# BVWS bulletin

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BRITISH VINTAGE WIRELESS SOCIETY • 1976 TO 2001 • 25 YEARS • XXV

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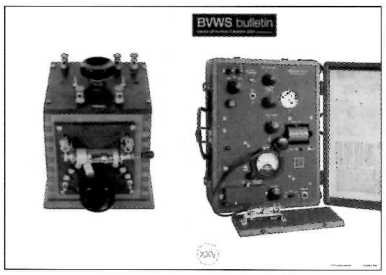



Front cover: A.R.11 or AN/PRC-5 US Clandestine TX/RX, WWII

Rear cover: Reynolds and Bradwell crystal set Model: R&B Year: 1924/25

**Front and rear cover photography by Carl Glover**
**Graphic Design by Carl Glover and Christine Bone**

This issue Edited by Rob Chesters , Carl Glover, Mike Barker and Ian Higginbottom.

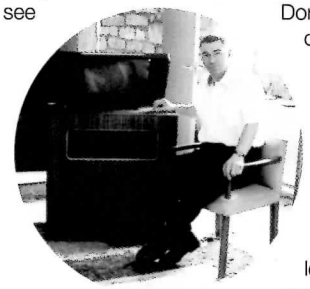
Proof-reading by Mike Barker, Ian Higginbottom and Peter Merriman

# Contents



# From the chair

Well, its two thirds through August, and the sun is still shining and the nights are still light until at least 9:30, so I've taken advantage of this and made a concerted effort to get some of those outstanding radio jobs done. First I had to clear enough space in the workshop to be able to see the surface of the bench (you think I'm joking?). The outstanding restorations should keep me busy until at least next year and probably well into next summer, with the amount of time I now get to do such things.



I am now in a position to tell everyone that as of this time, the well-known Vintage Television magazine, *405 Alive* will now be incorporated into the *BVWS Bulletin*. This is a permanent change for 405 Alive which up to now has been produced by Chas Miller and his team with editorship by Andy Henderson. This will mean that all the 405 Alive members who are not already BVWS members will automatically become BVWS members. They will share the same benefits and will receive not only the *405 Alive*, but in a form that gives them the *BVWS Bulletin* as well. The current BVWS membership will benefit from a bigger *BVWS Bulletin* each quarter with a Vintage TV section as well. The original content and context of the BVWS Bulletin will be maintained, and the extra pages needed for *405 Alive* added. I would like to formally welcome Andy Henderson into the BVWS as Editor of the Vintage TV section of the Bulletin and also say thank you to Andy Henderson, Chas Miller, and Andy Emmerson for the hard work and devotion put into *405 Alive.* Working with Andy Henderson and Carl will be Dave Newman of Poole in Dorset, who will be our technical Bulletin correspondent for 405 Television articles and who will be bringing you more in the way of interesting hints and tips with television restorations and collecting. On the subject of Articles, We need your Articles!!! The Bulletin is only as good as you make it, so jot down those interesting stories and let us know about the weird and wonderful items within your collections.

There are two new radio events to add to your diary. The first is on the 30th September in Leeds (see the rear of the Bulletin for details) for those members who live in the north of the country. Although not a BVWS meeting, It will be well attended and I am told the stalls are almost fully booked, so get in there quickly. The second will be the new BVWS meeting at Easton in Gardano Bristol on the 14th October. This meeting replaces the well known and attended Portishead meeting and is looking to be a great success. Again see the advert later in the Bulletin for details. See you all there.

Mike

# Rutherford revisited

by Tony Constable

In my article, "Message Received - Signal Hill, Detectors of a Bygone Age" (BVWS Bulletin vol 26 no 2 pp 4-11) I referred to the early Hertzian wave transmissions of Earnest Rutherford and I would like to expand a little on this important chapter of wireless pre-history.

Rutherford is best known for his pioneering work on the physics of the nuclear atom but we also know him as one of the early wireless pioneers. He had already taken an interest in the work of Heinrich Hertz and Joseph Henry while at Canterbury College, Christchurch, New Zealand where, in 1894, he published his first scientific paper entitled, 'Magnetisation of Iron by High Frequency Discharges' - here lie the origins of Rutherford's magnetic detector. When he came to Cambridge in October 1895 to work under J.J.Thomson, he brought his crude magnetic detector with him from New Zealand - illustrated in my article referred to above.

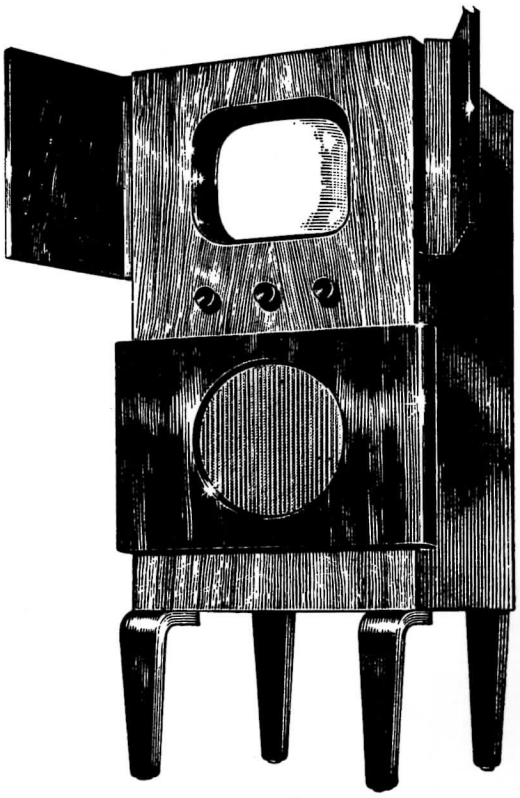
He demonstrated this detector at the Cavendish Laboratory in December 1895 when he gave a talk entitled, "A Method of Measuring Waves along Wires and Determination of their Period".

On 22nd February 1896, after a hesitant start, he succeeded in transmitting over a distance of 350 yards across Jesus Green to his detector at 23 Park Parade * where his fellow graduate student, John Townsend, had rooms. The following day he set up a Hertzian transmitter in the Cavendish Laboratory on Free School Lane consisting of the usual spark gap between two large plates and he installed his magnetic detector in John Townsend's rooms, just over half a mile to the north at 23 Park Parade. He successfully detected the transmissions, "... through solid stone houses all the way..." His equipment may have been crude, but no more so than some of his later equipment with which he fathered the fundamentals of nuclear physics! The measurements and results obtained at this time together with his previous work in New Zealand was presented to the Royal Society in June 1896 in his well known paper, "A Magnetic detector of Electrical Waves and Some of its Applications."

Rutherford's interest in the subject was essentially scientific but he also dreamt (but only dreamt!) of its commercial possibilities. In writing to his fiancée in New Zealand in January 1896 he was quite sure he would soon be able to transmit over many miles and be able to make, "...a considerable amount of money..." He considered it



continued on page 26



# The 1948 Murphy V134/6 It Bites back!

by Mike Barker

**Some years ago, I purchased a Murphy V136 television receiver. Even though I had, at that time decided not to collect televisions, this set intrigued me because of its unusual features.**

**Compared to other designs of the time, this set stood apart. It was different to all the rest. Whether it was due to the stubby short legs or the unusual doors on the front I know not, but I knew when I saw it, that this would be the start of my TV collecting.**

The set stood idle for a long time. In fact well over a year after I purchased my Dinosaur 405 line standards converter for this set, I had not yet made a start on the restoration. 405 line standards converters are very rare things, and you have to buy them when you see them. You may not get a second chance.

With the advent of the 1996, 20 years of the BVWS exhibition, I chose this set as an ideal exhibit in the TV display, and so the restoration began.

Firstly a little information about why this set is so different. This was Murphy's first TV to use an auto transformer, to use a TRF circuit as opposed to the usual superheterodyne, and EHT derived from the line output rather than from a winding on the mains transformer.

I remember all too well, being told by Gerry Wells, that this set was universally hated by service engineers of the time as it was seen as a hazard due to the numerous places you could get a nasty shock. In fact a skull and crossbones had been drawn on the cover of the service manual that he supplied. As with everything that was designed by Murphy Radio, there were very good reasons for all of these 'then' peculiarities.

The original design was for a table model and not as a console, hence the compactness of the chassis. Remember, at this time, materials were still in short supply and Purchase Tax (PT) was variable, and what would seem to be a reasonable price for an item before PT could well become out of reach to the man on the street after it was applied. The design of this television was to take these hurdles into consideration and go some way to make the set affordable to the masses, as did the pre-war Murphy A56V at just £30. It was market forces that changed the minds of the designers who decided that this should be a console receiver, perhaps due to the large sales of the Murphy V116 console receiver against the smaller sales figures of the 1946 V114 table model.

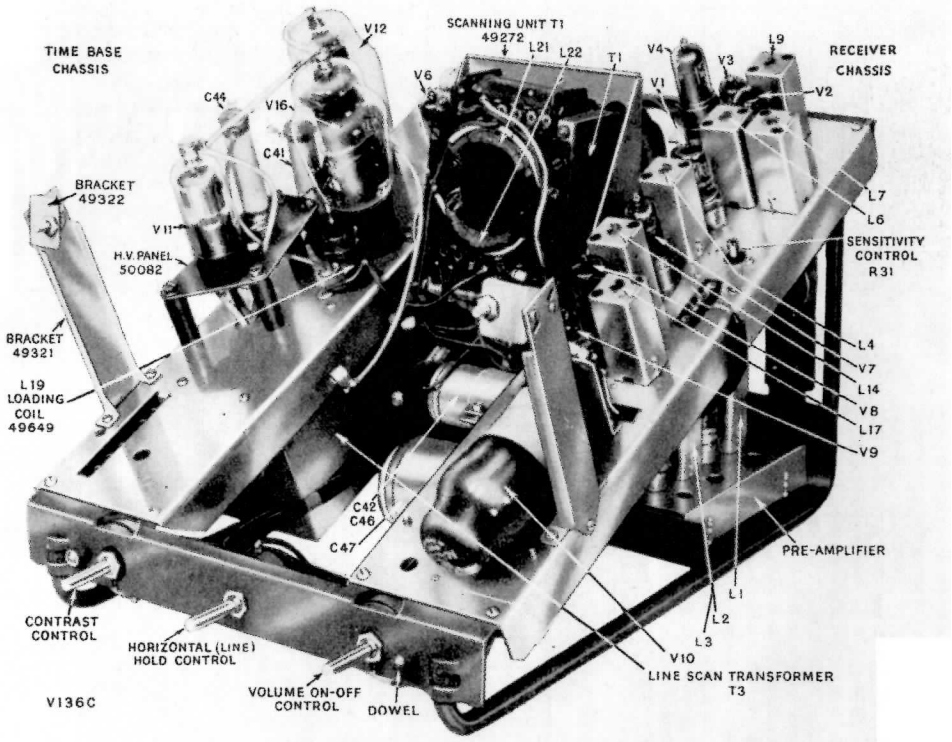
In the search for economies of manufacture, a new time-base circuit was developed in the Murphy laboratories, that allowed one valve to be used instead of the usual two in other models. This circuit was employed in both the line and frame time-bases resulting in a reduction of two valves.

A strange quirk of this was the fact that unless the set was connected to a signal, the frame time-base would often fail to run, leaving the set with frame collapse. The recommended cure for this was to switch off, and then on again, where the mains spike would kick start the oscillator. I have seen this effect for myself, but have not been able to produce it when even the weakest signal is present at the aerial socket, and the suggested cure does seem to work.

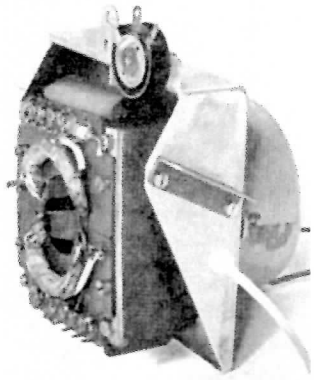
Other economies were achieved by designing the set to be of low sensitivity, a TRF circuit, which again kept the numbers of valves using to a minimum and then by designing a pre-amplifier that would be added to those sets requiring the extra sensitivity in areas of lower signal strength. This meant the same principal design was used for the whole of the television coverage area without the waste of amplification in those areas where it was not necessary, and the fiddling with signal attenuation etc.

The mains transformer could be kept to a minimum size and reduce on metal costs and weight by the use of an auto-transformer, meaning that the chassis would always be at half mains potential to earth. This was not seen as a problem, as caution was already needed with ordinary AC/DC mains radio receivers. Another of the stranger features, although not immediately apparent, was the placement of the horizontal hold control on the front of the set. By doing this yet another valve could be saved in the time-base circuits. The action of the horizontal hold control was different in this set to others, where altering the control made the stable picture shift in a locked state to the left or right some distance before the lock was lost. This allowed for mains voltage fluctuations and the various types of interference that were so commonly a nuisance to viewers' entertainment, where the line hold would be lost as the mains voltage changed, or interference caused a ragged pulling effect on the screen, meaning adjustment of the set might be required on a number of occasions during an evening's viewing.

The V134/6 picture would just shift rather than loose lock and so this could be corrected without having to fiddle at the back of the set. To compensate for any drift in picture focus, an interesting feature was exploited by the designers, where the focus coil was included in the anode circuit of the sound output valve. This used the high impedance of the pentode, allowing sufficient current change for focus without any effect on the sound quality or amplitude of the set. This method


General view of the V136C Chassis Assembly



Above: Scanning unit assembly

Below left: Chassis before restoration.

Below centre: The finished chassis.

Below right: Restored chassis being reassembled.

also meant that focus drift due to temperature change within the set was compensated for by the characteristics of the pentode and did not require any adjustment, once initially set at installation. This technique was later adopted in other models and by other manufacturers.

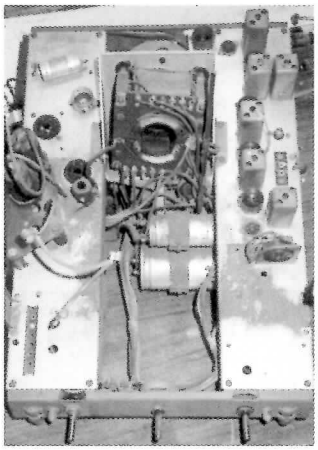
The EHT for the tube was derived from the addition of the positive peak voltages that appear on the anode, and the negative peak voltage on the screen of the line time-base valve. A pair of Mazda 6P28's were used in parallel operation to gain sufficient current in the scan coils to swing the spot across the tube from side to side. Again, this break from traditional EHT windings on the mains transformer meant a reduction in size and weight of the transformer, and less risk of it failing due to breakdown of insulation between the windings.

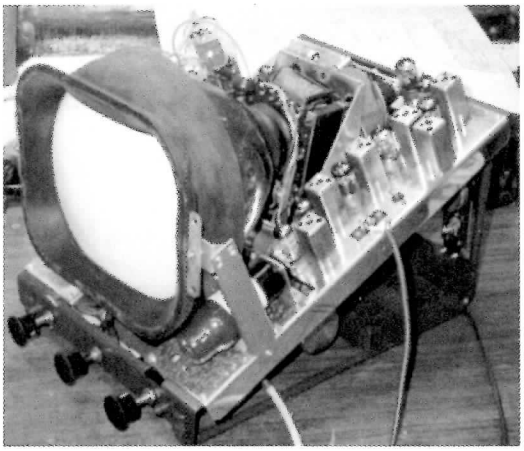
The cabinet was designed by Eden Minns who decided that doors were required to "conceal the rather wide-open yawning aperture produced by a blank television screen in the living room." These doors were raised above the top of the main cabinet to allow the fingers some grip to open and close them without the use of handles. When either open or closed the doors are held in place by catches inside the cabinet which make for a positive feel when they are moved, and keep them firmly in place. The tops of the doors being raised does mean that they are liable to damage, and this is where my set had suffered most. The Murphy News shows the V134/6 with bent plywood front legs that match those of the Murphy A122 Console, but all other pictures shown, and the sets that I have seen, have all had standard straight legs. Perhaps weight was a problem for stability.

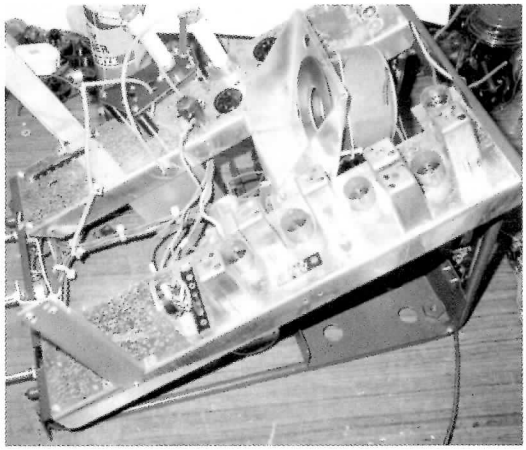
The first job was to dismantle the set, carefully taking pictures at different stages for later reference. The set had been well used, and in a house of heavy smokers. This in fact helped to preserve much of the aluminium and other metal work, and served as a good protection to the original cabinet finish.

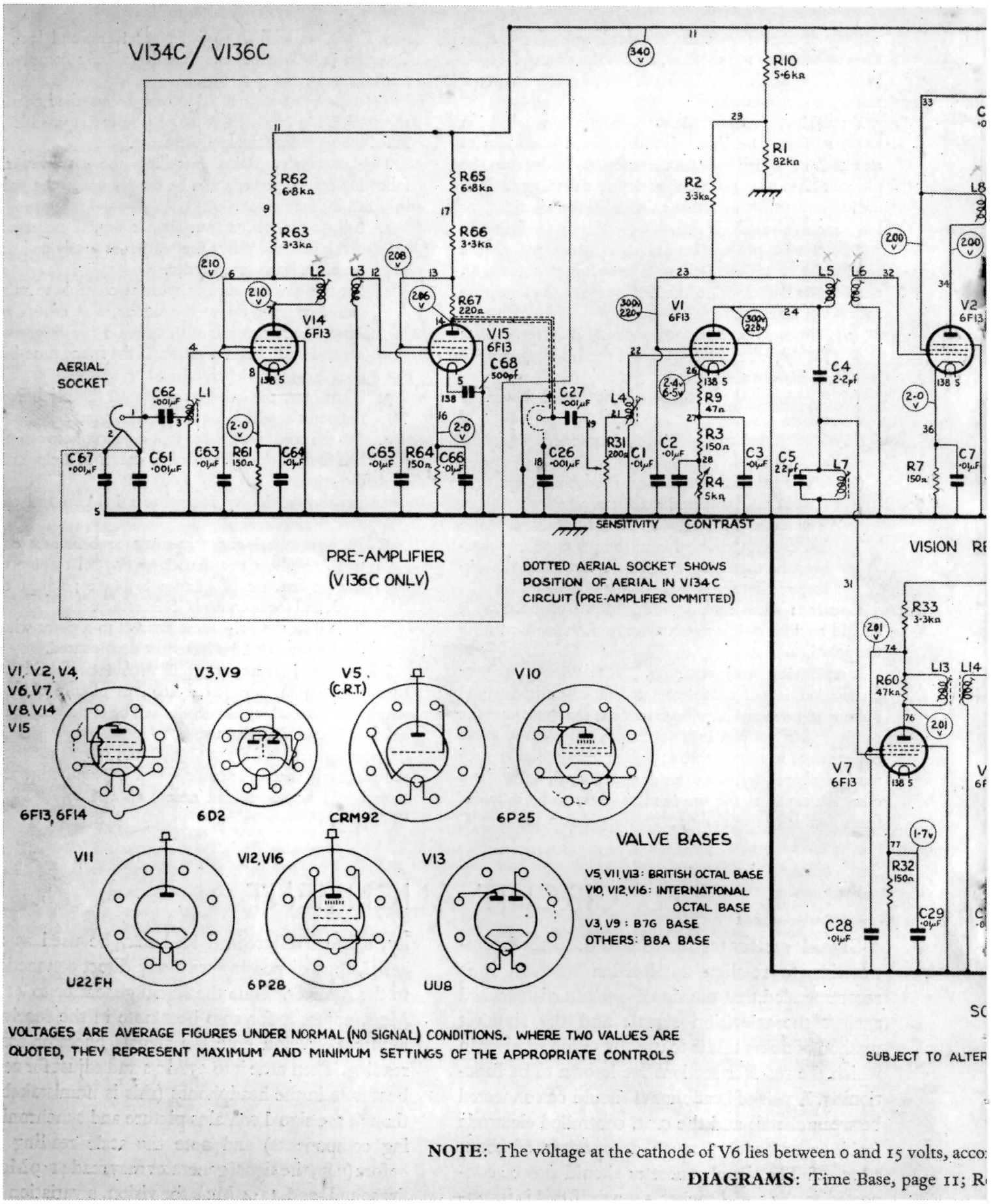
The main steel chassis frame was rusty in a number of places so work began on removing the sections of the chassis carrying the pre-amp, sound, video and time-bases. This left the frame with power supply and the front controls. The frame was stripped to bare metal, primed and sprayed in grey to match the original paintwork. All the rubber wiring throughout the set was brittle and crumbling away so a new wiring loom was made up of rubber wire in the original colours ready for when the chassis parts were complete.

The mains transformer passed tests with a megger and was cleaned and replaced in its original position. Then started the work on the combined sound and vision strip. This again was stripped of the components and cleaned and visually checked for obvious faults.









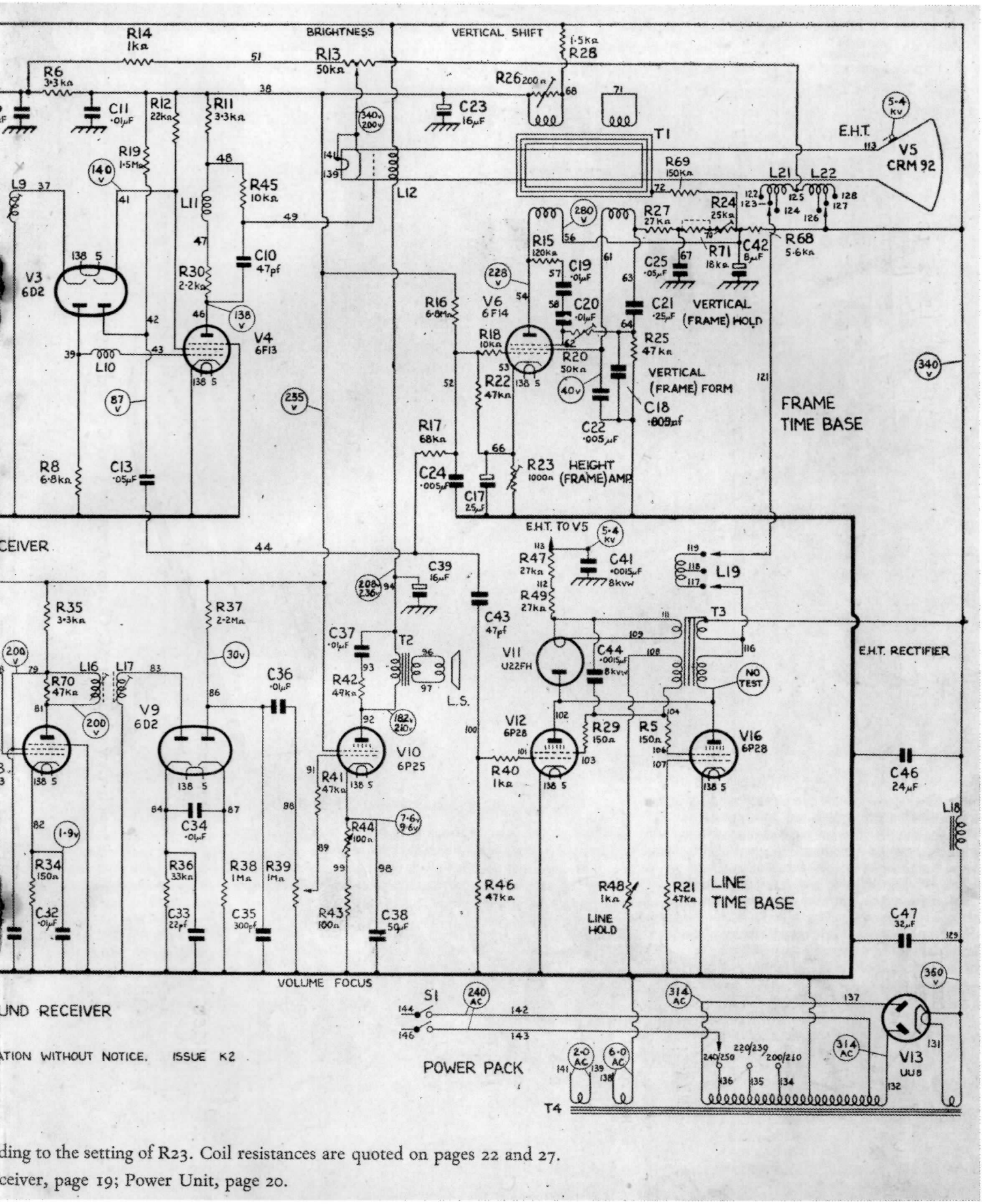

**NOTE:** The voltage at the cathode of V6 lies between 0 and 15 volts, acco

**DIAGRAMS:** Time Base, page 11; R

Every paper capacitor in the set was rebuilt with new caps placed inside the cases of the old ones and re-waxed and soldered into place.

