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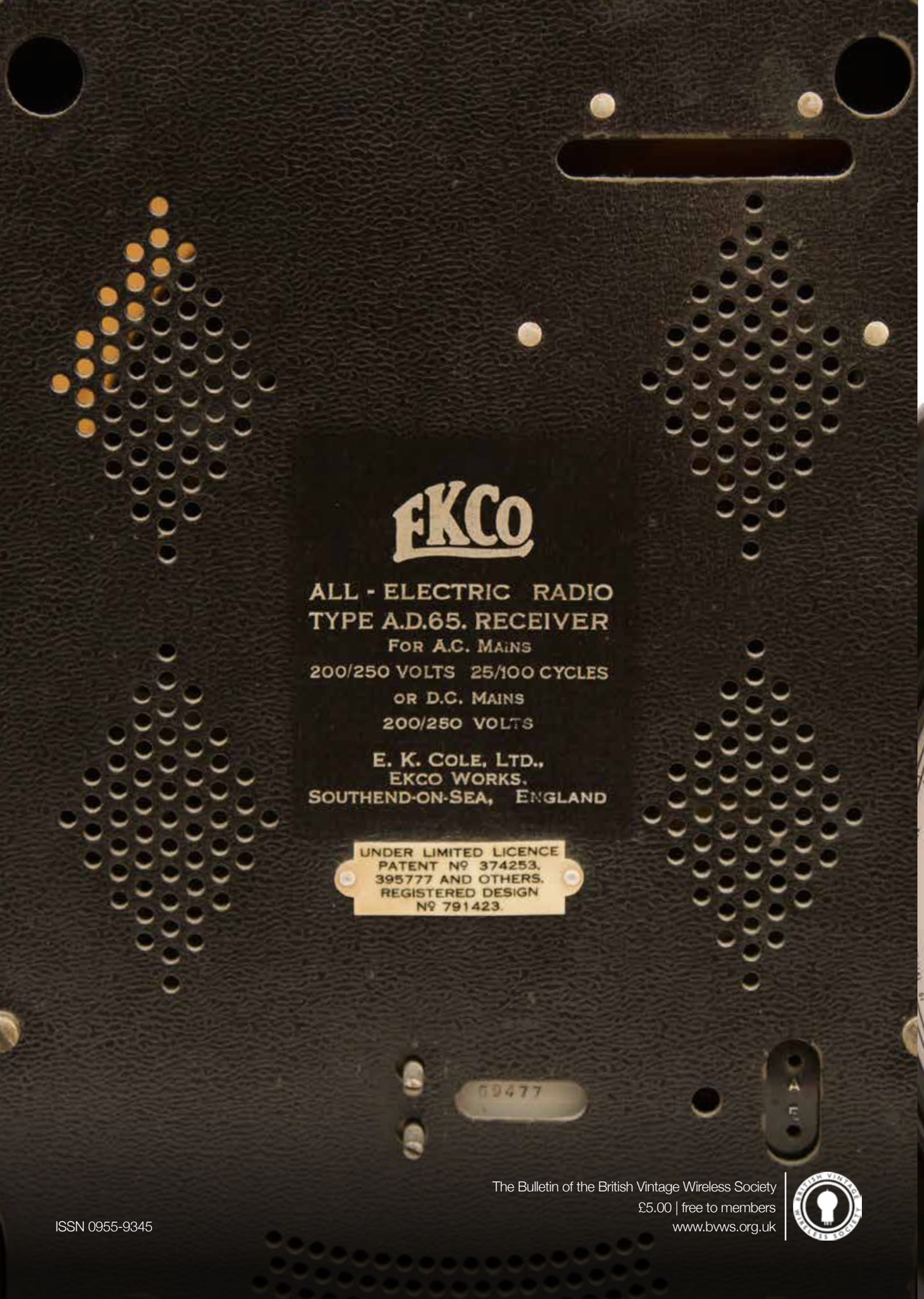

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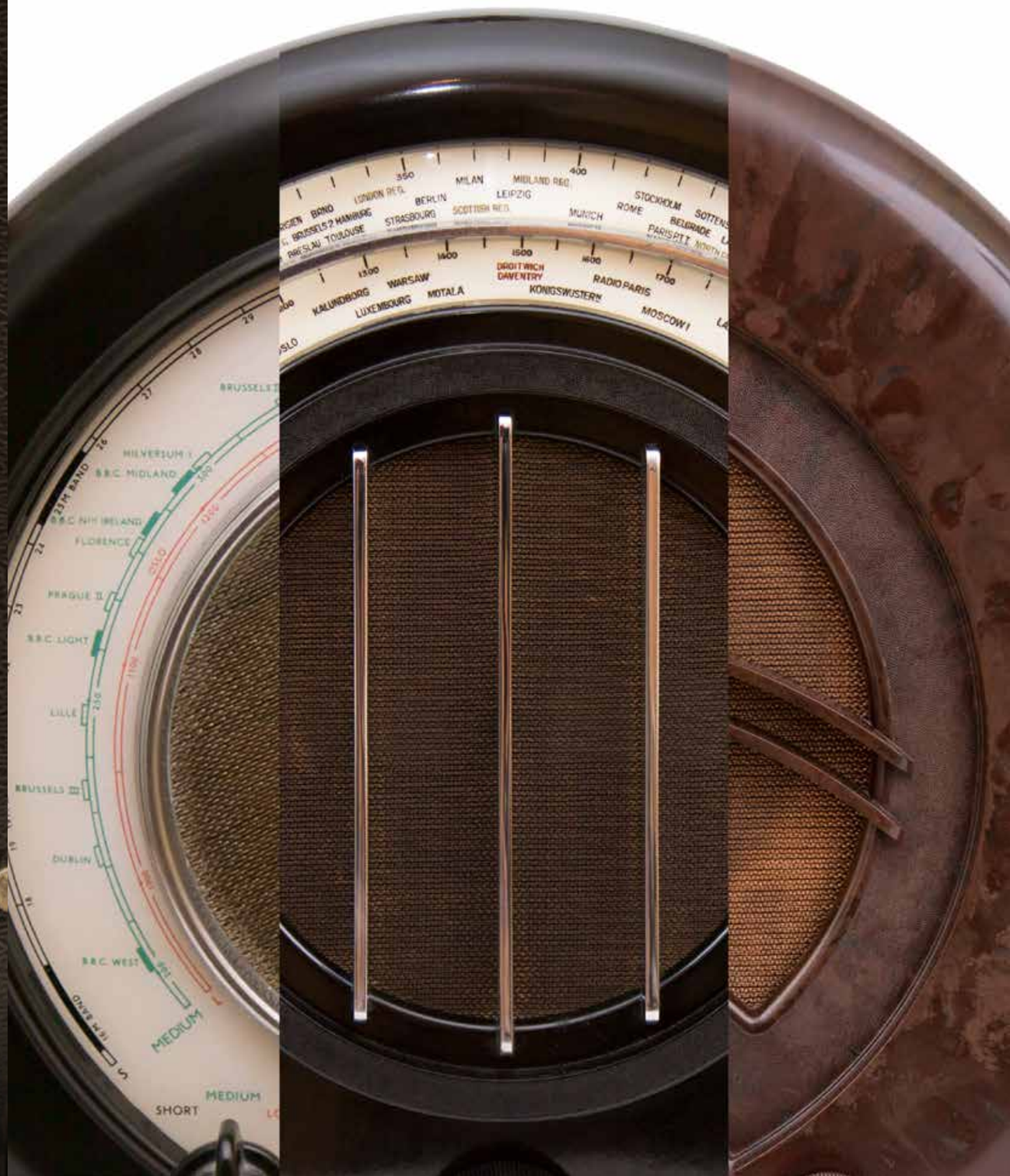

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Volume 42 No. 2
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Cover Images
'An Echo of Ekcos' from left to right, an Ekco A22, an AD-65 and an Ekco AD-36

Photographed by Alex Hewitt
Edited by Alex Hewitt
Proof-reading by Mike Barker and Steve Sidaway

From the Chair...

Having arrived in to this world in the first half of the 1960's, from my earliest memories I had a fascination for all things electrical, radio and television sets in particular. On the very few occasions that our trusty Philips 17TG100U telly failed, I was eager to see the repair man remove the back and swing the chassis out. There were some weird tubular glass things that gave an orange glow, plus some other strange and alien looking devices with coloured markings and wires that all looked far more interesting than anything my Lego or Meccano sets had to offer.

My interest was recognised and encouraged, radio sets that were no longer wanted in the neighbourhood were sent in my direction for me to fiddle with, usually ending up completely dismantled. And how I survived so many shocks before an earth leakage fuse board was fitted I'll never know! Cats get fewer chances!

I was first made aware of the BVWS back in the early 90's. But in those pre internet days I never got around to filling in the form and sending off a cheque. Then I became a dad (to our Bulletin editor, no less) and my own interests seemed to get put on hold for a few years. Fast forward to 2001 and I joined up having visited the NVCF at the NEC near Birmingham. In a world where no one seemed to care about old technology but discarded kit with frequent abandon to upgrade to the latest 'must have', I now realised that I wasn't alone in this world as a fancier of technologies past, indeed there was a large community of likeminded folk out there.

About 10 years ago at a Harpenden swap meet, I could see that the auction team were short staffed so offered to help on stage as a porter. And now I'm writing my first 'From The Chair', blimey, how did that happen? And I'm still a porter.

Mike had been on the committee for some 23 years and chairman for 18 of them. It was no secret that he was going to pass the baton on at some time in the near future and the last AGM he decided was the right time to do so. The Society has had the benefit of some very dedicated and hardworking people in its' history but I'm sure you'll all agree that no one has ever given quite so much of their life and time to the BVWS as Mike and of course his partner Jim have. But Mike did so much more than the normal duties expected of the chairman. He started the BVWS spares dept., the auction collection/storage service and I'm sure that those of you who have ever attended Harpenden or 'Bassett will agree that his skills with the hammer would put many a top auctioneer to shame. Fortunately for us, Mike has agreed to continue with these tasks so he'll still be present at our events but now being free from official duties he'll have more time and freedom to enjoy them. I wish him a very happy and well deserved retirement form the committee. The committee have awarded both Mike and Jim honorary membership of the Society.

I was honoured to be asked to take over at the helm of this wonderful and unique Society, now in its 41st Year. We've a strong and hard working committee, who I've always found most helpful and supportive. And I'm grateful to Jeremy Day for taking back on the job of treasurer.

You'll be pleased to know that I'll not be making any drastic changes, the Society has been chaired so well over recent years that I want to continue with the good work that has been done. However, although we celebrate the past with our collections and interests, it is important that the Society looks towards the future and that our existence is kept prominent and visible, utilising up to date marketing techniques and media to promote itself to both future members and to publicise events. This is something that myself together with the editor have plans to further develop.

And remember, it's YOUR Society after all, so why not drop the editor a line for the letters page (email is fine) and let us know what ideas you have to drive us forwards to the next 40 years….?

Best regards,

Greg…

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An Ekco of a Mayflower

Mark R James

This project continues the theme of my previous ones ("A Dragon of a Nixie" Vol.40/2 & A Glasshouse for a Defiant Vol 43/3) in that it evolved from an unplanned auction opportunity.

I have always liked the appearance of the round Ekco radio designs but have been put off by the high prices. However, when a damaged case for an Ekco AD36 of 1935 came up at an auction for a bargain price I could not resist it! The damage was relatively minor (Photos 1 & 2). The question then arose as to what to put in it. My initial inclination was to build a replica chassis. However, a few years ago I restored a Hacker Mayflower II which has been our kitchen radio ever since. It has met with the authorities approval because of its high quality sound and FM coverage which makes it so suitable for everyday use. After discussion it was evident which would be the preferred option if it was to be on general display. I put word out that I was looking for Mayflowers with no case or ones in poor condition. I rapidly acquired 3 chassis but with only one Out Put Transformer (OPT) between them – common faults occur commonly!

On measuring up the individual components I realised that fitting all the Mayflower components into the Ekco would be a challenge. I drew up a list of pre-requisites that any design had to comply with:-

1. No new holes in the case.
2. All existing holes to be utilised.
3. The majority of valves had to be mounted in a circular pattern as in the Ekco A22.
4. The dial had to be functional.
5. The magic eye had to be visible.
6. The Mayflower speaker should be utilised if possible & mounted on a wooden baffle.
7. The mains transformer had to be mounted low down for stability.
8. The chassis to be made out of brass to avoid corrosion. Ideally all pieces to come from stocks I had acquired in the past from a local non-ferrous recycler's which is now closed to the public; an aim I succeeded in!
9. The chassis to be easily withdrawn for servicing so all cables to it including the mains to be attached by plugs/sockets to allow extensions where necessary. In addition the dial stringing to be accessible.
10. All the methods of construction should be available to most competent radio repairers so that an article such as this should enable any radio enthusiast to follow in my footsteps utilising the principles for a circuit and cabinet of their choice.

The final product

Having drawn up this list and given the case a hefty coat of looking at I came up with a plan of action. At each stage I had only a few options for the next so the way it evolved was self determining.

The first problem was how to accurately map the existing holes and mounting points on the inside of the case. My solution was to use grub screws with the points sharpened and then inserted loosely into the brass ferrules with the pointed ends uppermost (Photos 3 & 4). A circular piece of plywood was then cut to fit inside the case and pressed down so that the centres of the ferrules were all accurately marked on it. Holes were then drilled using these indentations for location and the board mounted inside the case. The cut-outs and other holes could then be marked through from the front of the case onto the plywood pattern. The board was then removed, the holes drilled, and cut where appropriate with a fret saw. The inside of the case has two horizontal ledges approximately 3" up from the bottom which were obvious supports for a horizontal chassis member on which the mains transformer could be mounted. The plywood pattern was therefore cut at this point. The lower piece was then used as a template to make all the holes in the dial plate and a vertical supporting plate. Photo 5 shows it at this stage with the dial plate in position. I was fortunate in that the loudspeaker just fitted horizontally across the plywood template which then became the baffle board. The next stage was to mark up and trial fit the horizontal and upper vertical chassis plates. I wanted two parallel vertical plates firstly for stability as the brass I had to hand was quite thin and flexible and secondly to provide intervening surfaces to mount components on. The two plates were held together by a series of rectangular pieces of paxolin functioning as both spacers and stiffeners. With the loudspeaker in position and knowing the height of the valves and depth of the case it became apparent that space front to back was at a premium. The only solution was to cut out a circle in the rear vertical plate for the loudspeaker magnet and reduce the front plate to a ring to accommodate the cone. This enabled me to move the chassis as far to the front of the case as was possible – there was very little clearance! Photo 6 shows the trial fit. The next stage was to mount the vertical supporting plate at the front of the chassis. The dial plate, volume and tone controls are attached to this. Photo 7 shows the whole prototype structure clamped in a vice by the vertical supporting plate. As I said earlier each stage seems to have led to the next with only a few subsequent possible options ... it sort of designed itself!

Having obtained a basic chassis the next

Photo 1 - Cabinet

Photo 2 - Cabinet Damage

Photo 3 - Sharpened grub screw

Photo 4 - Grub screw in-situ

Photo 5 - Dial plate

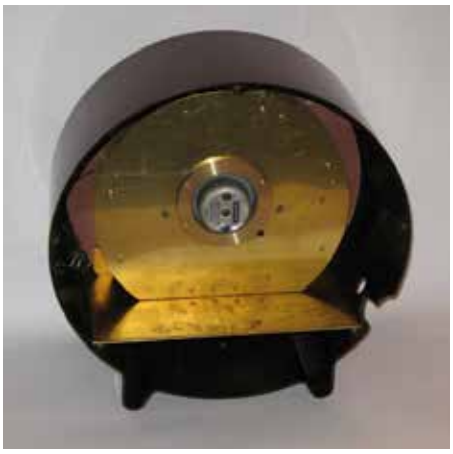


Photo 6 - Horizontal and vertical plates

constraining factor was to organise the dial drive and integral to that was placement of the tuner unit case which also had to leave enough space for the mains transformer. If possible I wanted a simple and accessible drive string, and to be able to remove a complete functional chassis from the case with the minimum of problems – I wanted it all! I quickly realised that with only 180° of dial visible there would have to be some form of reduction drive to the needle to enable accurate FM tuning. The solution was the easy availability on the internet of cheap nylon gears of virtually any module and teeth number. I would have liked brass but did not wish to take the risk of the significantly higher cost at this stage. Knowing that the dial

Photo 10 - Magic eye and dial & control mountings

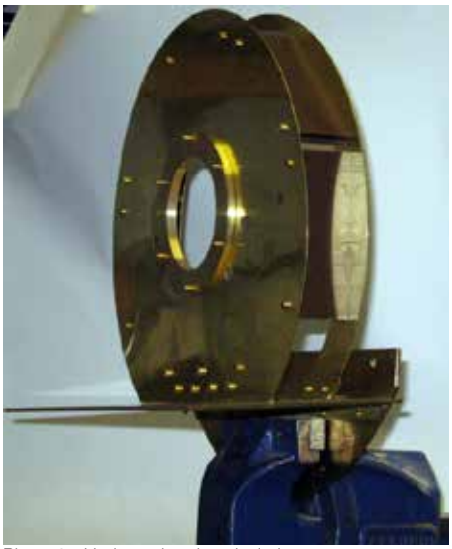


Photo 6 - Horizontal and vertical plates

should move 160°-180° and having measured the rotation of the drive to the tuner unit the gear ratios were quickly found. By choosing appropriate diameters it was then possible to mark the centres for the necessary shafts. To obtain the concentric reduction drive the dial string runs on the shaft from the knob to drive the tuner unit as happened in the donor Mayflower but at the back of the chassis for easy access. Four gears take the rotation from the tuner unit and reduce it and transfer it to a tube over the shaft to which the dial pointer is attached. Photos 8 & 9 show the elements of this which can also be seen in later photographs. With a piece of paper, a pencil and some accurate measurements this was not nearly as complex as it sounds. Enough space was left for the mains transformer, the mounting hole for which was chain drilled, cut and filed – another reason to use brass as it is so much easier to work by hand than steel. Try and use a new file though, as once they have been used on steel they are not nearly so good on brass.

Having fitted the key components the next stage was to work out how to place all the remaining ones. The valves and IFT's were easy as they were spread radially around the vertical plate so as not to foul on the transformer and tuner unit. The remaining components were placed where they would fit and least likely to cause or pick up interference. The shaped cut-outs for the IFT's were formed by utilising the relevant areas of the donor chassis. These were cut out with an angle grinder, clamped in position on the new chassis and the cut-out drilled and filed to the template. It gave a perfect result every time! The magic eye gave me a considerable headache. I came up with various options including side mounting it where the chassis was broken with a flick up mirror for visibility. In the end I struck on what should have been the obvious solution – to fit it so that it shone through the gap in the curved horizontal double bar/fret in front of the loudspeaker. A simple bracket was made to hold the valve and a piece of brass flat cut to suspend this in front of the speaker cone (Photos 10 & 11). As I wanted to be able to withdraw the chassis I installed a couple of plugs/sockets to disconnect the chassis easily from the cabinet mounted components. A simple 2 pin plug for the loudspeaker and a 9 pin for the magic eye and side mounted AFC switch (Photos 12 & 13). I could then use extension cables for working on the chassis remote from the cabinet. The next stage was to place and drill mounting holes for the remaining components such as fuses, electrolytics, dial light bracket and rectifier circuit tag strip. The OPT was placed below the chassis at an angle to avoid interference.

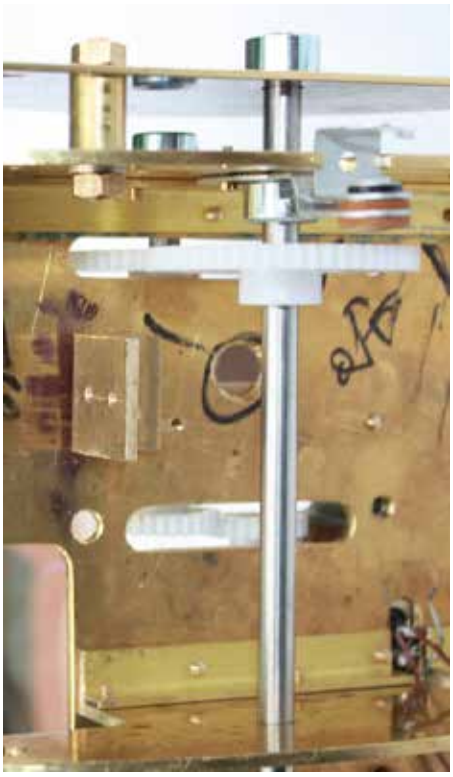


Photo 8 - Underside of gear train (rotated)

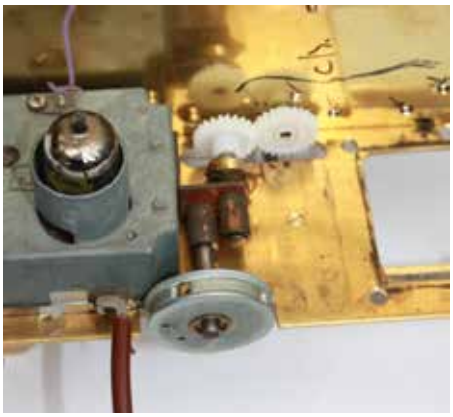


Photo 9 - Top side of gear train & discriminator drive

Brackets were made for the dial string pulleys, aerial socket, mains plug and on/off switch (Photos 14 - 17). A separate mains switch was needed as I was unable to make enough space for a potentiometer with integral switch at the front of the chassis. All the components were trial fitted at the time to avoid unpleasant surprises later! The chassis was now complete. Photos 18 – 25 show all the component parts of the chassis and a sequential trial build.

I had originally planned to polish and lacquer the brass but then came across a home plating system and decided to try this. The system is the subject of a separate article in this issue of the Bulletin. The plated components can be seen in the aforementioned article.

With the difficult stage done all that was left was to assemble, wire and test! The assembly was straightforward with some components being inserted during the process for ease of access (Photos 26 & 27). I was aware of the care that radio manufacturers took in placing components and routing the wiring in order to reduce/standardise any resultant capacitance/inductance/interference. I therefore mirrored Hacker's arrangement with some components around the valve bases and only those that Hacker had placed on tag strips on the circumferential paxolin

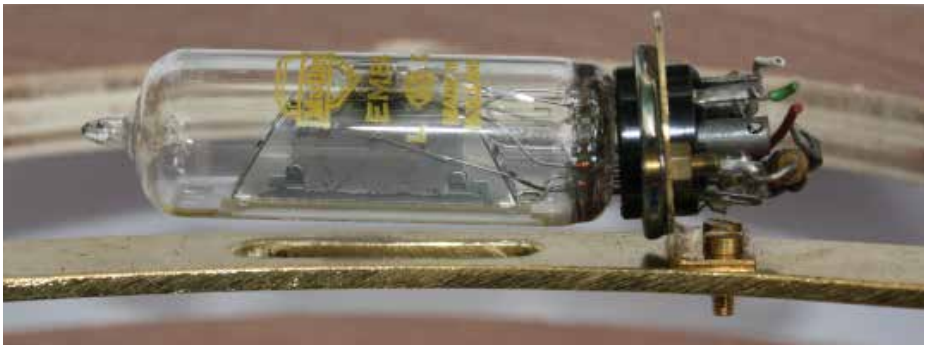


Photo 11 - Magic Eye mounting

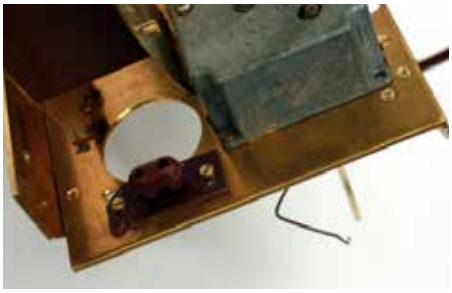


Photo 12 - Loudspeaker plug

Photo 13 - Magic Eye plug

boards. There was also some careful study of the circuit to help appropriate positioning of components. I planned out and marked all the component locations before commencing any wiring. This made the electrical build very straightforward with every wire/component checked against an intact Mayflower chassis for position (and also against the data sheets for specification/within tolerance) and then marked off on the circuit diagram. As was to be expected there was some head scratching to understand how Hacker had transposed the circuit into an actual build! All the valve heaters were supplied by twisted pairs and the metal rectifier replaced with a bridge made from four 1N4007's and a 30Ω resistor in series mounted on a tag strip. Photo 28 shows this stage of the construction. The front plated metal ring was then attached to the paxolin boards which made the whole structure rigid. The fully assembled structure is shown in photos 29 - 31.

