreed.

The next meeting will be at Swindon sometime after the Wootton Bassett swapmeet. MB will advise. The meeting closed at 21.15.





Back issues

Vol 10 Numbers 2, 3 & 4 Inc. The KB Masterpiece, Extinct Species "A Monster Defiant".

Vol 11 Numbers 1, 2, 3, 4 Inc. BTH VR3 (1924) receiver, Marconi's 1897 tests, Origin of the term 'Radio', Baird or Jenkins first with TV?

Vol 12 Numbers 1, 2, 3, 4 Inc. the Emor Globe, The Fultograph, Ekco Coloured Cabinets.

Vol 13 Numbers 1, 2, 3 Inc. Direct action tuning, The Philips 2514, Noctovision.

Vol 14 Numbers 1, 2, 3, 4 Inc. Cable broadcasting in the 1930's, The story of the Screen Grid.

Vol 15 Numbers 2, 3, 4 Inc. The wartime Civilian Receiver, Coherers in action, Vintage Vision.

Vol 16 Numbers 1, 2, 3, 4 Inc. The Stenode, The Philips 2511, Inside the Round Ekcos.

Vol 17 Numbers 1, 3, 4, 5, 6 Inc. Wattless Mains Droppers, The First Philips set, Receiver Techniques.

Vol 18 Numbers 3, 4, 5 Inc. The First Transistor radio, The AVO Valve tester, The way it was.

Vol 19 Numbers 1, 2, 3, 4, 5, 6 Inc. The Birth of the Transistor, Super Inductance and all that, reflex circuits, A Murphy Radio display, restoration.

Vol 20 Numbers 1, 2, 4, 5, 6 Inc. Radio Instruments Ltd., Japanese shirt pocket radios, Philco 'peoples set', notes on piano-keys, the story of Pilot Radio, the Ever Ready company from the inside, the Cambridge international, the AWA Radiolette, this Murphy tunes itself!

Vol 21 Numbers 1, 2, 3, 4 Inc. Marconi in postcards, the Defiant M900, GPO registration No.s, Personal portables, the transmission of time signals by wireless, the Ekco A23, historic equipment from the early marine era, the birth pains of radio, inside the BM20, plastics, Ferdinand Braun, pioneer of wireless telegraphy, that was the weekend that was, the first bakelite radios, BVWS - the first five years, the world of cathedrals, Pam 710.

Vol 22 Numbers 1, 2, 3, 4 Inc. Another AD65 story, the Marconiphone P20B & P17B, listening in, communication with wires, the story of Sudbury radio supply, French collection, Zenith Trans-oceanics, Farnham show, Alba's baby, the first Murphy television receiver, AJS receivers, Fellows magneto Company, Ekco RS3, Black Propaganda.

Vol 23 Numbers 1, 2, 3, 4 Inc. Sonora Sonorette, Bush SUG3, RNAS Transmitter type 52b, North American 'Woodies', Why collect catalin, Pilot Little Maestro, Theremin or Electronde, The Radio Communication Company, Early FM receivers, an odd Melody Maker, Black propaganda.

Vol 24 Numbers 1, 2, 3, 4 Inc. The Superhet for beginners, Triode valves in radio receivers, History of GEC and the Marconi - Osram valve, KB FB10, Great Scotts!, Riders manuals.

Vol 25 Numbers 1, 2, 3, 4 Inc. Repair of an Aerodyne 302, Henry Jackson, pioneer of Wireless communication at sea, Zenith 500 series, Confessions of a wireless fiend, RGD B2351, John Bailey 1938 Alexandra palace and the BBC, Ekco during the phoney war, Repairing a BTH loudspeaker, The portable radio in British life.

Vol 26 Numbers 1, 2 Inc. How green was your Ekco?, The Amplion Dragon, Crystal gazing, The BVWS at the NEC, Installing aerials and earths, novelty radios, Machine-age Ekco stands of the 1930s, Volksempfänger; myth & reality.

Supplements:

1 'The story of Burndept'.
2 'WW 1927 data sheet'
3 'Seeing by wireless' the story of Baird Television
4 Reproduction Marconi catalogue

Earlier Bulletins and supplements are priced at £2:00 each + postage. Bulletins from volume 21 onwards are priced at £2.50 each. + postage.

Postage: for individual Bulletins add 50p, for 2-5 bulletins add £1, for 6 or more add an extra 20p each.
23 Rosendale Road, West Dulwich
London SE21 8DS
Telephone 020 8670 3667.

Cheques to be made payable to 'The Vintage Wireless Museum'.

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

2007 meetings

12th December The Institute of Physics, 76 Portland Place, London W1. Ralph Barrett presents: 'Guglielmo Marconi – Radio's Founding Father.

A dramatised enactment. It is 1936, the year before Marconi died, aged 63. You will share a dissertation with this 'ardent amateur of electricity' as he called himself. He reflects upon his life and achievements, then outrage, divorce and remarriage.

This event first took place in London at the international Coference of 100 Years of Radio, 1995. This presentation is enhanced by new research and revision.

No charge for admission and refreshments at 6pm and wine buffet afterwards. Open to non–members. Tickets not required.

2008 meetings

27th January Workshop at Vintage Wireless and Television Museum
10th February Audiojumble, Tonbridge
2nd March Harpenden Auction and AGM
20th April Workshop at Vintage Wireless and Television Museum
11th May NVCF. The NVCF special exhibit will be mechanical music. Music boxes, roller organs, phonographs and much more. Many items will be demonstrated during the day. Organised in collaboration with the MBSGB, PPG and other mechanical music organisations.
31st May Garden party at Vintage Wireless and Television Museum
1st June Harpenden swapmeet
6th July Wootton Bassett
20th July Workshop at Vintage Wireless and Television Museum
15th August Friday Night is Music Night at Vintage Wireless and Television Museum
14th September Table top sale at Vintage Wireless and Television Museum
12th October Audiojumble, Tonbridge
19th October Harpenden swapmeet
2nd November Workshop at Vintage Wireless and Television Museum
7th December Wootton Bassett

Vintage Wireless and Television Museum: For location and phone number see advert in Bulletin. 11:00 start.

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

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, 01793 536040

For more details with maps to locations see the BVWS Website:
www.bvws.org.uk/events/locations.htm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