Each resistor, choke and transformer was tested to ensure it was within the original tolerances, and replaced with period components if found necessary. Once again all the rubber wiring was replaced with new rubber wiring to preserve the original look. Metal can electrolytics were opened and rebuilt invisibly. This all took a good number of hours and lots of fiddling.

Next came the turn of the time-base chassis. The line transformer was de-canned and checked. Thankfully this seemed fine, so new rubber and period EHT lead was connected up and the transformer re-housed in its can. Again all caps were rebuilt and components checked and replaced as necessary.



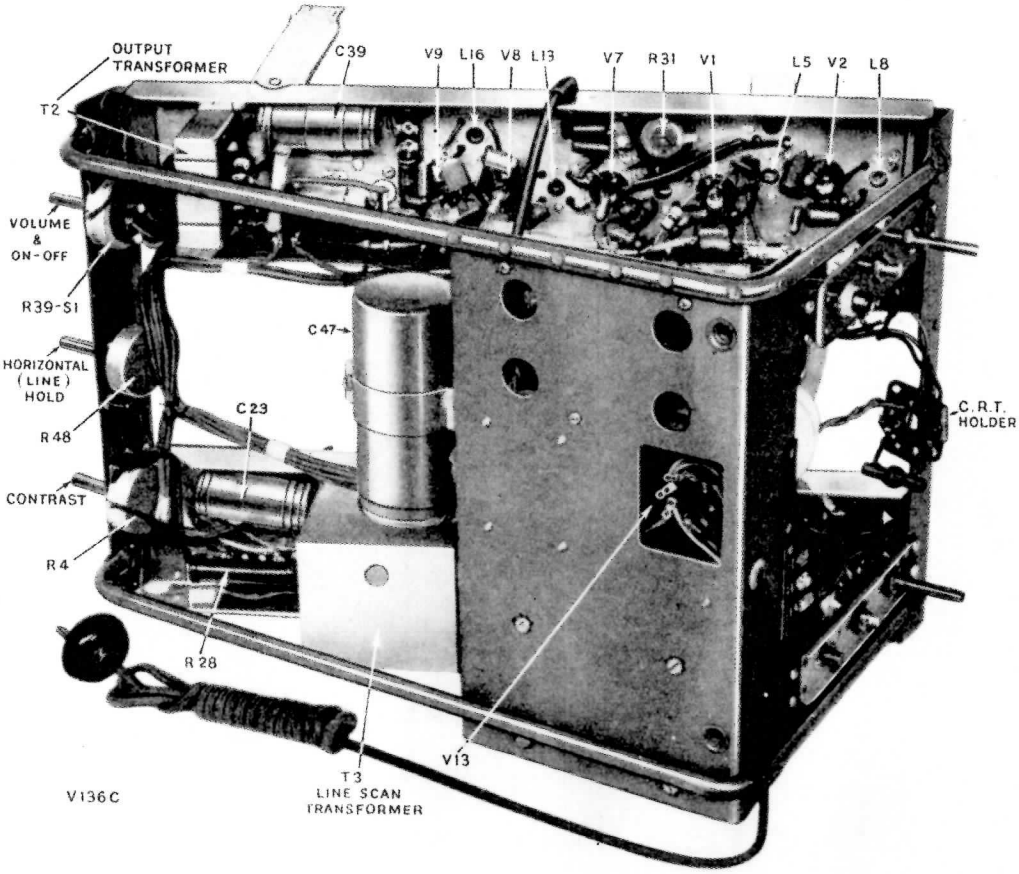

ding to the setting of R23. Coil resistances are quoted on pages 22 and 27.
ceiver, page 19; Power Unit, page 20.

The paxolin panel used for the EHT rectifier socket and mounting of the EHT capacitors had been drilled for Visconol replacements, but luckily the panel was not split. Original ceramic tube capacitors were found from another scrap set and these tested better than the Visconol types, so they were used, and look better anyway.

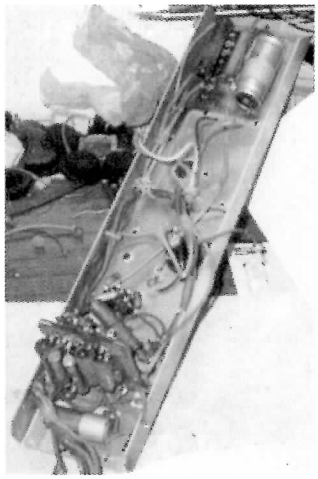
After a good number of late nights these parts were re-assembled on to the main chassis.

This just left the scanning unit and focus assembly. These items were stripped, cleaned and tested. This is where I found shorted turns in the frame winding. I was not sure what effect this would have on the finished picture as it was only a matter of a few ohms difference to that stated in the manual.

The wire used on this set of deflection coils is very

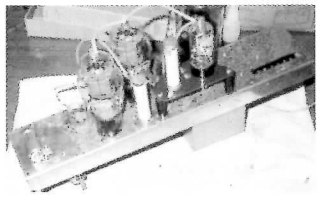



Underneath view of the V136C Chassis Assembly (less C18 and R25)



Above: Underside of timebase chassis.

Below: Restored timebase chassis.

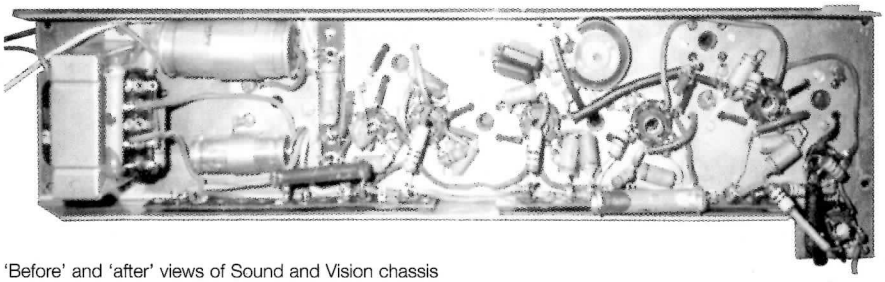


thin and exposed where they are taken from the coil to the solder tags. The joints at the tags were re-made for good measure, as there were signs of corrosion in this area. Once again, insulation tests were carried out between all the windings and the metal core they are wound on, as this large metal lump sits at full HT potential DC with respect to the chassis frame. This unit was then re-mounted into position ready to accept the CRT. All the wiring loom was then positioned correctly and the tie wraps removed and replaced with medical sticking tape to match the original. Attention was now turned to the pre-amp chassis. This is only a small unit with two valves and a few components. What appeared clear straight away is that the HT voltage is dropped significantly and a pair of resistors under the pre-amp chassis bore the brunt of the voltage drop. These were replaced with period components but of a larger 2 watt form. This chassis was then replaced on the main frame. Now with the tube still disconnected, power was applied via an isolating transformer and variac. The voltages were monitored as the variac was increased until full mains voltage was applied and the voltages around the set at main HT points were near enough to know there were no problems.

By this time the sound was clearly audible and so a test signal was applied to the aerial socket and sure enough it appeared at the speaker. The EHT voltage was measured and appeared to be a little low, but present, so the line stage was doing its job and the transformer running with no signs of breakdown.

The set was now placed on soak test with meters connected to various points and a signal being heard loud and clear. This was to allow any possible faults to be traced by visual examination of the voltages, this is visual exam.

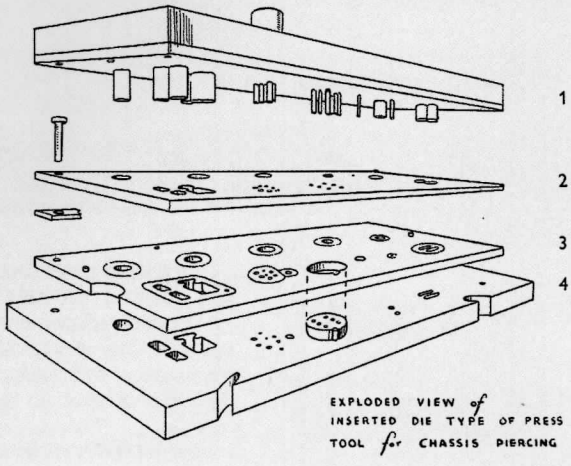
After running the set for an afternoon, I decided that the first stages of alignment could be performed. This is very easy due to being a TRF and everything being done without the tube in place.The set appeared to come into alignment very quickly without any problems;



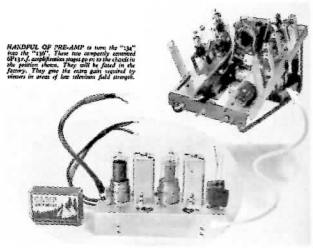
'Before' and 'after' views of Sound and Vision chassis

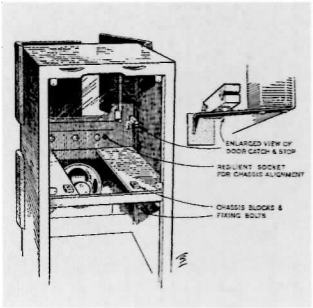
## *New Techniques*

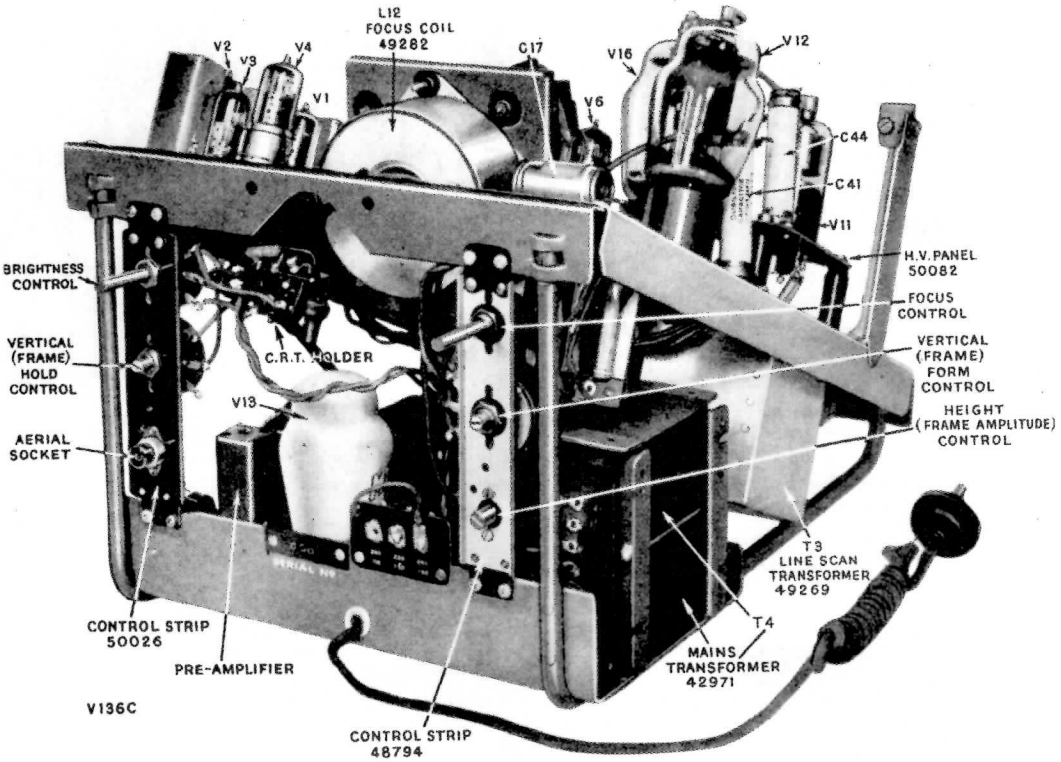
*New techniques used in the production of the "134/6" are described by R. S. Miller on the opposite page. In the manufacture of a chassis the four parts which comprise the press tool are shown here. The upper component (1) goes into the ram of the press. The other three are bolted to the bed. The metal for the chassis is "posted" into the slot between components 2 (the stripper plate) and 3 (the die). These are separated along their edges by a spacer (the small bit in this drawing), just sufficiently to allow the chassis to go between. The bottom tool part (4), shown here, is the bolster to strengthen the die plate. An important difference when these tool parts are used for making an aluminium chassis is that no inserts are needed in the die (3), with consequent saving of tool-maker's time.*




EXPLODED VIEW of INSERTED DIE TYPE OF PRESS TOOL for CHASSIS PIERCING





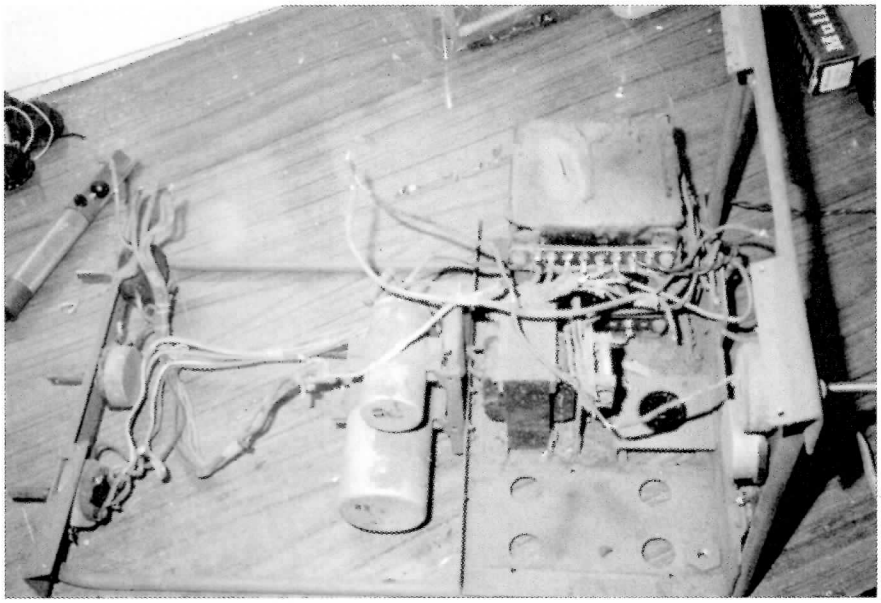



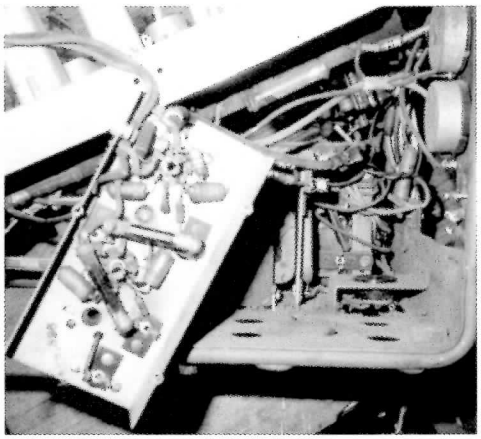

Rear view of the V136C Chassis Assembly (C18 omitted)

Below: Breaking down the chassis for restoration.

Bottom left: The receiver in working condition at the BVWS 1996 exhibition.

Bottom right: Underside of the preamp sub-chassis.





I had however squirted a little WD40 into the cores of the IFT's some hours beforehand to make sure that they were all adjustable before starting, as this is often the point where you hit problems. Once this was complete there was far more sound amplification and I was ready to connect the CRT and see what, if any, picture was visible.

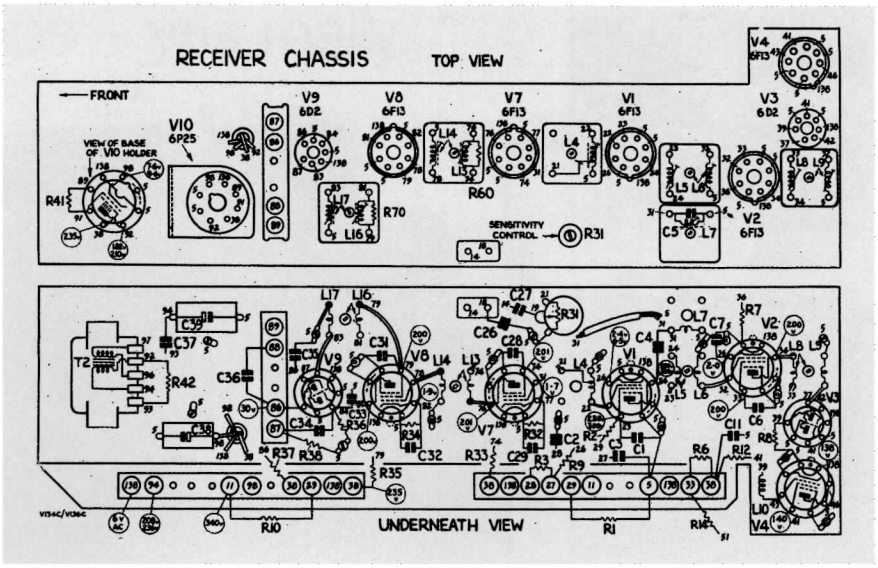
With the CRT clamped back in position, connected and making sure that the neck of the tube was pushed as far back as possible to ensure the scan coils were in the correct place, the set was switched on again. After a short wait there was a raster on the tube which was controllable. A few adjustments were made and a reasonably crisp and well shaped picture was obtained. Adjustments to the tappings on the scan unit were made to centre the picture and increase the width. Linearity was adjusted so that test card C showed a good balanced picture. There did however seem to be a distinct fault that could not be altered by any of the adjustments.

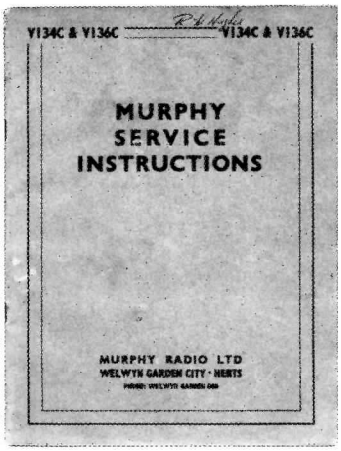
The top right hand corner of the scan was compressed. This was tracked down to the scanning unit; remember I found the frame coils tested with a different resistance to that stated in the manual. At this point, I dug out an old scan coil test oscillator, which really did not get any use, but this showed a clear difference between the windings on the scanning unit.

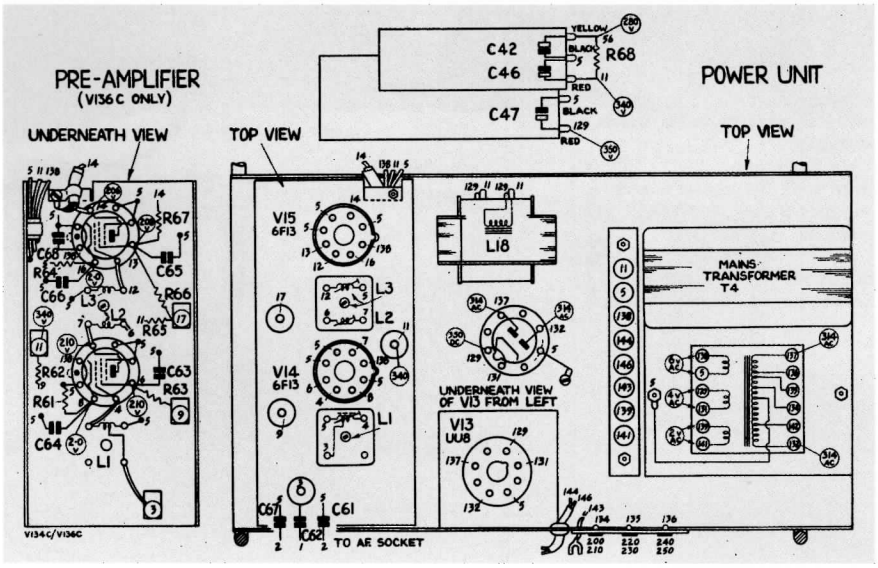
A lot of time was spent adjusting the whole picture for the best results obtainable so that the fault would not be so apparent. The set was then watched for some time, and the tube, that was pretty bright, but still with only about 70 % emission, appeared to become sharper, and a crisper focus was obtainable. After more minor adjustments my attention was turned to the cabinet. This had suffered some loss of lacquer in patches on the top, and there was no real alternative but to strip the top and re-polish, as the original was just flaking away. The set was burnished to clean the nasty sticky dirt build up and appeared to be in very reasonable order except the top. Some veneer had been lost on the top surfaces of the doors, where

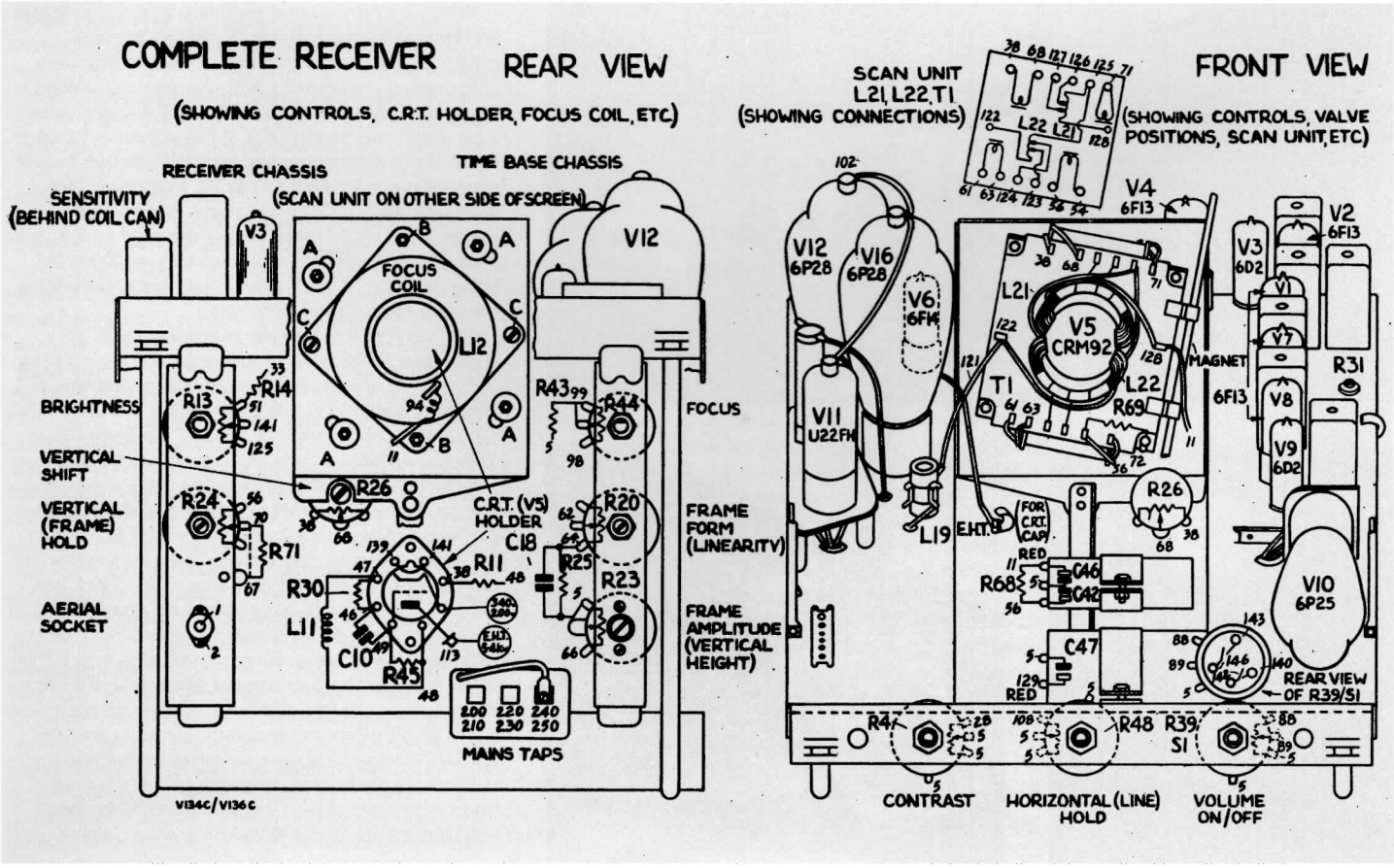
fingers would have been used to open and close the doors, and a little veneer was missing from the top of the speaker apron. New veneer was laid into the areas to match with the original colour and grain and the re-polish of the top with a cellulose spray was started. The other areas were touched up and made good. After a few days, a second application of lacquer was applied, with preparation between the coats. This was then cut back and polished so that the effect was not too high a gloss and revealing that the lacquers were different. Some repairs were carried out to the door stays to ensure they held good and did not let the doors flap when the set was moved. The set was then re-assembled and once again soak tested.

With about a week to go until the Harpenden exhibition, I ended up watching this little set for a good few hours to convince myself that it would be reliable on the day. Happily the set was installed in the small hall at Harpenden and run continuously throughout the day without any problems; well, this was after the mains voltage tapping was set to 200 volts instead of 250 as we seemed to be on very low voltage mains that day, or were we just sucking the current ! The set is still in good order and many of you will have seen it running recently at the NEC as part of the television display.