The next stage was to repair the cabinet. I had originally planned to use this to house both the AFC switch and the sensitivity control but in the end managed to locate the latter at the back of the chassis so minimising cable runs. I therefore planned to use the existing cabinet side hole to mount the AFC switch. I used a rotary switch for this rather than a slide as used in the original and made a brass ferrule to

Photo 14 - RH dial string pulley

Photo 15 - LH dial string pulley

Photo 16 - Aerial socket bracket

Photo 17 - Mains switch & socket brackets

Photo 18 - Brass chassis components

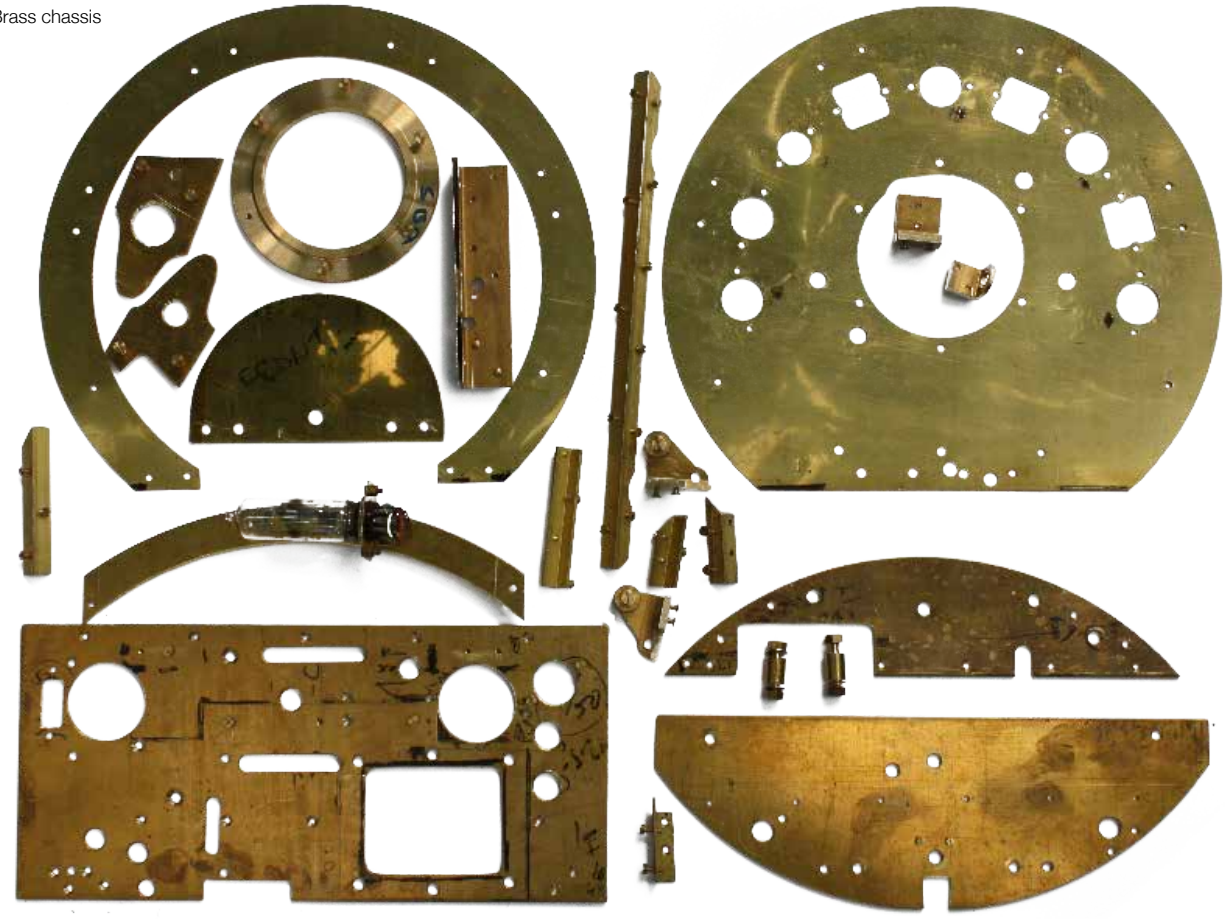


Photo 19 - Lower chassis in cabinet

appropriately reduce the hole size. I have read a bit about the techniques that have been used to replace Bakelite defects but in the end came up with one of my own. I was lucky enough to come across a broken cabinet from a 1930's Ekco which was a reasonable colour match and only cost me £2. This had straight sides but no curve which matched mine. The solution was to take a flat piece and hold it down with double sided tape. It was then filed/sanded down to just under 1½mm thickness at which point it was flexible enough to reproduce the curve without breaking. However, it was very fragile, the edges having broken off during the filing process leaving a piece just large enough for the job. This was then laminated to a piece of 0.6mm brass with Araldite and held against the outside of the cabinet with ratchet straps to cure, the cabinet being protected by cling film. The lamination technique worked well both supporting the Bakelite and fixing the curve. A piece was then cut out to match the defect. Choosing to match this shape was an error which I realised only after gluing the patch in place and back filling with a mixture of fibre glass resin and Bakelite filings. Photo 2 shows the original defect and photos 32 - 37 show the process of repair but the appearance in real life is quite good and I cannot quite bring myself to start again! Obtaining an exactly fitted piece for an irregular defect

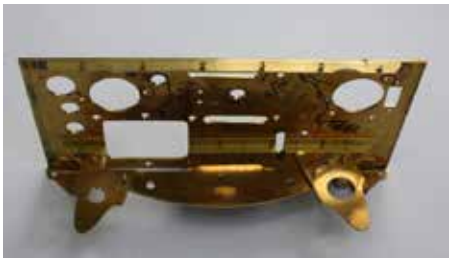


Photo 20 - Lower chassis

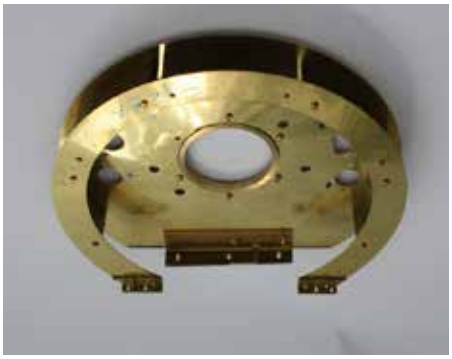


Photo 21 - Upper chassis

Photo 22 - Complete chassis

Photo 25 - Trial assembly front view

Photo 23 - Major components in situ

Photo 24 - Trial assembly rear view

Photo 26 - Build 1

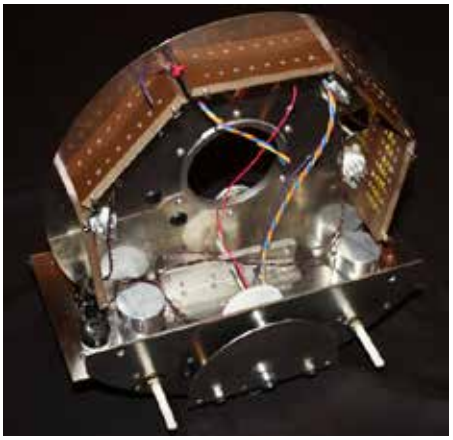


Photo 27 - Build 2

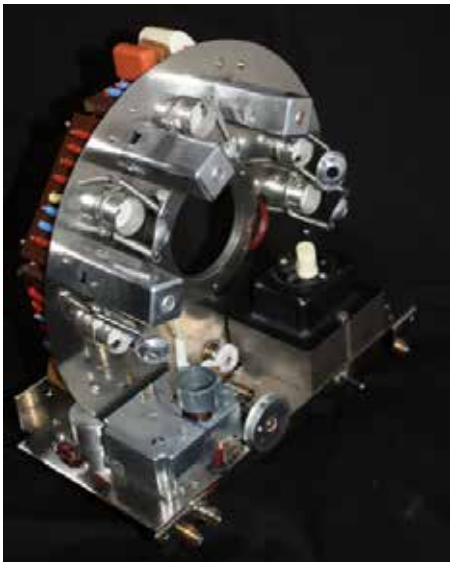


Photo 28 - Build 3

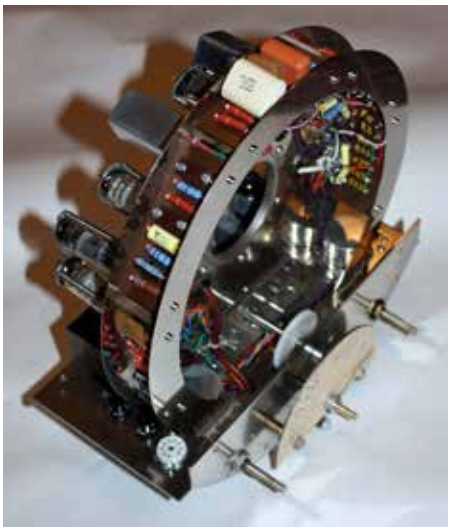


Photo 29 - Finished Chassis 1

Photo 30 - Finished Chassis 2

Photo 31 - Finished Chassis 3

Photo 32 - Gluing Laminate

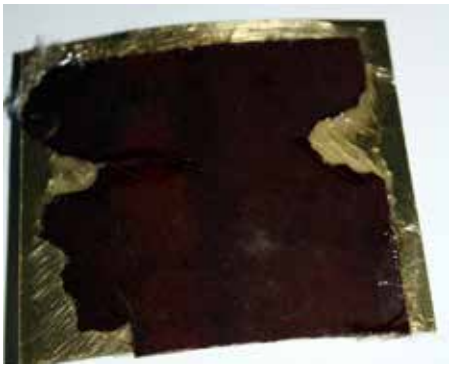


Photo 33 - Lamination

is quite difficult. What I should have done was convert the defect into a triangle. The replacement could then have been pushed in from the back giving a much tighter fit.

The inside of the finished cabinet is shown in Photo 38. Points of note are the laminated repair and the plug for the loudspeaker and the combined plug for the AFC switch and the magic eye. Extension cables were made for these to allow easy maintenance of the chassis. Fortunately, I had an acceptable speaker cloth and knobs in my collection of spares. The dial glass was cut from 2mm picture glass. The cut-out for the tuning shaft which is visible on the lower edge was a challenge and took several attempts.

Having gone to all the trouble to build the chassis it seemed a shame not to be able to show it, so a glass back was called for. This was again cut from 2mm glass but with the periphery covered in adhesive rubber edge trim and the whole held in place with some home made brass clamps which will be plated next summer. A guard was fitted to cover the lower aspect of the mains transformer (Photo 39). The completed radio is shown in the header photo for this article.

Prior to switch on all the usual electrical checks were carried out. Several Avo meters were used to monitor voltages and it was powered up via an isolated variac. Amazingly it worked at first switch on although selectivity was poor. Alignment was called for, something I had not done on an FM radio. This was another journey not for this article.... obtained an Advance 63E.... fixed it.... read up on FM alignment and watched youtube videos.... tried to carry out alignment.... broke cores in L1,L3 and the tuner unit upper coil (should have checked they moved OK before assembly).... Managed to remove and replace core from tuner unit but had to completely replace L1 and L3.... carried out alignment successfully.... it worked.

I now have a radio that looks like an Ekco AD36 but sounds like a Hacker Mayflower and am very pleased with the result. Building my own radio even using an existing circuit has taught me an immense amount about construction, repair and circuit functioning. I would thoroughly recommend the process!

Photo 34 - Insert

Photo 35 - Insert in place

Photo 36 - Finished outside

Photo 37 - Finished inside

Photo 38 - Inside Finished Cabinet

Photo 39 - Glass Back

Restoration of a 1930s Bestone Radio

Stef Niewiadomski

We tend to associate radio imports from America before and during the war with midget radios, often versions of the popular ‘All American 5’ design, produced in vast numbers at very low cost, made suitable for UK mains and occasionally with a long wave band added.

However, higher performance, and higher cost, radios were also imported, and an example of such an import during this period is the Pilot U-106, shown in Figure 1. At 24-inches high, the U-106 is certainly not a midget. The lower cost of valves in America, and an exchange rate of about $5 to £1, allowed radios like the U-106, with its ten valves, push-pull output, and covering six wavebands to be competitively sold in the UK for a very reasonable 25gns.

Compared with the U-106, the radio described here is only just over half the height, and contains only five valves (probably six when it was built, see later), but does have long, medium and short (covering 50m to 18m) wave coverage. It clearly states ‘Made in USA’ on its 4-inch diameter dial, which is calibrated in metres, and is also marked with European station names, and so it was built for export to Europe. The circular ‘Airplane’ dial is similar to that of the U-106, and this style was fashionable at the time. There is a distinctive motif of three crowns printed on the dial, but this in itself didn’t help with identification.

A little research led me to Figure 563 of Radio! Radio! which shows my model, see Figure 2. Jonathan Hill describes the radio as being a ‘Bruton’, which doesn’t seem to correspond to my radio: perhaps there were other importers of the radio, being sold under a different brand?

The radio came to me as a cabinet, size 13-inches high by 8¾–inches wide by 12–inches deep, containing a cardboard box (strangely of American origin, whereas the radio seems to have spent most of its working life in the UK) into which the chassis fitted neatly. The clever use of an upward-facing speaker attached to the inside top of the cabinet allows the reduction in height, and a compact chassis reduces the width and depth in proportion. See Figure 3 for the state of the cabinet before restoration. It had been stored for many years on the premises of a radio dealer, and was in danger of being consigned to landfill as the building was planned for demolition.

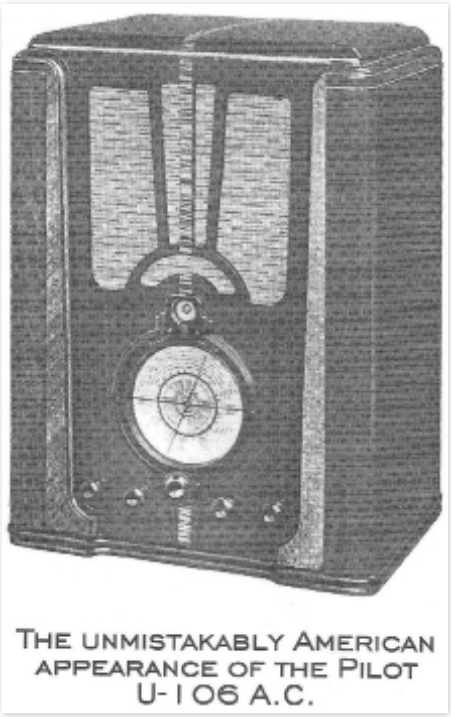


Figure 1: An example of a higher-end import from the USA before the war is the Pilot U-106, fitted with an ‘Airplane’ dial and a magic eye tuning indicator.

At the bottom of the front panel of the wooden cabinet, there was a metal label saying ‘Bestone’, but no other manufacturer’s

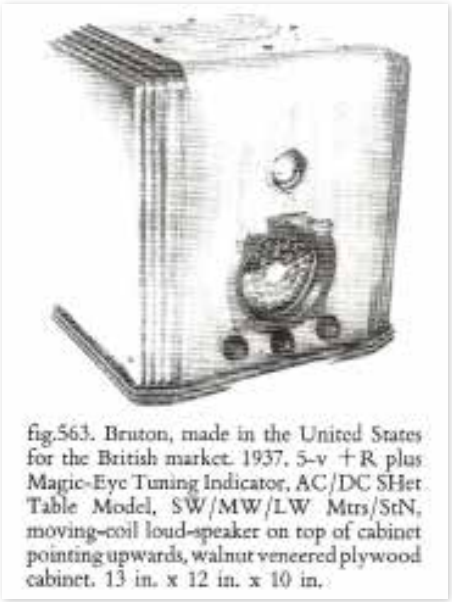


fig.563. Bruton, made in the United States for the British market. 1937. 5-v +R plus Magic-Eye Tuning Indicator, AC/DC SHet Table Model, SW/MW/LW Mtrs/StN, moving-coil loud-speaker on top of cabinet pointing upwards, walnut veneered plywood cabinet. 13 in. x 12 in. x 10 in.

Figure 2: My radio as shown in Figure 563 of Radio! Radio! The Bruton branding was not present on my radio.

or model name was present. There was no speaker and only two out of the three rather attractive wooden knobs were present. It would appear that the third knob had gone missing when the chassis had been dropped, and the shaft of the wavechange switch had been snapped off (perhaps more likely when someone had tried to straighten it) and one edge of the chassis had been bent. A sad-looking ECH35, with its location spigot broken off and its top cap missing, was the only valve plugged into the chassis.

Figure 3: The cabinet as it came to me.

Figure 4: The Bestone Little Corporal midget radio, which helped me track down the history of the Bestone brand.

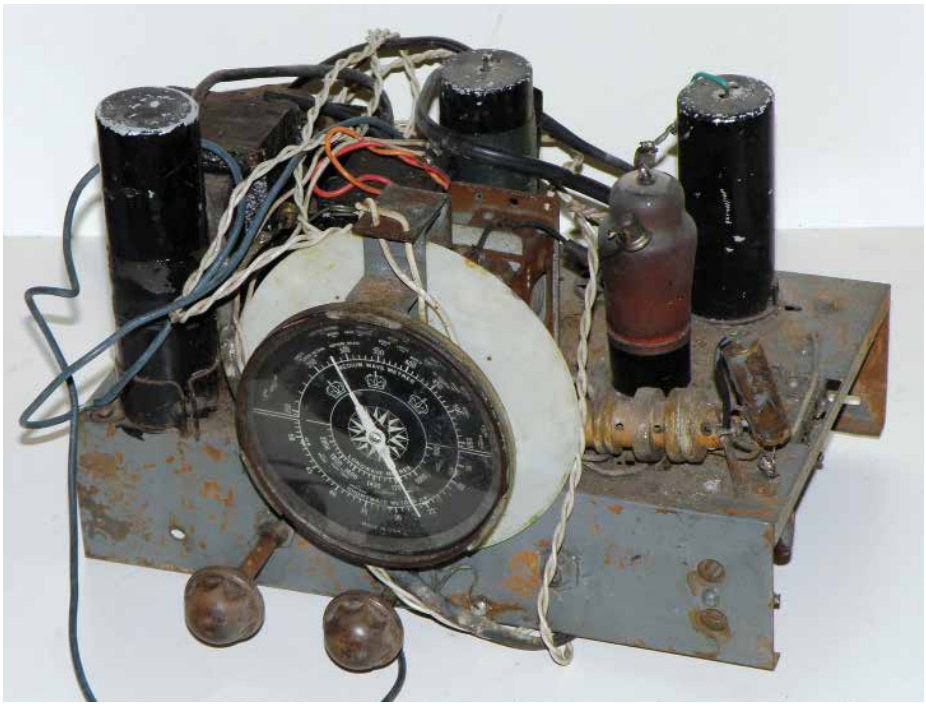


Figure 5: The state of the chassis as it reached me, fitted with its two remaining original wooden knobs.

Bestone and Namco

While I was restoring my Bestone radio, I came across a very neat four valve wooden-cased midget TRF radio at NVCF 2016, clearly labelled 'Bestone' on its dial, and with 'Little Corporal' as the model name (see Figure 4). This gave me a model name to search for, and some detective work uncovered the owner of the Bestone brand as being the Namco Manufacturing Corporation, based at 142W 26th Street, New York City, US. In 1941, Namco was succeeded by the Hamilton Radio Corporation, based at the same address. Percy L Schoen, who had previously marketed Bestone-branded radios in the UK, became Vice-President of the new corporation.

Owners of pre-WW2 radio magazines may find adverts for Bestone radios, and if you do, I'd be very interested in hearing which models they cover.

Restoring the Chassis

As mentioned earlier, there was only a broken ECH35 fitted to the chassis, and although this didn't seem likely to be a valve from when the radio was originally built, at least it gave me a clue to the set of valves that should be fitted to get it working. Figure 5 shows the distressed state of the chassis as it reached me.

I thought I'd start with the wavechange switch, the original condition of which is shown in Figure 6, and I knew that if I couldn't fix it, then the radio was more or less useless. As you can see, the shaft had been sheared off flush with the fixing nut. I didn't fancy

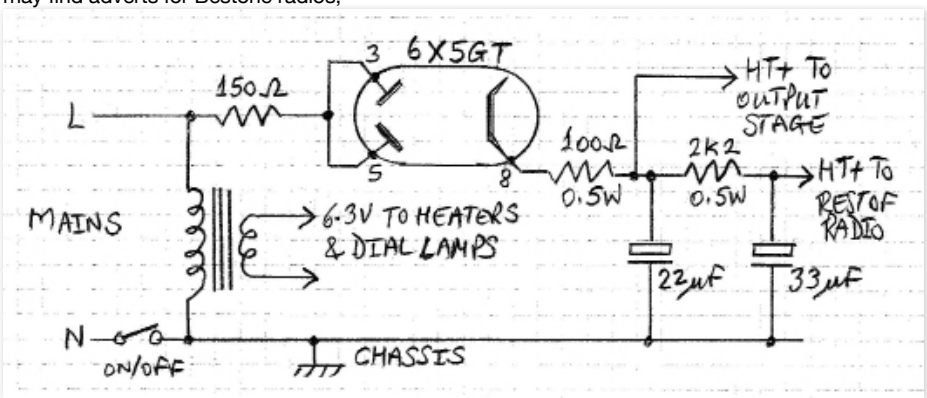


Figure 8: The new power supply circuit, with a resistor fitted in place of the original choke, which was open circuit.

Figure 10: The two distinctive original knobs and one of the replacements (on the left). I'll continue to search around for one of the original knobs so that eventually I can refit a full set of the originals.

Figure 6: The sheared-off shaft of the wavechange switch.

unsoldering all the connections to the switch, fitting a new one, and soldering them all up again. In my junk box I found a similar switch, took it apart until I had just the shaft and the spring-loaded click mechanism, which I substituted for the snapped off one of the original. It was rather fiddly, but I managed to unscrew the wafers from the original, remove the shaft and fit the new one, without removing any of the wiring. I was hoping that I hadn't broken any of the original wires. The new shaft was shorter than the old one, and so I fitted it with a small extension, cut this to the correct length, and filed a flat on the new shaft in the same orientation as the original.

The top of the steel chassis had a grey paint finish, but most of this had rusted off, and so a repaint was necessary. I removed as many bits and pieces that I could, including the tuning capacitor assembly (this needed a new set of rubber grommets fitting anyway), the output transformer, and the tall HT smoothing capacitor. I left the IF transformers, the mains transformer, and the valve sockets in place, and brushed away as much of the rust as possible, and treated it with a rust inhibitor. At this stage I could clearly see the outline of a previous set of valve holders on the chassis: I presume this was for the set of UX-based valves which were originally fitted in the factory. I then gave the top of the chassis a coat of Hammerite smooth finish grey paint, which improved its appearance considerably.

The tuning capacitor was rusty and needed anti-rust treatment, but seemed to be in good condition, with no obvious shorts as its shaft was rotated. The slow motion drive mechanism worked smoothly and the curved glass dial was intact. I wanted to remove the glass to clean the dial, but looked rather tricky and I didn't want to risk breaking the glass, so I left it alone. Only one of the dial bulbs was present and it worked once it had been screwed in correctly. A 6.5V 0.3A bulb

Figure 9: Bottom view of the chassis after restoration. You can see the new shaft on the wavechange switch, fitted with an extension to restore it back to its original length, and the power supply choke has been removed.

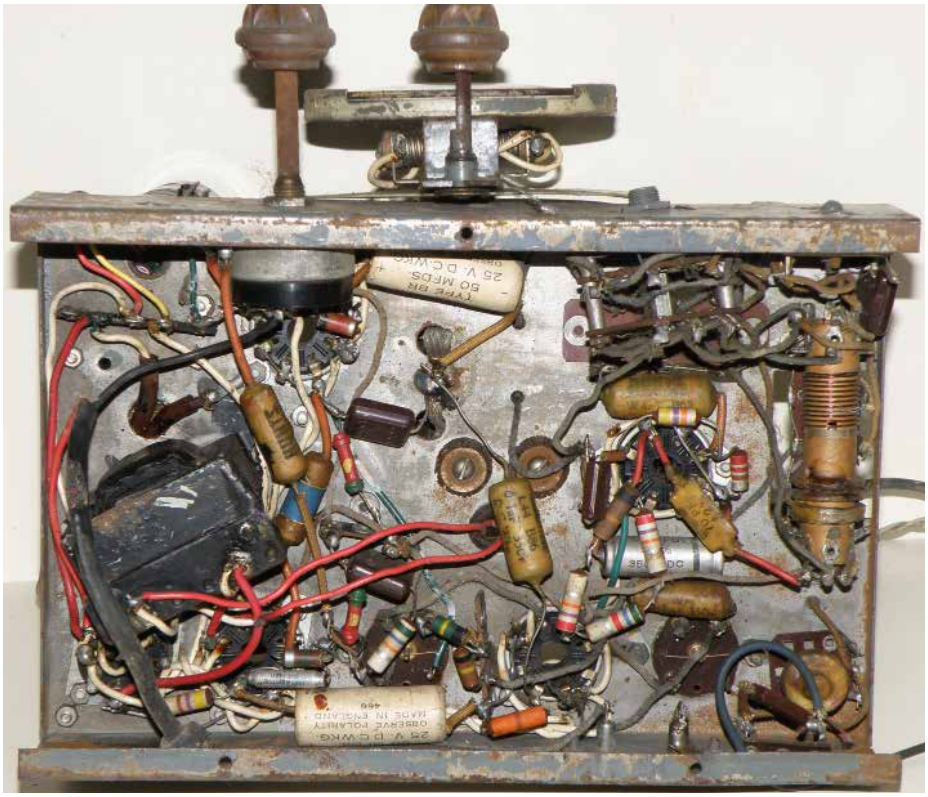


Figure 7: Under chassis view before restoration, showing the British Hunts, Dubilier and TCC capacitors fitted, and other clues that it had been considerably rebuilt at some stage. Unfortunately, the black-painted HT smoothing choke at the left hand side of the chassis was open circuit.

was fitted in the second bulb's position.

Above the chassis, I used black paint on the mains and output transformers, the two IF transformers, and the tall smoothing capacitor, matching the original finish. Once the paint was dry, I could re-fit the tuning capacitor assembly, and turn the chassis over and start to sort out the wiring.

The power supply is a live chassis design, with the live side of the mains connected to the HT rectifier, and the neutral side connected to the chassis via the volume control-mounted on/off switch. 6.3V for the valve heaters is supplied from a small transformer whose mains input is connected via a voltage selector, which allows the mains voltage to vary between 200V and 250V.

British Influence

The components under the chassis looked rather British, with Hunts, Dubilier and TCC capacitors fitted, and other clues that it had been considerably rebuilt at some stage, see Figure 7. I roughly traced out the circuit from the valve pinouts, and an ECH35, EF39, EBC33, 6V6 and 6X5 (or its equivalent, the EZ35, which is trickier to source) valve line-up looked likely. The 6X5 was wired with its two anodes strapped together to form a half-wave rectifier configuration. The 6V6 and 6X5 were physically close together on the chassis, and so I fitted GT versions to maintain a gap between their envelopes, although G envelopes would have looked better. I worked my way backwards from the mains input towards the

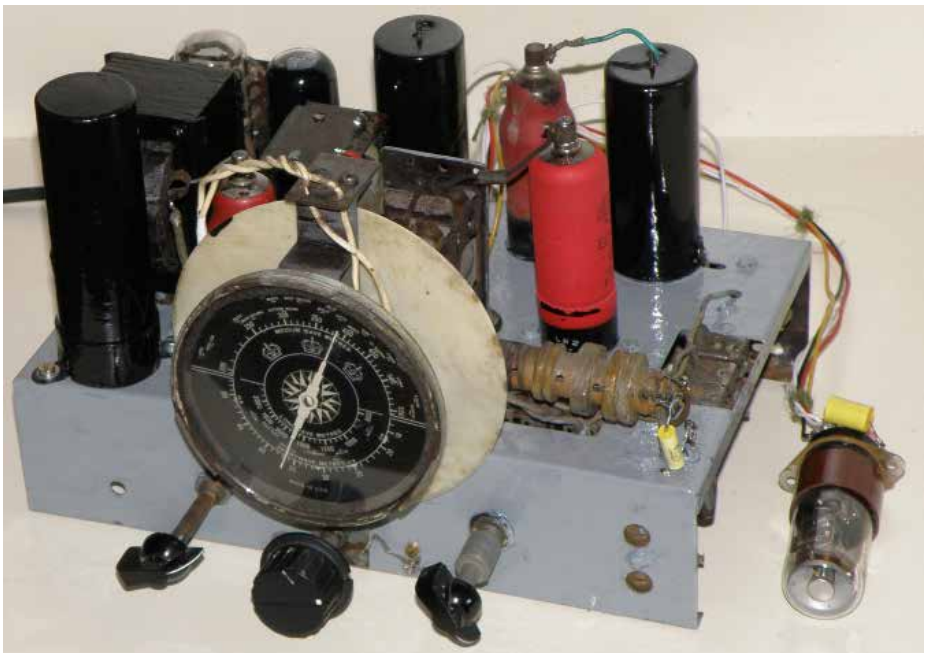


Figure 12: The restored state of the chassis, with the 6E5GT magic eye alongside, supplied by flying leads, before it was mounted onto its fixing bracket.