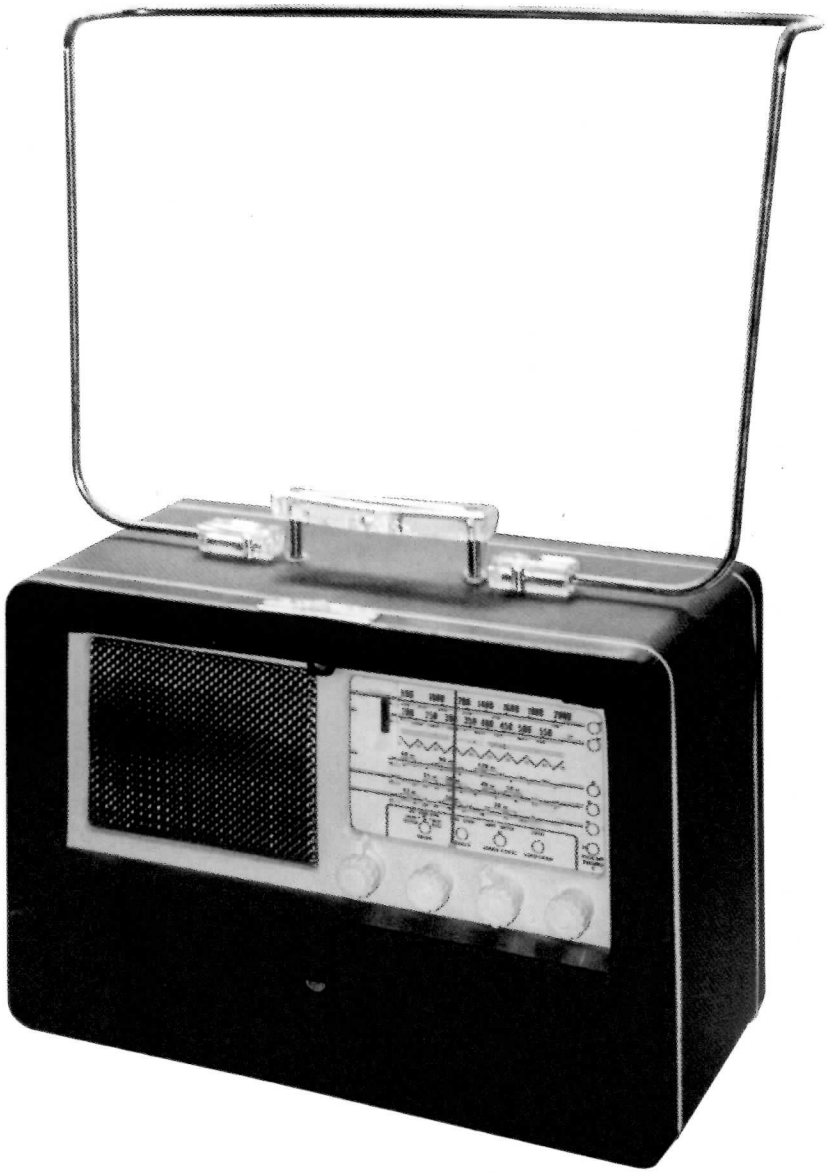



# A Dutch interior

By Geoffrey Dixon-Nuttall

**Philips radios have a fascination, due to the combination of technical excellence and bizarre mechanics. Recently I was given an obscure portable which exemplified both of these qualities, and provided some surprises as well.**



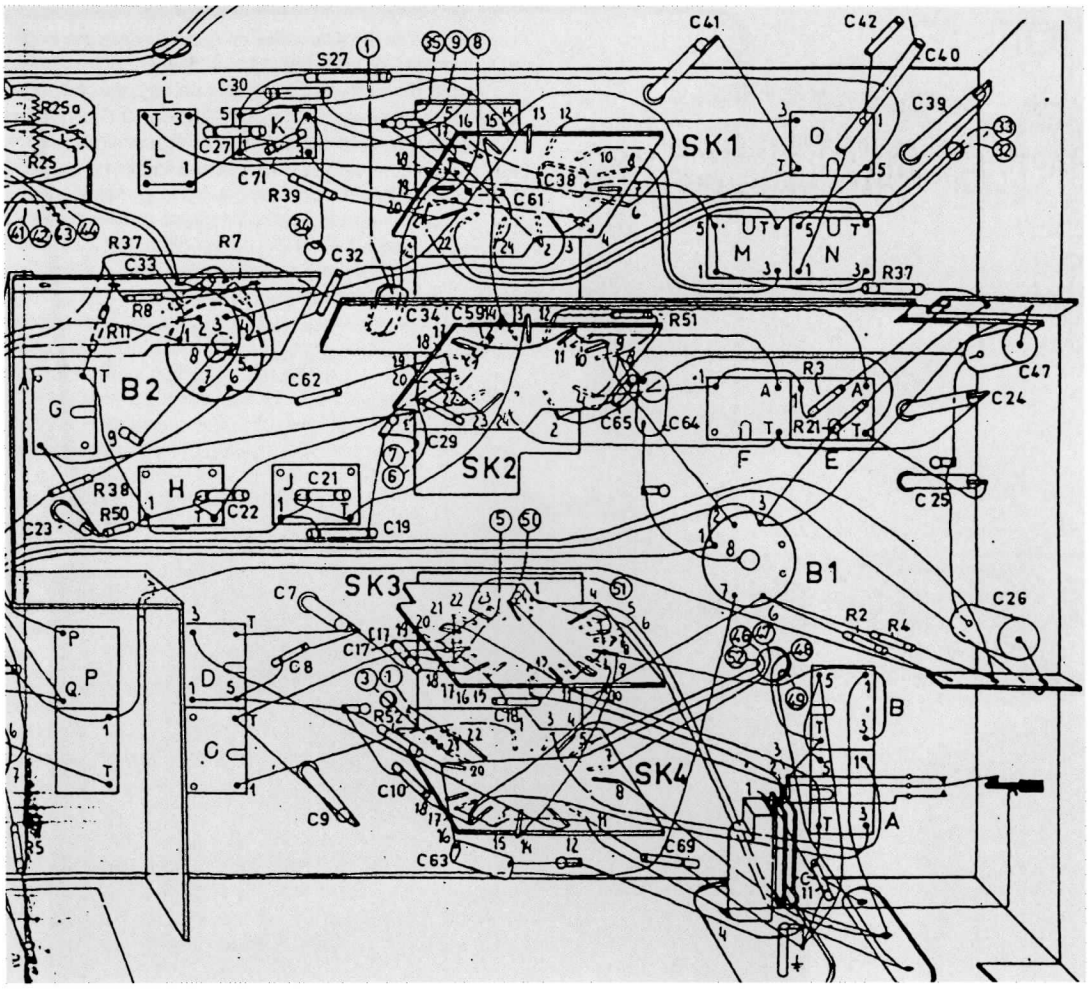
It is a model LX 548 AB. It seems to have been made in Holland and has slightly French qualities, the knobs being marked "Tuning/Syntonisation" etc. It also says "Transworld" which hints that they were competing with the Transoceanic. I don't know where this set came from, but it seems to have been exposed to tropical damp, as the fabric was peeling off at the corners. The output transformer is sealed in a can, so the frequent Philips problem of this going O/C will not occur. The cabinet sits on four perspex feet, one of which was smashed. Luckily I had a transparent door handle, from which I turned a new one. The badge was missing, but nothing can be done about that. The front door jammed, because the button of the catch had split.

This is a big set, measuring about 15" across. Also heavy, even with no batteries. The thing that looks like an enormous handle is the SW aerial. There is a total of seven valves, plus a metal rectifier and a Magic Eye. This is one of those odd things that lights up with a shriek! The circuit includes a RF stage and push-pull output, and it is for mains and battery. There are five bands, going up to 13 metres. For some odd reason Philips label these LW, MW, S3, S2, and S2A. There is one of their peculiar feedback tone controls, and the dial is covered by a retractable lid. Having no information on this set I made a start, but the circuit was so odd that it was obviously essential to have more information. Bob Schut has, apparently, contacts in Philips and produced the Philips sheet, in fact two, as there was a revision. The big snag is that it is all in Dutch! However, with a dictionary and a shifting spanner it is not too difficult to translate. (The Dutch for "screen grid" is Schermrooster. Rooster= roaster= grill=grid. ). Bob helpfully translated a couple of pages to get me started. There are one or two misprints, as the mains/battery switch is referred to in the description with a different number to the diagram, and surely the DK92 has no suppressor grid?

**Filament circuit**

So having got a circuit diagram, what do we find? As usual with this sort of set the filaments are in series, and the first puzzle was how did they light them all up on 10.5 volts, the LT being from seven cells? Crafty, as on battery one half of each output valve is switched off, and the Magic Eye has a 25mA filament which is in parallel with the phase splitter, which is a DAF96 connected as a triode. (As someone had fitted a DAF91 it took me some time to work this out). Another trace of a clot at work was a resistor connected across the filament dropper. As I suspected, this had overheated the valves and they all had low emission bar the DK92. R6 is a negative temperature coefficient resistor, which they say protects the low voltage electrolytics in the event of valve failure. One output valve is biassed from the junction of R14-R15, the other is returned to chassis. I don't know why R13-R12 could not be replaced by one resistor, and the purpose of R41 defeats me. The switch is shown in the mains position, and it then goes off-battery.

**This is a big set, measuring about 15" across. Also heavy, even with no batteries. The thing that looks like an enormous handle is the SW aerial. There is a total of seven valves, plus a metal rectifier and a Magic Eye. This is one of those odd things that lights up with a shriek!**




**Usually in this sort of set the output valve is put at the positive end of the filament chain and the bias is derived from lower down. However, this is what everybody but Philips does.**

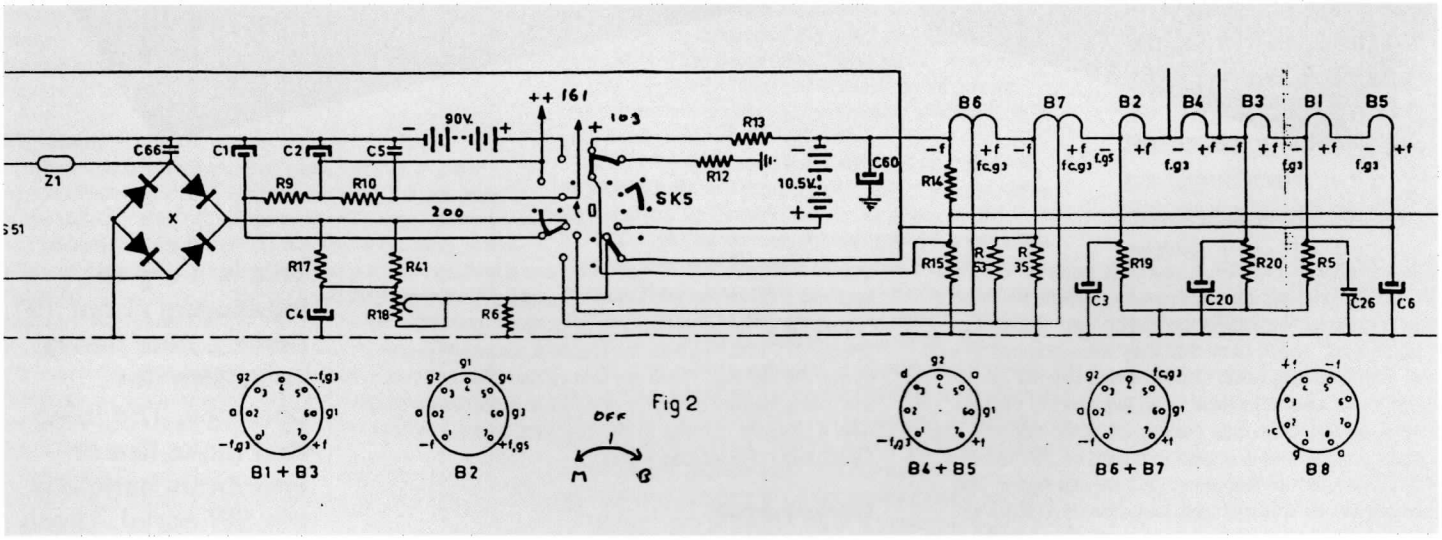



Fig 2

Usually in this sort of set the output valve is put at the positive end of the filament chain and the bias is derived from lower down. However, this is what everybody but Philips does. They put the output stages at the negative end, and then have to add a resistor network to get the bias from below negative, so to speak. This is where it starts to get tricky. On batteries, as mentioned, only half of each output valve is used, and the HT is lower, so the bias is different. Also when on "battery" the resistors in the filament chain are not connected in the LT circuit, or more batteries would be needed, so they are in the HT minus. This means that they have to be switched. The various Rs and Cs in the chain are to remove any signals and to take care of the anode current of the first stages, which would otherwise flow through the later filaments.

Why are the output valves at the wrong end? I can only think that it increases the available HT, and therefore the output power. The HT on mains is actually 160 on the output anodes, but the output valve filaments are about 10 volts above chassis, so that the actual HT is about 150. This is higher than I can find in any of the valve data, but they made the valves, so they should know! The only figures I have are for 90 volts HT and 9.4 bias, when they give 0.58 watts in class AB1. This set seems to give about 0.5W at the point of distortion, which is not bad at all.

**To Work**

The first thing to do was to get the volts correct. R9 had gone up from 1800 to 2400 ohms, and also the selenium rectifier was tired (they always are). The transformer was wound for 220 volts, being continental. All this meant that an extra 330 ohm

**There are people who make a living by repairing old radios. If I had to charge anybody for the time spent on this receiver it would obviously not be economic.**

resistor in the transformer output was needed to restore things. (I am not really happy with these battery valves in series. Measured cold, two DL94s read 18 & 22 ohms, and presumably the same variation occurred when hot).

When all seemed to be well, switch on and see what happens. Almost nothing. The answer was that the AVC is decoupled to chassis, and as the filaments are up in the air, the first three valves were well and truly cut off, due to leaky capacitors. Having sorted out this one, we got stations. (This effect is used when the set is switched to "gram" as the pick up is connected between the volume control and chassis, so paralysing the first three valves and the detector. Extra resistors are switched in to the filament chain to make up for the lack of anode current.)

The IF transformers were in alignment, which was a good thing. These coils are very small and very flimsy. The ferrite cores are tiny things like pencil leads, cemented to brass studs, which are screwed into tiny plastic tubes. Any pressure strips the threads: I don't think you are really meant to re-align them. I'm sure they are excellent from the point of "Q" but I hate them.

A glance at the wiring diagram will show just how complex this set actually is. The alignment procedure is quite elaborate, and as the dial is left behind when the chassis is removed they use the end points (gang shut & gang open) as the alignment points. This is not theoretically correct from the tracking point of view, but it works.

Trouble showed up as the LW RF coil would not trim, as it was O/C. Removing this, repairing the break and replacing was not a job for the faint hearted. Another trouble was caused by the jack in the aerial socket, which re-arranges things to suit an external aerial, and was not making contact. There was a further break in the S3 short wave band aerial coil. Although these coils seem to be very well made, I have had trouble in another set with them.

The aerials on the set are rather strange, as the SW aerial is the hoop referred to, but on long and medium they use the cream piping on the cabinet. This is connected as two turns in series, which is switched to the primaries of the aerial coils, which are wound on ferrite rods for good measure.

I had more trouble with one or two of the SW aerial circuits, and eventually discovered that there was no earth connection. This is made to a solder tag which is welded to the chassis, in spite of which it was O/C. I now think I have seen almost everything.

A slight difficulty which they point out is that the oscillator is high on all except the top band. This means that the image is on the low side except on this band, and it is easy to get this wrong. If you do there is an awful silence in the middle of the band as the oscillator and signal coincide. In spite of their carefully fitting neutralising capacitors there is quite a lot of oscillator pulling.

In the midst of this alignment the dial cord broke. This is a typical arrangement with the cord going through Bowden cables so that the gang can move on its mountings without shifting the frequency. I made up and threaded the cord according to the drawing, and it seemed to be too short. Comparing it with the broken bits, it was! Thank you, Philips.

One or two of the trimmers finished up fully in, and had to have extra 10pFs added. These are not the usual Philips "beehive" type, but brass rods inside a ceramic tube.The sheet says that the aerial circuits should be aligned with the set in the cabinet and with the batteries. This is quite a fiddle, requiring very short trimming tools. As this set will probably never have batteries I have aligned it without, and it probably makes a difference.

More trouble; the aerial on the second SW band would not align. On this band the hoop aerial is in series with the aerial coil, on the earthy end, and it is much happier with this coil shorted out. This is a mystery I have not solved, it can't be anything to do with the battery, as the hoop is up in the air, away from it. As the performance is quite good it can stay like that.

There are people who make a living by repairing old radios. If I had to charge anybody for the time spent on this receiver it would obviously not be economic.

**Was it worth it?**

I think I prefer the Transoceanic. The Philips sounds good, with its half watt against the Zenith's 200 mW (and a bigger speaker), and the sensitivity is quite good, but it has not such good bandspread, and none of the Transoceanic's extras, like the Wavemagnet or the comic tone control. Zenith very helplfully give the gain of each stage, but Philips of course don't, so I don't know if this set is as good as it should be. I don't like the odd aerial arrangements, also the dial drive is not quite good enough, there is some microphony, and the Magic Eye does not do very much. It does have a chassis which is isolated, which is a safety point. The 13M band is a bonus. I don't know what the original selling price was, but there must have been a tremendous amount of work in putting it together. Anyway, I learnt one or two things, and for a free gift it was good value, if only for the entertainment.

# Clandestine

## The Romney Marsh collection of clandestine Transmitters and receivers

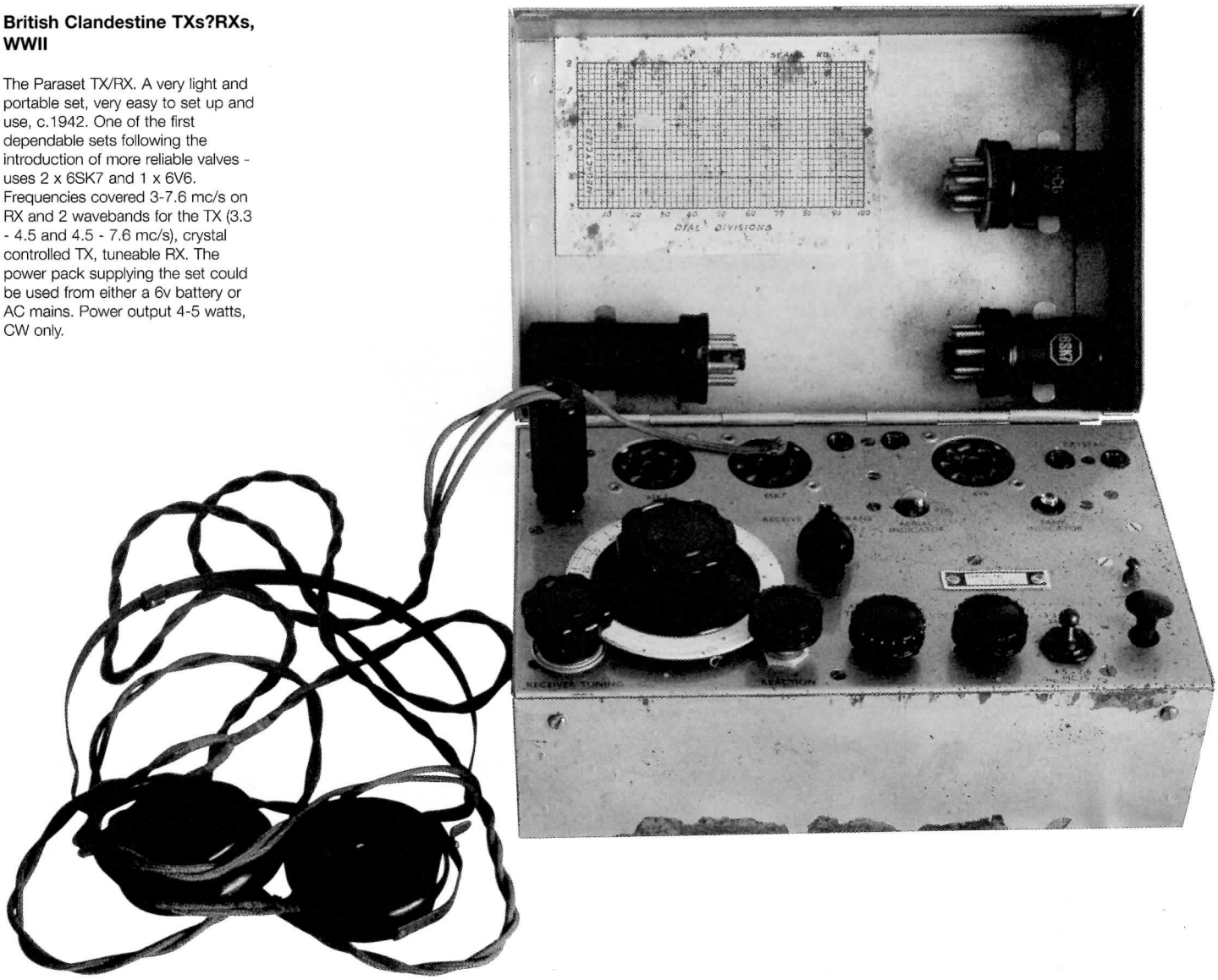
by John Elgar-Whinney,
photography by Carl Glover

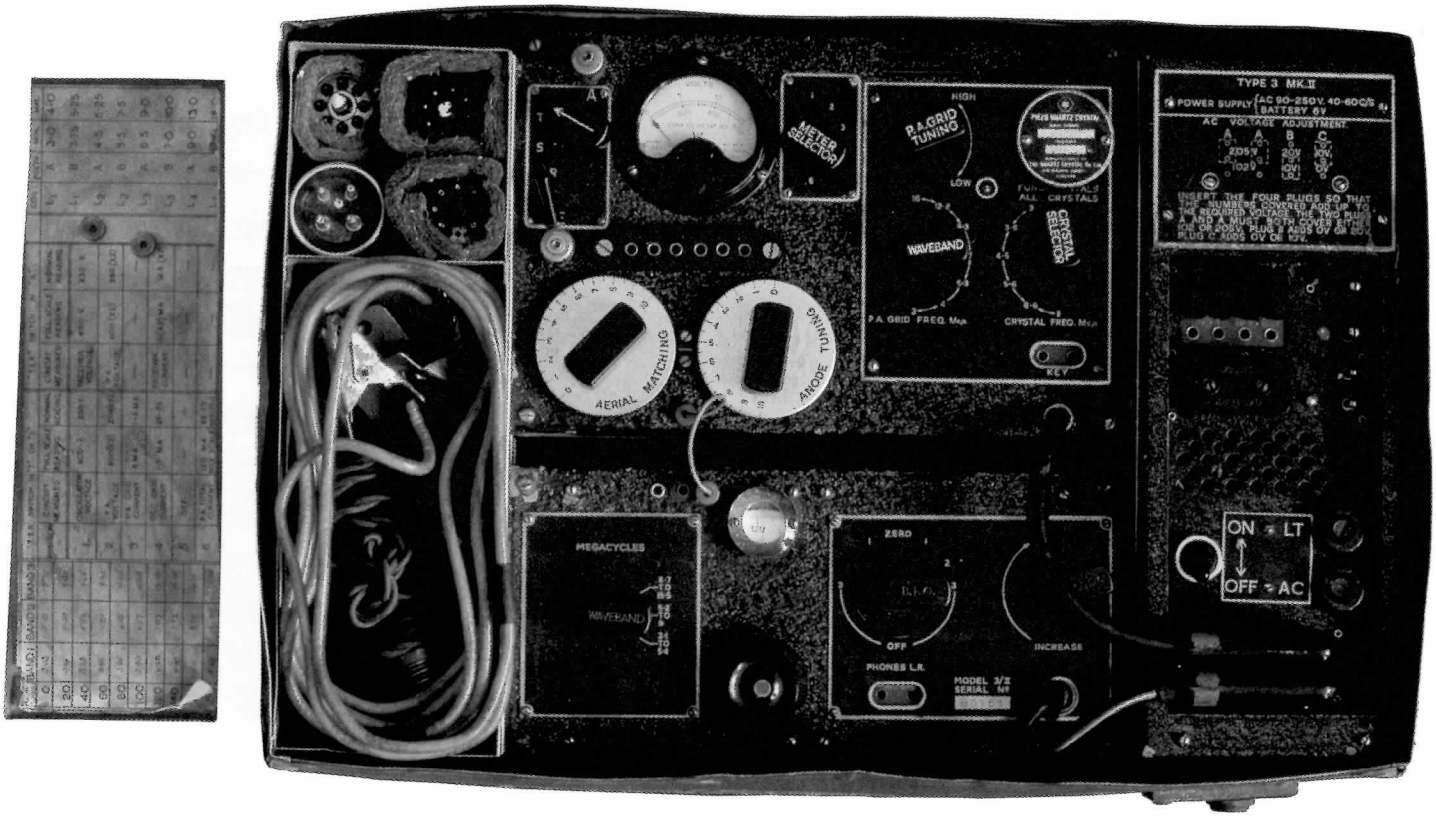
**I joined the RAF in 1950, did my Morse and radio mechanic training, passed out and went on to squadron service with B29s at RAF Marham, Norfolk. I then volunteered to go on to radio counter measures training and did this at RAF Watton. I was then posted to RAF Hemswell, Lincolnshire as a clandestine operator flying Lancasters and Lincoln aircraft. From there I went on to the Far East Secret Signals Unit in Hong Kong, finishing my service there.**

**Due to my RAF background, I have gained an interest in clandestine equipment. I started off with part of a 'B2' TX/RX and an MCR1 and have over the years built up a collection. I often find myself giving talks and demonstrations on the subject to interested clubs and societies.**

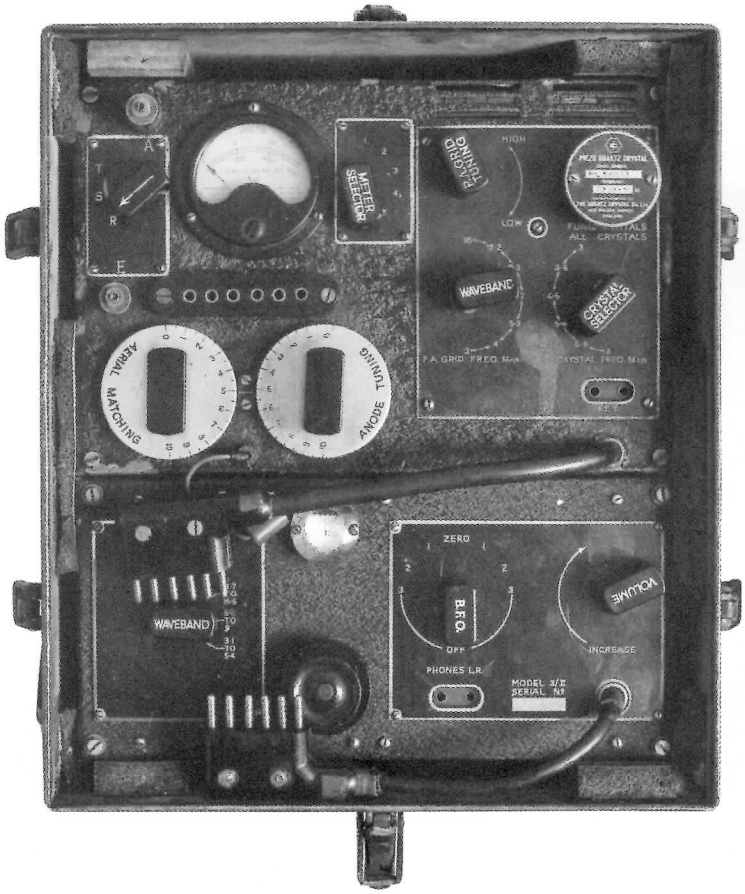
**British Clandestine TXs?RXs, WWII**

The Paraset TX/RX. A very light and portable set, very easy to set up and use, c.1942. One of the first dependable sets following the introduction of more reliable valves - uses 2 x 6SK7 and 1 x 6V6. Frequencies covered 3-7.6 mc/s on RX and 2 wavebands for the TX (3.3 - 4.5 and 4.5 - 7.6 mc/s), crystal controlled TX, tuneable RX. The power pack supplying the set could be used from either a 6v battery or AC mains. Power output 4-5 watts, CW only.