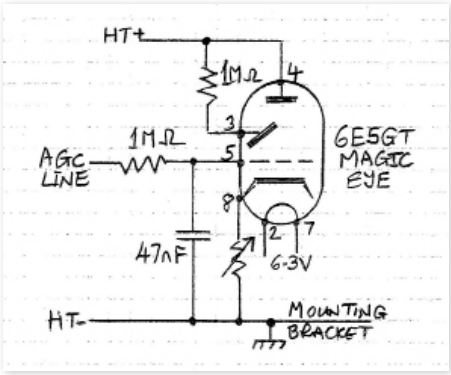


Figure 11: Circuit of the 6E5GT magic eye.

front end, and encountered some strange hangovers from the original wiring, in the form of wires that seemed to go nowhere, which presumably had been left in place when the re-valving had taken place. There was, for example, a screened audio cable passing through a hole in the chassis to a non-existent top-cap on the output valve (which may have originally been an 89?). To my relief, all the wound components were intact, except the HT smoothing choke which was open circuit.

I didn't have a smoothing choke of sufficiently low profile to fit under the chassis, and so I converted the HT smoothing to a resistor-capacitor configuration. The HT smoothing capacitors were leaky and would not reform, and so I emptied out the contents of the tall original case and re-stuffed it with a 22µF plus a 33µF electrolytic, both rated at 450V. The primary and secondary windings of the mains transformers gave reasonable resistance readings on my DMM, so they were both intact. Since the rectifier is being fed directly from the live side of the AC mains, I added in some series resistance to reduce the peak current through the rectifier and the 22µF reservoir capacitor. The circuit I used is shown in Figure 8. So that reasonable power-rated resistors could be used, I fed the HT for the anode of the audio output stage (via the output transformer of course) from the junction of the 100Ω and 2k2 resistors: this meant that both resistors could be rated at 0.5W.

All the original resistors seemed to be in good condition and measured close enough to their nominal values to be left alone. I changed six 0.1µF Hunts capacitors which were leaky under the chassis, and a single Micamold, marked 'Radio Corp, Bklyn, USA', capacitor above the chassis, for modern capacitors. A couple of 50µF 25V electrolytics were also changed. There was also a 0.005µF 'Metamite' capacitor that was changed for a 4.7nF device.

Figure 9 shows the bottom view of the chassis after restoration.

Switch On

I fitted a set of valves and a temporary speaker, connected an aerial, and after carefully checking that the neutral side of the mains was connected to the chassis, and that the radio was switched on, I plugged it into the mains. The dial lights lit up and after a few seconds of warm up time, the radio emitted a loud hum that couldn't be turned down using the volume control. The voltages around the 6V6GT seemed reasonable, but some of the wiring around its grid was original and so I removed it and replaced it with modern, tidier connections. This made no difference, so I turned my

attention to the EBC33. Tracing its wiring, I found that the connection to the top cap was crimped onto its clip, and wasn't making a good electrical connection. I made this connection good, and on powering up again, the hum had gone away, but I still couldn't hear any stations. I touched my aerial onto the top cap of the ECH35 frequency changer, and now I could hear some stations as I tuned around.

I suspected that maybe I had broken a wire or two when I changed the shaft of the wavechange switch, so I looked carefully in that area, and found an unconnected wire. Luckily I could see where it had broken off from and remade the connection. Now the radio worked!

Radio 4 was strong on the long wave, and I could hear the French station. The tuning was crackly and it took me a while to work out that one of the tuning capacitor's outer vanes was now slightly bent and was shorting out – a slight bending of the vane fixed the problem. Medium wave reception was very good, and I could hear stations on the short wave.

Cabinet Restoration

The cabinet was generally in reasonable condition: although there were some wood-worm holes, all the veneer was intact. The outside was covered in a dark varnish / stain, and I decided to lighten up the finish somewhat. I used fine sandpaper to remove all the varnish and get down to the wooden surface, which was treated inside and out with woodworm killer, and the holes filled.

One of the side panels had come away at the top, and a section of the side panel had been broken off, but happily the broken section was present and was easily glued back on as the side panel was re-glued.

The speaker is fixed into the top of the cabinet via a wooden baffle – which was detached but still present - and although there were already four holes in the top of the cabinet, I wasn't sure whether they were original. The Radio! Radio! photo clearly shows four screws in the top of the cabinet, and so I felt that I was being original to copy this method, rather than trying to conceal the fixing. I changed the tatty speaker cloth, and used brass countersunk screws to refit the baffle. I thought the screws looked too prominent and so after fitting them, I gave them each a dab of the wood stain to tone them down considerably. A 7-inch Goodmans speaker was then screwed to the baffle from the inside, which it fitted perfectly. It surprised me how big a speaker could be fitted into this comparatively small cabinet.

The radio came with an attractive antique bronzed bezel, detached from the cabinet. This bezel has a flat space which looks like it was intended to be stamped with a manufacturer's or brand name, but the space on mine was blank.

Fitting the Chassis into the Cabinet

The chassis is held in the cabinet with three screws: the live chassis design means that their heads need to be covered for safety. I only had two of the original wooden knobs, and Mike Barker kindly furnished me with three identical knobs, which were also wooden and so preserved the spirit of the originals. Figure 10 shows the two distinctive original knobs and one of the replacements. I'll continue to search around for one of the original knobs.

I fitted the bezel onto the cabinet using four small brass roundhead screws. They look rather bright, but they will gradually dull down. The magic eye opening doesn't seem to have ever been edged with a bezel, and I simply touched up the edge of the hole with black paint.

Fitting the Magic Eye

As it came to me, the radio's chassis showed no evidence of being fitted with a magic eye, and since the hole was there in the cabinet, it seemed a shame not to fill it. I had a couple of 6E5GTs, which I knew were good and so I connected up an octal socket on flying leads, to the circuit shown in Figure 11. After getting confused between the connection to pins 3 and 4, I finally got it right and the magic eye worked. I had a VI-103 (as used in the R1155), which had an octal base and the same pinout as the 6E5GT, and so I gave this a try. It lit up but barely responded to the strength of the broadcasts, but was too dim to be acceptable, so it was back to plan A, and the use of the 6E5GT.

I measured the AGC voltage, and it was about 0.1V with no signal received and -1.9V when receiving a strong signal. This wasn't a great range, and I suspect that the radio is still not operating at its best, and so the maximum (in a negative sense) AGC voltage isn't as high as it should be. To help get a more reasonable voltage on the grid of the magic eye, I inserted a variable resistance of 5kΩ into its cathode lead. This means that the cathode voltage can be set to be more positive with respect to the grid (and therefore the grid is more negative with respect to the cathode) and hence the eye opening can be made more significant.

Figure 12 shows the restored state of the chassis, with the 6E5GT magic eye alongside, supplied by flying leads.

I now had to make a bracket to fit the magic eye into the cabinet. Hopefully you can see from Figure 13 how this was done with an

Figure 13: Rear view of the radio with the chassis back in the cabinet. The upward facing speaker and the magic eye mounting bracket can be seen.

Figure 15: Close-up of the front panel, clearly showing the Bestone branding and the 6E5GT magic eye. The bright colours on the dial do not show up in this view, but have a very attractive effect when the radio is switched on.

Figure 14: Front view of the restored radio.

aluminium strip secured to the side panels with two L-shaped brackets. I chose to do it this way because the side panels were thicker than the front panel, and so I could use reasonable length screws to make the attachment to the cabinet, without risking breaking through to the outside. You should be able to see the potentiometer mounted to the left of the 6E5GT's socket, connected in the cathode lead of the magic eye.

The final condition of the radio is shown in Figure 14 – a great improvement on its original state. A close-up of the front panel, clearly showing the Bestone branding, is shown in Figure 15. The colourful dial is very attractive when lit up, and is well complimented by the green glow of the magic eye. Sadly my digital photography skills aren't up to capturing a good quality view of the lit up dial and magic eye.

Summary and Conclusions

My Bestone-branded radio seems to have started life in America, probably built using UX-based valves, equipped with a magic eye, and imported into the UK before the war. At some point the UX valves had been discarded, the valve holders changed for octal ones, and the chassis largely re-wired with UK-sourced components. The magic eye wiring seems to have been removed, and the hole in the cabinet left 'blind'. It would appear that sometime later the radio had stopped working, and the chassis removed to effect a repair – when it was dropped, resulting in the shaft of the bandswitch being snapped off and the chassis receiving a couple of dents. At that stage the owner seems to have lost his patience and put the radio tidily away, intending to repair it eventually. At least it wasn't thrown away!

When it reached me, the chassis was in poor cosmetic and electrical condition, and required a re-paint to get rid of a lot of rust and a rebuild of the power supply to get it working. Some of the old wiring relating only to the original valves was present and needed removing. I fitted the chassis with a combination of red-painted Mullard valves, a good old 6V6GT, and a 6X5GT rectifier to get it back to working condition.

I fitted a 6E5GT magic eye and connected it to the AGC line: it works reasonably well, giving a useful deflection on strong stations, but the AGC line's voltage swing is a little too small to give a deflection on most stations. A few hundred ohms from a potentiometer in the cathode lead of the 6E5GT allowed me to adjust its sensitivity.

The cabinet is compact when compared with many contemporary American radios. After stripping of the varnish and treatment for woodworm, the sides of the cabinet were re-stained, and the whole cabinet lightly polished. The refitted antique-bronze bezel, the Airplane dial, a fresh set of matching wooden knobs and the re-instated magic eye give the radio close to its original appearance.

Harpenden Auction & AGM, February 2017

Photos by Alex Hewitt

Jeremy Day searching for Ekco knobs

Russell Atkinson

Roger Grant receiving an award

Stef Niewiadomski receiving an award

The Saba 335 WL Villingen, A TRF with AVC

Gary Tempest

The name Villingen most likely comes from that of a town in southern Germany; as I found out with my Philips D57 Aachen it was common to call radios after them.

From restoring the D57 I have developed an interest in German radios and spotted the Saba on Ebay. As I'm a member of the on-line Radio Museum (RM.org) I was able to compare pictures of it from models that were listed. It was clearly missing items and that is just one of the useful features of being a museum member. Obviously, I didn't bid and actually had no intention of doing so as radios in Germany seem to be listed at very high prices compared to the UK. Do they sell?

It was described in the Museum model listing as a TRF with diode detection but on looking at the schematic that was clearly incorrect. Even a cursory examination showed that a pentode was being used as an anode bend detector; they often seem to have anode loads of around 250K. So what was the diode for?

I then started to look for more information and, if I was going to write an article, some pictures of the radio. Very kindly museum member Dietrich Ehrhold sent me lots and circuit diagrams. The model is probably rare anyway and his particular one looks in original condition. It would be difficult to restore, to working condition, without spoiling it so to me a good decision to leave it untouched. The radio has two wave-bands, MW and LW and also a pickup input for attaching a record player.

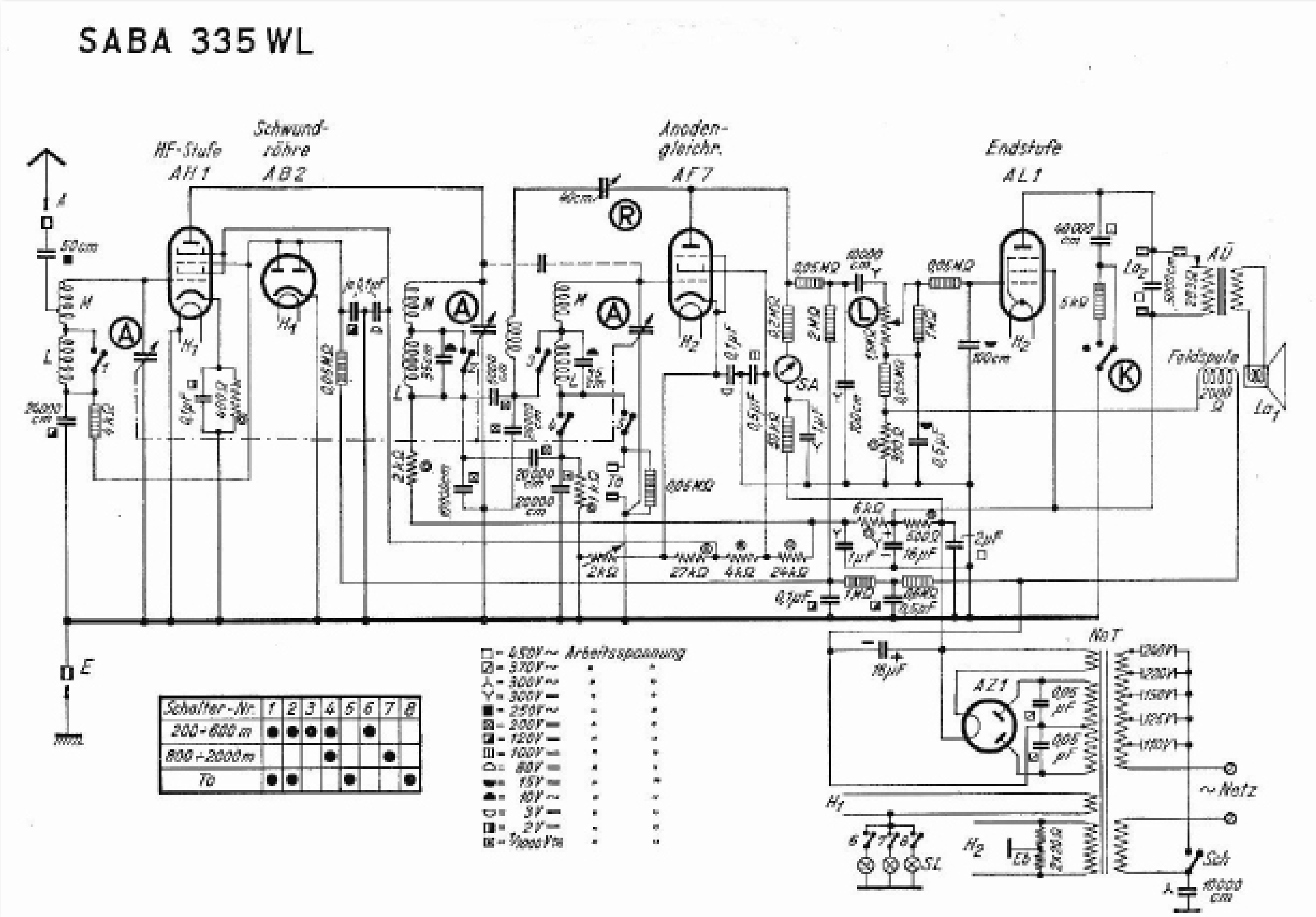
The circuit in detail

Apart from the AVC this circuit was interesting in other ways and prompted me to re-draw it, in simplified form. Certainly it wasn't built down to a price with the 'bean counters' looking over the designers shoulder. Apart from the beautiful mechanical design there is a mass of what would have been expensive de-coupling capacitors.

It seems easier to start with the more or less conventional parts. The switch for the line input is split into about the centre of the transformer where there is a capacitor to ground. Probably the inductance helped to protect this although less so if the radio was being used on 110V. The capacitor's intended function may have been to prevent inter-modulation distortion by RF being radiated on the mains lead back to the aerial input.

The transformer has high HT secondary voltages and they must have used at least 2kV rated capacitors across the windings. These in this position are rarely encountered although Philips did use them on the secondary side of the mains transformer. My D57 had just one, from a rectifier anode to ground. Even with a 3kV rating it had failed spectacularly with a large burn hole. Possibly, the Saba designer, ex Philips maybe, put them there to do the same as a capacitor across the primary to suppress line transients and noise.

A raw HT of 280V is generated, filtered by a 50K resistor /1mF pair, and is used by the detector which is an AF7. The speaker field coil and a series resistor are in the supply negative, to generate a high voltage for the AVC circuit, and the part across the resistor, to bias the grid of the output valve, a directly heated AL1. A heater DC return, for the anode current, needs to be present anyway and the 20 Ohm resistors, forming an artificial


SABA 335 WL
HF-Stufe
AH 1
Schwund-
röhre
AB 2
Anoden-
gleichr.
AF 7
Endstufe
AL 1
Feldspule
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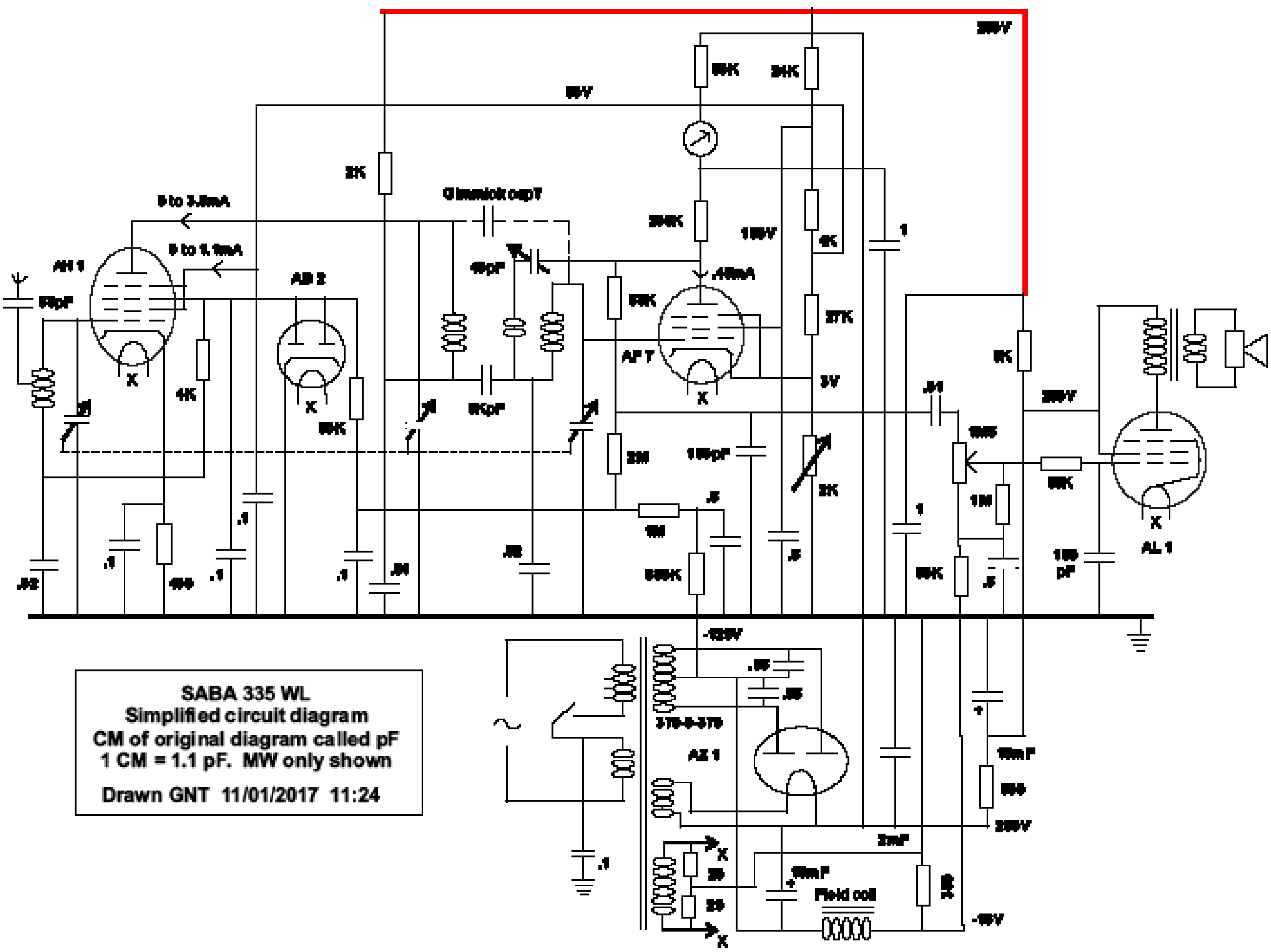
AH 1
AB 2
AF 7
AL 1
AZ 1
Field coil
SABA 335 WL
Simplified circuit diagram
CM of original diagram called pF
1 CM = 1.1 pF. MW only shown
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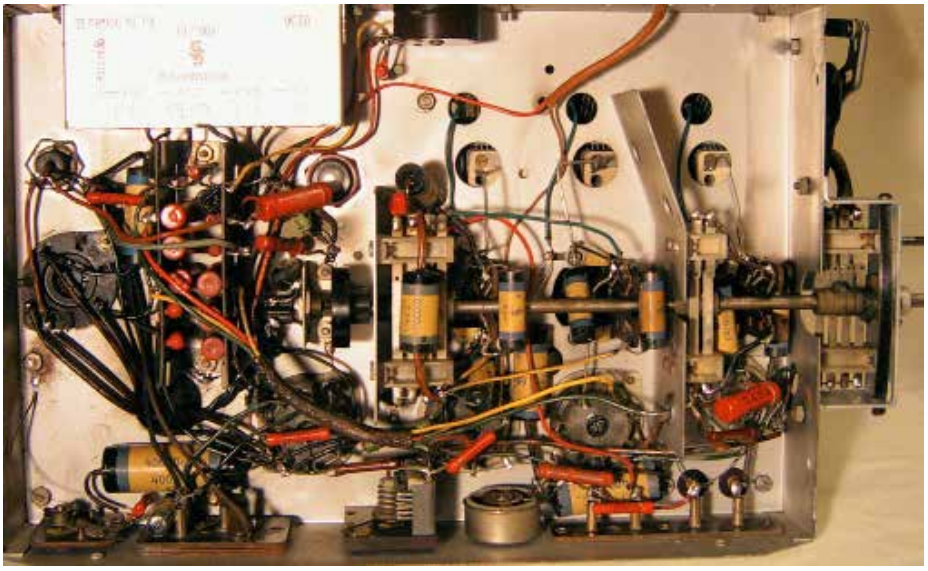


centre tap, mitigates hum by balancing the EM field from the wiring and the heater itself.

The anode bend detector runs in the usual biased to almost cut off mode. It has the advantage of plenty of audio gain with low loading of the preceding bandpass tuned circuit which would happen with a diode. It does introduce some audio distortion, but this was considered acceptable in small receivers.

If the Ia / Vg curves are consulted, it passes about the current shown on the circuit diagram, with the bias given, and no signal, so the anode will be at about 170V. It's just Ohms law to work out what the voltage under this condition would be to G1 and G3 of the heptode AH1, with the potential divider of four resistors strung between this and the -120V rail. It is actually a few volts positive but will be held close to zero by the clamp diode AB2.

As usual the detector will conduct for positive excursions of carrier and modulation. The carrier is filtered off by 100 pF capacitors before the output valve grid. The mean anode voltage will fall and the heptode grid voltages will go negative, as AVC, reducing the gain of the valve. There is quite a lot of smoothing and so there will be a time constant in the reaction of the AVC as in any usual Superhet.

Before the detector is a bandpass filter which looks most complex until re-drawn. The coupling turns out to be by mutual inductance with a little top addition by what is possibly a 'gimmick capacitor' of two twisted wires on the tuning gang.

There is variable reaction by a capacitor from the detector anode to a coupling winding in the output filter coil.

Some information from Philips

For any unusual circuit design you could have expected them to have a hand in it back then. There is "Data for Set-makers", for their E 449 hexode, which shows this method of applying AVC using the negative voltage from diode detection in a Superhet. It says this: "If only small H.F. input voltages of about 1V are to be handled … the same controlling voltage may be applied to G1 and G3 and does not need to be made strongly negative." "The total regulating range can be controlled with a voltage variation of from 0 to 6 volts". It goes on to say that amplification control is only possible into the hundreds with a normal screen grid valve compared to thousands using the hexode in this way. This level of control would be needed as there are no alternative aerial sockets or switches to prevent overload on strong local stations.

Conclusions

The 30's certainly were the Golden Era for valve radios and even after many years of our hobby it was exciting to find a different circuit design to puzzle over.

On RM.org there are other radios, such as the Siemens 47 WL or the Ultra-Geadem 304 WL for example, that use a hexode valve in this manner but neither have the clamp diode. Without this leaping out of the schematic of the Saba when I saw it, I would just have passed on by so it was a lucky day.

It seems a number of hexodes were in use: the AH1 made by Philips, Tungsram and Telefunken. Then the E 449 by Philps and the RENS 1234 made by Telefunken.

By the time of these interesting radios the variable mu pentode was available and the Superhet was becoming the popular receiver. Perhaps Saba and a few others, like Philips with the Super Inductance, had reasons for trying to hang onto the TRF; amongst them the Superhet patents held by RCA. What a shame that Philips didn't design a Super Inductance Receiver with hexode AVC.

FM to AM Radio Converter

Guy Fernando

Owing to a fast decline of medium waveband broadcasts and a continuing interest with vintage AM radios, Guy Fernando (M0OOX) presents this cost effective design for enabling FM broadcast stations to be listened to on classic vintage AM radios.