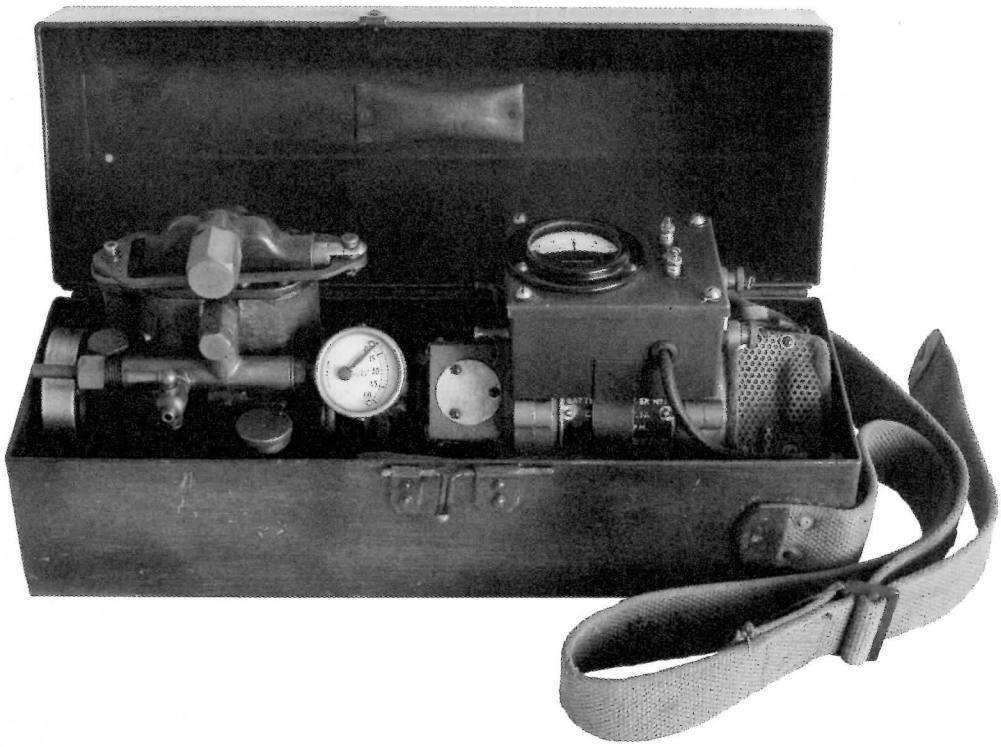





The Type 3 Mk II (B2) suitcase TX/RX The most widely used set from 1942/3 through to 1945. A very good set, easy to operate with a power supply of 30 watts, capable of being used from AC/DC mains or batteries - it could be swapped over from mains to batteries simply by reversing a plug on the power unit which would operate from 97-250 volts AC. The example above is shown in a suitcase. Below illustrates the set in their parachute containers as they would have been if dropped to the Resistance.





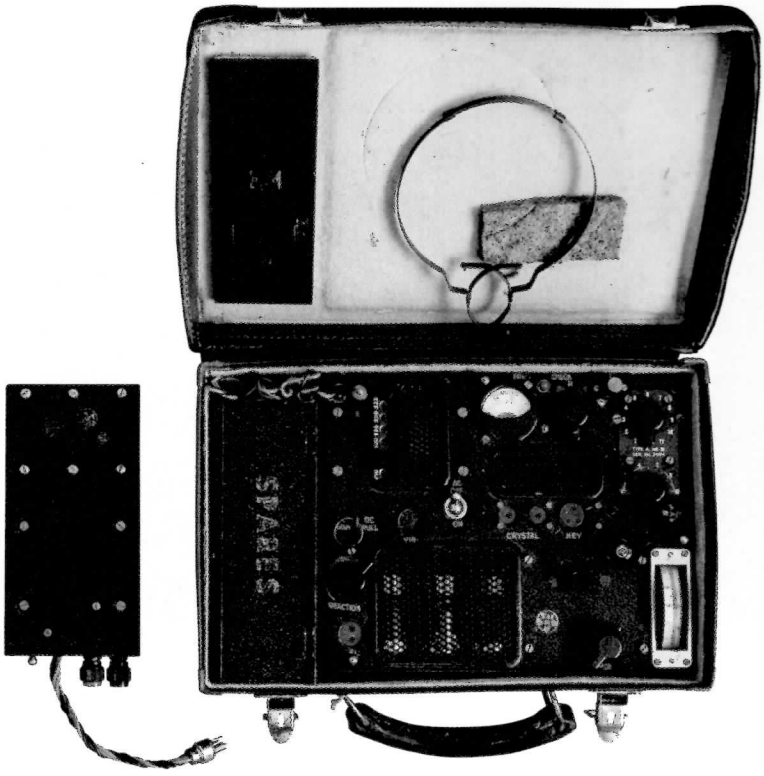


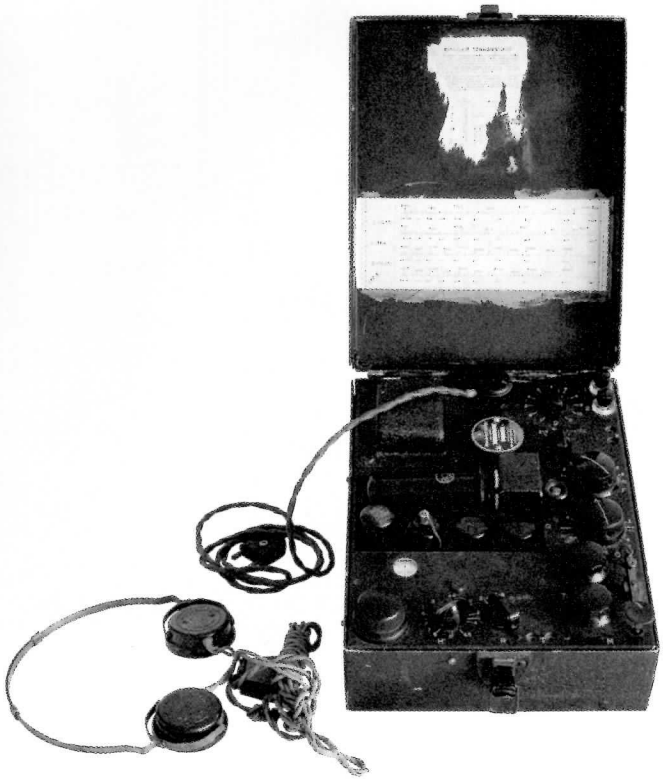
Top left and right: Steam generator for B2. It generated power when the pedal generator was not available but fuel for the boiler was capable of recharging the set's battery power source as well as operating the set itself. The item on the left is the boiler unit, whilst the object on the right is the boiler.

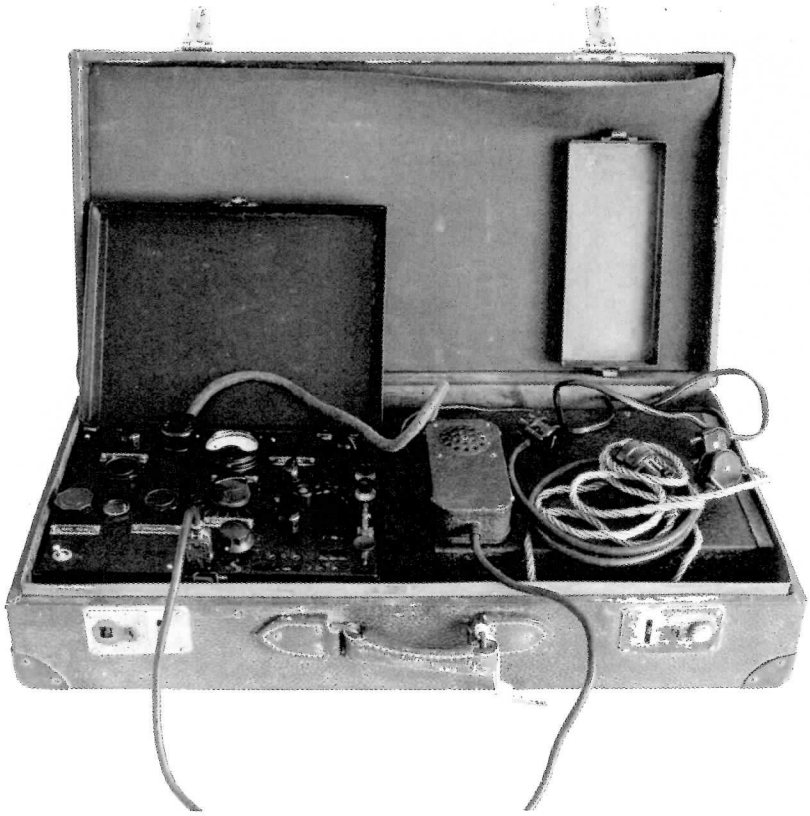
Below: Mk III Suitcase TX/RX
The latest of the S.O.E. sets, 1943/44. By far the most portable and user-friendly of the S.O.E. sets produced - light, easily operated and, being in a small case, easily hidden. Frequency range in 2 wavebands, 3.2-5.2 mc/s and 5.9 mc/s. Power output 5 watts average.

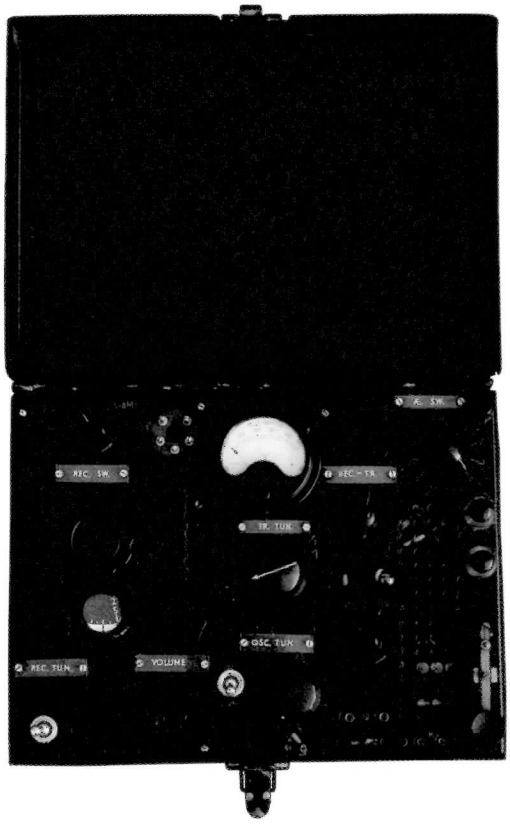
The Mk III set came with the spares box and a vibrator power supply which could be plugged straight into the set. It could be changed over from mains to battery operation simply by pulling up a ring on the face of the set.

**Polish Clandestine Txs/Rxs, WWII**
Bottom right: Model AP-5 - A very compact self-contained TX/RX built by Polish exiles in Britain during the last war. Built-in key (TX CW only). Fully tuneable RX, frequency range 2-4, 4-8 and 8-16 mc/s. Note the slight overlap of top tuning band. TX is crystal controlled, power output 8 watts average. The AP-5 could only be used from a mains power supply of 110-250v AC/DC.



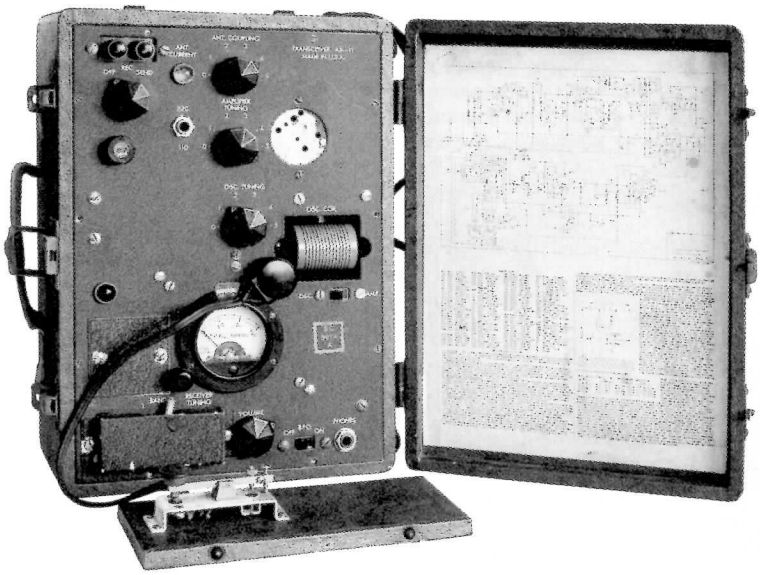


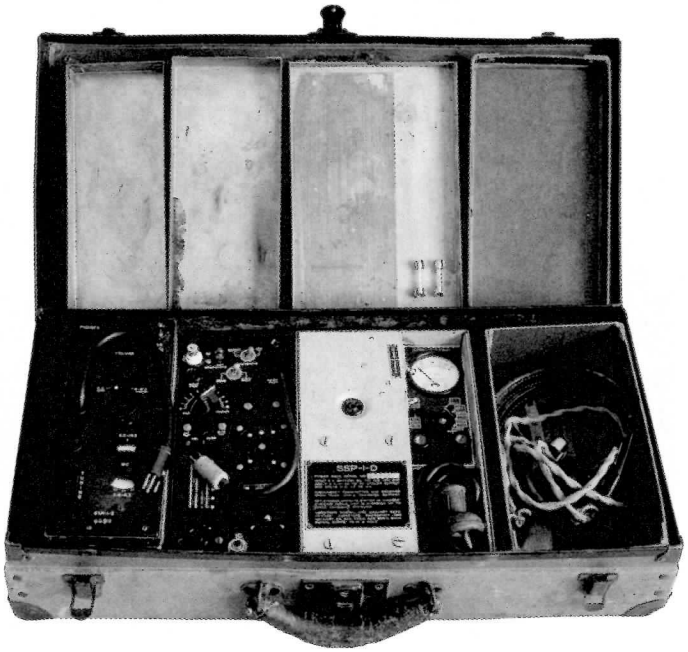


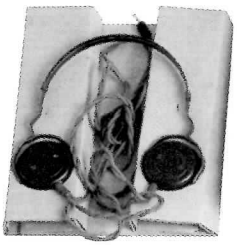

Top left and right: Model BP-5 - The most powerful set designed and used by the Poles. This TX/RX covered 2 bands, 2-5 and 5-8 mc/s, the TX being crystal controlled and the RX fully tuneable. Note the overlap between TX and RX coverage. Power output 30 watts average. The example shown has its original mains power unit, plus a rotary power unit and also the case in which it was used in Yugoslavia during WWII. Provision is made for R/T to be sent as a microphone is supplied. In addition, an automatic Morse code keyer could be plugged into the same socket.
Below left: The main unit of the BP-5 removed from its case.

**US Clandestine TXs/RXs, WWII**
bottom left: A.R.11 or AN/PRC-5
Originally designed in 1937, the example shown was used by the Canadian forestry commision for communicating with outposts. At the start of WWII. It was redesigned slightly and used by the O.S.S. and re-designated AN/PRC-5. Fully portable, it was capable of good long-distance communication on CW transmission and CW and AM on receive. Frequency ranges by interchangeable coils 4-6, 6-8, 8-12 and 12-16 mc/s, the TX being crystal controlled. The example shown was used in Scotland by Mr Jack Miller, a 'V.I.' (volunteer interceptor) in the last war to search out German spy sets and U-Boat transmissions. A very few of these sets (A.R.IIs) were used in Britain.

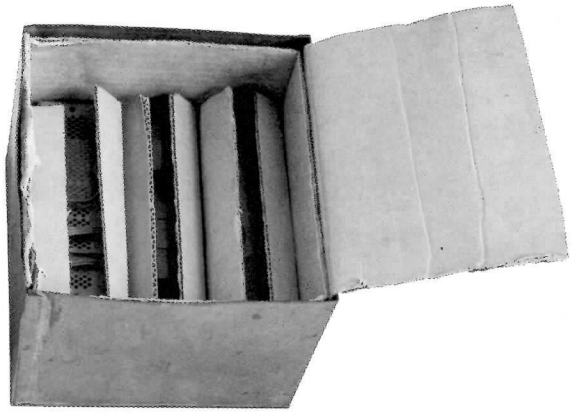
Bottom right: SSTR1
It was designed along the lines of SOE's A Mark II set of 1942. The SSTR-1 became the standard OSS transceiver in the field, its construction enabling various modules to be concealed when necessary. More usually these were kept in the suitcase provided and might be powered by batteries or mains supplies ranging from 90 to 230 volts of alternating current. The range of signal transmitted could exceed 1,000 miles with the appropriate aerials.

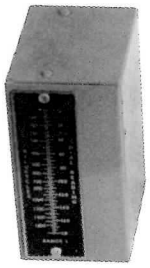


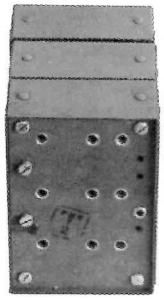


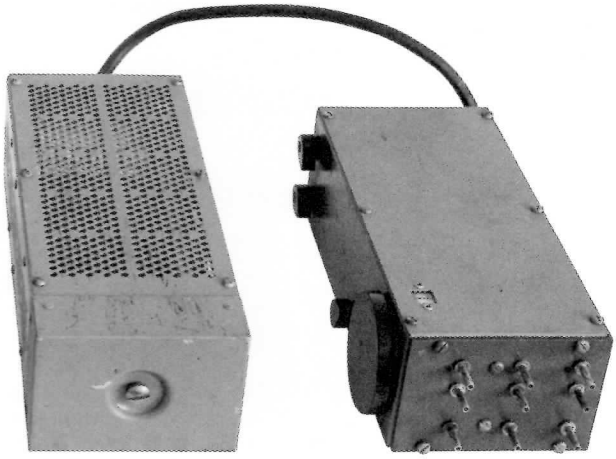


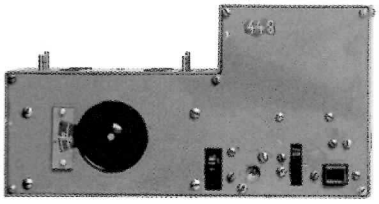


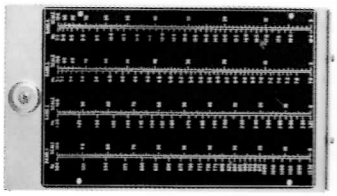


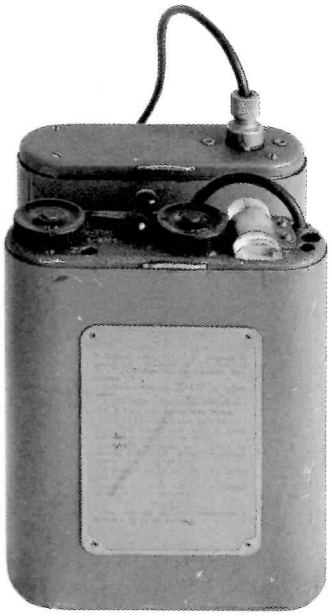










**Clandestine Rxs, British and Polish, WWII**

Top left: The MCR1 ('Biscuit') RX
Designed during the latter part of WWII as a sensitive 5-valve superhet. Powered by a special battery or mains power pack. It was capable of using 97-250v AC or DC. It was delivered in a 2lb Huntley and Palmers biscuit tin with (A) receiver (B) power pack and batteries and (C) 4 x plug-in coils and aerial and earth wires. Ranges covered, 150 kc/s-1.6 mc/s. 2.5-4.5 mc/s. 4-8 mc/s and 8-15 mc/s.

Second from top: The 301 RX
Made during the last part of WWII as more convenient RX than the MCR-1, it featured wired-in miniature valves, a one pack 4-way coil pack and an integrated spares/battery box, fully pocket transportable. The 4-range coil pack was capable of receiving frequencies similar to the MCR1.

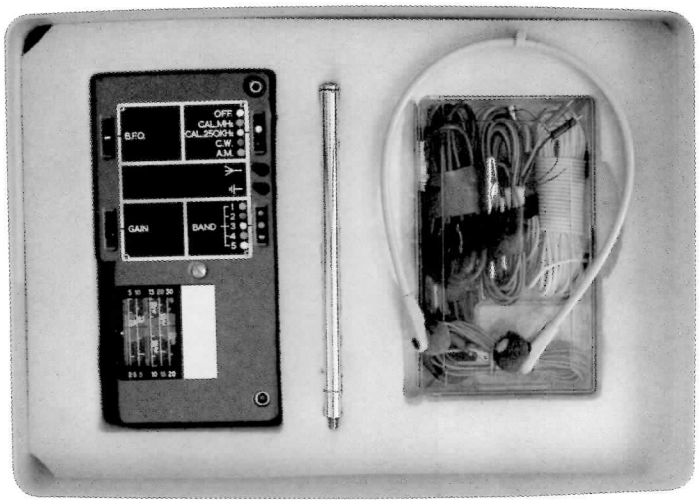
Second from bottom:
The OP-3 Polish RX
Designed and made by Polish exiles in Britain during WWII. It is a compact RX, very portable and with good characteristics. *i.e.* vest pocket RX and battery container. All controls on top and therefore very easy to operate. Frequency ranges, 200-500 metres, 2-5 mc/s and 5-12 mc/s.

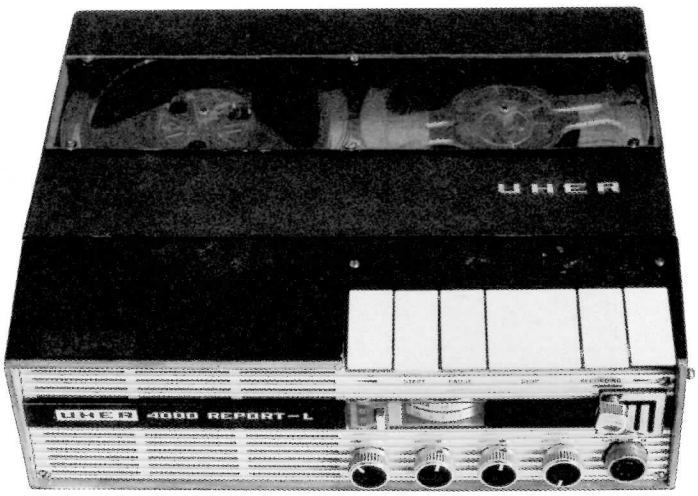
Bottom:
The Sweetheart RX (Type No.31/1)
Designed by Willy Simonsen in 1943, around 50,000 were produced by Norwegian exiles in Britain. Of simple design, it employed a 3-valve straight circuit (IT4s) and was produced with economy of batteries in mind (4.5v and 30v). Frequency range 6-12 mc/s (25-50m). Apart from the later 301 RX, the Sweetheart was the smallest RX of the war.

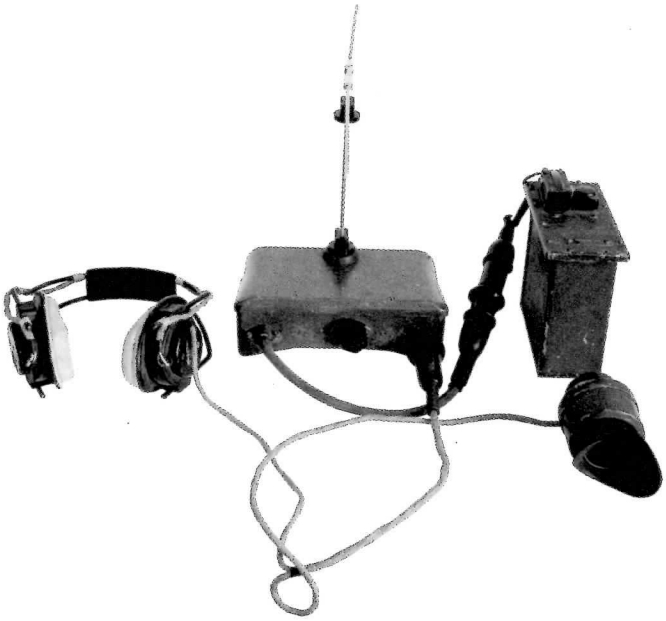
Next page, top: The 328 RX
Designed in the late 1950's to early 1960's, the 328 is a general purpose clandestine RX. It employs a fully transistorised circuit and was used mainly by embassies to record diplomatic traffic via a tape recorder like the Uher 4000 (also illustrated). Power supplies, internal 10.5 v or 10.5-16v DC Outside source. Frequency ranges 2.5-30 mc/s in five bands. Capable of receiving morse via internal B.F.O. Under good conditions, the telescopic aerial is capable of worldwide reception.

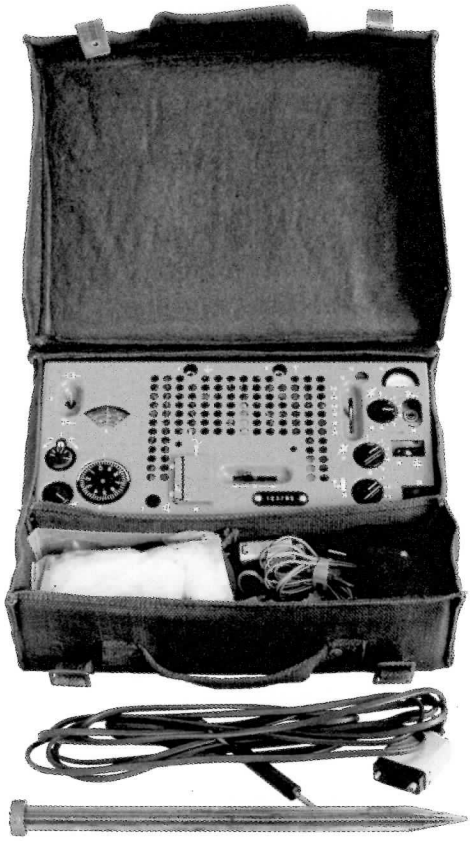
Next page, centre left:
S-Phone Type B/MK 1V 1943
Used by an agent on the ground to direct an aircraft to the drop or landing zone. Strapped to the body with the aerial plugged in, it had a range of 40 miles when the aircraft was at 10,000ft. The TX and RX were separated in frequency so it could be used as a radio-telephone. The set was very directional; the operator had to face the aircraft to gain communication as the wearer's body acted as a reflector. Worked by batteries via a vibrator power pack, it's frequency was about 330 mc/s. A corresponding set in the aircraft also had a visual display as to the direction and distance of the ground operator.

Note: the microphone is of a special type - with the mike in the normal position no sound can be heard nearby, hence 'S-phone', or 'Secret-phone'.



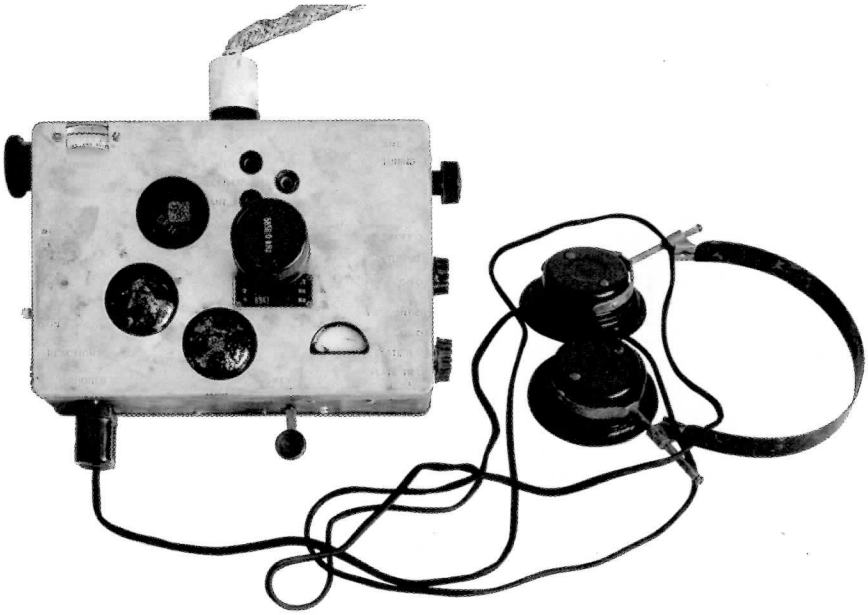



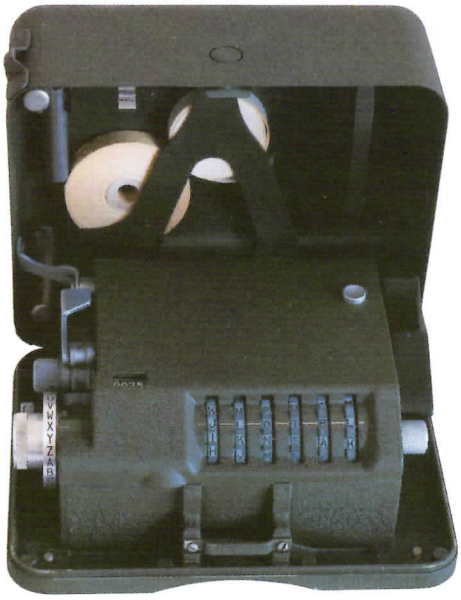


Centre right: The MK 123 (spy) set Produced in the mid-1950s onwards, the set was designed to be used by special forces in the field. It came with the facility to operate from 12v DC mains or via a hand-driven generator. Frequency ranges (3 bands) 2.5 to 20 mc/s. TX crystal controlled with a power output of some 13-25 watts. The example illustrated is in a canvas carrying bag but they were also supplied in a wooden box with all the kit (headphones etc.)

Below left: Telesonic Receiver (1945) Used to monitor enemy telephone conversations via either the coil around the case or a large pick-up loop laid on the ground. It is a high gain audio amplifier using the same induction principle as a loop for reception in a hall or theatre.

Below right: S.E 109/3 German WWII TX/RX set.

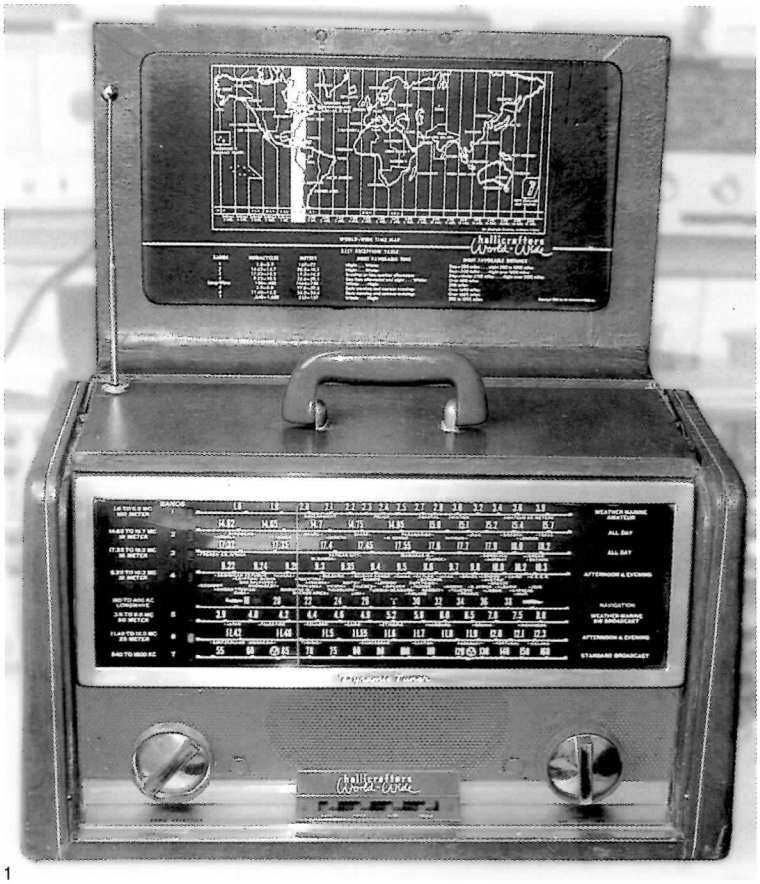
Large pictures, left and right: An Enigma encoding machine used by the German services during WWII. Each had a numbered ring corresponding to the 26 letters of the alphabet, three of the five available rotors being used according to the setting instructions for the day. The rings were set to align specific letters in the cover apertures above each rotor. This gave the primary setting. A face-board below the type-keys had lettered sockets for plugs, seven linked pairs of plugs were inserted to patch socket 'A' to 'U', 'V' to 'C' or whatever connections were required according to the setting instructions for the day. The electro-mechanical mechanism produced the coded letter for each key depression, the coded letter lighting up on the panel above the keyboard. Despite its complexity, the Allies broke this code. The operator or his assistant wrote each coded letter in letter-blocks on a signal pad, ready for transmission. The recipient had his Enigma set up to decode this message. Although there were different daily settings for various devices, each received a monthly schedule showing the three rotors to be used, their primary setting sequence and the socket connections to be made for each day of the month. Instructions to operators stated that no message should exceed 180 letters.

Small Pictures, top left and top right: The American M-209 cipher machine. It was used for messages that did not require a high degree of secrecy, but the messages could be encoded in 15 to 30 minutes depending on their length. Such speed was often more important than secrecy with such low grade messages. The M-209 was developed by Boris Hagelin with rotors that were easily re-set to the day's instructions. To encode a letter the operator aligned the marked dial wheel on the left with a mark on the mechanism lid. When this was closed the encoded letter appeared in a small aperture and was printed on a paper strip. The intricate polyalphabetic cipher of this device has a period of 101,405,850 before a specific letter's coding is repeated.

# For the man who had everything –

## Zenith Transoceanic 600 versus Hallicrafters TW-2000

By Jim Duckworth



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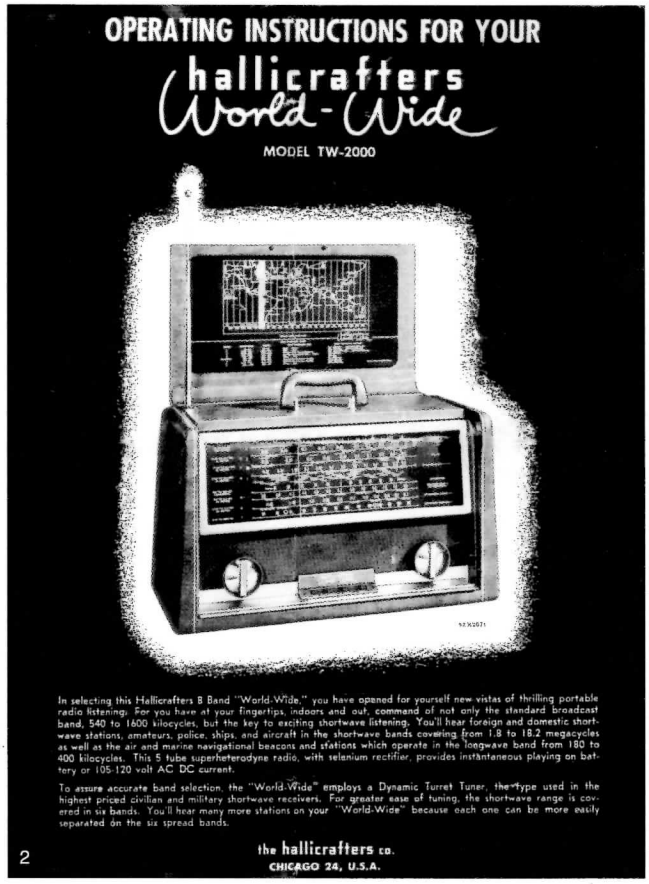

OPERATING INSTRUCTIONS FOR YOUR

hallicrafters World-Wide

MODEL TW-2000

In selecting this Hallicrafters 8 Band "World-Wide," you have opened for yourself new vistas of thrilling portable radio listening. For you have at your fingertips, indoors and out, command of not only the standard broadcast band, 540 to 1600 kilocycles, but the key to exciting shortwave listening. You'll hear foreign and domestic shortwave stations, amateurs, police, ships, and aircraft in the shortwave bands covering from 1.8 to 18.2 megacycles as well as the air and marine navigational beacons and stations which operate in the longwave band from 180 to 400 kilocycles. This 5 tube superheterodyne radio, with selenium rectifier, provides instantaneous playing on battery or 105-120 volt AC DC current.

To assure accurate band selection, the "World-Wide" employs a Dynamic Turret Tuner, the type used in the highest priced civilian and military shortwave receivers. For greater ease of tuning, the shortwave range is covered in six bands. You'll hear many more stations on your "World-Wide" because each one can be more easily separated on the six spread bands.

2

the hallicrafters co.
CHICAGO 24, U.S.A.

**The market for worldband portable receivers started as an American affair due to the massive local market with its high enough proportion of affluent 'men and women who had everything'. From the very first it was dominated by the Zenith Corporation, who introduced the legendary Transoceanic range during January 1942, and stayed in the driving seat for the next 25 years. However, even with their massive resources and the undivided attention of the energetic Commander McDonald, 'his baby' had a three year long and painful gestation period. The fact was, these sets were one of the more complex consumer items of the day and very difficult to design and develop for mass-production.**

### Anatomy of a Worldband Portable Receiver

The front end of course was the problem. To allow non-skilled users to tune in to the short waves with ease, it was found necessary to bandspread the international SW broadcast bands. This was usually done in four bands from 31 to 16 metres, plus continuous coverage from 2-4 and 4-8 MHz: throw in the medium wave 'Broadcast band' and Hey presto, you had a minimum of seven wavebands and twenty-one separate coils and trimmers, assuming a tuned RF amplifier design. You then had to devise a band switching system, 'close enough' to the coils and three gang condenser to ensure short lead lengths and hence stability, and rugged enough to last (Consumer abuse) for ever. Indeed a first class mechanical design was every bit as important as the electronic one and often the decisive factor in the long-term success of the project. Other considerations included providing for high-class components in key areas such as the local oscillator where (for example) only a 2.5% drift would move the 16 metre band off the dial!

### Creating the market

Development and production costs for these luxury portables were very high and invariably ahead of budget, so the selling price had to be correspondingly high. Zenith launched the first Transoceanic in 1942 at $75 and succeeded in establishing a high-end market at this price. The previous most expensive portable from the range was the 6G60 (which provided the basic Transoceanic chassis) at only $30.

After world war two the 8G was launched in 1946 at $120 but this was throttled back to $99 with the G500 – the first of the B7G models introduced for Christmas 1949, which enabled substantial production savings to be made.

With the introduction of the H500 in 1951, with its completely restyled and very attractive cabinet, Zenith got into their major stride ramping up production to very high levels for a set which now cost $124 and was clearly a money spinner.

Fig 1: The Hallicrafters TW-200 World-wide receiver.

Fig 2: Front page of Hallicrafters TW-2000 operating instructions.

Fig 5: Brown leather Zenith Royal 600 with wavemagnet in handle swivel mount.


5

Announcing the New Zenith
Super Deluxe TRANS-OCEANIC Portable

7 NEW features added to the World's only 13 year proved Shortwave Portable Radio

1. New Powerized Detachable Wavemagnet® Antenna . . . plus powerful new circuits increase sensitivity on the standard broadcast band up to . . . three times!

2. New International Tuning Dial permits far easier reading! Simplifies locating and tuning stations all over the world on shortwave or standard broadcast bands.

3. New Spring-Button Dial-lite illuminates entire face of dial. You can easily tune in your station in pitch darkness. Automatic release avoids excessive battery drain.

4. New Reelaway Power Cord reels out from side of case. Plugs in for AC or DC power. Springs back when not in use, readying set for battery operation.

5. New Voltmatic Regulator automatically maintains constant power flow through set, regardless of fluctuations at power source. Extends tube life!

6. New Log-Chart Compartment includes 24 pages full of complete weather and marine information. Data data about all major short-wave stations in the world.

7. New On-Off Indicator further guards against excess battery drain . . . provides extra safety check against power loss when set is not in use.

ZENITH SUPER DELUXE TRANS-OCEANIC RADIO

Zenith POWERIZED Features!

- Tropically treated against humidity, to prevent loss of sensitivity. AC, DC or long-life batteries.
- Long Distance Chassis brings you programs from dozens of different countries.
- Super-sensitive electrical spread-band tuning . . . brings you ship-to-ship conversations, marine and weather reports, amateur broadcasts, popular programs from all over U. S.
- Exclusive Radiorgan® Tone Control gives you choice of 16 different tonal combinations.

*One of these battery-operated portables is as necessary in your home as a flashlight in case of power failure caused by air raid or other emergency.*

*ASK ANY ZENITH OWNER!*

ZENITH
The royalty of television and RADIO
Backed by 35 years of Leadership in Radionics Exclusively
ALSO MAKERS OF FINE HEARING AIDS
Zenith Radio Corporation, Chicago 39, Illinois

*Model shown in durable Black Stag, $149.95*. Also available in luxurious top-grain cowhide at additional cost.*

*Manufacturer's suggested retail price (subject to change) not including batteries. Slightly higher in Far West and South.

**But what annoyed Zenith even more was they had been upstaged by the appearance of the slide rule dial, a feature they were to introduce a year later with the 600 series in 1954.**

### The competition hovers and strikes

Zenith's pioneering efforts were closely watched by other American giants and Hallicrafters, with their enormous short wave know-how, fancied their chances more than most to carve a slice out of this new market. Their customer base was more rooted in Hams, hobbyists and a small part in the Military and they must have coveted the prestige of having 'Kings, Ambassadors and Captains of Industry' as their customers for a change!

In 1953 they surprised the world and shocked Zenith with the introduction of the TW1000 at $150, a blatant Transoceanic lookalike complete with identikit cabinet and the 'Radiorgan' four tone control switches, an innovation that came with the introduction of the very first Transoceanic in 1942. But what annoyed Zenith even more was they had been upstaged by the appearance of the slide rule dial, a feature they were to introduce a year later with the 600 series in 1954.

The TW-1000 gave way speedily to the TW-2000, which looked almost identical but had brown rather than black staghorn covering and tidied up several minor shortcomings. This was the model I managed to import from America and, after necessary restoration, I was able to do a side by side comparison with my Zenith 600.

### The Hallicrafters TW-2000 first impressions

Fig (1) shows my example after restoration. I received it on the shabby side of very well used and it was not working. But it was otherwise complete including the detachable 'Skyrider antenna' inside the rear lid (Fig 3), and most unusually, with the original owners' manual (Fig 2) and shortwave guide. There was even a spare 1L6 in the 'Tube rack' inside the case, but alas its filament was blown...What was the bit about 'The Greeks bearing gifts'?

The first impressions after opening the case lid are dominated by the enormous slide rule tuning scale surrounded by a brass bezel and running the entire length of the cabinet, which itself is an inch longer than the Zenith 600 and half an inch wider. It covers eight wave bands displayed strikingly in green upon black, including the long wave, which Zenith did not have. This magnificence is reinforced by the world time map, heavily embossed with gold on black and covering most of the inside of the lid. The 5x7 elliptical speaker is directly below the scale and the 'copycat' Radiorgan tone switches below that. The band selector and concentric tuning/volume knobs are spaced symmetrically either side of the tone switches.
The owner's manual Fig (2), as well as providing a comprehensive operation guide, is an ebullient sales document high on the 'romance of communications'. Its opening paragraph refers to the 'new vistas of thrilling portable radio listening' and the short wave station guide follows up with the slogan, 'Your passkey to the world's romance'. This was all very much in line with their main short wave business promotion and designed to appeal strongly to the armchair traveller. In addition, the huge tuning dial is filled with station names, many evocative of lost empires and Somerset Maugham type travels around the South seas in the nineteen twenties. So on the 16 metre band we have Batavia and W.Samoa, and Rangoon, Java and Haiti on the 31 metre band. By way of contrast, the Zenith 600 owner's literature was a sober affair, concentrating on new technical features with their associated benefits and no station names on the dial.

### Review of the works

Fig (3) show the open cabinet rear and chassis and Fig (4) the chassis removed with the scale dismantled for repairs. The layout differed totally from the Zenith

Fig 3: Hallicrafters TW-2000 cabinet rear and chassis.

Fig 4: Hallicrafters TW-2000 chassis with dial removed for service.

Fig 6: Zenith Royal 600 cabinet and chassis.


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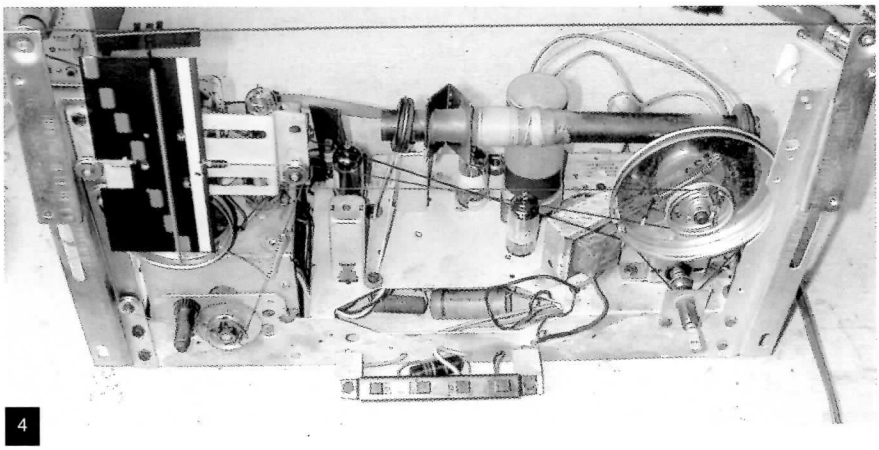

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600 having the battery compartment at the top and speaker underneath the dial rather than respectively at the bottom and RHS, but more significantly because the front end was based around a rotary 'Dynamic turret tuner' seen on the extreme right, as opposed to the Zenith coil tower (see fig 6 on the LHS), which had run basically unchanged from the G500 onwards. This turret tuner was a compact item similar to those used in Uhf short wave receivers and television sets. It was very well made and created a lot of free space on the main chassis as the RF amp and mixer valves were mounted on top of it along with the three-gang condenser.

Hallicrafters made much of this tuner in their various publicity bulletins, claiming it was the vital differentiator giving them a performance edge. And so you wouldn't forget it, they engraved 'Dynamic tuner' on the front brass dial bezel.

The MW ferrite rod aerial or wavemagnet was mounted on wire stilts on the main chassis and the moveable one or 'Skyrider antenna', which was supposed to attach to train or plane windows with rubber suckers, was clipped to the rear lid. Zenith combined the two functions in one on the 600 (qv.).

**The valve line up**

Consisted of 1U4-RF amplifier and IF amplifier, 1L6-mixer/oscillator, 1U5-detector+1st AF and 3V4 AF output. This is identical to the Zenith 600 so you would expect the circuit and performance to be the same and it is basically, though differences do emerge. The valves themselves were not the ones normally found in standard post war portable superhets so are worth a quick comment.

The 1U4 was the high end of B7G battery RF amplifiers having a higher Gm and Ra (Ac output resistance) than the more familiar 1T4. This was almost twice as high at around 1megohm and allowed 455KHz IFT's to be designed virtually independent of the valve characteristics, and equally important in a set like this, it gave superior performance on the higher SW bands i.e. above 10MHz.

The 1L6 has been the cause of a lot of comment over the years, based on the fact it was originally conceived as a 'special' by Sylvania for Zenith and became obsolete in its own lifetime and virtually impossible to find now. (They are auctioned at between $25-40 in the USA). In addition it does not have a simple 'plug and play' replacement. The DK92 is the best valve to use, though measures must be taken to prevent 'squegging' and one or two other problems. For interested parties, I addressed these issues in a detailed article some three years ago while restoring a collection of valve Transoceanics.*

The 1U5 had different pinning to the better known 1S5 and could stand anode and screen voltages up to 100v rather than 90 but otherwise was identical. Finally the 3V4 was the top end of the B7G AF output valves having a higher Gm than the 3S4 and allowing 90v on the screen as well as the anode. It gave the highest audio output and the sound is very impressive coming from the respective good quality speakers in the large 'luggable' cabinets.