AM broadcasts in the United Kingdom and the rest of the world are in rapid decline and are likely to cease altogether by the middle of the 2020s, mainly due to higher transmitter running costs and dwindling listeners. Many countries in Europe have already closed AM broadcasts completely. Here in the UK on the long wave band (148.5 - 283.5kHz) only BBC Radio 4 can be heard. On the medium wave band (526.5 - 1606.5kHz) there remain a few regional and commercial stations that can be heard, but the only nationally covered stations are BBC Radio 4 and Radio 5 Live. It is however a different story on the FM band (87.5 - 108.0MHz). At least for the foreseeable future, there remains a wider selection of FM stations including regional, community and the national BBC stations, Radio 1, Radio 2, Radio 3 and Radio 4.

It is feared, with the imminent closure of the AM band countless vintage radios will become aesthetic curios or worse end up in skips - FM to AM converter to the rescue! These types of converters were widespread in the 1960s and 70s and sold mainly as AM car radio adapters, but have now disappeared into obscurity and the few that are still being manufactured are fairly costly owing to the niche market at which they are pitched. It is hoped this simple converter design described here will offer a new lease of life to AM only radios without breaking the bank.

Operation

The converter has two separate trailing wire aerials, one black for the FM reception, and one red for the AM transmission. The red wire must ideally be placed close to the AM radio or ideally connected to the AM radio's external aerial socket if a socket is available. The black wire is positioned for best FM reception. There is no requirement for a volume control on the converter, as the volume is adjusted on the AM receiver itself.

The single tact switch button performs multi function operations depending on how long it is pressed. The button can be briefly pressed, pressed for about a second, or pressed for about 10 seconds; serving respectively to seek to the next station, seek to the previous station and to store a default station in memory. During station seek and when approaching the end of the band, the seek function wraps around and starts again seeking at the beginning of the band. When a default station has been set, the converter will automatically tune to the default station on power up. The default station remains memorised, even if the batteries have been removed and changed. The converter has no power on/off switch, but it will automatically switch itself off into standby mode after 2 hours of operation to conserve battery life. Two hours was considered lengthy enough for listening to most broadcasted shows. The converter of course can be instantly switched on again while in standby mode, by pressing the button.

The Converter

The Electronics

The electronics has three sections namely the PIC microcontroller, the FM receiver module, and the AM transmitter, as shown in Figure 1.

At the heart of the circuit is a PIC12F1572 PIC microcontroller, chosen for its low cost and low pin count. The author also selected a Microchip based microcontroller as he has much experience working with this microcontroller manufacturer. The PIC's primary function is to communicate with the RDA5807M receiver module using the Inter-Integrated Circuit (I2C) serial computer bus. Port pins RA4 and RA5 are used as the clock (CLK) and data (DATA) bus lines, allowing commands to be issued and responses received. Although the maximum I2C clock frequency for the RDA5807M is quoted at 400KHz, it has been limited to 100kHz so that the PIC port's internal pull up resistors can be used saving two 4.7kΩ external pull up resistors as specified by the I2C standard. Port pin RA2 is configured as a digital output which is held low during normal operation. RA2 is taken high during standby which essentially powers down the AM transmitter section. Port pin RA0 is configured as a digital input which is normally held high by the port's internal resistor, and goes low when the button is pressed. The decoupling capacitor C1 is used to eliminate digital noise appearing on the positive rail, and must be placed as close to the PIC as possible.

The RDA5807M FM receiver module is a near baseband FM receiver with a low digital IF and audio DSP core. It has a built in synthesized local oscillator and so requires no

Parts List

C1	100n
C2	56p
C3	2n2
C4	220p
C5	220p
C6	100p
C7	150p
L1	150u
L2	1mH
R1	470k 0.25W
R2	1k 0.25W
R3	120k 0.25W
Q1	BC184L transistor
U1	PIC12F1572 (Available pre-programmed, see http://www.i4cy.com/m0oox/fm2am)
U2	RDA5807M FM receiver module
VC1	3-30pF variable trimmer
BUTTON1	Momentary tactile push button for CH-UP/CH-DOWN/SAVE
BT1	Two 1.5v AA batteries
Enclosure	OKW Part# A9052118, Soft Case L OKW Part# A9152219, Intermediate Ring OKW Part# A9152010, Set of Battery Clips
Screws	2off. M2 x 5mm pan head self tapper
Veroboard	Copper strip board 10 x 34 holes, 0.1" pitch
IC Socket	8-pin low profile DIP
Veropins	4off. Vero part 18-1658
Wire	40cm red insulated stranded 7/0.2mm 1000V PVC Ø1.2mm 40cm black insulated stranded 7/0.2mm 1000V PVC Ø1.2mm 15cm single core insulated 33SWG Ø0.25mm 15cm tinned copper un-insulated 22SWG Ø0.71mm

setup or alignment which radically simplifies the setup of the converter. The mini PCB module unit was chosen in favour of the actual RDA5807 integrated circuit this is only available in SOIC package which is considered too fiddly for the majority of constructors. The module also contains a 32.768kHz crystal that forms the clock for the chip's internal synthesizer. The only other notable connections to the module are the FM antenna trailing wire (ANT), and the stereo audio output where only the left channel (L_OUT) is connected to R1 forming the input to the AM transmitter section. Even though the RDA5807M has inbuilt FM stereo and RDS decoding, these functions are of course not required and so are switched off by the firmware during initialisation.

A Colpitts oscillator forms the foundation of the AM. Where L1, C4 and C5 form the basis of the tank circuit oscillating at a centre carrier frequency of around 950kHz, with VC1 offering fine tuning about that frequency. Resistor R3 sets the base bias voltage of Q1 at around 2.4v. The audio output from the RDA5807M is fed into a simple filter network composed of R1, C2 and C3 which provide attenuation and band-pass filtering with a lower -3dB cut off frequency at 150Hz, and an upper -3dB cut off frequency at 6kHz. This pass-band is typical of the frequency range that AM broadcast stations use, and limit the sidebands to well within the required 9kHz AM channel spacing. The audio signal is injected into the oscillator's DC biasing point at the junction between R3, C3 and L1. This varying of the transistor bias voltage has the effect of changing the oscillator gain causing the carrier to be amplitude modulated by the audio signal. The RFC L2 provides a large reactance at the oscillator frequency and a low resistance at DC to help start and sustain oscillation. The output of the oscillator is fed from the Q1 emitter and coupled to the AM aerial via C7 which provides a reactance of around 1kΩ to limit the loading of Q1, delivering about 1mW of RF power.

Construction

The circuit is constructed on copper strip board (veroboard) with components positions placed as shown in Figure 2. Cut a piece of strip board so that it has 34 strips by 10 holes wide. Offer the board up to the enclosure top cover standoffs to accurately verify the self tapper mounting screws drill hole positions. Carefully drill two 2mm holes, top right and bottom right of the board.

Using Figure 2 as a reference, begin

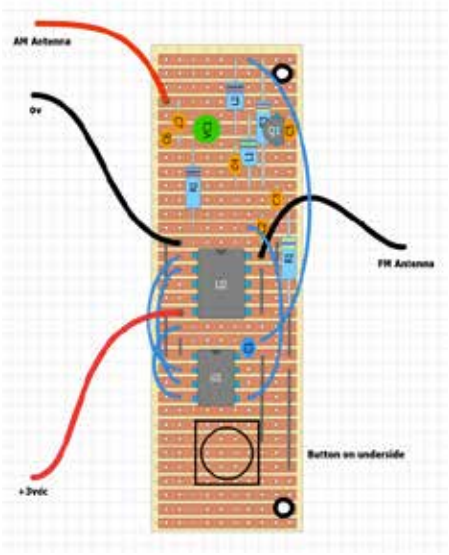


Figure 2 - Strip board Layout

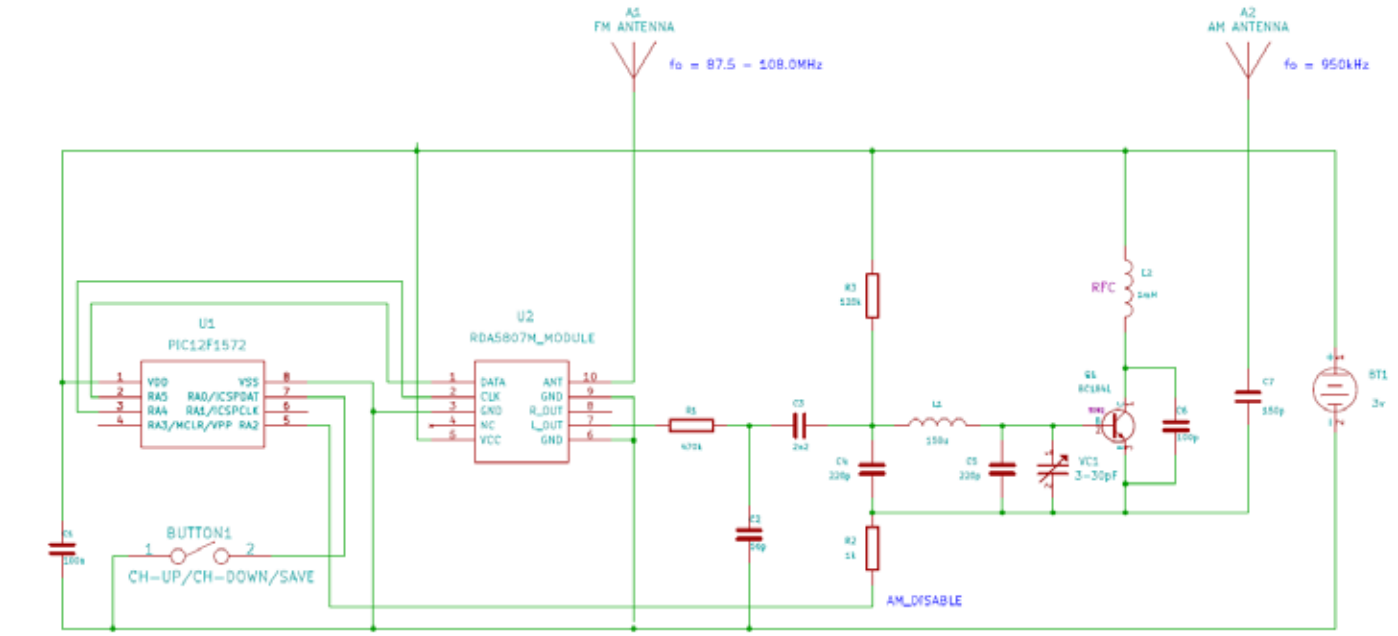
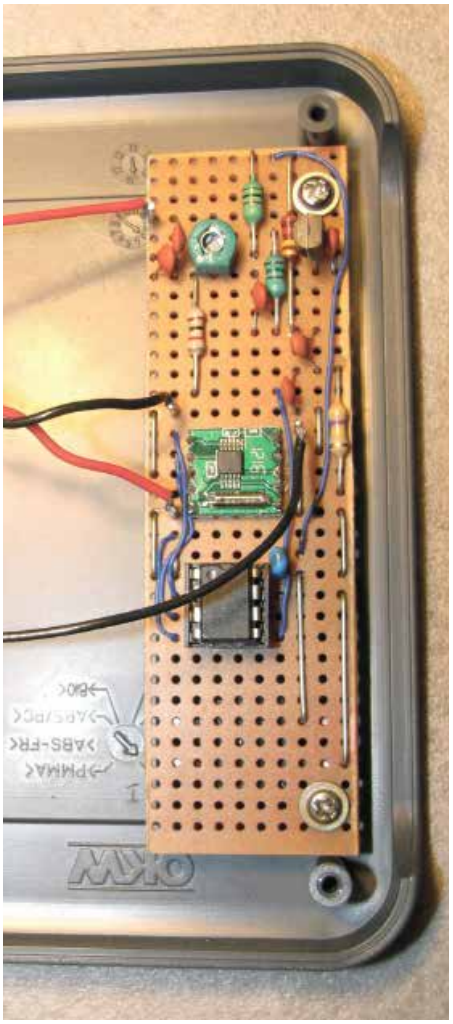


Figure 1 - Schematic Diagram



Close up of the strip board construction

soldering the discrete components, i.e. resistors, capacitors, inductors and then the transistor. Also solder the 5 thin flying insulated wires shown in blue, and then the 8 un-insulated tinned wires shown in dark grey.

Next solder in the IC socket for U1, and solder 10 short tinned wires from the RDA5807M FM receiver module edge so that it can be soldered to sit just above the strip board. Solder in the 4 veropins at the points on the board where the battery and antenna leads connect. Using an appropriate tool or drill bit, cut the copper tracks between pins of both U1 and U2. There are 9 cuts in total and are the only tracks that require cutting on the board. On the underside of the board, solder the button to the copper tracks as shown in Figure 2. Now insert the pre-programmed PIC into the DIP socket, observing that the semi-circular notch on the IC is correctly oriented.

Three holes require drilling in the enclosure. First the button hole is drilled through the enclosure top cover. Again to accurately assess the position of this hole, offer the board up to the enclosure top cover where it is to be mounted, and mark the centre position of the switch. Drill a hole sufficiently large to allow operation of the button typically 8mm. Next drill two 1mm holes through the "intermediate ring" part of the enclosure for the antenna wires. Cut two 30cm antenna wires (one red, one black) and thread them through the 1mm holes as shown in Photo 3.

Fit the board to the enclosure front cover using the two self tapping screws. Push the metal battery clips into position in the battery compartment part of the enclosure.

Using the remainder of the red and black wires, strip the ends then solder them connecting the battery terminals to the +3vdc and 0v board veropins. Connect by stripping and soldering the red AM antenna and black FM antenna wires to the appropriate remaining veropins on the board.

The Firmware

Programming a blank microcontroller with the firmware requires specialised software and programmer equipment that most readers will not have access to. For this reason a pre-programmed PIC12F1572 PIC microcontroller can be obtained from the author's website at:

http://www.i4cy.com/m0oox/fm2am

The firmware tasks programmed into the PIC include:

1. Issuing commands to the RDA5708M FM receiver chip via the I2C bus. On power up, the PIC issues a command to initially set the receiver chip to monophonic, with flat frequency response, 75µs de-emphasis and RDS turned off. The converter will then tune to the first station it finds. Depending on how the button is pressed the PIC will issue a command to either seek to the next station, the previous station or save the current station as the default station.

2. Controlling power modes. The converter during normal operation consumes 20mA, but by controlling the AM_DISABLE line and placing the PIC into low power mode this sets the converter into standby mode reducing the current consumption to only 20uA. This should be more than sufficient giving a theoretical 15 years of standby operation using a standard set of 2700mAH AA batteries.

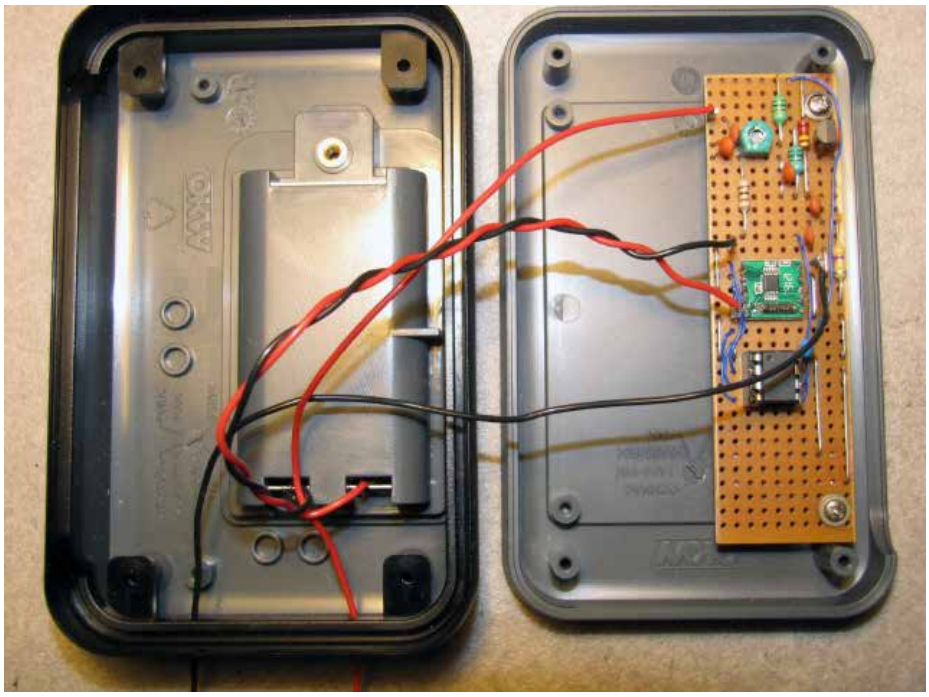
3. Checking when and for how long the switch is pressed. A software timer is used to determine this.

4. Saving a default broadcast station to the non volatile PIC flash memory. PIC flash memory will retain the saved channel for many years even without batteries.

Alignment and Testing

Switch on the AM radio and tune to around 950kHz or closest to that frequency where a broadcast station is not found. Insert two AA batteries into the converter. Position the red AM antenna next to the AM radio and straighten the black FM antenna and position it away from the AM radio. Briefly press the button on the converter, and after a short period an FM station should be heard coming from the AM receiver. The trimmer capacitor VC1 may require adjusting to fine tune the converter frequency to that of the desired position on the AM radio's tuning dial. This completes the alignment procedure. Finally screw the enclosure together using the remaining hardware supplied with the enclosure. Operating the converter is simple, and is described near the beginning of the article.

Happy listening!



Completed construction showing wiring

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Around Europe on a 622

Martin Daines *(Apprentice – Radio Rentals)*

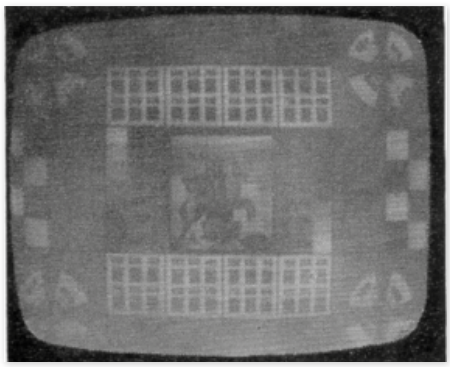
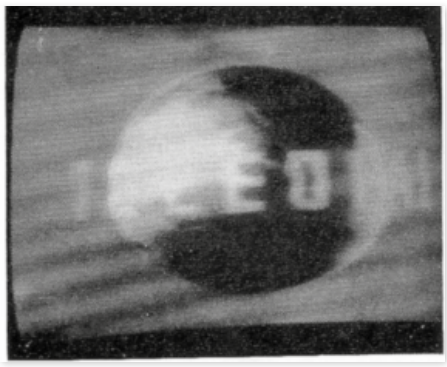
Our journey begins on the 16th July, 1963, soon after the 622 was issued to branches for trial tests. Previously I had obtained a book showing test pictures of many foreign stations and also the modifications necessary to a normal receiver to receive these European stations.

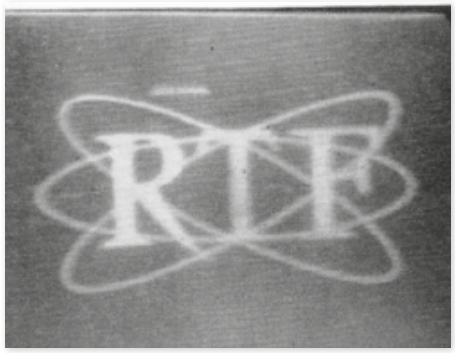
I found that these modifications would have proved to be of little value on any of the single standard sets, because the only sets which were easily obtainable, were old ones with poor tubes. This, of course, would have been unsatisfactory for photographic purposes.

On receiving a 622, we were amazed at the outstanding performance of this set. This model also proved to have a very good gain and sync, even in a poor reception area of St. Albans, on a telerod. The normal type of aerial used in this area is a D.B.7 on a high mast. I felt that, with a receiver of such high standards as the 622, it would be worthwhile trying to obtain foreign stations, for which it would be necessary to use different channel coils which we did not have in stock at the time. Whilst these coils were on order, we were experiencing very bad atmospheric conditions, and on the 16th July we obtained Test Card C from both Stockholm and Budapest on the original channel 1 biscuit. We had de-tuned this coil from our existing station on channel 1, and switched to receive 625 line transmissions, keeping in use the standard channel tuner, rather than the UHF tuner. We received these stations for about two hours, but during this time lost the picture many times. We were all very interested, and prayed that these conditions would last for at least a few more days. I Think that luck must have been with us, because on the 20th July at 9.30 a.m. we received a very clear picture from Norway. Unfortunately it did not last very long, for when our local BBC transmitter started up we lost everything. On the following Monday our extra coils arrived, but we were unsuccessful in receiving anything, except other English stations, until the 29th. On this date we were able to receive very clear pictures and a little sound from Madrid, much to our suprise, for about an hour. During this time we saw the Spanish test card, advertisements and also the news followed by some interviews.

Wednesday the 31st was our best day for receiving foreign stations and we started it by receiving a test card and quiz programme from Russia at 9.15 a.m. There was also another station in the background, but we could not distinguish this. It lasted for only thirty minutes, much to our disappointment, but when it ended we saw another test card flash on the screen. After much close viewing, we saw that it was the Italian test card, which came up very clearly after a short while. I phoned my friend and asked him to bring his camera along to get some photos, but unfortunately





he arrived too late and missed our rare view.

We sat with our eyes glued, and camera poised at the screen, hoping we would get something else through. It was not until 3 p.m. that we again saw a picture flash on to the screen. This was very good - Madrid - our third station of the day. For three quarters of an hour we saw a mixture of programmes which included sport, news and advertisements, and music. I have never seen a camera take so many photos in such a short time! We finished two films, taking sixteen photos in all. All but two were developed successfully, some of which are shown. We felt very satisfied after such a good day, which was just as well, because we did not receive anything else until October. We tried many times to get something during this time, but in vain.

On the 11th October atmospheric conditions started again, and in the late morning we managed to receive French Television sound on channel 10. This was coming through very clearly, and we were able to listen to "Paris Club" and the news with very little fading. When the station finished its lunch-time programmes, they put on a continuous whistle. We thought there was no point in listening to this, so we changed to channel2, and to our delight, there was the French test card, in two halves. The French use 819 lines to make their picture. After a little thought, we decided that all that was necessary was a small resistor in the time base. After this small modification we were able to see the test card for two and a half hours continuously with only a couple of flickers. Unfortunately I had no camera with me, and I missed the best pictures we had ever received from the continent.

When I came to work on the following morning, I armed myself with a camera, we managed to take a couple of pictures of the French programmes, but as before when our local transmitter started we lost nearly everything except a little sound.

NVCF, May 2017

Photos by Alex Hewitt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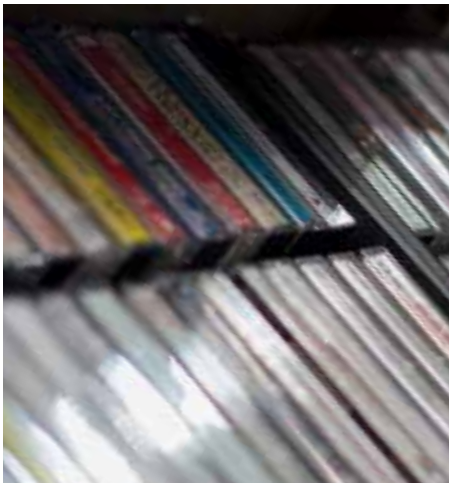


A home-brew one-valver from the 1920s

Richard Shanahan

In many ways this is a postscript to my article, see the Autumn 2015 Bulletin, Vol40 No.3, “My Life and Radio”, covering the first crystal set I made. This one-valver comes from the same book - Cassell’s Book of Knowledge. Although, on the face of it, this is a very basic radio, the mechanical construction is of a wholly different ball-game!

A brief look at the crystal set article shows the level of practical expertise required, this set needs a higher level. Please note of figs 3-21 cover the book’s illustration reproduced here on page 37 I have a couple of books from this era and earlier, requiring the constructor to make rheostats, variable capacitors, called condensers in these times etc. These are aside from the ‘simple’ actions of drilling holes, making terminals and valve holders etc!

The books, in eight volumes, are billed as an “encyclopedia for children”. If so, the children it is aimed at would have to have access to, for the times, some very expensive workshop tools or as I suspect, have a relative, usually Dad, or have well-equipped friends.

I was lucky as a child, having a Dad who was good with his hands and a neighbour with radio knowledge. Even so, as my earlier article illustrates, I had to make one or two divergences from the original design. For this radio I shall try to keep to the original design as closely as possible. I am fortunate in having two lathes, a Myford 7 and a Lorch. The Lorch has a milling attachment, which I made.

Photo 1

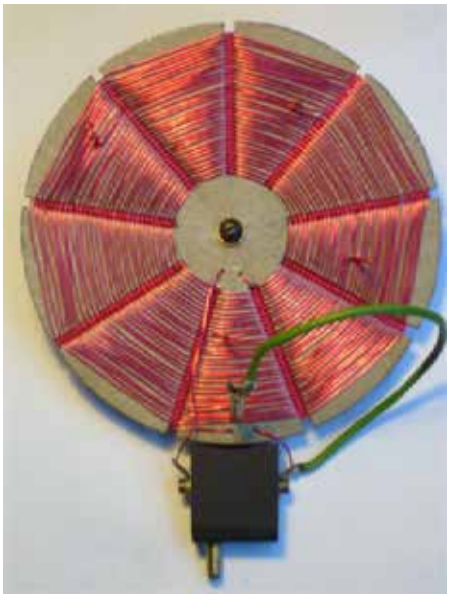


Photo 2

A study of the book’s pictures of the constructional details, figs 3 to 21, show a number of conventional items e.g. terminals, tuning capacitor (early references called them condensers) rheostat, etc. but even these are the types found in that era.

What is unusual, in today’s technology, are home-made capacitors and resistors.

I thought that I would describe each of the components needed, giving any modifications necessary. There isn’t any particular order but one or two items need to be assessed first.

The valve

(See photo no.1)

The text mentions using a 4- or 6-volt accumulator depending on the valve used. I was given a Cosmos A45 by a friend. It was in a box with my friend’s findings of its characteristics. The box carried a similar list on the side.

A Google search gave a lot of details. It was introduced in 1925 by Metro-Vick supplies. The website gave absolute ratings. A heater voltage of 4.5 volts, an anode voltage of 30-to-120 volts, a grid voltage of -6 volts, a Va of 20K, Gm of 0.45 and an amplification factor (μ) of 9.

My friend’s details and those on the box largely agree. A test on my trusty Mk.II Avo valve tester, using a grid voltage of zero and an H.T. of 50 volts got an anode current of 1.3mA. Using the values above, I got a mA/V of 0.3 and a reading in the middle of the ‘replace’ scale.

As this valve could be close to 90 years old, I was not surprised. I have found old valves, with virtually no gain registered, often surprise in their performance. This was the case with this one - see later.

The panel

The text mentions ebonite. This would almost certainly have been black. I had a small sheet of a hard, shiny, black plastic 3/16ths inch thick, large enough to just cover the original dimensions which are imperial.

Referring to fig.5 shows the dimensions needed. I usually cover the surface with a sheet of self-adhesive paper; this protects the surface and makes marking out easy. I will not drill any holes until I’m sure that I have everything needed.

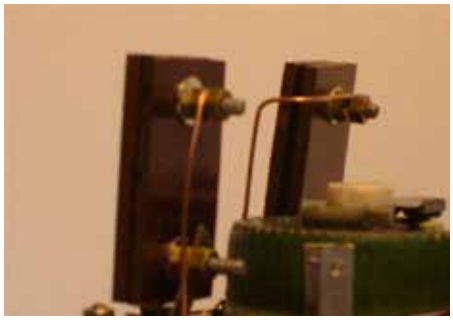


Photo 3

The coil

(See photo no.2 and figs 6-9)

The design calls for 76 turns of 26swg d.c.c.(double cotton covered) copper. I have an R.S. [Radio Spares] bobbin of 22swg (enamelled). I decided to use this, I can always make another using 26swg.

I used some stiff card, varnishing it before winding. As the wire was thicker, I only got 68 turns, approximately 10% less.

A test in my Marconi 2700 bridge gave an inductance or 290μH. Tests on my Advance type 1 ‘Q’ meter gave 280μH at 500KHz with a ‘Q’ of 65.

The grid and phone capacitors

(See photos 3&5 and figs 10-15)

I forgot to take pictures before they were mounted! The dielectric, in both cases, is mica. The first question would be “where would I get mica these days”? I’m well aware mica is a mineral, which can be easily split into thin sheets, rather like slate.

I spoke to an engineering friend of mine who said “find an old toaster, the elements are wound on sheets of mica”.

This prompted me to realise I had a couple of high wattage resistors, the elements wound on a rectangular sheet of mica. Dismantling the wire resulted in a 5-inch by 1½ -inch sheet, about ⅛ inch thick. It easily separated into innumerable thin sheets. The thickness specified was 0.002 inch (2 thou’). I measured 0.0025 on my Moore and Wright micrometer. As a bonus, the dismantled resistors yielded some plated brass strips, I used these for mounting the capacitors and the grid leak.

For the foils I used brass shim, again around 2 thou’ thick. Both mica and shim were cut easily with scissors. The end plates I cut out of some brown paxolin sheet, about ⅛ inch thick.

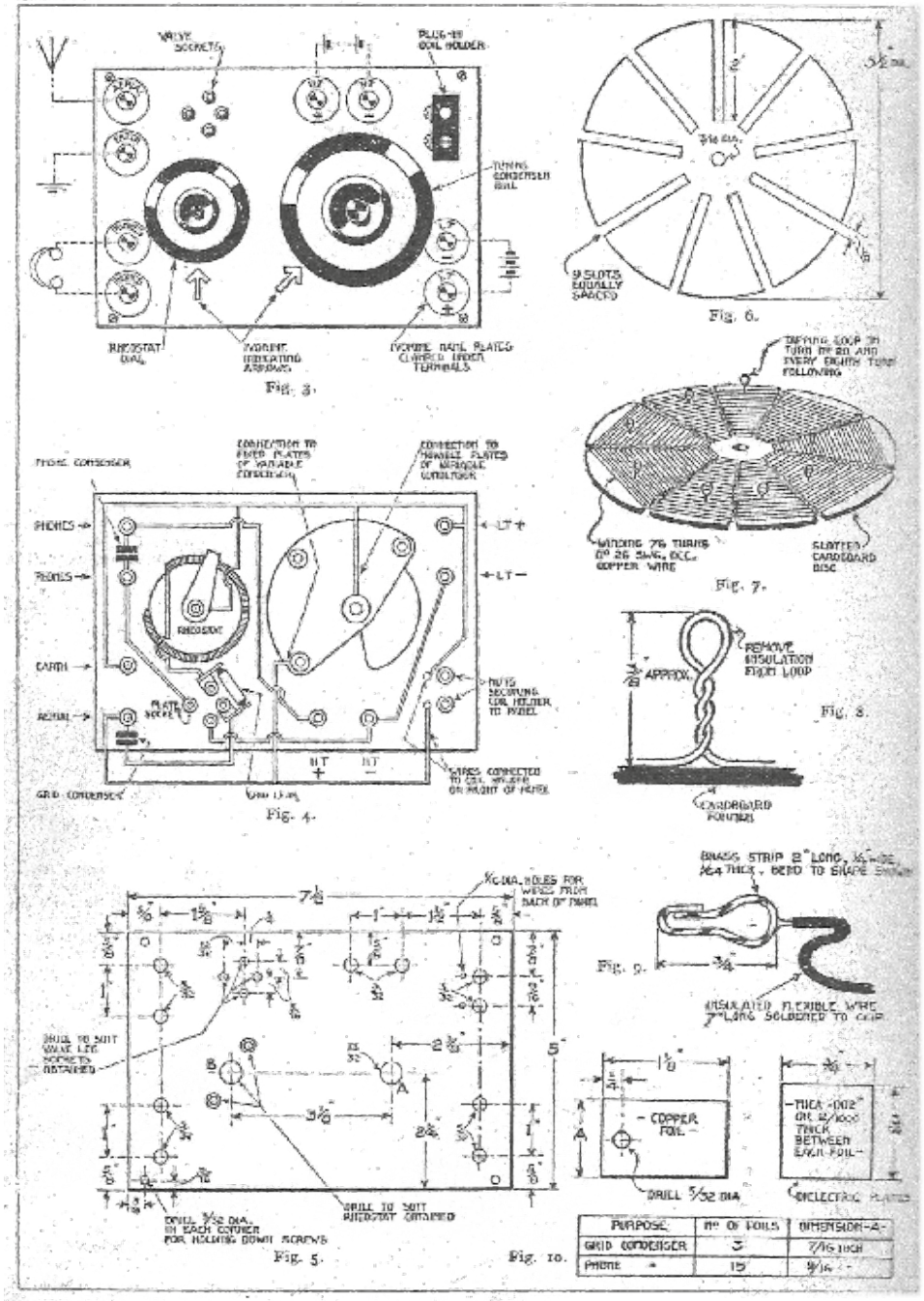
The construction was ‘fiddly’. It was difficult keeping the mica and brass sheets ‘in line’. On completion I tested both, no I didn’t use the flash-lamp and battery! See fig.13.

As we all know, the formula for a two plate capacitor is:

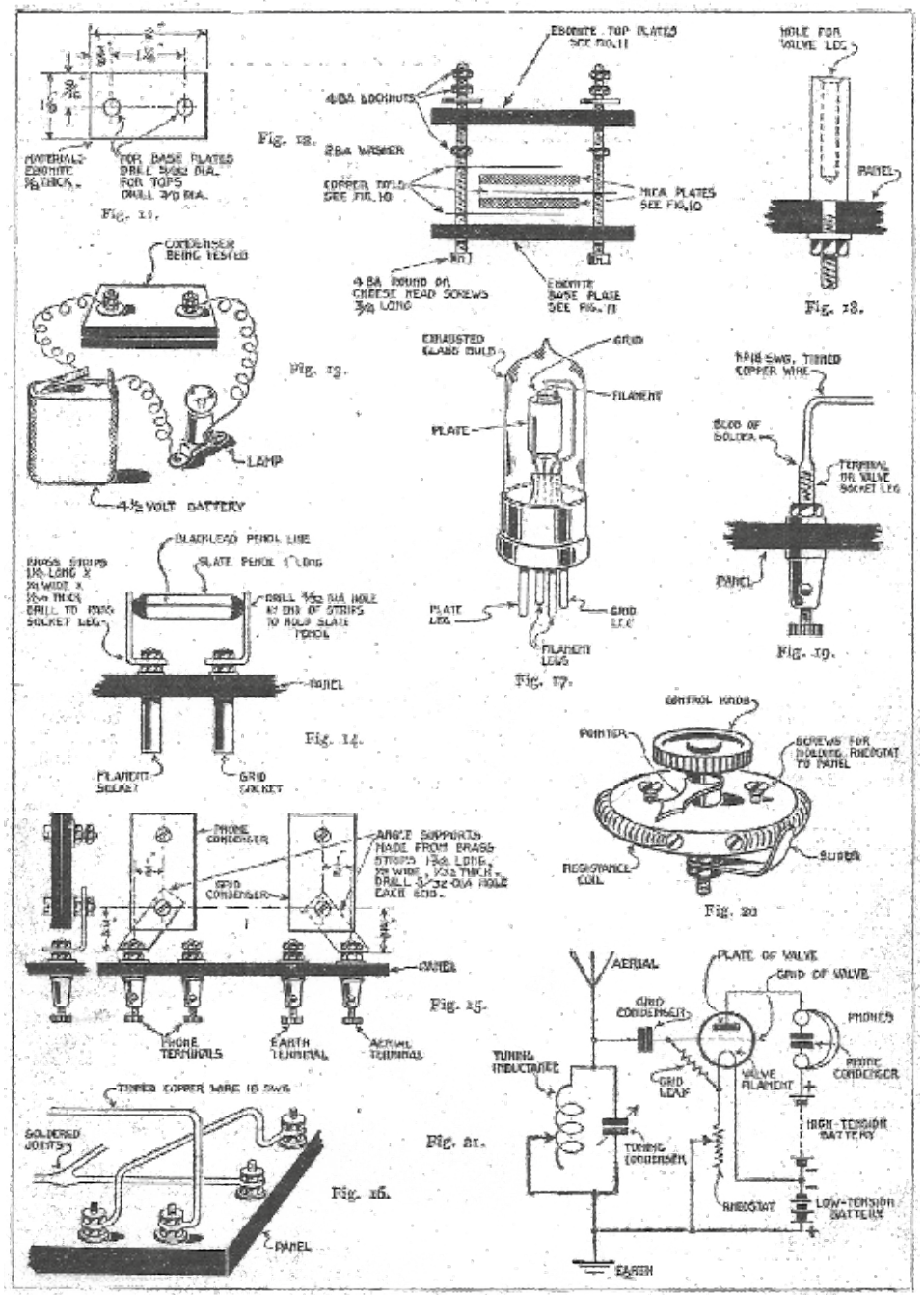
$$F\,(Farad) = \frac{\epsilon_o \epsilon_r a}{d}$$

For ‘n’ number of plates:

$$F = \frac{\epsilon_o \epsilon_r (n-1) a}{d}$$



MORE PARTS OF A VALVE SET



For those readers dying to work out the theoretical values, εo is the permeability of free space at 8.85x10-12F/M, εr is the relative permeability of the dielectric used. 'A' is the area of a plate, in square metres and 'd' is the distance, in metres, between them.

When I taught these subjects I had problems with students who hadn't been properly introduced to negative powers. Most had to be shown how to convert square millimetres to square metres. My early technical training involved converting imperial measurements to S.I. units, you end up with very awkward figures. I used 5 for εr, being mid-way in the range for mica. For the grid capacitor I worked out the value around 550pF, a test on the Marconi was 135pF. The phone capacitor calculation was approximately 4nF (0.004μF), a similar test showed 1.5nF (0.0015μF). I'm not at all surprised by these results, I rounded up, or down, converting imperial to metric and the test values would reflect my accuracy of manufacture materials, clamping, etc.

The grid leak

(See photo no.4 and fig.14)

I was fascinated by this. Original black lead pencils, as with the blacklead mixture used on fire grates, must have contained a mixture of lead/carbon. We have some small sheets of slate in the garden. How do you cut slate ? I found by scribing a line with a bradawl it was comparatively easy. The illustration shows a length of one inch, the width looks about a ½ of an inch. I carefully 'nibbled' along my scribed lines, with small pliers. The ancient art 'napping' comes to mind in making flint arrow heads.

During my nibbles, the final shape selected originally came off, with a thickness of about 1/16 of an inch.

I drew a line, using a 2HB pencil which gave a reading of 50KΩ on my DVM. I rubbed it out and experimented with thinner ones, I settled for 300KΩ.

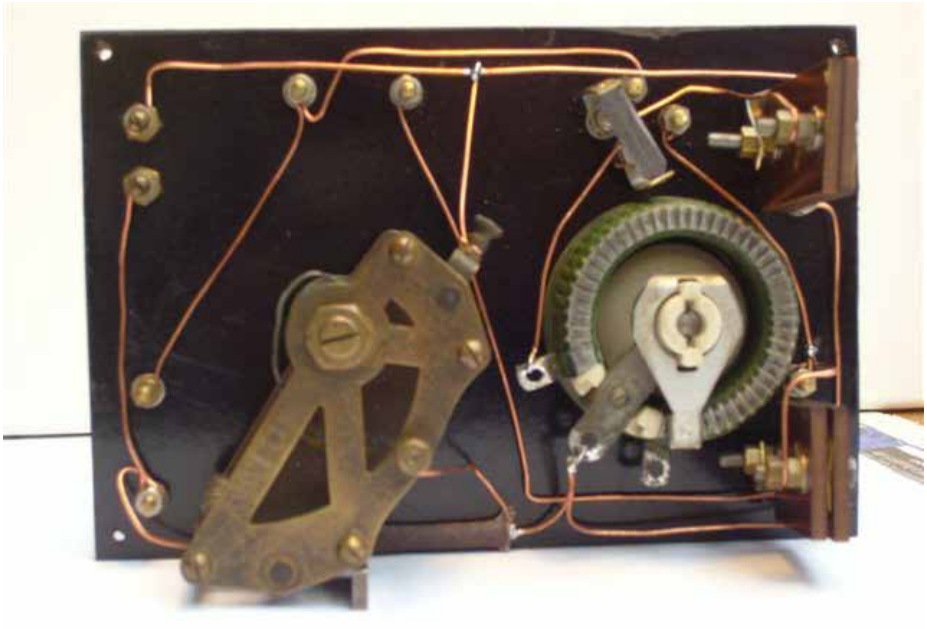


Photo 5

The tuning capacitor

(see figs 4 and photo no.5)

The text gives a value of 0.0005 or 0.001μF. The illustrations show a 'square law' or linear type. I used a logarithmic one of 500pF approx. It is made out of brass and has the word 'Lotus' engraved on a side plate.

The Rheostat

(See figs 4 and 20, also photo no.5).

A 'Bercostat' of 3Ω, rated at 4A, taken out of its case, yielded the rheostat. The element is wound on a ceramic toroidal former around two inches in diameter, with a ¼ inch shaft. The skirt of the knob carries a rotational index of 0-10. It is a near perfect match for the original.

Knobs

(See fig 3, and photo no.6)

For the tuning I used the lower section of a 'double' control knob, engraved 0-180°. To get a near look-alike to the original, I used a marriage of another one, Araldited to the engraved section. It was a near perfect match. I re-filled the engraving with a 'lacquer stick' made in the USA. This is a white compound which you rub over the engraving.

The rheostat control used the skirt, from the original knob. Again, something which looked a near original. It was however, a little more complicated than the tuning one. I 'trepanned' off the skirt plus a thin section it was screwed to, doing a similar action on the 'top' section of a second knob. I drilled a 4BA thread to accommodate a grub screw in this section. Without a lathe this work would have been difficult.

Again, I Araldited the two together. I made the arrows from some plastic sheet. See photo no.6.

Valve sockets, terminals, idents and case

(See fig 1, 3, 18 and 19 and photos 6 and 7)

The sockets I made on the lathe. The drawings are self-explanatory, out of brass rod. The terminals I could match exactly, thanks to a clear-out from my old college! The idents, I had all but two, the LT- and the aerial. I made these from black plastic sheet and rub-down lettering, covering with self-adhesive clear book covering.

The case

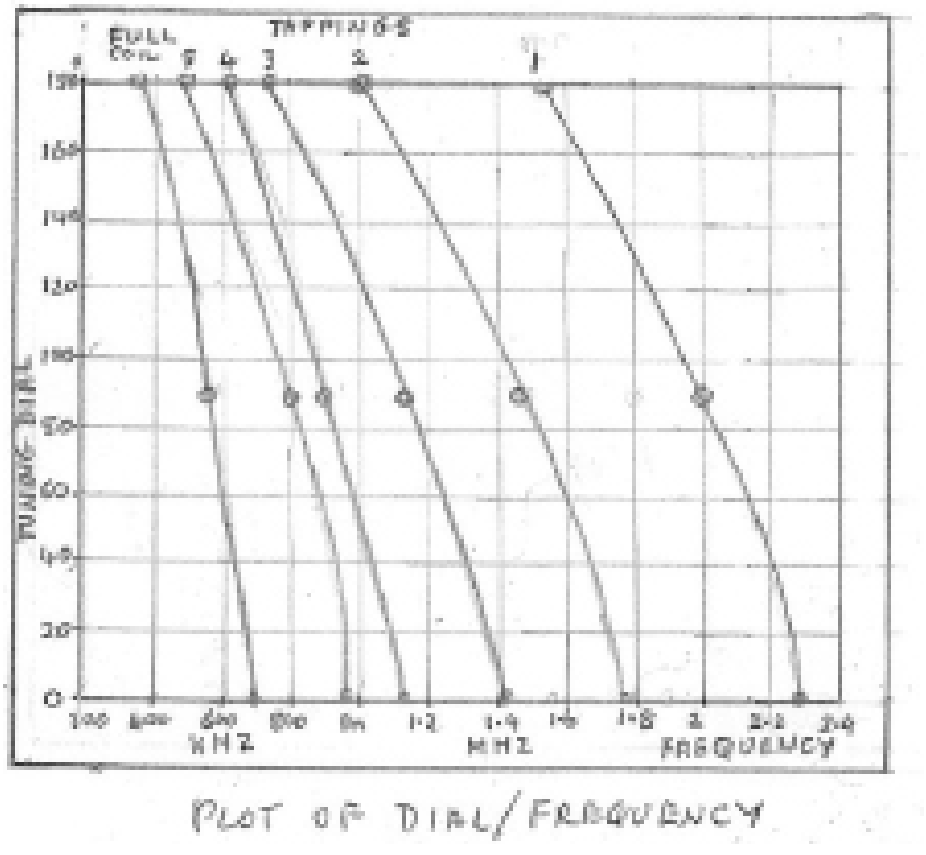
(see fig 4 and photos 5 and 6)

There were no details in the text, which I found surprising. I used oak from some cupboards. The local DIY, wood section, kindly planed it down to ⅜ inch thick for me. I used simple 'butt' joints, screwed and glued. The base is the same, with four rubber feet. As the panel is set into the case, it had to be a very good fit. Any gaps would look horrible. I used a natural beeswax polish.

Photo 6

Photo 4

Photo 7



PLOT OF DIAL/FREQUENCY

Assembly and Circuit

Now I had all the components, I could drill the panel. I did this on my Black and Decker pillar drill to ensure the holes were 'square'.

I wired-up, using the earth conductor from a piece of 1.5mm twin and earth oval cable.

I avoided using solder tags. I think they were around, Brown Brothers showed them in a 1925/26 catalogue, but this design was, earlier I think.

Also, I clamped the wire under the fixing nuts. Soldering, although advised in the text, would have got the terminals very hot. I was not going to risk a disaster with the plastic panel.

Switch-on

With an LT of just under 4 volts, the rheostat at max 'R', an HT of 60 volts, my S.G. Browns headphones, a garden longwire aerial and an earth, it worked ! These valves are bright emitters and by reducing the rheostat resistance, the valve began to glow. I could get stations, at a low volume, as expected. Substituting a Cossor 210LF and reducing the applied LT to 2V dramatically increased the volume.

I returned to using the Cosmos and using a home-made amplifier to give loudspeaker volume. The amplifier I used was made to demonstrate 'phone'-only radios, it uses a Maplin 3W kit, and is battery driven.

I used my Advance B4A7 signal generator to plot the frequency coverage, see table below:-

Coil Settings	Tuning Capacitor Settings		
	0°	90°	180°
Tap 1 @ 20 turns	2.3MHz	2MHz	1.35MHz
Tap 2 @ 28 turns	1.75MHz	1.46MHz	1MHz
Tap 3 @ 36 turns	1.42MHz	1.15MHz	750KHz
Tap 4 @ 44 turns	1.15MHz	900KHz	625KHz
Tap 5 @ 52 turns	985KHz	800KHz	525KHz
Full Winding	700KHz	555KHz	380KHz

380KHz (789M) to 2.3MHz (130M) with this coil is possible.

As mentioned earlier, using 22swg wire resulted in a 10% drop in turns. If I made one with 26swg I would expect a roughly 10% change in frequency coverage.

It was interesting to plot the six frequency ranges on the graph shown to the left.

The plots are very linear due, as expected, to the logarithmic capacitor.

The tuning, as expected, was not 'sharp', occupying on most stations about 10 dial degrees. I kept the LT voltage below 4 volts, these valves are rare!

Conclusions

Making this radio was very enjoyable, in a small way bringing past technology into a modern communication era.

Also, it showed how the constructors of this radio and other such devices would have had skills not in evidence today.

Cosmos A45 - http://www.r-type.org/exhib/aaj0182.htm

Audiojumble, February 2017

Photos by Greg Hewitt

Garrard 401


ReVox
ReVox


SONY
STUDER
ReVox
ReVox

Restoring a Sobell 511W

Scott Elliot

Released in June 1950, the Sobell 511W is the walnut veneered cabinet version of the 511 series. The other members of the series were a plastic cabinet version and a table radiogram.

It is a 4-valve (plus metal rectifier) 3-band superhet designed to operate from AC mains of 200-250 volts, 50-100 c/s without adjustment. Valve V1 is a triode heptode (Brimar 7S7) operating as a frequency changer with internal coupling. V2 is an RF pentode (Brimar 7H7) operating as the IF amplifier. V3 is a double diode triode (Brimar 7C6) for detection, automatic gain control and audio amplification. V4 is a beam tetrode output valve (Brimar 6V6G). The schematic for the Sobell 511 series taken from the Trader service sheet is shown in Figure 1.

It seems appropriate at this stage to point out that I am relatively new to vintage radio restoration, only taking it up after I retired a few years ago. It all began when my sister-in-law presented me with a Bush DAC 90A, partly dismantled in a cardboard box. Apparently, it had once belonged to my wife's Aunt but had fallen fowl to an abortive repair attempt. Although I have had a lifetime career in radio communications, I have never been involved with the Radio and TV Trade, so seeing this old set made me curious and presented the challenge of trying to get it working again. After that, I was hooked!

Anyway, back to the job in hand – the Sobell. The set came into my possession due to an attic find and would be my first attempt at restoring one with a wooden cabinet. What challenges would that throw up I wondered.

At first glance it looked in a pretty shabby state, with its glass dial loose and leaning at a drunken angle, but at least both knobs were present and looked to be original and

The Completed Restoration

undamaged, as was the 'speaker grille. The cabinet was badly afflicted with scratches and chips making it look dull, dirty and sad as seen in Figure 2. Turning the tuning knob had no effect on the dial pointer, but after removing the back cover for a quick appraisal, it appeared through a layer of undisturbed sooty dust, that all the major components seemed to be present. The layer of dust made me feel quite optimistic that the radio hadn't received a visit from the 'phantom mechanic' – at least not recently.

Although no signs of woodworm were apparent, I thought it prudent to treat the inside of the cabinet with woodworm killer. The last thing one wants is a worm-infested workshop (or house!). This was easily achieved after removal of the chassis, loudspeaker and grille.