**Repair and restoration – finding the faults**

The TW-2000 like the Zeniths was designed to accept 117v Ac or Dc as well as a combined 90v HT/ 7.5v LT battery. For 'Overseas service' a 220v plug-in adapter was available, again a Zenith look-alike. So for mains operation the input side was a relatively simple affair with a half wave selenium rectifier (invariably replaced with a silicon rectifier, thank goodness!) and heavily decoupled voltage dropping resistors for the HT, then LT filaments. In times of fluctuating supply, the filaments were sometimes starved of voltage and current causing

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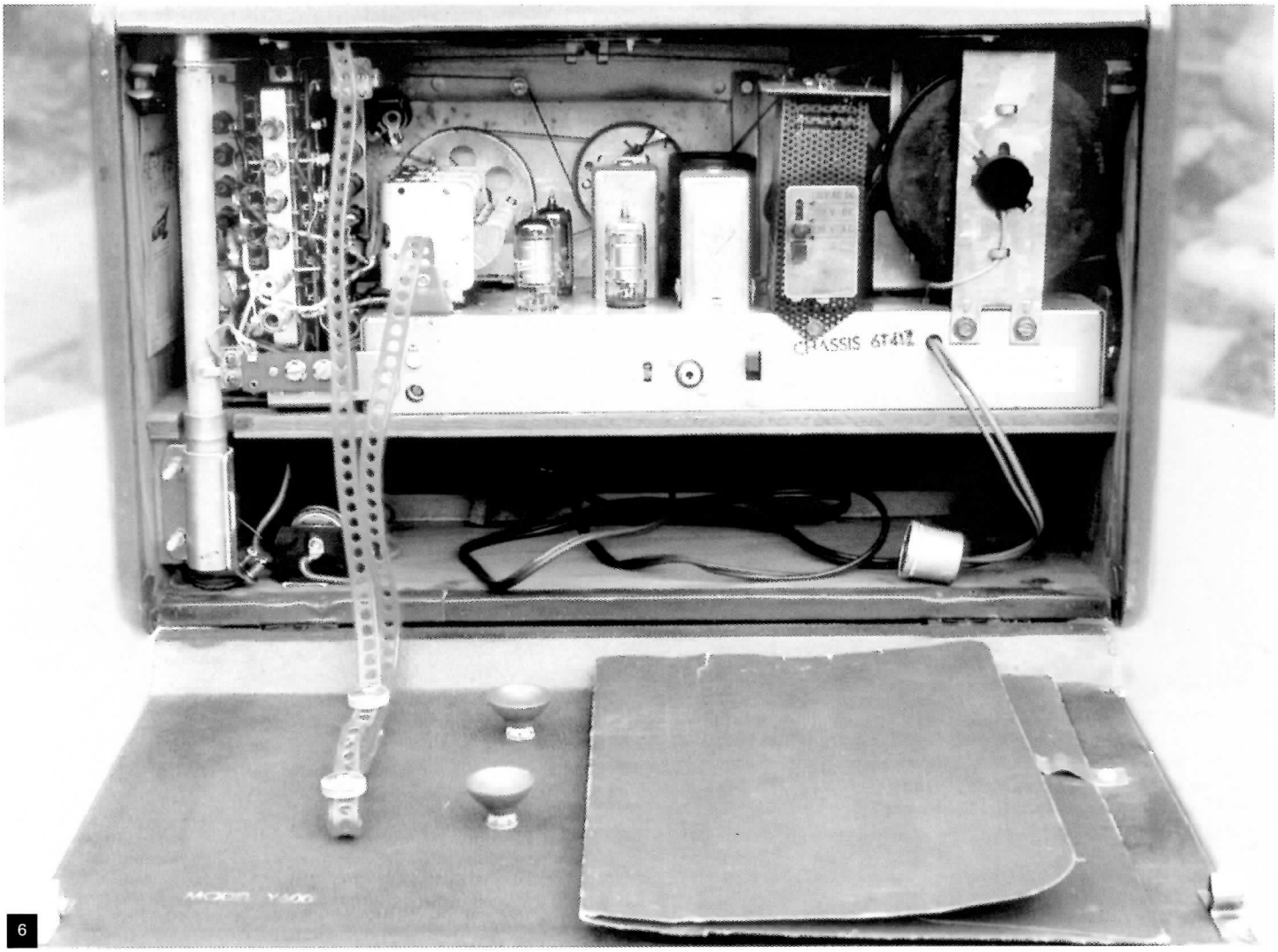


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non-operation of the local oscillator. Zenith's answer in the 600 was the introduction of the 50A1 current regulator valve at the top of the filament chain, but the TW-2000 had no such refinement.

I powered the set up on my 110v Maplin autotransformer as it was not fitted with the 220volt adaptor, but got no sound at all. I also made the interesting discovery that the complicated waveband indication system driven by the 'Dynamic turret tuner' was not working, but would have welcomed sound on any waveband at this stage!

So I removed the valves and checked the filaments which were OK, There was nothing for it, the chassis had to come out which was done by removing three bolts under the cabinet and one on each side inside. The whole chassis and dial assembly can then be lifted out at the front rather than rear with the Transoceanics. Voltage measurements revealed very high HT, explained by the lack of any LT across the filament chain, yet the filaments themselves were OK. So each valve was removed once again and the valveholder sockets cleaned carefully along with the pins. That did the trick, the set sprang to life and both HT and LT read normally. It didn't sound very loud or very good and there was instability on both the 19 and 16 metre bands along with some mains hum. Furthermore, it was very difficult to tell what band you were supposed to be on with the indicator system disabled, so fixing this became my first priority.

**Fixing the dial indicator system**

The whole dial assembly had to be dismantled to get at it, and it can be seen quite well on Fig (4).(ignore the main dial pointer which is unfortunately in the way!). In essence, a drum driven by the geared tuner spindle has a dial cord system, which moves a metal shutter along horizontally. Rectangular (red) 'patches' are mounted in a staggered vertical sequence on the shutter and each click of the tuner detent positions one in the appropriate waveband window. So what's the long vertical (yellow) stripe for, you ask? Now for the fun bit! One click past the Broadcast band at the bottom of the dial and there is no reception and nothing in the windows. One more click to the right and Bingo, you hit the jackpot. A yellow flag appears in all of the windows and you have selected the long wave band, which appears bizarrely in mid dial, similarly coded in yellow. My guess is that Hallicrafters had a large excess inventory of 9 position rotary tuners, maybe from a TV project and made a virtue out of necessity by using it in the TW-2000, which only used eight positions. (And probably started out in the Labs with only seven, i.e – no lsong wave!).

But why the jumbled sequence for the bands? The long wave is only one example, the rest are all over the place as well. Perhaps it was due to frequency absorption in the compact turret tuner assembly and they had worked out the optimum waveband sequence to nullify the effect. Anyway, to get my indicator working again I had to restring a broken drive cord and reset the whole system to give the correct indication. While I was about it, I took the opportunity to restring the main dial drive which was on its last legs, and was grateful to have the Howard Sams service sheet which showed the meandering route the cord takes around three drums.

**Restoring it to full spec**

With the Dial cleaned and back in place and all drive systems working I was able to turn my attention to other items. The RF instability was cured by fitting a new 1U4 in the RF amplifier position and the low and poor AF with a new 3V4. For the mains hum, two sections out of four of the composite main electrolytic

were replaced by wiring new ones in underneath the chassis along with the main 100mfd discrete filament chain capacitor. I then aligned the IFT's which were very close to true and set about the wavebands, thereby discovering some of the snags of the turret tuner system. Medium and long wave were OK as that section of the turret was open and accessible, but the RF section of all other bands could only be accessed by unclipping the appropriate aerial section wafer. This then had to be replaced and aligned itself through a hole in the turret rear, and that was only 'one pass'! (Unfortunately Hallicrafters were not using the 'hollow coil core' technology, which allowed a hex tuning tool to pass through one core to get to another. The Zenith 600 IFT's and 2-4, 4-8MHz bands used this.). The oscillator coils were aligned through a front hole – see the round cover just to the right of the turret knob in Fig (1). The corresponding cover to the left of the other knob had nothing behind it. It was for symmetry only!

In the TW1000 unbelievably, the 'oscillator hole' had been omitted so the set could only be aligned with the chassis dismantled! I would have liked to have been a fly on the drawing office wall when the chief engineer came in to talk about that one. It must have been the catalyst to a very early change to the TW-2000. So with everything working more or less to spec, I cleaned and polished up the cabinet and was then in a position to do a side by side performance comparison with the Zenith 600.

**The Zenith 600**

This was the 5th generation of Transoceanics so they had learnt a thing or two along the way. Fig (5) shows the brown leather version ($20 extra in 1954!), with the wavemagnet mounted in its 'swivel' position in a bearing on the case handle – one of the more significant innovations over the previous model, the H500.

On opening the case lid, the 600 gives a sumptuous and pleasing impression which must have made the 'man with everything' feel immediately that he was getting value for money. The dial scale with its bold white on black lettering was a little over half the length of the Hallicrafters but the useable SW broadcast part was actually longer on the 19m band and about the same length on the others. Most of the front face of the set was occupied with a high quality pale gold plastic moulding which 'tied together' the speaker, dial and waveband switching. The latter, based on the tried and tested 'coil tower' push button system was simple to operate and logical in the waveband order. The 'original' Radiorgan tone switches were beneath this, flanked by the volume and tuning knobs respectively. In addition there was a front mounted phone jack and for the first time, a dial light switch.

The inside of the lid was covered almost completely by two stylized plastic mouldings, one of which contained the book of logs and charts. The cabinet top surface had the Broadcast band wavemagnet recessed in a slot behind the handle. With the cabinet back open, it could be pushed up from beneath and mounted in the handle swivel bearing making the set a formidable Medium wave Dx machine. Alternatively it could be stuck to (the same!) train or plane window on the end of its red extension lead, normally stashed on the rear panel along with the rubber suckers.

Fig (6) shows the 600-rear view. Some of the features... the coil tower on the LHS allowed alignment in the cabinet, the cable drum on the RHS stored the mains lead and was sprung to automatically reel it in (could be a nuisance!), and the plug-in 220v adaptor is just to the left of the drum.

The rear lid had a clip for the owner's handbook, which was present in this case!

**Comparison and conclusions**

So how did they do? I stood them side by side and tuned them in turn to a variety of stations across the bands. The answer, (as reported elsewhere in the case of the Zenith) is very well indeed. Using the telescopic aerial fully extended, the sensitivity on both was very high and stations from the other side of the world were pulled in without difficulty. If anything, the Hallicrafters had a slight edge on selectivity but there was very little in it. Regarding ease of operation, I preferred the Zenith with its separate, rather than concentric tuning and volume controls. Also the tuning had a very tight and precise feel rather than the slightly 'spongy' one of the Hallicrafters. This probably was a consequence of the three tuning drums/extra scale length. As for sound quality, both are brilliant compared with modern solutions and for me the best way to listen to the short waves. Overall I preferred the sound from the Zenith which seemed to be more focussed and very lifelike.

So the TW2000 created a strong impression when it entered the market. It was a high quality product with an innovative front end and a dramatic appearance which appealed immediately to Hallicrafters enthusiasts, and still does today, if the speed with which it is snapped up on the Ebay auction site is anything to go by. For it was not produced in very large numbers and made no great dent in the powerful Zenith commercial machine. Which as we know, carried on to make its mark with Transoceanic portables in the new Transistor age. But that's another story.

**On opening the case lid, the 600 gives a sumptuous and pleasing impression which must have made the 'man with everything' feel immediately that he was getting value for money.**

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Transoceanic 1L6 replacement– the ultimate solution. Jim Duckworth. BVWS vol 22 no 4, Winter 97.

Transoceanic. Geoffrey Dixon-Nuttall. BVWS vol 22 no 2, Summer 97.

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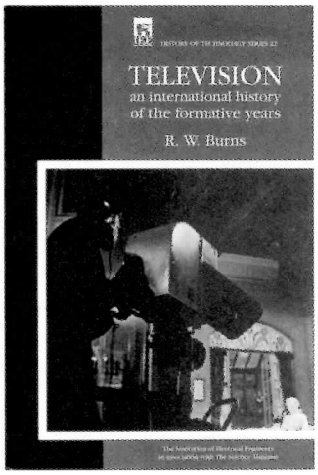
rutherford revisited continued from page 3

would be possible to transmit signals from, "...lightships and lighthouses to the shore so that signals could be sent any time." He said that, ".... if my next week's experiments come out as I anticipate, I see a chance of making cash rapidly in future." Ah well!

Rutherford, like many other young physicists at this time, became intrigued with the discovery of X-Rays in 1895 and the ionising radiations from uranium salts in 1896 and slowly turned his attentions in that direction.

* I am grateful to my brother, Peter, who located this house number for me. Peter happens to live in Cambridge - on Park Parade!




# Television: an international history of the formative years by Russell Burns

Institution of Electrical Engineers 1997
ISBN 0 85296 914 7
Hardback pp 656
£75 (discount to IEE members) but also see end of review.

Who invented television? If you are British the usual reply is Baird, cross the Atlantic and they will say CF Jenkins. But the story of television is not that of a single inventor, it is a star studded epic that crosses time and technology. Man had dreamed of distant vision for millennia; dreams turned to reality in the 1920s; the climax was in the 1930s. Russell Burns guides us through this epic in a book of similar proportions.

To begin at the beginning. Burns starts the journey in classical times and halts briefly at significant inventions such as the camera obscura, lantern slides and zoetropes. Then he reaches what were possibly the two most critical discoveries in the prehistory of television. The first of these was the concept of breaking down an image into a myriad of elements - scanning - used by Alexander Bain in his early attempts at facsimile transmission. Bain was hindered by the lack of any means of translating amounts of light into corresponding electrical signals. Willougby Smith discovered the photosensitivity of Selenium in 1873 to provide that vital link.

Burns puts all of these contributions into their context and clearly illustrates their place in the evolution of television. He has chronicled the contributions made by the stars in the television hall of fame. Nipkow, Campbell-Swinton, Baird, Farnsworth, Zworykin, Engstrom, Shoenberg and others are all placed in their context. After the broad sweep of the early chapters we see much more detail about TV development in many countries.

One abiding theme of the book is the David and Goliath contest between the lone inventor and the giant corporation. Unlike the biblical story, the Davids of television ultimately lost. The Davids are represented by Baird and Farnsworth while EMI and RCA were the Goliaths. It seems unlikely that television would have evolved in a practical form without the huge resources of EMI and RCA yet the lone inventors provided the vital stimulus to make television a reality. The contest is also reflected in the push for ever more lines. From the mechanically scanned 30 line pictures, which had necessarily limited entertainment value, to the bold foresight and ultimate glory of EMI's all-electronic 405 line system, the story is one of heroic efforts and achievements.

Although the scope of the book is wider than any other single history of television it still seems very heavily centred on the US and the UK. Perhaps this is a reasonable reflection of the pre-eminence of these countries' contribution to television. There are smaller, but still substantial, chapters on developments in France and Germany but it would have been interesting to know more about early work in such countries as Russia and Japan.

Since writing this review I have heard that the IEE has reduced the price from £75 to £39. This is a praiseworthy move. At the original price this excellent book must be mainly for the libraries; the reduced price makes it affordable for all who are interested.

Jeffrey Borinsky MIEE CEng

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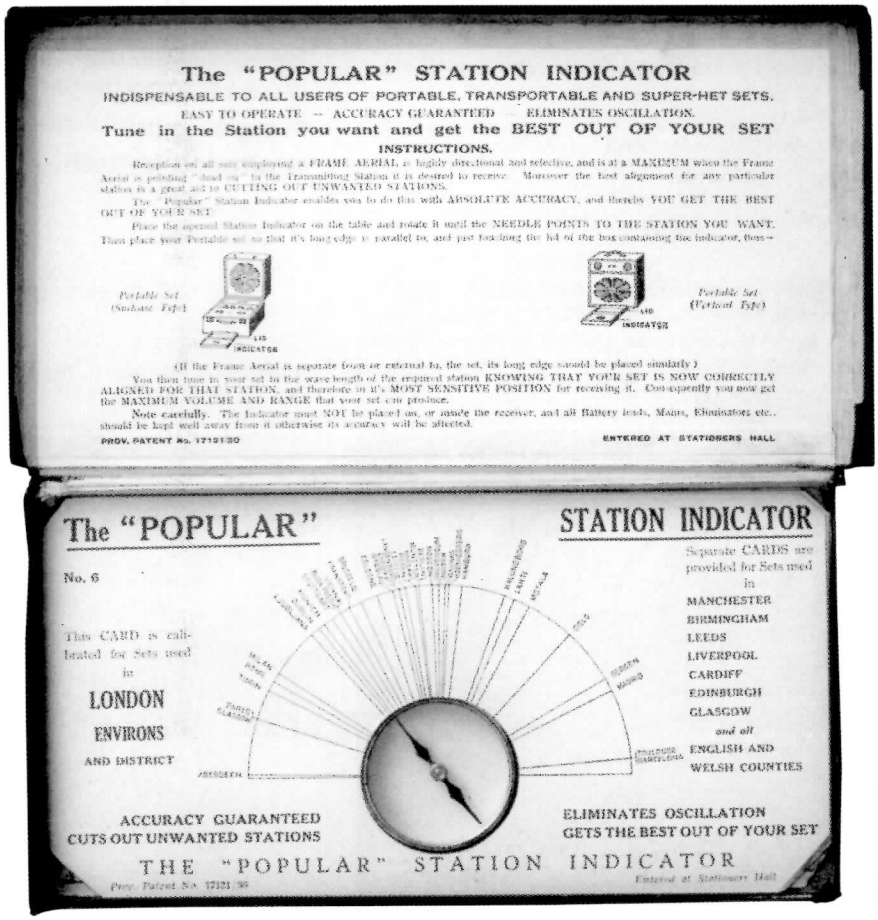
# The 'Popular Station Indicator'

by Ray Bayliss

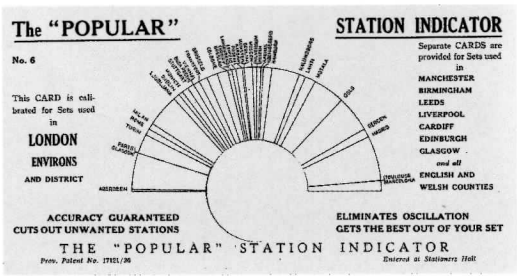



Although I have a reasonably varied collection of old wirelesses, components, accessories and ephemera, the only item I have never seen reference to is the 'Popular Station Indicator'.

The purpose of this device was as an aid in locating radio transmissions when using a portable radio. It is a small box about 8 3/4" x 5" x 1" containing a compass without the usual N, E, S, W markings and a set of double-sided removable cards which fit in the box. The cards have a hole in them to fit around the compass and station names are marked at various points on the periphery. Each side is marked with the name of a major town in the vicinity of which it is to be used. When the compass needle is aligned with the station to be received the long side of the box is at the correct angle and the portable is aligned with it. All one has to do then is find the station on the dial.

A provisional patent on the box indicates the date of maufacture was 1930. In spite of its name it does not seem to have been very 'popular'.

If a modern equivalent were to be made it could still be used with today's radios, bearing in mind that a ferrite rod needs to be aligned at right angles to the old frame aerial.



# The Bush TR82 A Design Classic

by Ian Liston-Smith

Front view of the TR82/97

**Design**

The TR82 has surely become an icon of the 1960s, no doubt enhanced by its frequent appearance in nostalgic TV programmes like *Heartbeat.* Although probably associated with the 1960s in most people's minds, Bush designed the case for the MB60 valve battery/mains receiver in 1957.

I don't usually feel particularly strongly about the aesthetics versus functionality arguments of any of the sets I collect – after all there's not much to design in a domestic LW/MW radio is there? But as many readers will agree, things aren't that simple. Some set modellers got their cabinets beautifully designed time after time, while others did not! Readers will no doubt be able to bring to mind examples of both. Regarding Bush however, I feel whatever there is to get right, they managed it in just two of their designs; the DAC90 (and 90A) and the TR82.

The dial of the TR82 is large and clear. When picked up by the substantial rounded handle, the radio is nicely balanced. All the controls have a firm, positive feel to them and the gently styled curves of the cabinet finish it off perfectly.

I am not a Bush expert, and don't intend this article to be an exhaustive examination of Bush's models from this era. It is therefore possible that I have overlooked a rarer set from this group. However, I have managed to uncover the following: the case was used not only for the TR82 and the earlier MB60, but also for the ETR82 short-wave/medium-wave valve/transistor export model, followed by the ETR92 all transistor version.

Then came the VTR103 LW/MW/VHF. There is also a TR82CL with a button marked 'Luxembourg'. This selects the pretuned factory set wavelength of 208 metres. No doubt the disadvantage of this arrangement was that the average listener probably wouldn't have known how to tweak the correct trimmer to adjust for the receiver drift as the tuned circuit components aged. How painful to listen to Radio Luxembourg when it isn't quite tuned in!

The TR82 came in at least three versions, each identified by suffixes:

TR82B brown with brass trim
TR82C blue with chrome trim
TR82D tan with chrome trim

As the production and performance of the germanium transistor developed rapidly during the early 1960s, Bush made internal circuit alterations of varying complexity. For example, early versions of the Mk I used OC72 transistors throughout the audio stages, but later these were changed to OC71s and OC78s. In the Mk II AF117s replaced the OC44 and OC45 transistors used in the mixer/IF stages of the Mk I and OC71 and OC81 were used in the audio circuits. Unfortunately the prefixes only related to the case style and not the circuit.

**Some set modellers got their cabinets beautifully designed time after time, while others did not! Readers will no doubt be able to bring to mind examples of both.**

A selection of TR82Cs and TR82Ds

Rear view of the TR82/97

**Buyer beware**

There are a few points to check when considering buying a TR82. Internally all models are pretty straightforward and solidly built - if it's not working when you buy it, this set is relatively easy to repair. The overall state of the case is a more serious consideration. The back panel is very thin around the edge and will often be found chipped.

The large tuning knob should be clear, but exposure to sunlight irreversibly clouds the plastic and occasionally these can be found completely opaque. There should also be a metal disc glued at the centre of the tuning knob, although these sometimes fall off. The BUSH lettering has usually lost some of its chrome finish and the top and bottom sections of the 'S' are sometimes broken off too. You must decide how badly damaged the case is before you buy.

**Dismantling and cleaning**

The most difficult part of this is the removal of the tuning knob. Bush recommend using a rubber sink plunger. But if you have strong (preferably thin) fingers, the knob can usually be eased off with a firm upward rocking motion. A little caution is required here; if the tuning capacitor mounting grommets are badly perished, this upward pulling will move it in its mountings. There is the chance that when pulling off this large knob, one of the tuning capacitor's mounting screws will be pulled too far forward and dent the red tuning dial plate from the inside.

Now remove the pointer - it's just pushed onto the tuning spindle. This usually benefits from a clean and/or repainting. The chassis is held in place by four self-tapping screws. Once unscrewed the chassis lifts out. The wave-change buttons pull off, but to remove the volume and tone control knobs, one end of the ferrite rod must be released by unscrewing one of its mounts. For thorough cleaning, the case is further dismantled by releasing the screws holding the top plate and front panel to the outer moulding. Spring clips hold the handle in place and are released by judicious use of a thin screwdriver.

All the knobs, case and fittings clean up like new when soaked in warm soapy water and scrubbed with a toothbrush. One word of warning though; the markings on the dial will withstand a little water, but not a soaking or scrubbing.° All the plastic parts, particularly the dial and clear tuning knob and the Rexine cloth come up like new after a good washing and rubbed over with ordinary furniture polish. A polish designed specifically for plastics should be even better.

The paint in the embossed lettering above the aerial socket and on the LONG/MED buttons is frequently discoloured or partly missing. It can be removed completely (after a good soaking) with a toothpick or similar to be replaced with the appropriate gold or silver from a felt-tipped pen. Any excess from around the edges can be dissolved and rubbed off with furniture polish if you have selected the right type.

**The chassis**

Unusually for a transistor set, no printed circuit board is used. Bush decided to continue their point-to-point wiring. The transistors are mounted on the upper surface of the chassis and are easily replaced if necessary. Depending on the model, the set may contain waxed paper and/or Hunts capacitors. Although these are not stressed in the same way as in a valve circuit, they often become leaky (i.e. act as if shunted by a resistor). The Hunts capacitors in my experience have a habit of going low in value or open circuit.

Some restorers don't believe in routine removal of components unless they are faulty. Well, it depends

The original TR82, ready for assembly.

what type of capacitors they are, but those described above are rarely fully up to spec. after 30 to 40 years, so they might as well be replaced. The electrolytic capacitors also tend to go low in value, so I'd be inclined to change these too. Other types are unlikely to deteriorate with age to anything like the same extent and don't need routine replacement.

If the volume control is very noisy, this sometimes indicates a leaky electrolytic capacitor on the wiper, putting DC on to the base of TR4. But if the electrolytics have been replaced and the control is still noisy, give the volume and tone controls a squirt of contact cleaner. Although a better solution is to open the controls up, clean them properly and gently wipe the track with a soft (B or 2B) pencil.

The tuning capacitor can be unsoldered and cleaned. This also enables its mounting grommets to be replaced once the gooey mess they've left behind is scraped off. Another area to clean is the wave-change switch. The contact surfaces of this usually tarnish badly causing noisy or intermittent operation. A squirt of contact cleaner and a small stiff fibreglass brush will have the desired effect. A general brush around the chassis will remove fluff, dead insects and food crumbs (how do they all get in?) that accumulated in its past life.

On a couple of these Mk I radios, I found noise and instability present on long wave, while medium wave worked perfectly. In both cases this was eventually traced to a faulty TR1, OC44.

As mentioned earlier, the Mk II used AF117s in the RF and IF sections. These transistors suffer from the well-known fault of the transistor shorting internally to the earth connection - the fourth lead. This is usually cured by simply snipping it off or on some other sets placing a 0.01 uF capacitor in series with the earth lead.

There is another 'fault' which can develop with old transistors. Their lead spacing is often only 1/16th inch or less where they enter the encapsulation. Over the years oxides and dirt can build up between the leads creating a resistive path between them. This can cause noisy or intermittent operation but is easily cured with solvent and a stiff brush - always worth a try before searching for another transistor.

**Alignment**

I never feel a restoration is complete without a check on the circuit alignment. I don't just mean the accuracy of the dial, but also the shape of the IF curves. After so many years there is the probability that the tuning of the IF transformers is no longer what it should be. However, in the dozen TR82s I've worked on in the past ten years or so, only about half needed any significant tweaking in the IF and RF sections. The wobbulator is invaluable for this. (I have a transistor/IC circuit and notes that are available to anyone sending an SAE. Perhaps I should get around to writing it up for the Bulletin...)

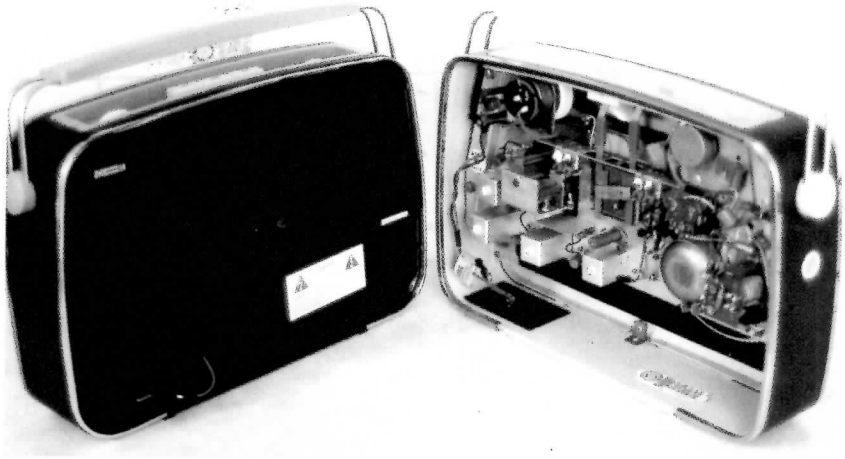
When the IFs are nicely re-centred on 470 kHz (not too narrow or it will result in sideband clipping making the radio sound muffled) mount the chassis into the case. If necessary, once the chassis is secured, slacken the loudspeaker mounting clip, push it firmly to the front panel and retighten. Replace the pointer with the tuning gang closed, aligning it along the horizontal line with the vanes closed. To facilitate future removal of the tuning knob, add a little grease where it grips the tuning shaft. Sensitivity and calibration are then checked and corrected in accordance with the service sheet.

All being well, the TR82 will last another 30 years.

**Bush TR82/97**

Bush released the TR82/97 in their 'Nostalgia range of Audio Products' a few years ago. It is currently (April 2001) selling for £39.99 – very considerably less in 'real terms' than the original TR82 that sold for £17.8.11 plus £5.7.11 purchase tax in May 1959 according to the Trader Yearbook.

On examining the reproduction set it was clear that it was made down to a price, and I have tried to bear this in mind while writing this. (Incidentally, the Roberts 'Revival' sells for well over twice the price of the TR82/97. It would be interesting to compare the Revival to the Robert's original...)



Inside view of the TR82/97 and TR82

The most significant differences to the original TR82 are that it can be run straight from the mains if required and also has VHF/FM. (In fact it's nearer to a reproduction of the VTR103.) There are no parts that are readily usable for replacements for the earlier design.

It has some quirks that are worth mentioning. The LW and MW dial is marked with the original station names in their original positions, but it is calibrated in kilohertz. Fair enough you might think until you realise that the tuning operates in the opposite direction to the 1950s design. So even if the named stations were still operating on the same wavelength, they'd be found at opposite ends of the dial!

To those familiar with the original set, the reproduction case does not quite have the exact styling of the TR82, although it is the same size. These minor differences include the slightly different handle and dial pointer. The on-off switch is on the volume control, although this is how it was done on the VTR103.

One of the less attractive features is that the VHF aerial is flimsily mounted on the back of the set rather than coming up through the top as it was on the VTR103. The headphone socket is on the top rather than the side and the large dial is held in place with what seems to be a self tapping screw just holding a friction mount. This isn't particularly satisfactory as adjusting it makes it either too loose or too tight.

The back is quite awkward to remove and replace too, as not only does the centre retaining screw have to be completely undone (it is not captive on this model, so will eventually get lost), but the panel has to be pressed in two places to slide it off. This cumbersome arrangement appears to be necessary to take account of the mounting of the FM aerial. It presumably confused some early users as paper labels are stuck on the back as reminders on how it should be removed. There is one improvement – the outer edge of the back is much thicker and less likely to chip.

Once the back is open, the works are concealed under a plastic cover held in place with ten screws. I wasn't inclined to dismantle it further.

Judging from its performance one would be forgiven for thinking that RF technology had made no significant progress in 40 or so years. It is truly no better on LW and MW than the original - well actually it's somewhat worse as none of my TR82s have second channel whistles on LW or MW, not even at night. Additionally, the accuracy of the dial on MW is appalling in my example - reading about 40 kHz high over most of the scale. No excuse for that these days no matter how cheaply the set is made.

Not having heard a fully working VTR103, I can't compare its VHF performance with the original, but this at least should be an improvement, of course also covering the full 88 – 108 MHz rather than just up to 100 MHz.

**Judging from its performance one would be forgiven for thinking that RF technology had made no significant progress in 40 or so years.**

The set comes with a 'Certificate Of Authenticity' stating, among other things that "The unit has been produced to the same design and strict standards as the original models." Well, on my original model I don't get radio pagers operating on 138 MHz and 153 MHz breaking through on medium wave.

If you have a good example of an original TR82, (or VTR103) I suspect there are aspects of the reproduction that will either annoy or disappoint you. Nevertheless, the styling is kept alive for another generation to appreciate, although I suspect the old TR82s will still be working long after the TR82/97s have fallen apart.

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# A 1950's Radio shop pictures courtesy of F. Hawkins

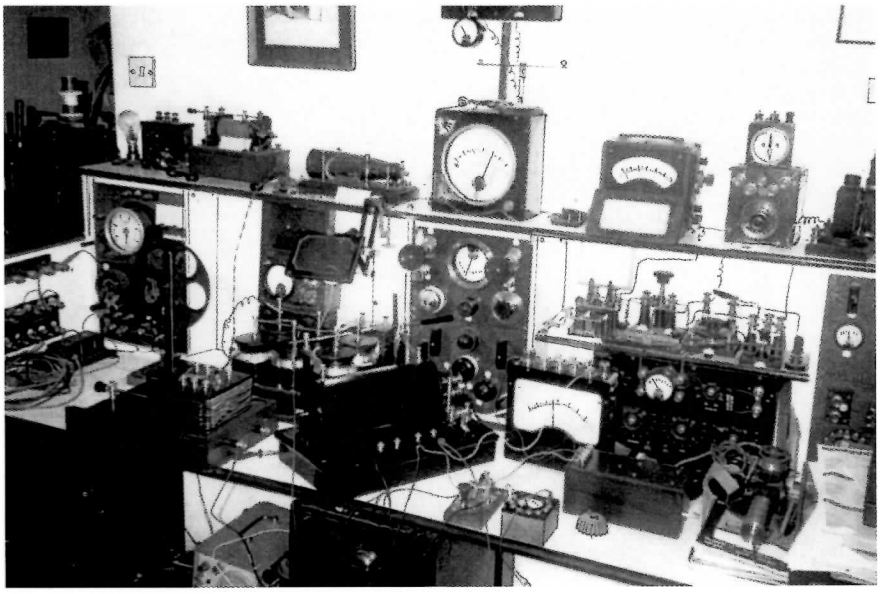
Right:J&M Stone of Regent St. Swindon circa 1955.

Bottom right: The shop in early 1950.


# In Marconi's Footsteps – yes really!

by John E. Packer

**An insignificant looking hut sits on top of windswept cliffs at Bass Point near Lizard Head in Cornwall, the most southerly point in Britain. It was erected by Marconi in 1900 and has survived a century of Cornish gales to become the world's oldest wireless station. In January 1901 it received over-horizon signals from the Isle of Wight, encouraging Marconi to conduct trans-Atlantic tests which succeeded in December the same year from nearby Poldhu. It then became one of the earliest ship-shore stations.**




The hut was recently purchased by the National Trust and restored to its original appearance. Photographs showing a 150 ft wooden mast and an internal view of the spark station c1902 have survived. Cornwall Archaeological Unit and staff from Porthcurno Telegraph Museum surveyed the site and found that the base of the mast survives, and after stripping layers of wall-paper-from inside the hut the aerial feed-through point was found plus screw holes on an internal wall which corresponded exactly with the shelves of equipment seen in the 1902 photograph. A sort through the undergrowth with a metal detector sadly failed to reveal the wireless treasures hoped for, just a 'home-made' insulator with eye-bolt and remnants of stranded copper wire which is probably original for in 1901 there were no such things as commercial aerial insulators, just the ceramic pots on telegraph poles.

Porthcurno Museum was commissioned to build a replica station. We decided to make a real working installation using as far as practicable the tools and techniques of 1901. The 10-inch spark coil secondary was wound in separate pancake coils in best Victorian fashion and produced an impressive spark. The aerial transformer or 'jigger' contains real coupling coils, the Leyden jar condensers do 'condense' and our restoration expert Ted Amor researched the right mixture of metal filings for the coherer receiver. We managed to find old fabric-covered wire for interconnections as PVC just wouldn't look right. A genuine antique P.O. relay, morse inker, and pad of message forms to put on the operators bench completed the installation.

Last January a re-enactment of the historic Isle of Wight – Lizard contact was made exactly 100 years later. Today's licensing regulations don't allow broad-band spark so the contact was made using a modern SSB transceiver to transmit the sound of the spark transmitter. A single-sideband transmitter radiates nothing when there is no microphone input; so it really was the spark set that generated the morse signal, but with the limited bandwidth acceptable today. To complete the restoration the National Trust put up a 30 foot wooden mast on the site of the original 150 foot version - planning permission for the latter would be difficult to obtain in this area of outstanding natural beauty although Marconi didn't seem to have any problem! A second room in the hut houses a modern amateur station with the call GB2LD which is used by licenced radio amateurs, and the hut is open to walkers on the coastal footpath from Easter to October. The hut is about one mile east of Lizard Lighthouse but is not accessible by road. (N.B. This path is now open again after foot-&-mouth restrictions)

To celebrate this Marconi centenary year we then decided to equip a room in the Porthcurno Museum with a replica of the wireless cabin of the RMS Titanic. Another replica spark set was built, and a vintage magnetic detector and tuner was lent by B.T. The installation is based on a photograph of the Titanic's sister ship the 'Olympic' which was equipped with the same standard Marconi marine installation. The spark set feeds into a light bulb to soak up the power and show visitors that it does actually work. We have not yet got the tuner/magnetic detector working, but one day we may try and see what it will do on an external aerial - it will probably get a dozen transmissions at once!

The project was enlightening and has cleared up a few queries. A "ten-inch" induction coil was the Marconi standard in 1901 for low power marine use. This meant a coil producing a ten-inch spark when unloaded, not a coil physically ten inches long. However, we found that when connected to the tuned circuit the spark length was drastically reduced and its quality changed. Without a tuned circuit a long unidirectional purple spark like miniature lightning was obtained each time the primary circuit trembler broke the current. With the tuned circuit connected a much shorter gap was

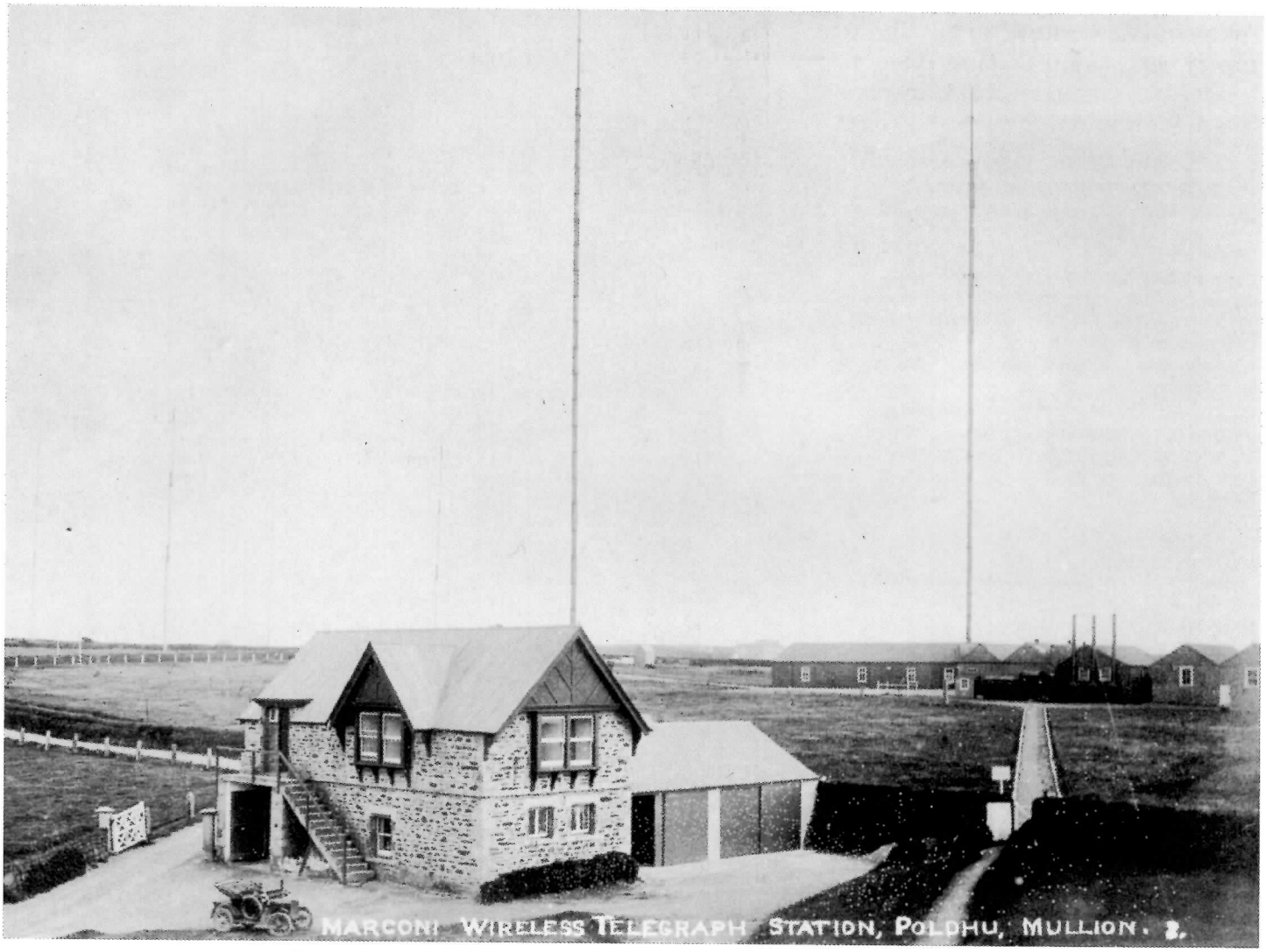
Top: Transmitting station.

Above: RMS Titanic wireless cabin.

Next page, top left: Marconi's wireless telegraph station in Poldhu, near Mullion.

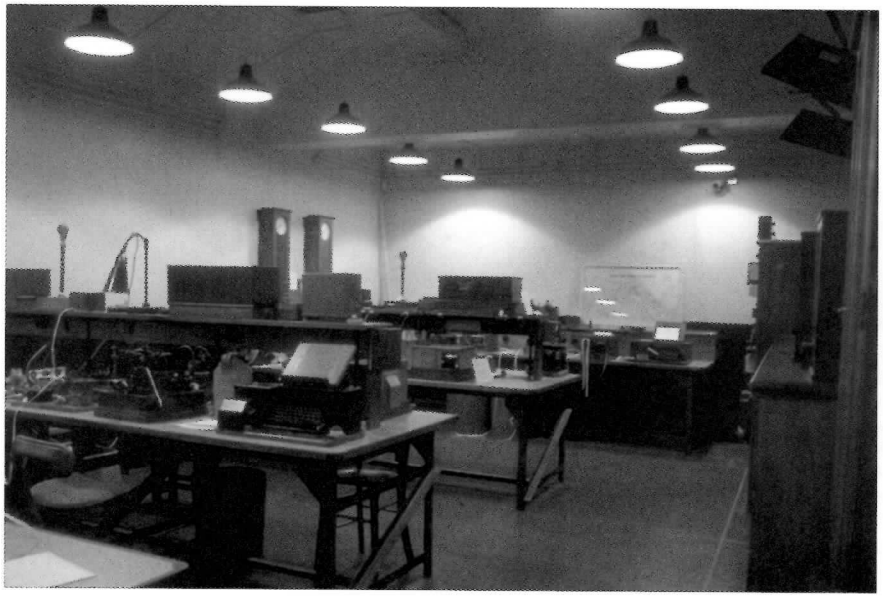
Next page, left: a working wireless station at Porthcurno.

Next page, right: Guglielmo Marconi.




necessary. A bright blue hot spark was obtained, and at each 'break' of the trembler the flywheel effect of the tuned circuit was actually providing a rapid succession of alternating sparks whose frequency, determined by the inductance and capacitance employed, was several megaHertz.

For those who like sparks, Porthcurno Museum also has two other replica spark sets, plus a genuine 'Great War' 20 watt trench spark set, and a Sterling airborne spark set. If you prefer valves we have a varied collection of World War II wireless equipment, most of it demonstrated to visitors in working order, and a transceiver which we operate on the amateur bands with the callsign GB2PK. There are also extensive collections of working landline and submarine cable telegraphy equipment covering the period 1836 to 1956. I am sure BVWS readers will find a visit to Cornwall of particular interest this Centenary year, with Porthcurno Museum, Goonhilly Satellite Earth Station, and Lizard Wireless hut all within easy reach of each other.



# Letters

**Dear Editor**
I wonder if the BVWS would be interested in making the valve museum known to its members.

At www.valve-museum.org <http://www.valve-museum.org> we have nearly 1,200 valves databased as a digital collection ( over 3,000 type designations covered). Each valve has a quality photograph and as much information as we can locate. The whole collection is extensively indexed and an equivalents list is available with over 4,100 references.

Some of the transmitting valves were donated by Gerry Wells, and many of the exotic valves are in the collection at HMS Collingwood.

When I visited Gerry last year his comment on the quality of the photograph of an R-type was 'I could build one from that picture'. I was very pleased to have impressed him.

The museum has featured in RadCom and Radio Bygones, and the CD-ROM of the site is selling well.

Best regards
Allan Wyatt
Curator

**Dear Editor**
SONRA (Society of Newfoundland Radio Amateurs) and Parks Canada are organising Marconi centenary celebrations for later this year and I have been asked by their researcher/writer Pamela Coristine if I would allow the use, for one of their exhibits, of two pictures from my vintage wireless website at http://www.vintagewireless.freeserve.co.uk . The exhibit, which will be displayed at the Cabot Tower, Signal Hill National Historic Site, tells the story of Marconi in Newfoundland and the history of amateur radio there.

Lorne Clark, BVWS member


Listen with a
Meccano Receiver

The Meccano Crystal Receiver No. 1 is a highly-efficient and splendidly-finished instrument. The detector is enclosed in a glass chamber, which effectively protects it from dust and moisture. Two slides are provided, one on each side of the inductance, giving great selectivity and clearness of reception.

The usual range of a crystal receiver for telephony is about 20 miles, but the Meccano Receiver with a good aerial should be effective up to 30 miles, according to local conditions, on which the range at over 15 miles largely depends.

No. 1 RECEIVER
Wave Lengths: Zero to 1,000 metres.
Dimensions of Set: 9¾ in. × 8¼ in. × 5 in.
R.S.1. (without 'phone) .. Price (Post free) 15/-

The Meccano Crystal Receiver No. 2 is of the constructional type, and is assembled from standard Meccano parts. It is specially adapted to the requirements of those who wish to carry out simple experiments.

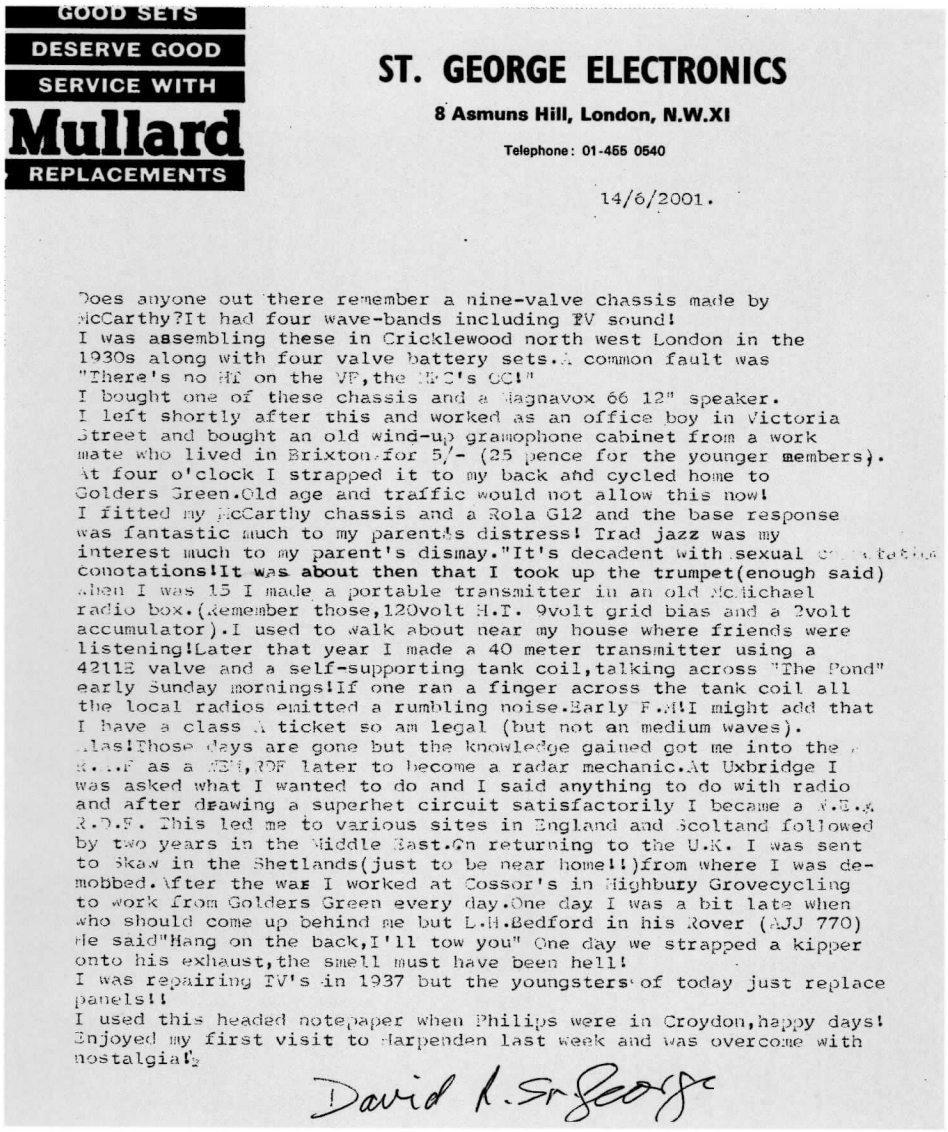
No. 2 RECEIVER
Wave Lengths: 300—400 metres (By adding additional inductances the wave length may be increased if desired).

R.S.2. Parts to make the No. 2 Receiver, complete in strong carton, including single 'phone, 2000 ohms resistance. Price (Post free) 22/6

R.S.2A. Parts, as above but without 'phone .. Price (Post free) 15/-

MECCANO DOUBLE HEADPHONES
British made, 4000 ohms resistance, and of the highest quality procurable, giving loud, clear and undistorted reception. Comfortable to wear and easily adjusted.
Price (Postage paid) .. .. .. .. 15/-

MECCANO LTD. BINNS ROAD LIVERPOOL


GOOD SETS DESERVE GOOD SERVICE WITH Mullard REPLACEMENTS

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Telephone: 01-455 0540

14/6/2001.