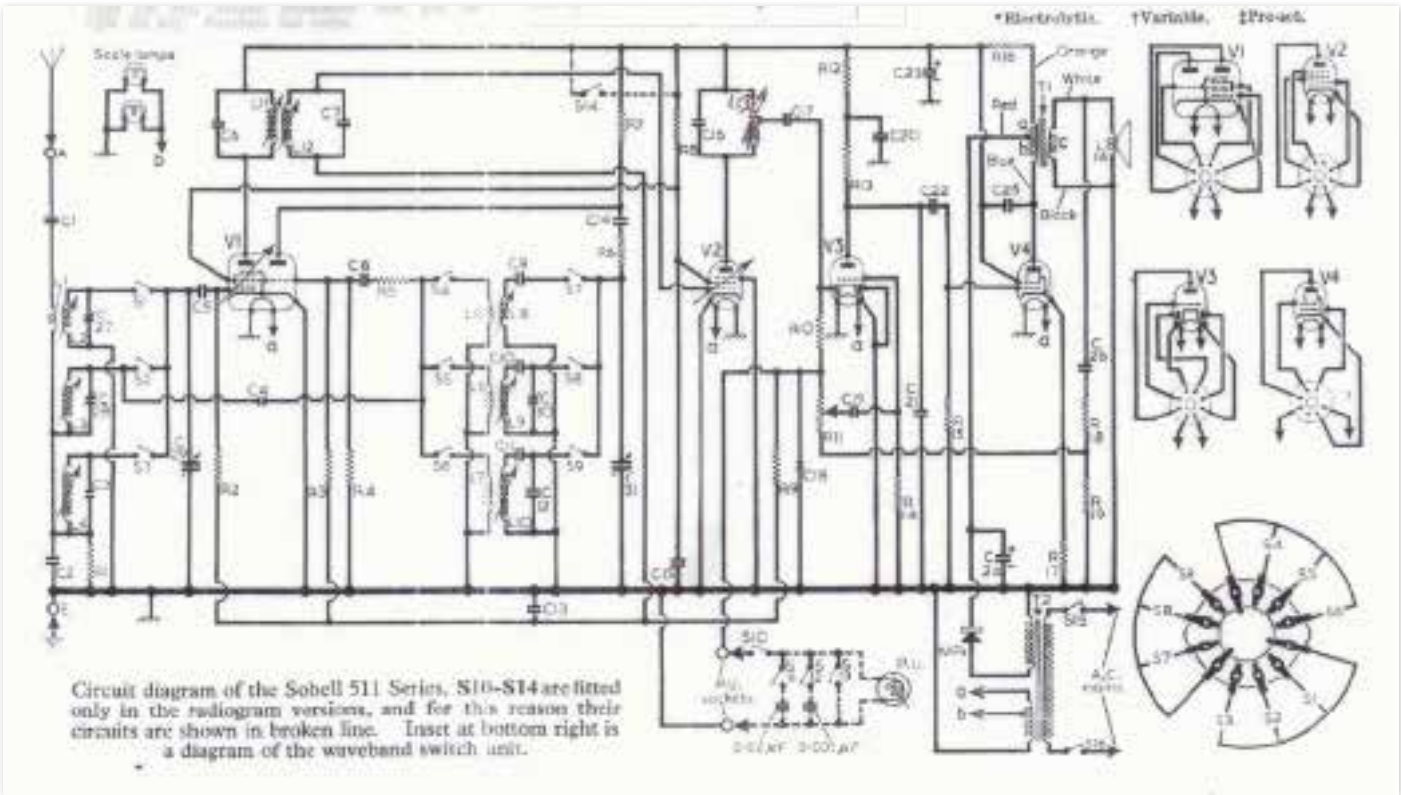


Figure 1

Figure 2

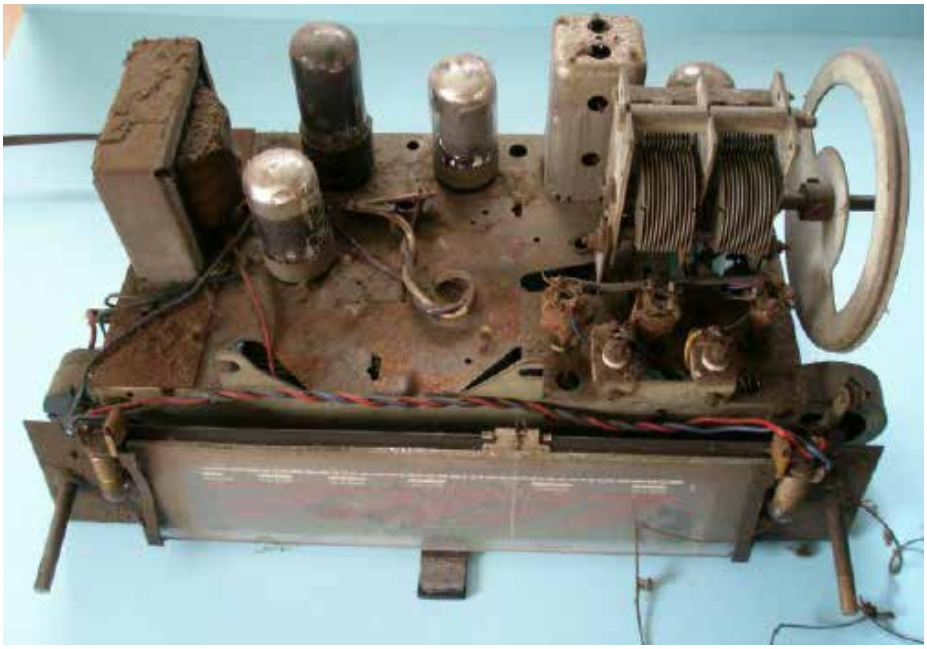


Figure 3

Figure 4

The chassis

With the cabinet put to one side, attention was turned to the chassis. It was immediately obvious why the tuning mechanism didn't work; the drive cord was lying loose having disengaged itself from all the pulley wheels as seen in Figure 3. However, its tensioning spring was nowhere to be seen! (So much for my assumptions about the phantom!) Fortunately, this set's drive cord arrangement was simplicity itself to re-string; reference to the Trader Sheet being made only to see how many turns of cord to put around the control spindle. New cord was used and with a suitable tensioning spring found in the junk box, a quick and effective repair was made. I noticed that a flywheel was attached to the control spindle, affording the set some degree of 'flywheel tuning'. During the above operation, it was noticed that the rubber grommets used to mount the gang capacitor were completely perished and would need replacing. In view of this I left the cursor off, as its exact position on the cord will have to be determined after the grommets have been replaced later.

The usual 'cold' electrical checks were carried out next, which confirmed that the mains lead, on/off switch (part of the volume control) and the mains transformer primary winding all had electrical continuity without any short circuits to chassis; the on/off switch was functional. The HT line was also free of any short circuits to chassis and the AVO 8 test meter measured resistance momentary as the smoothing capacitors charged up. Finally, the audio output transformer and 'speaker windings were checked for continuity and as these too were healthy, it was time to connect the loudspeaker and switch on.

With the test meter connected between the smoothing capacitor positive terminal and chassis, mains was applied via an RCD and safety lamp. The latter glowed dimly, as did one of the two scale lamps while I waited for the meter to indicate HT. No such luck! The pointer on the meter refused to budge, so its positive lead was connected directly to the metal rectifier cathode terminal (figure 4), but again no voltage was present. The metal rectifier anode terminal was tested next and found to have a healthy 255 volts AC. Clearly, the metal rectifier had failed, so after isolating the set from the mains, it was duly removed from the chassis. Its faulty state was confirmed using the AVO, which showed open circuits in both forward and reverse directions. Consideration was given to replacing it with a suitable modern silicon diode and resistor, but on seeing how the metal rectifier was constructed, I thought I'd try a different approach.

The metal rectifier consists of eight individual diodes in series bolted together on a central rod. By removing a retaining nut from the end of the rod, the diodes slid easily from the latter for testing. After wiping the contact areas of the diodes with a clean cloth, each now boasted a forward resistance and (a different) reverse resistance – just as they should. I suspect it was just bad electrical contact between each diode that was causing the problem. The Rectifier was re-assembled, making sure that the polarity of the diodes were correct when placing them back on the central rod; the retaining

nut was then done up nice and tight to ensure good contact between the diodes. A final check revealed that the assembled unit now also had forward and reverse resistances, so it was fitted back in the chassis.

On re-applying mains power, the HT as measured at the reservoir capacitor was 177 volts DC. Unfortunately, this was accompanied by the most horrendous mains hum I have ever heard! I apologised to the loudspeaker as I quickly switched the set off. Combined reservoir/smoothing capacitors C24 and C23 respectively (figure 4) are readily accessible so it was easy to bridge each in turn using a suitable modern capacitor. With the reservoir capacitor bridged, the mains hum was eliminated. I disconnected the dud section and strapped the modern replacement to the original case using small cable ties and made the electrical connections permanent. (figure.5) The HT now read 177 volts at the reservoir and 155 volts at the smoother with the safety lamp bypassed. These readings were within a couple of volts of those stated in the Trader Sheet. Interesting to note from the circuit diagram that any residual hum is neutralised by feeding the HT current through a section of the output transformer primary.

Before going any further, I checked to see if the output-coupling capacitor (C22) was leaky. I like to do this sooner rather than later, because if it's very leaky, it could drive the output valve so hard as to damage it and probably its cathode resistor as well. With the test meter leads clipped between V4 control grid and chassis, it was found that its voltage changed when V3 anode was shorted to chassis, proving that C22 was indeed leaky. This too was replaced with a modern equivalent. The new components can be seen in Figure 5.

With my 'throw out' aerial and local earth connected, the set was quickly receiving all the usual local stations, plus Radio 5 Live on the medium wave band – with good clarity and volume. The long and short wave bands appeared to be totally dead, but I have come to expect this, as most of my previous restoration sets have suffered from the same problem. So without further ado, the wave-change switch contacts were given a dose of switch cleaner and the switch operated a good number of times, which sorted out the problem. The set was now quite lively on all wavebands with Irish Radio 1, BBC Radio 4 and two French stations on long wave all being received at good volume levels. The volume control was a little crackly when operated so that too was successfully treated with switch cleaner. I soak tested the set for an hour or so and with nothing overheating or any other obvious problems developing, I was happy to start cleaning up the chassis and replace the gang mounting grommets as mentioned earlier.

The gang is secured at three points, each utilising a mixture of screws, washers, and spacers and of course the grommets. A sketch was made of each fixing point to eliminate guesswork when it came to re-assembly. The job was made easy by virtue of the unobstructed access to the three fixing locations. At this juncture, I oiled the moving parts associated with the tuning control and the wave-change switch. The latter is operated from the front of the set by means of a lever connected to the switch via a rod and crank mechanism.

Figure 5

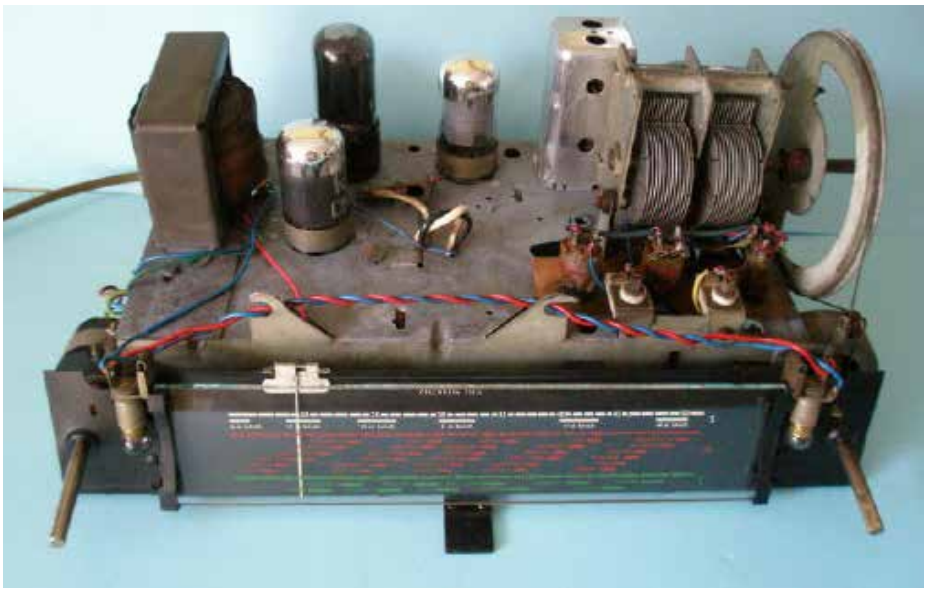


Figure 6

Figure 7

The chassis cleaned up nicely; only a few small areas needed de-rusting and treating with Hammerite paint. The valves were removed while doing this, their pins being cleaned using a fibre brush and their holder contacts with switch cleaner before being re-inserted. The two-core mains lead was replaced at this stage using modern 'vintage look' gold coloured three-core cable, the Earth wire being connected to chassis. I like to do this on isolated chassis sets as an added safety feature. I know it puts extra stress on the mains transformer windings, but one could argue that if, as a result it breaks down electrically, then it needed changing anyway! The dud scale lamp was replaced with a new MES 6.3v 0.3A bulb.

The cabinet

With the electrical and mechanical jobs taken care of, attention turned to the wooden cabinet. As stated earlier, the surface was dirty and dull; the grain of the walnut veneer was barely visible. A good rub down using foam cleaner and cloths soon got rid of the dirt but of course did nothing for the many scratches and chips. Some of these were quite deep which convinced me that sanding it down was the only option.

Using fine sandpaper and block, it quickly became apparent that this had once been a very handsome radio. The grain was becoming more prominent and it could be seen that the walnut veneer had been applied in a 'mirror image' style producing a very attractive pattern. All was going well, the chips and scratches disappearing nicely – then disaster! One swipe too many with the sandpaper exposed a white spot, proclaiming that I had worn right through the veneer revealing the plywood carcase beneath; and as Murphy's Law clearly states, this has to happen at the most prominent part of the job - on the front near the top in my case!

For the moment I put the blunder to the back of my mind in the hope that I could fix it later. I carried on sanding the scratches and dings out with extra care – especially on the curves and corners – using very fine wet and dry paper. In hindsight it would probably have been quicker and safer to use paint stripper to remove the layers of cellulose before final sanding. However, apart from the 'white spot incident', I was now very pleased with the way the cabinet looked. All the scratches and chips had disappeared and the grain was prominent and appealing.

I tried various things to camouflage my misdeed. Coloured wax furniture-restoring sticks; various types of polish, plastic wood etc but nothing seemed to work. Whatever I did, the blot on the landscape just seemed to scream 'I'm still here'! Then either inspiration or desperation (still not sure which) came to my rescue. For some unknown reason, I coloured the white spot using a black marker pen and deliberately smudged it before it dried. Believe it or not, this actually looked better than all my previous efforts! The veneer does have some small dark areas so perhaps that's why it seemed to blend better. Anyway, with a little further development I managed to make the now black spot look pretty convincingly like a knot! When I eventually concluded that I couldn't improve on my creation, I made another one on the other side of the cabinet in order to maintain the mirror image effect. Definitely a case of 'when is a knot not a knot?'

Next, decisions had to be made as to how the cabinet should be finished. It would have been nice to keep its originality by using cellulose, but I find that it is quite difficult to obtain these days – especially in the small quantities that I would require. So a modern finish it would have to be. After much debating, I decided to try some clear polyurethane, which I had to hand. After all, it made a great job of that garden bench seat I refurbished last year.

After just one coat I couldn't believe how well the wood now looked. The grain became even more prominent with a golden hue. It eventually got four coats of polyurethane with a light rub down with 1200-grade wet and dry paper (used wet) between coats. Several days later I polished it with car polish, which gave it an extra shine and eliminated the slight imperfections to the surface caused by applying the polyurethane by brush.

Figure 8

The grille cloth was intact with no holes or fraying – but filthy; this and the grille was tackled using foam cleaner and paper kitchen towel. I found that spraying the cloth generously with foam cleaner then squeezing it from both sides simultaneously with kitchen towel, to be an effective way of extracting the dirt. It took a few goes but the results were good. No shrinkage or distortion of the fabric occurred.

The inside of the glass dial was filthy and would require some very careful cleaning to ensure the legend didn't get damaged. It is held in place by a spring clip at each end and the reason that it was so crooked to start with was simply because one end had slipped out of position in its clip. I found cotton buds dampened with water to be a safe and effective method to clean the dial. Care being taken to avoid as much of the lettering as possible and not to rub too hard. Patience is the name of the game. In actual fact, this dials seems quite robust compared to some I could mention – but one can't be too careful. With the dial now looking pristine it was securely placed back in its clips.

With the dial now in its rightful place I could fit the cursor to the correct part of the drive cord replaced earlier. Having tuned the radio to a local station I placed the cursor on the drive cord at the correct wavelength as marked on the dial before tightening its tab to grip the cord. A quick check showed that other stations seemed to be more or less where they should be on the dial so decided there wasn't much point in trying to attempt a re-alignment. This is something I may do in the future to gain the experience. The restored chassis is shown in Figure 6, the dial Figure 7 and the restored cabinet in Figure 8. Can you spot the (not) knots?

Conclusion

The Sobell 511W is an uncomplicated 1950's superhet receiver, the circuitry being typical of many from that era; perhaps a little less so regarding the metal rectifier, as many later sets were still using valve rectifiers. The ease of dismantling and open access to most of the parts likely to need attention or adjustment, make it an ideal set for anyone just starting out with vintage radio restorations. After all, in my book the whole point of radio restoration as a hobby is to have fun doing it. With sets like these that have little or no intrinsic value, are easy to obtain for a pound or two and a delight to work on, there is little to loose by having a go. Yet much pleasure can be had when they burst into life again – and maybe for the first time in 50 years. It does have to be borne in mind of course, that when restoring any veneered cabinet, the depth of the chips and scratches may be perilously close to that of the veneer!

I only use a throw-out aerial (about 10 feet) and mains earth, but the sensitivity is very good, receiving many stations on all three bands. It would be very interesting to hear the results if connected to an elevated outdoor aerial. It may not win any 'concours d' elegance' competitions but is still an attractive set in my opinion and worthy of a place in any collection.

DIY Electroplating Kits - An answer for the purist restorer?

Mark R James

Some time ago I spotted some home plating kits by Frost A.R.T. Ltd. I have used their products in the past and been very pleased with them so when the opportunity of an on-line discount arose I made the necessary purchase. My plan was to use the kit for my project which I have described earlier in this edition of the Bulletin (“An Ekco of a Mayflower” p5).

When I discussed my intentions with other members of the Society it became clear that there might be more widespread interest and a proper review of the kits may be of value. I had bought the equipment for brilliant nickel plating, however, it was felt that there would be interest in both this and also the cadmium-zinc finish. After discussion I approached Frost who supplied the cadmium-zinc module FOC – the remainder I had already bought. I have no other connection with the company. To thoroughly test the kits I decided to re-plate two steel chassis – one with bright nickel and one with cadmium zinc. I would then do the same for two chassis made from brass. As you will see from what follows this is a process to undertake in a well ventilated outbuilding; even I did not contemplate using the kitchen! As the fluids need to be at a reasonable temperature it is probably best done in the summer.

Common plating module

Some common equipment is required for all the plating modules and Frost supply this as their Common Plating Module. It consists of a 10L tub and lid, a 0.16A variable voltage power supply, a control unit, two stainless steel suspension rods (one of them sleeved with insulation) and clips to hold them to the rim of the tub, a bundle of leads with croc clips and a dust mask and gloves (Photo1). In order to optimise my chances of success I also bought their degreaser/neutraliser solutions and their agitator air pump (Photos 2 & 3).

What I liked about this module was that everything fitted together. The suspension rods fitted neatly through the clips, the tub was roughly the same diameter as height and the 10L nearly filled it which maximised the size of object which could be plated etc. Having spoken to their chemist they have obviously gone to some trouble to ensure that their system works reliably. Voltages/ currents/electrode surface areas/volumes of fluids have all been calculated. One could cut corners and use what is available in our workshops but it may require some experimentation and I have no idea what is in the control box apart from current limitation/short circuit protection. However, their agitator pump is just an aquarium air pump which could easily be improvised.

Brilliant nickel plating module

This module consisted of another 10L tub, a tank heater, nickel salts, scouring powder, nickel anodes, nickel brightener, and instructions (Photo 4). The instructions were comprehensive and the whole kit was quickly assembled along with the items from the common plating module (Photo 5). The salts were then dissolved and poured in followed by the brightening agent. For my first piece I decided to use a flat brass chassis piece. The instructions stress the importance of a clean grease free surface for plating so I scrubbed this with Swarfega, rinsed it, abraded it with 800 grit emery used wet on a block, rinsed it, scoured it, rinsed it, degreased it, rinsed it, neutralised it, rinsed it and then put it in the plating tank! I set the voltage according to the table in the instructions and then plated it for 4 hours occasionally moving the agitator position and rotating the piece once through 180° vertically and horizontally to ensure even plating. I was very pleased with the results for a first attempt. The finish was closer to chrome than that which I associate with nickel although maybe it was like this 60 years ago when new! A duller finish could be obtained by using the standard or matt nickel modules which are significantly cheaper. There were however, a couple of problems. Firstly, I discovered that the plating will not fill in scribe marks – I was warned that if you want a mirror finish then the prepared metal has to have a similar finish (Photo 6). Secondly, I had a hole in my glove and had left a finger print on the metal when transferring it into the plating tank. This was visible on the final finish (Photo7). As with all things there is a learning curve. The remainder of the sheet brass chassis was then plated in a similar fashion except that after the 800grit I then used 1200 grit. When washing the pieces in the degreaser and neutraliser baths I also scoured them with abrasive hand pads and had no further problems with marks on the plating. However, the main chassis and front would not fit in the white tank provided with the kit. Fortunately, on an enforced visit to the local garden centre I spotted that their fertiliser came in 10L rectangular tubs and managed to scrounge one! This proved to be perfect. I managed to fit the main chassis in this by tilting it and placing both anodes along the one edge. By rotating the chassis a few times during the plating process I managed to obtain a very even plating. Photo 8 shows the chassis (which measured 32 x 18 x 4 cm) in the solution. The alternative would have been to plate the chassis in sections but I was concerned that this may result in obvious lines. Photo 9 shows the almost mirror finish that is obtainable. The completed chassis components are shown in photo 10, with photo 11 showing the complete chassis along with the home made coils wound on glass formers cut from glass spice jars. Another learning point was that if the system stops plating after some use then check the anodes – they had been completely consumed! Frost supplied two sets with the kit so this was not a problem. Another trick that I found useful was to hang the piece from the cathode bars with pieces of 1.25mmØ copper wire salvaged from grey twin and earth cable. The croc clips were then attached to this. It gave much more secure suspension, allowed the whole piece to be immersed and kept the clips out of the solution.

The next stage was to progress to plating an old rusty steel chassis. I had picked up a box at an auction which contained two Pilot Little Maestro chassis in very poor condition. One was pre-war and the other post-war. The components were removed and put to one side for a later re-build. The chassis at this stage were rusty and covered with grime and melted wax – a long way from what was needed as a plating substrate! First stage was to put each chassis through my cheap Chinese ultrasonic cleaner. I used “Sea Clean 2” as a

Photo 1 - Common plating module

Photo 2 - Degreaser-Neutraliser

Photo 3 - Agitator pump

Photo 4 - Brilliant Nickel module

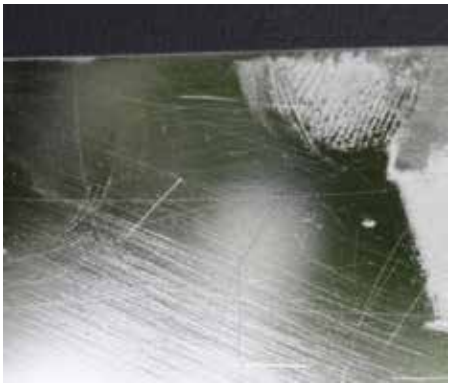


Photo 7 - Finger print

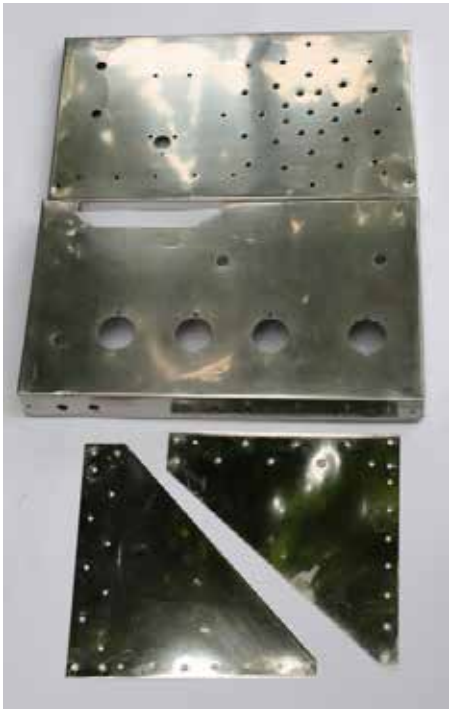


Photo 10 - Chassis components

cleaning agent. This had been recommended to me by a fellow member; no connection to supplier etc. I was stunned by the results – not only did it remove all the grease etc but also most of the rust. The chassis were then rubbed down with 800 grit emery used wet. (There are some important safety caveats here! Some chassis were plated with cadmium which is toxic and not always easy to differentiate from nickel which can itself cause sensitisation. One therefore needs to avoid exposure both from both inhalation/ingestion and skin contamination. It is important to use appropriate protection.

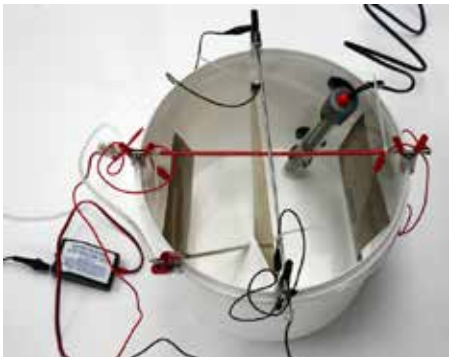


Photo 5 - Assembled tank

Photo 8 - Chassis in solution

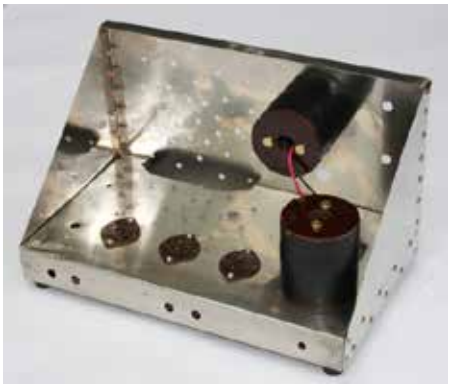


Photo 11 - Completed chassis

I avoided dust by using water lubrication for the emery and wore nitrile gloves.) Having learnt from my first piece I followed the 800grit with 1200grit to remove the fine scratches and also used a hand held wire brush for awkward areas and rust pits. I did not use power tools as any groove formed by an edge of the tool/slip would be impossible to remove. In addition, power abrading can passivate the metal surface and make it difficult to plate. It took longer by hand but was less of a risk. I eventually achieved a clean steel finish which was in fact so clean that it started to rust in less than a minute. The same scouring/degreasing regime was followed as with the brass. The steel was then plated for twice as long as the brass. The reason for this was that the finish on the brass was predominantly for cosmetic reasons whereas on the steel it has the very important function of corrosion protection and is therefore better if somewhat thicker. I was very pleased with the final result (Photos 12 &13). The steel had been completely plated including all the rust pits and the stamped chassis number. The pitting gives the chassis a certain patina. I did not feel that power sanding it back to a completely flat surface was in the spirit of restoration although others may disagree. The only areas not plated were inside some of the small diameter holes for screws which I had not cleaned out. Even though these will not show I should have done this with a round needle file; another learning point.