Does anyone out there remember a nine-valve chassis made by McCarthy?It had four wave-bands including TV sound!
I was assembling these in Cricklewood north west London in the 1930s along with four valve battery sets.A common fault was "There's no HT on the VP,the MPC's OC!"
I bought one of these chassis and a Magnavox 66 12" speaker.
I left shortly after this and worked as an office boy in Victoria Street and bought an old wind-up gramophone cabinet from a work mate who lived in Brixton for 5/- (25 pence for the younger members).
At four o'clock I strapped it to my back and cycled home to Golders Green.Old age and traffic would not allow this now!
I fitted my McCarthy chassis and a Rola G12 and the base response was fantastic much to my parent's distress! Trad jazz was my interest much to my parent's dismay."It's decadent with sexual connotations!It was about then that I took up the trumpet(enough said)
When I was 15 I made a portable transmitter in an old McMichael radio box.(Remember those,120volt H.T. 9volt grid bias and a 2volt accumulator).I used to walk about near my house where friends were listening!Later that year I made a 40 meter transmitter using a 4211E valve and a self-supporting tank coil,talking across "The Pond" early Sunday mornings!If one ran a finger across the tank coil all the local radios emitted a rumbling noise.Early F.M!I might add that I have a class A ticket so am legal (but not an medium waves).
Alas!Those days are gone but the knowledge gained got me into the R.A.F as a WEM,RDF later to become a radar mechanic.At Uxbridge I was asked what I wanted to do and I said anything to do with radio and after drawing a superhet circuit satisfactorily I became a W.E.M. R.D.F. This led me to various sites in England and Scotland followed by two years in the Middle East.On returning to the U.K. I was sent to Skaw in the Shetlands(just to be near home!!)from where I was demobbed.After the war I worked at Cossor's in Highbury Grovecycling to work from Golders Green every day.One day I was a bit late when who should come up behind me but L.H.Bedford in his Rover (AJJ 770) He said"Hang on the back,I'll tow you" One day we strapped a kipper onto his exhaust,the smell must have been hell!
I was repairing TV's in 1937 but the youngsters of today just replace panels!!
I used this headed notepaper when Philips were in Croydon,happy days!
Enjoyed my first visit to Harpenden last week and was overcome with nostalgia!

David A. St George

**Dear Editor**
After the article on Meccano Crystal Sets in the Winter 2000 Bulletin I have found a Meccano magazine dated Dec 1924 which also shows a No.1 receiver (see picture on left).

Also, for those who like crystal sets I have discovered a source of Woods Metal. A company in Cambridge called Goodfellow sells 50 gram pots of woods metal used for fixing crystals into crystal cups. The pot cost £53.80 + VAT. Its a bit pricey but a few members could get together and share a pot. If anyone should wish to contact the company their telephone no. is (01480) 424814 and the contact is Steve Aldesley.

Hope that this may be of interest

Best regards
Chris Brown

**Dear Editor**
With reference to the Summer edition of the BVWS Bulletin, I have a few comments: On page 23 the article on the Spring Harpenden Swapmeet captions two of the photos as '1920's lots'. I feel flattered by this as the sets in question had been built by me only a year or two before as an exercise in replica construction. However, they were not intended to fool any prospective buyer and were sold at a reasonable price for what they were.

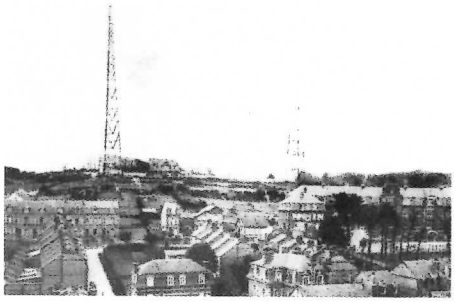
On page 26 the excellent article on aerials and earths discusses the difficulty of earthing but does not mention a practice I use myself (for crystal sets only). I use the earth from a nearby 13 amp mains socket. I cannot see why this should be dangerous. Have I overlooked something?

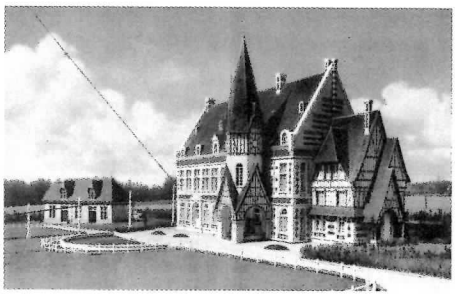
On page 34 a reader asks for information regarding a BTH VR2 Receiver. Some time ago I bought a cabinet for the above and set about building an interior. The set features on page 73 of 'Radio Radio'. My guess is that it comprised an RF and detector stage with special plug-in coils on the front panel. The valves would originally have been bright-emitter triodes but any later 2 Volt battery triodes would do instead. If your reader is still in difficulty and would like to contact me on 0115 9233 978 I would be glad to help further if I can.

Yours sincerely
Phil Rosen

**Dear Editor**
Thankyou for the latest Bulletin, I am glad to see that it is of the usual high standard.

I have enclosed a couple of reproduction booklets that we (Offshore Echos) have produced on Radio Normandie [see pictures on next page], which may be of interest to BVWS members. I would expect that many





Top: The masts of the Radio Normandie transmitter.

Above: The Radio Normandie building showing the cable going off-picture to the masts.

Both pictures are taken from 'Radio Normandie 1926 – 1939 Edition Souvenir' which can be obtained from:

Offshore Echo's
PO Box 1514
London
W7 2LL
UK

listened to Normandie on their valve wirelesses, as later generations tuned to Radio Caroline on their transistor radios.

There is a very nice section, in French although with a lot of pictures, on our website at www.offshoreechos.com.

**Dear Editor**

Tony Voysey's letter in the Summer Bulletin complained of radio interference on both AM and FM. From his description of the interference it is highly probable that the cause is a faulty central heating thermostat in his, or an adjoining house. The problem occurs when the contacts of the thermostat separate and an arc is drawn across the contacts which generates a broadband noise (just like the early spark transmitters). Typically the inteference lasts for several seconds and repeats again some minutes later. He may be able to locate the source by using a modern battery radio and use the directional properties of the internal ferrite aerial to find the source. Alternately simply place the radio near the central heating boiler, or room thermostat; if the interference increases in volume he has located the source. This kind of interference is very common, and is more likely in the Winter when central heating boilers are working.

Yours sincerely
RJ Harry

**Dear Editor**

I was interested to read Andrew Emmerson's article 'Electrolytic myths' in the Summer 2001 Bulletin. In general I agree with his conclusions, i.e. that the use of a variac in slowly powering up an old set does not help to re-form old electrolytic capacitors for the reasons he gives.

Nevertheless, the variac is useful in restricting potential damage if there are any serious problems in and around the set's power supply, HT line etc. Any uncharacteristic noises or smells - well before full mains voltage is applied - should alert the restorer to a fault before too much harm is done. Just connecting to the mains (without a low current fuse) is indeed asking for trouble as there is usually no time to react!

I have long been an exponent of the routine removal of some types of capacitor, all electrolytics being one of them. Unfortunately, those used in the power supply are often either expensive, difficult to obtain or both. Replacing with 'new' is the best action, but how new is 'new'? Any that were bought as 'recently manufactured' and then kept in storage for say five years would almost certainly be perfectly usable after re-forming.

I don't know where I first read it, but I remember a rule of thumb suggesting that 0.5 to 1 mA of leakage current per microfarad at the working voltage was acceptable for a high voltage smoothing capacitor once it was fully re-formed. This can be checked after isolating the capacitor by inserting a 5 watt 10 k ohm resistor between an HT power supply and the capacitor during the re-forming process. A leakage current significantly greater than this would indicate that the capacitor should be replaced. What I would like to know is, in a multi-section capacitor, should each section be re-formed separately, together, or doesn't it matter?

Eventually, 'recently manufactured' HT electrolytic capacitors will be unavailable at any price and at least an attempt at re-forming will probably be the only option.

Ian Liston-Smith
ian@wireless-sparks.freeserve.co.uk

**From *The Radiophile* concerning *405 Alive* to Mike Barker, Chairman of the BVWS**

**Dear Mike**

I would like to thank you from your good offices which have resulted in the publication of *405 Alive* being transferred from Radiophile publications to the BVWS. Please accept this as our official confirmation of the move.

I must admit that when the idea was first mooted I was taken aback, as until then the thought of this had never crossed my mind. However, it would be idle to pretend that there have not been difficulties - beyond our control - in the production of this magazine and your suggestion prompted us to consider what would be the best way forward for it and its readers. A prime consideration was of course, the opinion of the Editor, Andy Henderson, and it was not until we recieved his approval that we made a final decision that in the interests of all parties concerned would better be served by transference. Whilst we feel some sadness at the departure of *405 Alive* from our lists after a good number of years, this is well tempered by the knowledge that it is going to be in very good hands, and that we shall have more time to devote to our flagship *The Radiophile* and to our other publications. In this context I would like especially to mention *Radio Days*, a magazine which gives us great pleasure to produce and which, with a new editor appointed, continues to build up circulation.

In closing, I would like to pay tribute to Andy henderson, who for the last two years has been trying to do a very difficult job in the face of numerous problems, and of course to your good self for the courtesy and integrity which you have brought to all our discussions.

Yours sincerely
Chas. Miller

# The French Connection

by Peter Logan

**Have you ever wished you could turn the clock back and find a boot fair at which every stall was virgin territory and the dealers hadn't got there first. Well, it happened to me last year when we were staying with friends in a remote area of France. A nearby village announced that it was to hold the equivalent of a boot fair on the following Sunday when the whole village was invited to take part. Wow! I couldn't wait.**

That Sunday morning my wife and I, plus friends, arrived early. It was grey and overcast with a chill in the air and having been directed to park in a field by the Gendarme, we joined the trickle of visitors which led us to the start of the stalls.

It was exciting, it was fantastic, it looked like the contents of every barn, garage and attic was thrown on the ground and spread out on any convenient surface; an arranged table was not the general custom.

Many radios and TVs were in evidence, but mostly modern and although had I been back in England, I could have been tempted with some of the older sets, the idea of carting them around on holiday was out of the question.

As I was also on the lookout for literature concerning valves and scientific instruments, it was with some delight that on our way back to the car I discovered in a cart loaded with mildewed magazines and books, a rather tatty 1901 science text book, not that I can read French, but the tome was of the type that contains beautiful line illustrations of science apparatus and experiments.

One of the chapters that caught my eye was simple transmission and receiving devices with *Machines fondées sur l'induction* and *Radioconducteur de M. Branly, (cohéreur),* I understood that without translation, and I expect most readers will be familiar with the experiment anyway.

What I found even more intriguing, tucked in between the pages of this chapter was a cutting from an old newspaper dated 8 march 1928, giving the first instalment of a potted history of radiotelegraphy up to the invention of the coherer by Branly. This to my mind suggested that it was put there by a student fired by the same enthusiasm which we must have all encountered at some time in our lives when we have read something stimulating.

Looking at the cutting now with its heavily underlined key words, I began to wonder who that student might have been; did they pursue a career in radio? Might they have been some well-known figure in the world of communication today? What a pity it was not a signed letter or an initialled circuit diagram: it might have become a precious museum exhibit or a key piece to someone's personal family jigsaw.

I enclose a copy of the cutting for the benefit of our French-speaking BVWS members, and in the hope that this article will prompt other readers to go out there and make the French connection. Bonne chance!

(for translation see right-hand column)


Les amateurs français de radiotélégraphie et de radiotéléphonie ont un grand défaut, qu'il serait bon de leur signaler. La plus grande partie d'entre eux ne connaît pas l'historique de la T.S.F. et impute à telle personne la paternité d'un montage alors que c'est une autre qui l'a inventé.

Les débuts de la T.S.F. sont dus aux travaux distincts de deux physiciens très connus, l'un allemand, l'autre français. Hertz, physicien allemand, a découvert que les courants à haute fréquence se propageaient dans l'espace comme tous les autres phénomènes vibratoires. Son excitateur se composait d'une forte bobine de Rhumkorf sur l'éclateur de laquelle étaient montées deux grosses boules métalliques écartées de l'éclateur par deux tiges conductrices. Les ondes qu'il obtenait ainsi étaient très courtes, le circuit oscillant formé par la capacité entre les boules et la self des tiges étant très faible. Il reconnaissait l'existence des ondes nommées ondes électromagnétiques ou ondes hertziennes à l'aide d'un résonateur qui n'était autre qu'une spire conductrice dont les deux extrémités du fil étaient séparées par un espace très court. Chaque fois que l'excitateur était en marche, c'est-à-dire lorsqu'une étincelle partait entre les boules de l'éclateur, une étincelle éclatait entre les deux extrémités du fil résonateur.

Ces deux appareils permirent à Hertz de découvrir le principe de la transmission des ondes électromagnétiques et de déterminer les lois qui permettent de calculer la vitesse des ondes. Hertz trouva des chiffres inexacts par le fait que son résonateur n'avait pas les constantes électriques voulues. Des mesures exactes de cette vitesse ne furent faites que plus tard par M. Blondlot, d'une part, et par MM. Ferrié et Abraham, d'autre part.

Les travaux de Hertz qui eurent lieu vers 1887 avaient pour but de vérifier une théorie émise par Maxwell sur la décharge des condensateurs.

Hertz avait donc trouvé le principe de la télégraphie sans fil mais, malheureusement, son résonateur n'était pas assez sensible et la liaison ne pouvait se faire qu'à proximité immédiate de l'excitateur.

C'est alors que le physicien français Branly, entre en scène et découvre, vers 1890, un dispositif récepteur beaucoup plus sensible que le résonateur de Hertz.

Ce dispositif était basé sur le fait que la limaille métallique offre au courant d'une pile une résistance très grande due aux contacts imparfaits entre les grains de limaille. Si, en même temps, un courant à haute fréquence traverse la limaille, il se produit une sorte de cohésion entre les grains, les contacts imparfaits disparaissent et la résistance diminue dans de grandes proportions. Cet appareil a reçu par suite le nom de cohéreur. L'effet de cohésion se faisant sentir même lorsque le courant à haute fréquence avait cessé de circuler dans la limaille, il suffisait de frapper le tube la contenant pour revenir à l'état normal. — (*A suivre*). — H. ETIENNE.

Below: translation kindly supplied by Peter Merriman:

There is a particular failing which can serve well to identify French amateurs of radiotelegraphy and radiotelephony. Because the great majority of them do not fully appreciate the historical development of wireless, they tend to credit one person with the whole process even though it was another who originated it.The origins of "wireless" lie in the quite distinct works of two well-known physicists, one German and one French. Hertz, the German, discovered that high-frequency currents propagate through space like all other oscillatory phenomena. His generator consisted of a powerful Rhumkorf coil, across the spark gap of which were connected two rigid conducting pillars terminating in two large conducting spheres. The resulting waves so generated were very short, since the oscillatory circuit consisted solely of the capacity of the spheres and the self inductance of the conducting supports. He detected the waves, called electromagnetic or hertzian waves, by using a resonator which was simply an open-ended loop of wire whose ends were closely spaced. Each time the generator was operated - as shown by a discharge across the spark gap - a spark was observed between the ends of the resonator wire loop. These two items of equipment allowed Hertz to set out the principle of transmission of electromagnetic waves and the formulae for calculating their velocity. However, Hertz's figures were inaccurate, due to the fact that his generator did not have the necessary stable electrical constants. Exact measures of this velocity were achieved only much later by M. Blondlot and, independently,by Ferrie and Abraham.

Hertz's work, starting in about 1887, was aimed at verifying a theory proposed by Maxwell on the discharge of condensers.

Hertz had thus found the principle of "wireless" transmission but, unfortunately, his resonator was insensitive and coupling could occur only when it was in close proximity to the generator.Then, in about 1890, the French physicist Branly came on the scene with a much more sensitive detecting device than that used by Hertz. This device operated on the fact that metal filings present a high resistance to current from a battery because ot the poor electrical contact between the granules. However, if a high frequency current passed through the filings, it seemed to produce a type of cohesion between them, resulting in a very large diminution of resistance. This device was thus called a coherer. The cohesive effect between the grains continued after the high frquency current had passed, but it was only necessary to tap the tube containing them to restore the normal (high resistance) state.

.....To be continued) H.ETIENNE.

End of Text.

I have deliberately avoided a literal translation, but have tried to preserve the meaning of the original. I am certain that it was not meant to be tongue in cheek, but it probably reflects the French attitude at the time - a trait not entirely limited to the French? I also wonder how many instalments the item ran to!

Peter Merriman

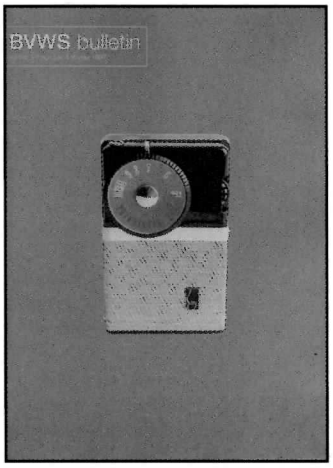
# Back issues

**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 Ekco's.
**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, KBFB10, 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 phony 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 and 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 0181 670 3667. Cheques to be made payable to 'The Vintage Wireless Museum'.

# News and Meetings

## The keeper of the list

Martyn Bennett still has the role of custodian of the BVWS list of G.P.O. Registration Numbers. As many members will know the project of assembling this list was started in the early days of the BVWS and, more recently, has been enthusiastically carried on by 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.

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

**Harpenden meetings**
There will be a swapmeet on the **25th of November**.

**Leeds radio fair**
Contact Andy Wilcox. **30th September** at the Jarvis Windmill Hotel, Ring Road, Leeds 14, LS14 5QF. 50 stalls, easy access and parking, 8am stallholders entrance, 10am open to the public. Stalls 30 pounds, entrance 2 pounds. Tel: 0113 266 4077 for details.

**Harpenden meetings 2002**
Auction AGM **3rd March 2002**, Swapmeet **9th June 2002**, Swapmeet **1st September 2002** (featuring 'Talking About Wireless' lectures in the small hall), Swapmeet **24th November 2002**.

**Southborough meeting**
John Howes will be running his South East area BVWS swapmeet on **Sunday October 21st** at: Victoria Hall, Southborough, Kent. All enquiries John Howes 01892 540022.

**Bristol swapmeet**
Contact John Horne 01275-373369.
**Sunday October 14th** at St Georges Hall, Easton in Gordano, M5 junction for Easton, follow road towards Bristol, first left, down hill and hall on left just past playing fields. Stall holders 09:30, members in at 10:15.

**Wootton Bassett meetings 2001**
Mike Barker will be organising a swapmeet on Sunday **December 2nd.** For further details please see advert on this page.

**Ashurst, Hampshire Swapmeet 2002**
Due to the succesful Lyndhurst swapmeet earlier this year there will now be one at Colbury Hall, Nr Ashurst Hampshire on **Sunday May 19th** 2002. For further details concerning this swapmeet please contact Sam Turner on 0238 0292374.

**Gerald Wells' garden party 2002**
Gerald will be hosting his garden party on **Saturday 8th June** 2002.

**NVCF 2001**
Jonathan Hill will be organising the next NVCF on Sunday **23rd September** Please see advert on page 2 for further details.

**NVCF 2002**
Forewarned is forearmed, next years NVCF meetings will be on Sunday **5thMay** and **Sunday 29th September**.

**New Articles**
If you have anything interesting to say concerning Wireless, Television, Broadcasting, Collecting etc. please send it to the Editor for future publication in the BVWS Bulletin. Your article can be just a few paragraphs long if you think it conveys its message to your fellow members. Also if you have any photographic material that would look good in the Bulletin, don't hesitate to post it to the Editor. The chances are that I will definitely use it!
Please send to: Carl Glover, 33 Rangers Square, London SE10 8HR.
Tel: 020 8469 2904 email: choris.b@virgin.net

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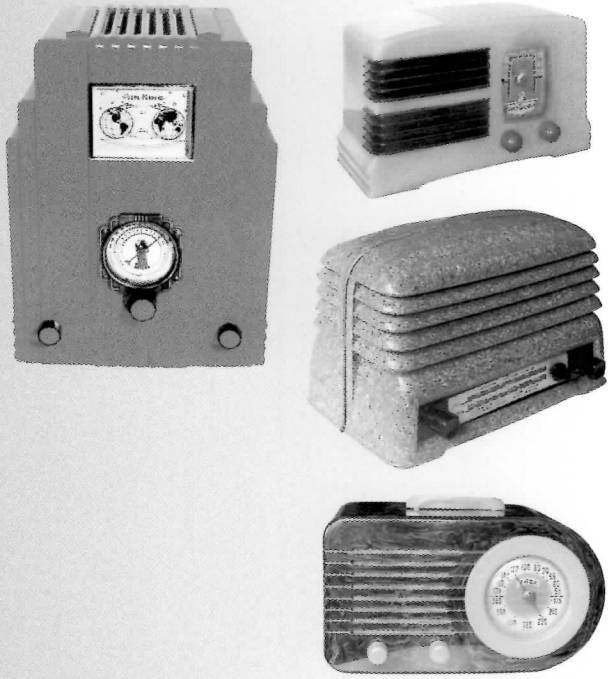

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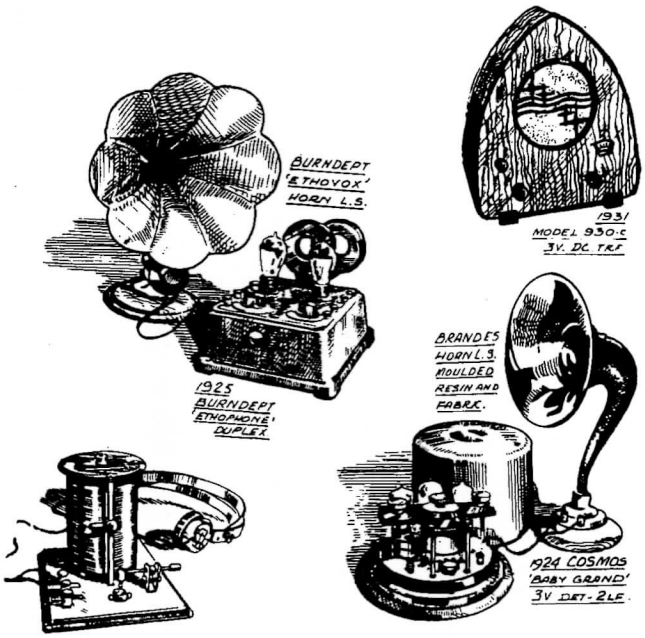
# BVWS POSTERS

3 designs depicting wireless sets from the 1920's, 1930's and1940's onwards

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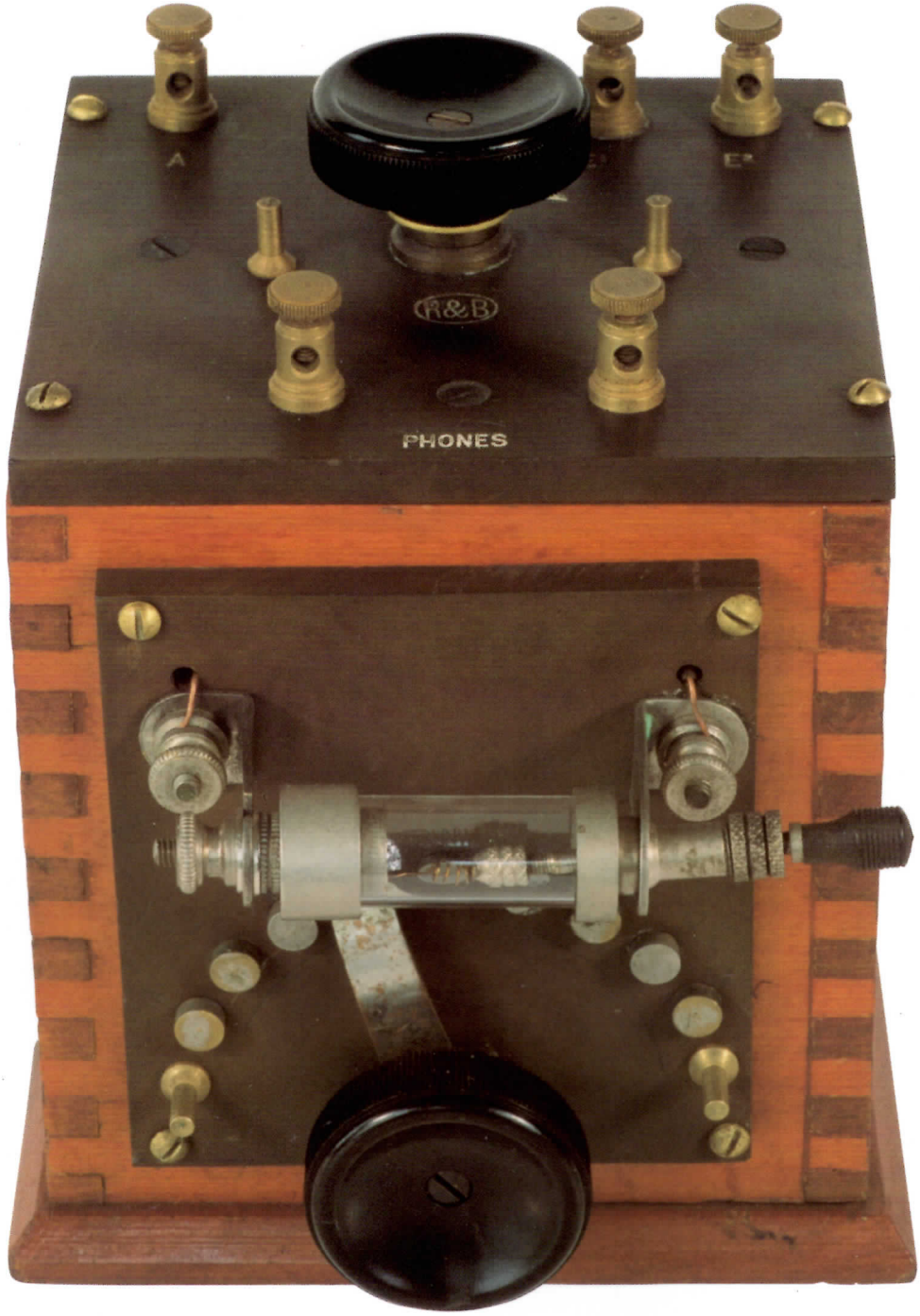
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