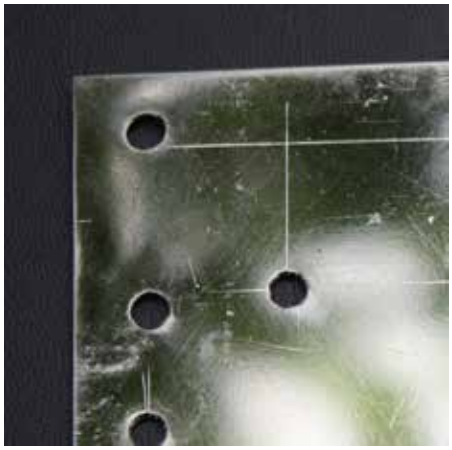


Photo 6 - Scribe marks

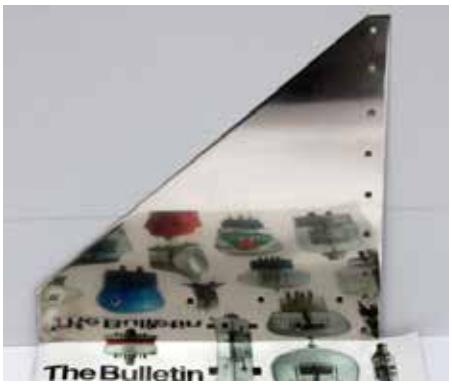


Photo 9 - Mirror finish

Cadmium-Zinc plating module

Cadmium was widely used in the past for plating both in the electrical industries and also in aeronautical engineering. It is a soft white metal that functions as a “sacrificial coating”, corroding before the substrate metal. The corrosion protection is often enhanced by the addition of a chromate conversion coating which yields the familiar yellow/gold colour often seen. From our perspective a most important point to be aware of is the toxicity of cadmium and the need to avoid ingestion/inhalation/skin contamination. The kit provided by Frost does not, for obvious reasons, contain cadmium. According to them, it does however, give the same finish and protection without the dangers. This module consisted of another 10L tub, cadmium-zinc salts, scouring powder, cadmium-zinc anodes, post-plating solution, and instructions (Photo 14). As with the nickel module the instructions were comprehensive and the whole kit was quickly assembled along with the items from the common plating module. The salts for this module were already dissolved and supplied in two containers. The sharper of you will have noted that both the common plating and nickel modules were each supplied with a 10L tub leaving me with a spare. This was just what was needed for this set-up as it requires a tub each for plating and post-plating treatment. The set-up with the components from the common plating module were similar to the nickel one and the plating solution was poured in. This time I started with the steel chassis which was prepared exactly as the other Little Maestro one above. The plating was carried out according to the table in the instructions. I then hit problems ..... the air pump produced mounds of foam and I had to switch it off after a couple of hours. At this time the chassis was still mostly bare metal but with a patchy matt battle ship grey coating with some black

Photo 12 - Finished Little Maestro

soot like splodges. I therefore re-scoured the chassis and put it back in without the agitator pump. At the end of a further 2 hours the result was the same. Post-plate treatment and drying as per the instructions did not improve the appearance. After some thought I tried again with a piece of brass but with the same result. There then followed several e-mail exchanges and phone calls with Frost's chemist. The conclusion was that the solution had either become contaminated by a constituent of the chassis or more likely that the electrodes had been shorted out by the foam resulting in iron contamination of the solution. I then tried as advised to "plate out" the contaminant using scrap pieces of brass but to no avail. I also followed the recommendations that I had been given and checked the electrical circuit was complete through the solution, used new crocodile clips, tried different voltages, scoured the anodes, plated with and without agitation and post-plate treated for different periods all without a noticeable improvement in outcome. If plated for a while and then polished back I could produce a bright finish but this was only realistically possible on flat pieces and risked cutting through the plating. At this point the only option that I was left with was to replace the solution and start again which was not financially justifiable.

Return to the brilliant nickel plating module

The main subject for the whole plating enterprise was the brass chassis for the Ekco project. I had left this until last to gain as much experience as possible before tackling it. I had intended to "cadmium plate" this but after the forgoing was not willing to do this and decided to nickel plate both this and the Little Maestro chassis that I had unsuccessfully

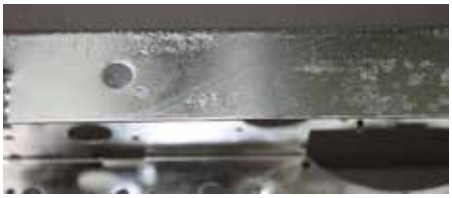


Photo 13 - Little Maestro serial No

tried to "cadmium plate". When I designed the round chassis I was aware of the size constraints that the plating system would impose on me. This was one of the reasons for making the whole thing a "flat-pack" assembly rather than silver soldering/riveting it together. With regards plating it there were benefits and drawbacks to this. The main advantage was that all the pieces were flat or angle section and therefore easy to prep. The disadvantage was that there were a lot of them! Although this took a while, being able to set the tank up each time, (often with multiple small pieces), and then leave it to run meant that it was not actually very time consuming. I did use finer (1500 grit) paper on this chassis to try and improve the finish further and was very pleased with the results (Photo 15). As detailed before I had held the chassis together with brass screws/washers/nuts which I felt would look better plated. These were cleaned with the ultrasonic cleaner, scoured with a toothbrush and Frost's paste and degreased. The assembled fixings were suspended in the solution as "strings" using copper wire which provided electrical connection and enabled large numbers to be plated at once. The results were excellent (Photo 16).

After completing the Ekco chassis I went back to the Little Maestro chassis that I had failed to "cadmium plate". I cleaned it back to bare metal again and then plated it with the bright nickel without any problems producing an excellent finish!

Conclusions

The main conclusion ... every time that I take on a new project I end up learning a lot! I now know a lot more about plating than I did before and would not be concerned about taking on a radio with corroded

Photo 14 - Cadmium-zinc module

chassis components. The most important message that I could pass on has been said countless times before about both plating and painting. If you want a blemish free result then surface preparation must be carried out in an almost obsessive manner.

The kits were all comprehensive and with good instructions. They are not cheap but can be used repeatedly and are more economical than using professional services. The main limitation is the size of the object which can be plated. The results are worth the effort as in my view a chassis painted to look as if it has been plated is not quite correct. Plus you do not require all the extra earth wires!

With regard to the bright nickel plating kit. I would recommend this without reservation as it delivered excellent results despite me pushing it beyond its design parameters in terms of the size of the objects plated. Nuts, bolts and small fittings are always difficult to replace when restoring a set and being able to buy new (or make) and then plate will be a great advantage.

With regard to the "cadmium" kit. I was very disappointed with this for obvious reasons. Contaminating the solution irrevocably was a disaster. Perhaps if I had plated the brass objects first the outcome would have been different. In retrospect I wish that I had compared one of the ordinary nickel or the matt nickel kits with the bright nickel as I suspect that the former will have more uses for our membership.

Refrences

Frost A.R.T. Ltd
www frost.co.uk 01706-658619

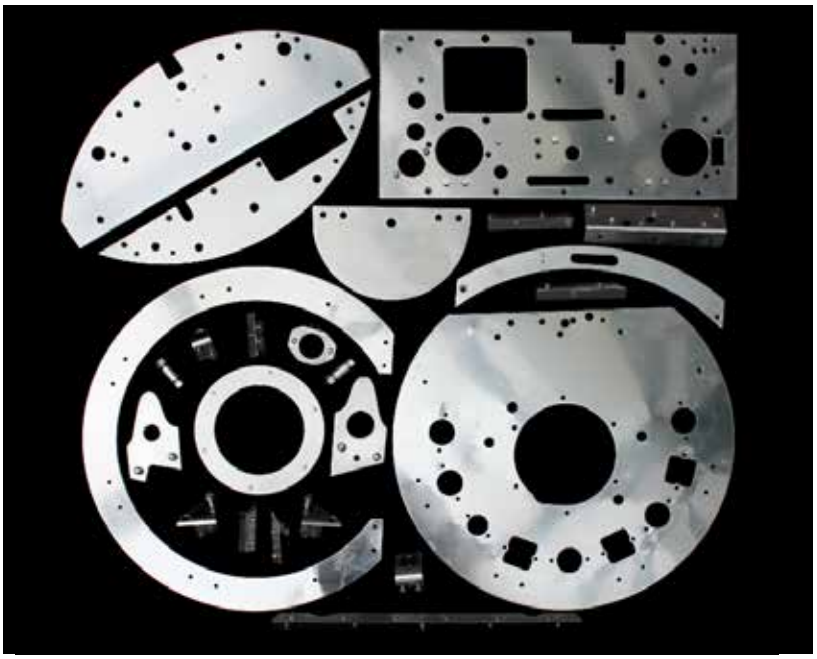


Photo15 - Plated Ekco components

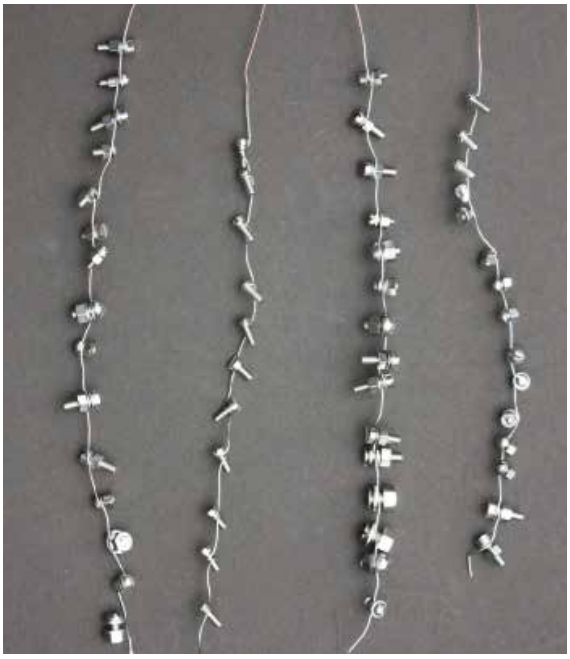
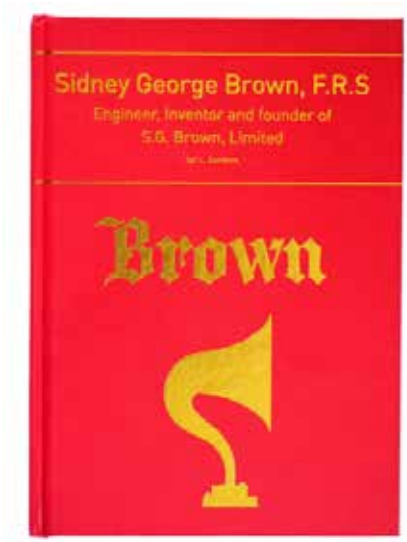


Photo 16 - Plated nuts etc

Review of Ian L Sanders Book – 'Sidney George Brown, FRS Engineer, Inventor and founder of S.G. Brown, Limited.'

Martyn Bennett

Prolific author & BVWS member, Ian Sanders, has produced a magnificent book on another of the early wireless pioneers. His latest book describes the life, achievements and tribulations of English engineer and inventor, Sidney George Brown, FRS.



Early-wireless collectors will be very familiar with some of the numerous loudspeaker models produced by his firm, S. G. Brown Limited, produced in the 1920's and may also have come across his ingenious electro-mechanical amplifiers, which were sold as an accessory to attach to crystal sets. What most collectors will not know about are the numerous inventions and electro-mechanical instruments he developed.

The hard-cover book, of over 250 pages, is beautifully laid out, with copious illustrations. In the preface Ian gives a glimpse of how the structure of the book evolved as he uncovered more & more facets of the inventor's life. The outcome is that the book is in two, similar sized, sections; the first covers the 'Story of S. G. Brown, Limited' and the second 'Brown's Legacy of Innovation: Inventions and Products'.

Although I find the life stories of the early pioneers intriguing I am primarily interested in their technology and products. Even from this perspective I found the historical section very interesting. S.G. Brown Limited was revealed as a true partnership, with Sidney concentrating on the engineering aspects, while his wife, Alice, effectively ran the company! I was also surprised to discover that the well known Telegraph Condenser Company (T. C. C.) was also set up by Sidney Brown (with Arthur Dearlove) in 1906.

As Ian points out, in his introduction to the second section of the book, Sidney Brown's forte was the design of precision instruments, primarily electro-mechanical in nature. Notable areas were: gyroscopic instruments, cable telegraphy, wireless telegraphy/telephony and sound transducers. Most BVWS members are likely to be interested in the wireless electro-mechanical amplifiers and loud speakers, but I also had a particular interest in his gyroscope developments and his conflicts with the Admiralty – who favoured The Sperry Gyroscope Company - as I worked for that company at one stage.

As a major collector of horn speakers (and early wireless sets) I found the chapter on speakers very complete and informative.
I had given Ian access to my collection, but had not otherwise been involved in the preparation of the book. I was pleased that the information was consistent with my own researches - with the exception that I don't believe the company produced an ebonite horn. The book is sprinkled with quotes from the S. G. Brown monthly sales publication, The Brown Budget, which gives them a marketing 'spin'. In the words of President Trump's spokesperson these may be 'alternative facts'. That aside, the book is an outstanding piece of work and I hope a good number of members will buy it.

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Golborne Swapmeet, April 2017

Photos by Greg Hewitt

The BVWS Table

Perdio Portarama

Midget American Set

Tannoy 15" Monitor Gold - Only one!

Quad II Amplifier

The scope of things to come

A survey of Long Wave transmissions

Stef Niewadomski

Assuming it is equipped with long wave coverage, a basic vintage domestic radio will probably have the BBC broadcast at 1500m (marked Light or Droitwich, depending on naming preference), Allouis at about 1800m, and Kalundborg at about 1200m, marked on its dial.

A better quality radio (or one with more optimistic designers) may also have a selection from Paris, Ankara, Oslo, Luxembourg, Hilversum, Lahti (sounds like it should be in Hawaii, but located in Finland), Reykjavik, Saar, Munich, Moscow, Prague and other European cities marked on the long wave portion of its dial.

Figure 1 shows the long wave portion of my Bestone radio, described elsewhere in this issue of the Bulletin: Saratov (presumably the city located on the Volga River, in the Soviet Union when the dial was printed) at about 870m - approximately 345kHz - is above the higher frequency end of the modern definition of the long wave band; Huizen is located in Holland, at about 1900m (approximately 158kHz) on the dial, and seems to occupy the channel more commonly known as Hilversum.

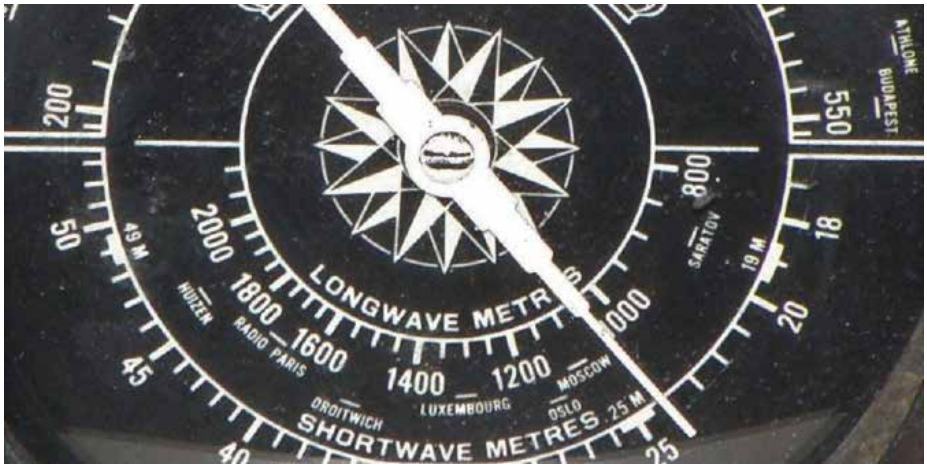


Figure 1 shows the long wave portion of my pre-war Bestone radio, described elsewhere in this issue of the Bulletin.

Figure 2 shows the long wave segment of an Emerson CULW274 midget TRF radio, imported into the UK in about 1939, showing thirteen stations. My Pye P131MBQ valve portable radio – from 1955 - is marked with no less than seven long wave stations (see Figure 3), and again this may be due to over-optimistic designers (or pushy marketeers). Figures 4 and 5 respectively show the long wave sections of the Aerodyne 472 valve radio from 1946, and the Fidelity 208 Bandspread transistor radio, from 1965. These station names reflect the long and varied history of the band.

Before long wave broadcasting closes down altogether, I wanted to make a survey of what I could hear on the band, and perhaps encourage others to listen.

Shutdown

With the prospect of the gradual shutdown of medium wave AM services (not just in the UK), long wave AM broadcasting is already slowly 'downsizing', and this trend will inevitably continue. For example, the Irish broadcaster RTE Radio 1 on 252kHz, having originally scheduled its long wave shutdown for October 2014 - in favour of FM and digital 'platforms' - has recently announced that the switch-off will finally happen in May 2017, which may have already happened when you read this. With no prior notice, Russia switched off most of its long wave transmitters in 2014, and the remaining one, located in the Caucasus, in 2015. This network of transmitters was an ideal way of broadcasting to the population spread across this vast country in the pre-internet age.

BBC Radio 4 on 198kHz, said to be relying on the last of a handful of vintage valves, is in danger of shutdown, though why a new solid-state transmitter can't be installed is probably more of a political question than a financial or technical one. Its aerial and masts (which also support the medium wave Radio 5 Live aerials) were refurbished in 2014, and so these should not be the limiting factors. The Radio 4 carrier frequency is very closely controlled, and acts as an off-air frequency standard: it would be interesting to know what would happen to the standard if BBC broadcasts were to end. Presumably the valves would still wear out if the AM modulation were to be switched off. I believe many users now take their frequency standards from the GPS network, so maybe the 198kHz standard is not as important as it used to be. There is also a phase-modulated data stream transmitted on this frequency, apparently to remotely control Economy 7 electricity meters (see Reference 1). Again, how this would be managed if the transmitter were to close down is not clear.

According to its 2015/16 annual report (see Reference 2) the BBC spent almost £225m on BBC Online in that year: assuming that the masts and aerial are now in good condition, the cost of a new Radio 4 transmitter would be a very small proportion of that spend.

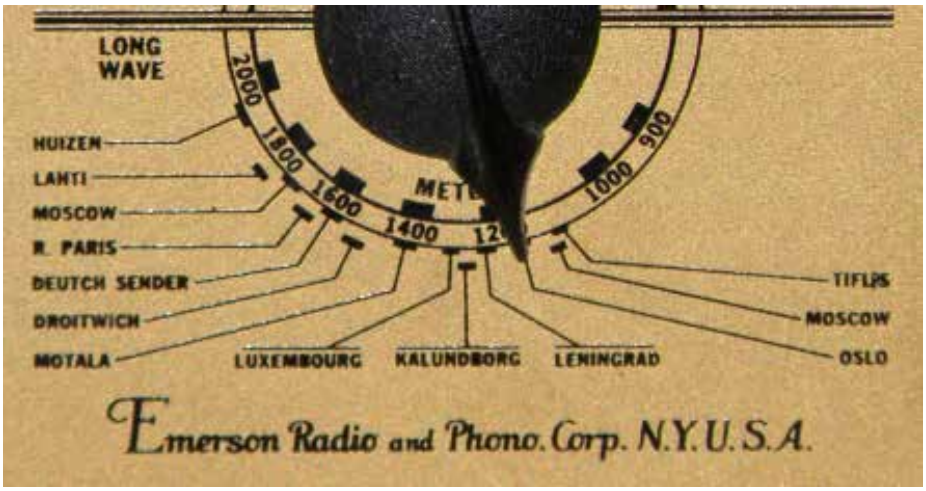


Figure 2: The long wave segment of an Emerson CULW274 TRF radio, from about 1939, showing thirteen broadcasters. The town of Motala is located in Sweden – half way between Stockholm and Gothenburg - and the station broadcast on 191kHz until it was shut down in 1991.

Radio and aerials used

Many domestic radios are surprisingly good at receiving long wave AM broadcasts. Frame aerials, with which many are equipped, are a simple solution to providing a compact long wave aerial at low cost. As I surveyed the long wave, I wanted to accurately measure the frequency of any broadcasts found, and tune to any carrier-only signals. A domestic radio is not suitable for this because it is generally not accurately calibrated and not equipped with a BFO. For these reasons, I used my almost thirty-year-old JRC NRD-525 communications receiver. This is sensitive down to 90kHz and has a frequency stability of +/- 3 parts per million. It also has digital frequency readout which automatically adjusts when CW, LSB or USB modes are selected so that it displays the true carrier frequency. For example, the Droitwich transmission on 198kHz zero beats with the NRD-525 displaying 198.0kHz, and so I concluded that it was displaying the received frequency within a few Hz of its true value.

Having selected the receiver, the next question was how to provide an efficient aerial for the tests. I have a 'long' wire about 15m

Figure 3: The long wave section of the dial of the Pye P131MBQ valve portable radio, from 1955.

in length, which is reasonable for providing a signal to domestic medium and short wave radios, but which is distinctly 'short' and inefficient for the long waves. I'm very fortunate in having a farmer's field at the bottom of my garden and have had for a while the idea of draping a length of wire along the hedge which runs approximately east-west on one side of the field, and trying it as an aerial. So that's what I did: I used about 350m (say about 1,000 feet) of 7/0.2 plastic-covered wire, at a height of 2m or so, which should act as a rather good aerial on the long wave. So as not to annoy the farmer, I only kept the aerial in place for a couple of days (and nights), and after that I connected the receiver to the (non-electrified) metal fence which ran along the edge of the field, and was pleasantly surprised at how well this worked!

I realise that 350m long aerials are not available to most readers, and the next type I plan to try is a loop aerial. This can be physically small, tuneable and directional, which helps eliminate man-made and natural interference. Ready-made designs, with and without built-in amplifiers, are available commercially, and some homemade designs can be found online (see for example Reference 3). Some loop designs couple to the receiver inductively, whereby the receiver is simply placed inside the loop, with no physical connection, whereas others have an extra single turn winding which is connected between the receiver's aerial and earth inputs.

Listening times

Long wave transmissions are strongly affected by the time of day, and in the winter (which was when I conducted this survey) night time is definitely better for long distance propagation. Interference from atmospheric phenomena such as thunder storms can be intense during the summer, and nearby TVs, switching power supplies and other domestic noise sources can make reception difficult. Therefore, the obvious time to listen is in the middle of the night during the winter when many man-made interference sources are switched off and there aren't too many thunderstorms around. The results shown later were mainly obtained during the night in February 2017.

Carrier frequencies

By international agreement, the carrier frequencies of long wave broadcasts are exact multiples of 9kHz, ranging from 153kHz to 279kHz. However for historical reasons, there are stations which do not use these 9kHz-spaced channels – for example, the French language station Europe 1 on 183kHz (located in Germany), and what are believed to be three active Mongolian transmitters on 164kHz, 209kHz and 227kHz - none of which I managed to hear. See below for the strange behaviour of the transmitter nominally allocated to 243kHz.

The results

Table 1 is a summary of my listening tests, as heard in my Oxfordshire location. The long wave is used by public broadcasters only in ITU Region 1, that is in Europe, Africa, the Middle East west of the Persian Gulf, the former Soviet Union and Mongolia, and so these are the regions from where we might expect to hear transmissions.

In the table, I've shown the frequency and wavelength of potential broadcasts and whether I successfully heard a carrier at that frequency and a recognisable broadcast – defined by me as a voice and/or music. My foreign language skills are not great, but I've tried to show the language of any broadcasts: this tends to be the language spoken by the announcer as there is much English-language vintage pop music being broadcast on most of the transmitters. The signal strength is as read from my receiver's S-meter: you shouldn't take too much notice of the absolute value, but the relative values between the different transmissions are useful indicators of which are stronger and which are weaker. Not surprisingly, Radio 4 on 198kHz was the strongest broadcast heard.

One thing that surprised me was the amount of French language broadcasting. Despite the cessation of programmed broadcasting from Allouis on 162kHz, there are still five regular broadcasters in French, partly due to the ex-colonial influence of France in North Africa.

Carriers only

I could hear carriers at 162kHz, 189kHz and 279kHz, but no voice or music broadcasts. The carrier at 162kHz is easily explained, but I'm not sure how to interpret the existence of the others. It may be that the broadcasters transmit a carrier on their channel even when not broadcasting speech or music, perhaps to demonstrate that the channel is occupied, or perhaps other data is being transmitted (as is the case on 162kHz), which I couldn't hear.

I presume that the Mongolian transmitters on 164kHz, 209kHz and 227kHz are simply too distant for me to hear carriers, speech or music. I would have expected to hear broadcasts from Iceland on 189kHz, but this

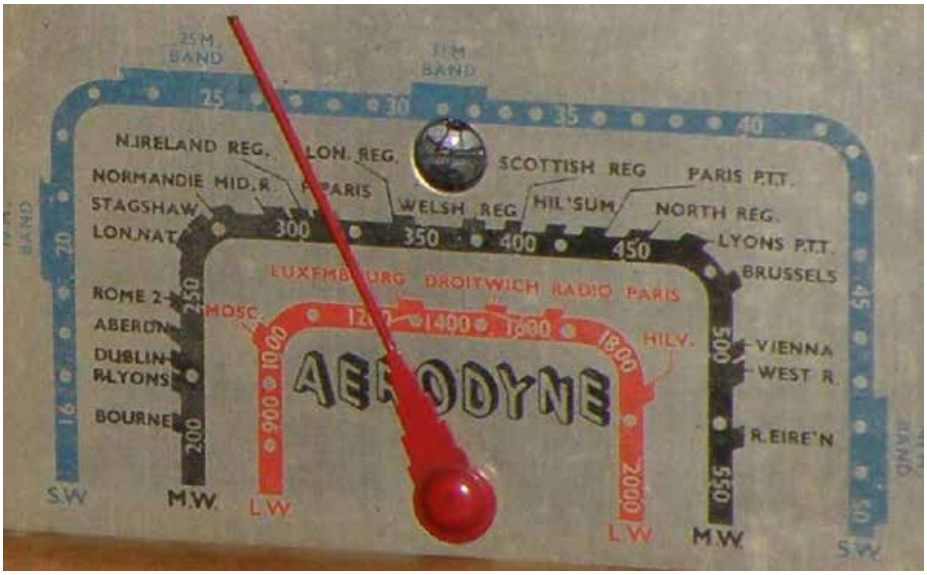


Figure 4: The dial of the Aerodyne 472 valve radio from 1946.

Figure 5: My Fidelity 208 Bandspread transistor radio's long wave dial, from 1965. I believe that the station marked Saar is the same as Deutch Sender marked on the Emerson CULW274's dial. The prominent Luxembourg marking is indicating the position on the bandspread dial of the station's medium wave 208m transmitter.

channel is sandwiched between two powerful transmitters, on 183kHz and 198kHz, both of which are strong signals at my location, and they may be masking the Icelandic signal. These four channels now represent a challenge to me for future listening!

No entries are shown in my table for the 9kHz-spaced channels at 180kHz and 261kHz: over the years many broadcasters have used these frequencies, but all are now categorised as closed down or inactive. I could hear no carriers on these frequencies, so they do not seem to be held 'in reserve' by anyone for possible resurrection. It seems unlikely that broadcasts will start again on these frequencies.

The higher frequency end of the official long wave is invaded by some Non Directional Beacons (NDBs). These are low power transmitters, generally broadcasting between about 300kHz and 400kHz, used by aircraft for navigation. They are amplitude modulated with a tone which carries that particular NDB's callsign in slow Morse. I could clearly hear one at 277kHz, transmitting its call sign CHT. These beacons can provide listening 'sport' in themselves: see Reference 4 for more information.

243kHz (1235m)

This frequency is allocated to Danish broadcaster DR Langbolge, with the transmitter at Kalundborg, from which it broadcasts for part of the day. I found that when it was not broadcasting, there was a carrier which varied slowly between 242kHz and 243kHz. I only managed to catch a brief broadcast of speech and music one day at about 08:00 UK time, at which time the transmitter was tuned to its exact 243.0kHz frequency.

252kHz (1190m)

RTE Radio 1 took over Atlantic 252's long wave frequency and Clarkestown transmitter in 2004, as it planned - and carried out - closure of its medium wave broadcasts. During the daytime I found I could listen to the RTE broadcast, but in the evening and night time, it was gradually overwhelmed by the much

Table 1: Long wave broadcasts heard in February 2017

Frequency / Wavelength	Carrier Heard?	Broadcast Heard?	Language	Location	Signal Strength	Comments
153kHz 1961m	Yes	Yes	Romanian	Brasov, Romania	59	Romanian station regularly heard. Also Norwegian (NRK P1) and Algerian (Chaine 1) stations on this frequency, but not heard.
162kHz 1852m	Yes	No	Not heard	Allouis, France		Strong carrier on 162kHz. Was France Inter until end-2016, now phase-modulated time signals only.
164kHz 1829m	No	No	Not heard	Ulaanbaatar, Mongolia		No carrier heard on 164kHz. Mongolian MNB Radio 1 broadcasts on this frequency over part of the day.
171kHz 1754m	Yes	Yes	French / Arabic	Medar, Morocco	59	Moroccan Medi 1 station, playing eastern music and western pop.
183kHz 1639m	Yes	Yes	French	Felsberg-Berus, Germany	59+20dB	Europe 1 station, programmes produced in Paris, and transmitted towards France from Germany. Marked 2xar on some older radios.
198kHz 1587m	Yes	No	Not heard	Gufuskalar, Iceland		Carrier heard on 198kHz, but no distinct voice or music broadcast. Icelandic national broadcaster RUV broadcasts on this frequency.
198kHz 1515m	Yes	Yes	English	Droitwich and three other locations, UK	59+30dB	BBC Radio 4, transmitters owned and operated by Arqiva. Also transmits phase-modulated data.
207kHz 1449m	Yes	Yes	Arabic?	Ariel Beraute, Morocco	56	Carrier heard on 207kHz. Faint voice and music heard, probably from SNRT Al Kitab Al-Watania. Icelandic national broadcaster RUV also allocated to this frequency.
209kHz 1435m	No	No	Not heard	Mongolia		No carrier heard on 209kHz. Frequency allocated to various locations of Mongolian broadcaster MNB Radio 1, but no broadcasts heard.
216kHz 1388m	Yes	Yes	French	Roumoules, France	59+15dB	Radio Monte Carlo, broadcasts between 03:30 and 23:00 CET.
225kHz 1333m	Yes	Yes	Polish	Solec Kujawski, Poland	59	Polskie Radio Jedynka (Radio 1) came into operation with a modern solid-state transmitter at this location in 1988 after the collapse of its Warsaw mast in 1991. Polish announcements, but much western pop music.
227kHz 1322m	No	No	Not heard	Altai, Mongolia		No carrier heard on 227kHz. Frequency allocated to Mongolian transmitter at Altai.
234kHz 1282m	Yes	Yes	French	Beidweiler, Luxembourg	59+15dB	French commercial broadcaster RTL, formerly Radio Luxembourg. French announcer and lots of western pop music.
243kHz 1235m	Yes	Yes	Danish?	Kalundborg, Denmark	57	Carrier seems to vary between 242.6kHz and 243.0 kHz. Danish broadcaster DR Langbolge transmits on this frequency for part of the day. Weak speech and music heard once at about 08:00 UK time.
252kHz 1190m	Yes	Yes	Irish / French / Arabic	Clarkestown, Ireland (RTE) Tipaza, Algeria (Chaine 3)	59+15dB	RTE Radio 1 heard strongly during daytime. French / Arabic (Chaine 3) station interferes strongly during evening and nighttime.
270kHz 1111m	Yes	Yes	Czech?	Topolna, Czech Republic?	57	Carrier heard intermittently on 270kHz. Faint speech and music (some western pop) heard at some times of the day and night.
279kHz 1075m	Yes	No	Not heard	Tartousskaia		Carrier heard on 279kHz, but no broadcast. The frequency is allocated to TRI Watan Radio in Tartousskaia. NDB broadcasting CHT in slow Morse on 277kHz from Chiloro (Portlock) can be heard.

Table 1: Summary of results from my long wave listening tests.

more powerful (although it reduces this power at night) French and Arabic language Chaine 1 transmitter located in Algeria. Checking on the internet, this interference is a regular source of annoyance, and sadly is only likely to be cured when RTE on 252kHz finally closes down. In theory at least, I suppose RTE could move up in frequency slightly to the empty channel at 261kHz, but I doubt that this will happen before it closes down.

Sources of data

From an historical point of view, Philip Darrington's 'Guide to Broadcasting Stations' (Reference 5) is a very useful reference to long wave broadcasters, and of course those on the medium and short wave bands. The latest version I have is the twentieth, published in 1989, and it may be that this was the last paper edition. Older versions, published by Wireless World, are historically interesting. More recently I've used the 'Radio Listener's Guide' (Reference 6), the 2017 edition of which is now available. The magazine 'Communication' of The British DX Club (Reference 7) contains much information on AM, FM and DAB transmissions on the broadcast bands.

There are several online sources of data: Wikipedia (Reference 8) provides a very useful source of general information on the long wave (propagation, broadcast and non-broadcast use, mast heights and locations, etc) and what appears to be a well-maintained list of stations currently broadcasting. Other sources of data on long wave broadcasting can also be found online.

Stop Press on 252kHz

A rumour has been heard that RTE will continue to broadcast on 252kHz after the announced May 2017 shutdown date, though this has not been confirmed yet by the station itself.

Summary and conclusion

Whatever the politics, in the UK and around the world, of an AM shutdown, the long waves still provide an interesting listening experience. On a good quality radio and at various times of the day and night, I could hear twelve broadcasters (I'm counting RTE Radio 1 and Chaine 3 on 252kHz as two, although they regularly obliterate each other) over the 126kHz-wide band allocation. I'm not claiming that all these broadcasts came through 'loud and clear' – the band is challenging at the best of times, and perseverance is needed to positively identify the stations broadcasting.

I realise that 350m aerials aren't available to most readers: an alternative is a long metal fence, but do make sure that it isn't electrified. The next type I plan to try is a loop aerial, and I'm hoping that its directionality will be able to separate the two loud broadcasters on 252kHz. Such an aerial should be straightforward to construct, being a fairly easy exercise in woodworking. If you plan to design your own square loop aerial, a useful starting point is the online inductance calculator at Reference 9, so that you can calculate the required parallel capacitance - usually a ganged pair of 500pF variable capacitors connected in parallel are used.

If you have a vintage radio that you think is particularly sensitive on the long wave, give it a try at various times of the day and night and see how many broadcasts you can hear – sadly, they probably won't all be there for much longer.

References

Reference 1: Details of the radio teleswitch system can be seen at: https://en.wikipedia.org/wiki/Radio_teleswitch

Reference 2: The BBC's budget for 2015/16 can be found at: http://www.bbc.co.uk/foi/publication-scheme/classes/what-we-spend

Reference 3: Some frame aerial designs can be found at: http://www.mds975.co.uk/archive/Content/aerials1.html

Reference 4: A list of non-directional beacons (NDBs) in the UK can be found at:

http://www.infotechcomms.co.uk/downloads/ndbs.pdf

Reference 5: 'Guide to Broadcasting Stations' by Philip Darrington, published by Heinemann-Newnes, in various editions.

Reference 6: 'Radio Listener's Guide' edited by Clive Woodyear, in various editions. See the website at: http://radioguide.co.uk/ to order the latest version.

Reference 7: Details of how to join The British DX Club, and receive its monthly magazine, can be found at: www.bdxc.co.uk

Reference 8: Wikipedia's long wave section can be seen at: https://en.wikipedia.org/wiki/Longwave

The website shows active, inactive and closed long wave broadcasters.

Reference 9: To work out the inductance of a square coil, see: https://technick.net/tools/inductance-calculator/square-loop/

Remembering Dennis Yates

Dennis in happier times at Harpenden.

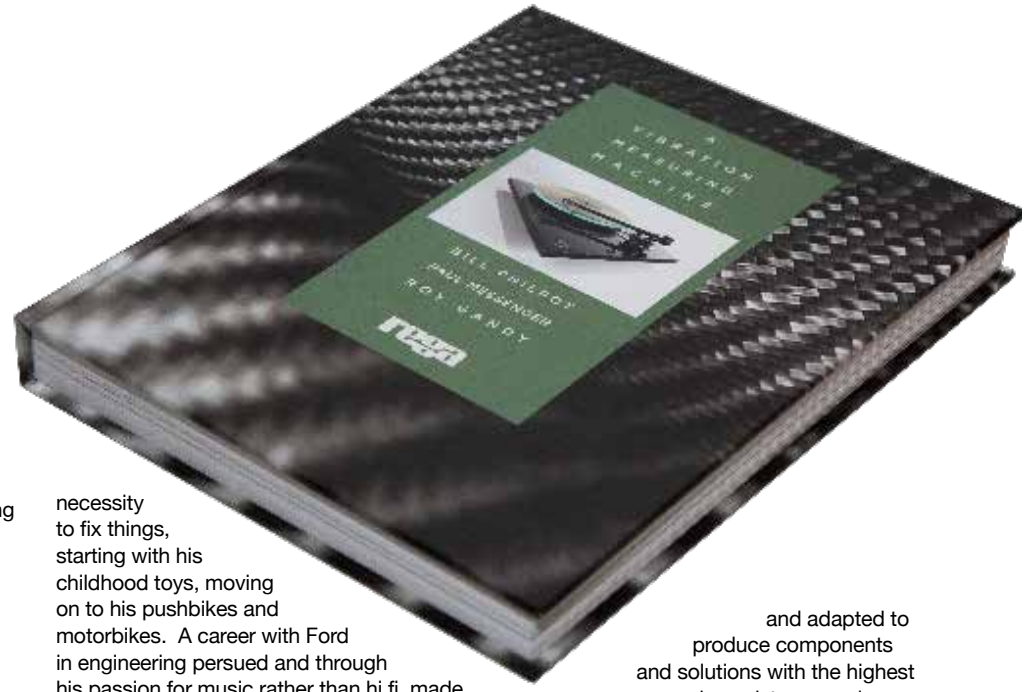
The Society has been informed of the recent death of Dennis Yates. Somewhat of an enigma, Dennis was a long standing member of the BVWS until after the Bletchley Park saga when he was expelled from the Society. Our condolences are extended to his family and friends.

Book Review, A Vibration Measuring Machine

Greg Hewitt

Many of you will have read the excellent book 'The Setmakers'. Published in the early 1990's, it chronicles the story of the British radio and television manufacturing industry.

Many of the small companies, that were to become household names, started life as cottage industries. The story is told of the passion and enthusiasm of their founding entrepreneurs and characters who drove the industry forward in to the boom years and inevitably the lean times that were to follow. While summing up in the forward, it is mentioned that another but similar book is still waiting to be written, namely that of the British hi-fi manufacturers, again made up of mainly small companies who started out from the most humble of beginnings. You'll find books about Wharfedale, Tannoy, Quad with their roots in the first half of the twentieth century but very little from what I refer to as the golden years of British hi fi, namely the 1960's to the 1980's.



Well Rega Research have helped to tip that balance with their book 'A Vibration Measuring Machine', over 300 pages and it's actually three books in one. Authors: Bill Philpot, co founder Roy Gandy and renowned hi fi reviewer Paul Messenger. I bought myself a copy at the recent Audiojumble and found it so engaging, it's well worthy of a review:

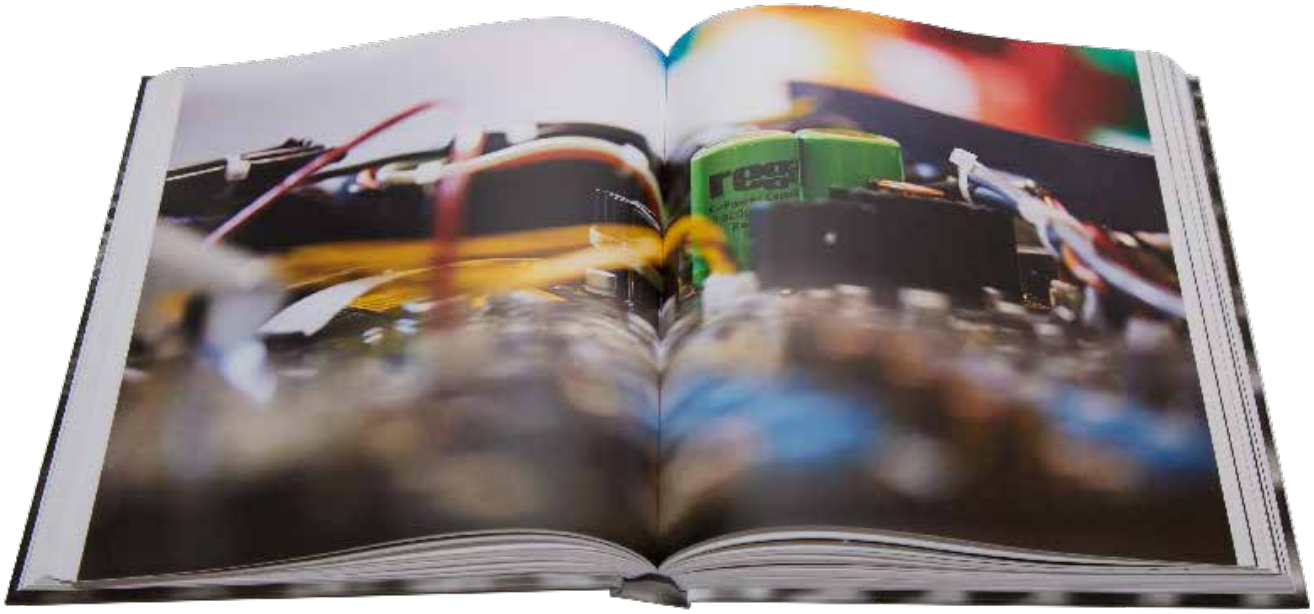
If you were to ask people at random on the high street if they'd heard of Rega, the chances are that most wouldn't have. But ask anyone around the globe who's had an interest in hi fi during the last 40 plus years and they're sure to know of the minimalist design Planar 2 and 3 model turntables, for which there always seemed to be a waiting list. These days, about 80% of production goes abroad. But never a company for expensive glossy advertisements, the money others would normally plough in to marketing, Rega would rather plough in to making a better product, thus the product would gain a better reputation and demand would follow…

Book 1 starts with the early life of Roy Gandy. A natural born engineer proved by the necessity to fix things, starting with his childhood toys, moving on to his pushbikes and motorbikes. A career with Ford in engineering persued and through his passion for music rather than hi fi, made transmission line loudspeaker enclosures from concrete for work colleagues in the evenings and experimented with turntables prior to the formation of Rega Research in 1973.

The story then moves to the company itself, manufacturing the afore mentioned Planar turntables, cartridges, tonearms, speakers (with wooden enclosures this time), amplification, CD players, D to A converters, through the gradual demise of vinyl sales in the 1990's forward to the current day and now with a much larger range of turntables. A real rollercoaster ride of decisions and risk. And all the adventures and relationships with suppliers over the years, some who weren't really interested and others who have stayed faithful and adapted to produce components and solutions with the highest accuracy and consistency and processes previously considered impossible.

Book 2 appeals to enthusiasts and engineers alike, Roy's thesis on the exacting standards of turntable engineering involving the materials, mass, frictions, resonances, transfer of energy, every part and component is clearly explained and justified in an understandable manner with clear illustrations, thus blowing away much of the perceived black magic and myths about high end turntables and why many aftermarket modifications are a retrograde step (a little knowledge is a dangerous thing!)

Tonearm and cartridge design is also covered and explained in great detail, we're talking of extracting energy from groove modulations down to a micron or two

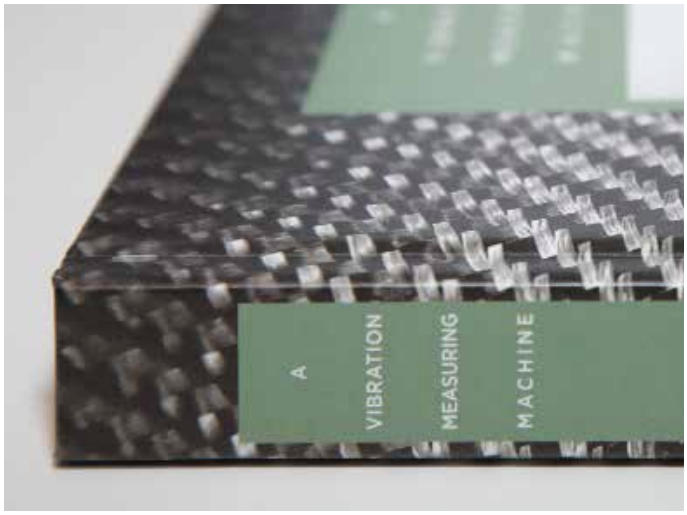


My own early Planar 2 turntable which I've recently restored.

here, when the very best precision tonearm bearings have more play in them than that.

Book 3 is about the people involved in the running the business, research, design and manufacturing. It's clear that the people who make up the Rega family were taken on and engaged not necessarily because of letters after their name and impressive CV's but rather because of their passion and values and wanting to help. They're engineers rather than hi fi buffs, continually striving for improvement and solutions to problems.

So an excellent read, a great story and the business decisions whether economic or technical, all explained and justified with the reasons why. A most open and authentic publication. Not following the usual business recipe of setting goals, planning, budgeting and having to please the bean counters has ultimately been the key to success. Hi fi and engineering aside, it's an interesting business biography in its own right.



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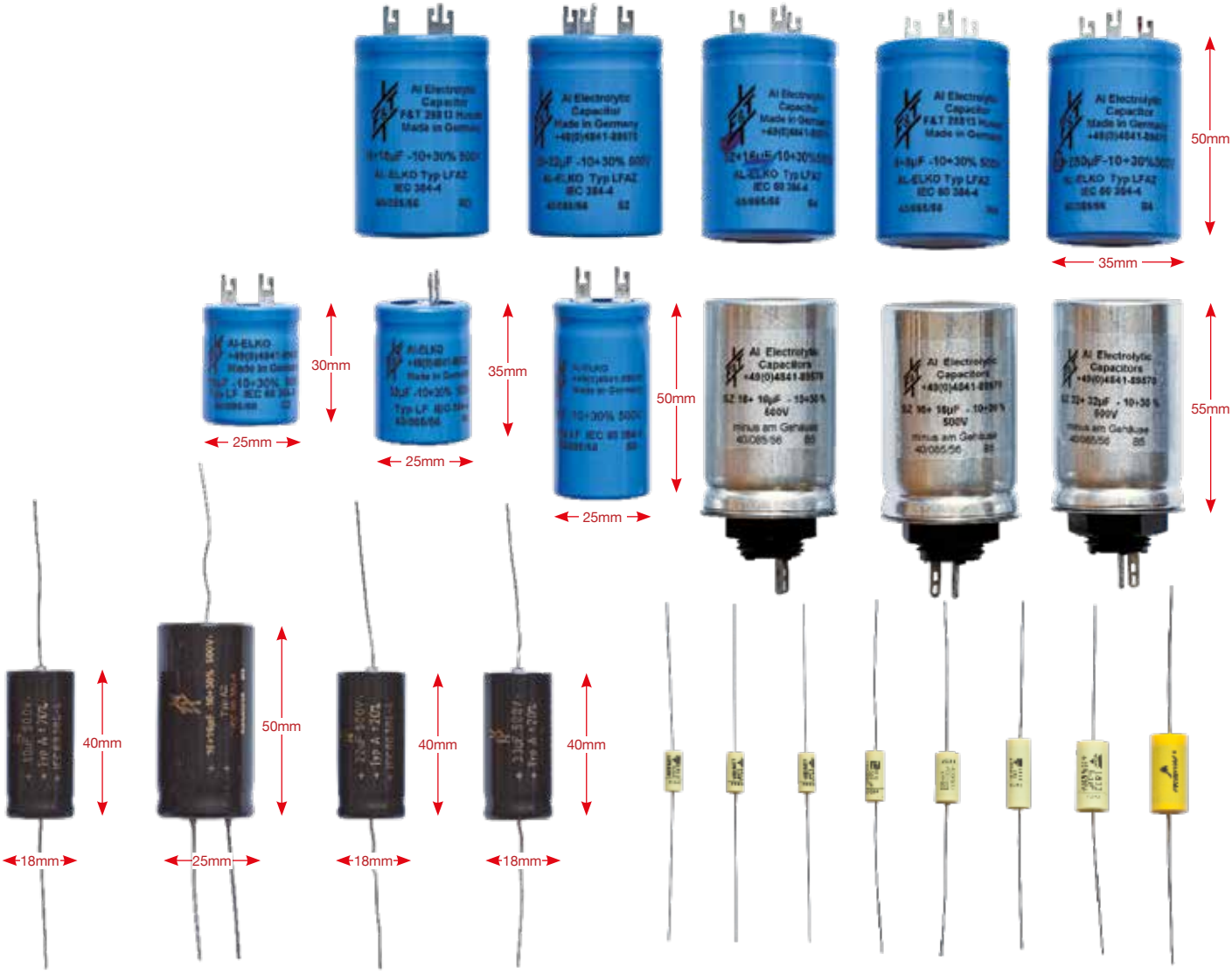

For non UK addresses, please contact Mike Barker for prices, (see below). All orders should be sent (with payment made out to BVWS) to: Mike Barker, Pound Cottage, Coate, Devizes, Wiltshire, SN10 3LG. Cheques payable to British Vintage Wireless Society. Please allow 14 days for processing, but usually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

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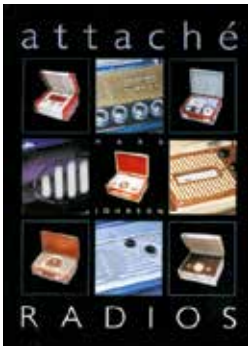

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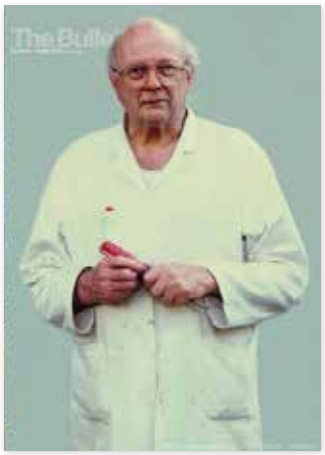

The Bulletin back issues

All Bulletins and supplements are priced at £4.00 each + postage.

Postage: for individual Bulletins add £1.50, for all extra bulletins add £1 each. Cheques to be made payable to 'British Vintage Wireless Society'.

Mike Barker, Pound Cottage,
Coate, Devizes,
Wiltshire, SN10 3LG

Events Diary

2017 Meetings

June 3rd Garden Party at BVWATM
June 4th Swapmeet at the Cinema Museum, London
July 2nd Royal Wootton Bassett
August 6th Punnetts Town
September 10th Murphy Day at Mill Green Museum
September 24th Harpenden
October 1st Audiojumble
November 12th Golborne
December 3rd Royal Wootton Bassett

2018 Meetings

11th March Harpenden
8th April Golborne
8th July Royal Wootton Bassett
23rd September Harpenden
11th Novmeber Golborne
9th December Royal Wootton Bassett

GPO Numbers
Martyn Bennett is the custodian of the BVWS GPO Registration Numbers list. As many members know, the project of assembling this list was started in the early days of the BVWS and was carried on by the late Pat Leggatt. Members are strongly urged to help build the list, whenever they get the opportunity, particularly as it is something that will help with the identification of vintage wireless in years to come. The list is by no means complete and the GPO no longer have a record of the numbers granted to wireless manufacturers. The BVWS Handbook contains the current listings - one in numerical order and one ordered by name. Please let Martyn have any additions, or suggestions for corrections, by mail or over the phone.
Martyn Bennett, 58 Church Road, Fleet, Hampshire GU51 4LY
telephone: 01252-613660 e-mail: martyb@globalnet.co.uk

The British Vintage Wireless and Television Museum:
23 Rosendale Road, West Dulwich, London SE21 8DS
020 8670 3667
Harpenden: Harpenden Public Halls, Southdown Rd. Harpenden.
Doors open at 9:30, tickets for sale from 09:00, Auction at 13:00.
Contact Vic Williamson, 01582 593102
Audiojumble: The Angel Leisure Centre, Tonbridge, Kent.
Enquiries, 07873 862031 info@audiojumble.co.uk
NVCF: National Vintage Communications Fair
For more information visit: www.nvcf.co.uk
Royal Wootton Bassett: The Memorial Hall, Station Rd.
Wootton Bassett. Nr. Swindon (J16/M4). Doors open 10:00.
Contact Mike Barker, 01380 860787
Golborne: Golborne Parkside Sports & Community Club.
Rivington Avenue, Golborne, Warrington. WA3 3HG
contact Mark Ryding 07861 234364
Punnetts Town: Punnetts Town Village Hall, Heathfield,
East Sussex TN21 9DS (opposite school)
Contact John Howes 01435 830736
Mill Green Museum: Bush Hall Lane, Mill Green, Hatfield, AL9 5PD

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

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