The Bulletin

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Disappointing Audio Broadcast

This is a call for all members to put pen to paper and send the UK Government a *Strong Clear Signal!*

I am asking you to write a letter to your local MP and lobby them to halt the plans for the Analogue radio switch off which is targeted for 2015. This is a totally unnecessary move to force the change to digital radio without any real benefit to anyone other than the failing DAB radio industry and profitless commercial broadcasters. We cannot prevent the eventual switchover, but we can make it clear that this is neither the time to do it, nor the correct system to use. Below are the most salient points that you should make very clear in your letter.

Ofcom research shows that 4 out of 5 listeners are happy with current choice of analogue stations and audio quality.

Power consumption of DAB receivers is much higher. Typically an AM/FM radio will give 375 hours of listening on batteries costing £6 where a similar quality DAB radio only gives 32 hours at a cost of £9. This is an unacceptable increase in listening cost for everyone and especially those on low incomes and pensions and increases the cost of responsible battery disposal. It is also true to say that mains powered DAB receivers are more power hungry.

The DAB system used in the UK is now obsolescent with only two other European countries using it. Any digital broadcasting should be using DAB+ with the more efficient AAC codec instead of MP2 of the 1980's. FM on good equipment will always beat DAB for sound quality without annoying "drop-outs" and background "bubbling mud" noises. FM works well in large built-up areas and when in vehicles. DAB requires many extra smaller relay transmitters to give the same coverage as FM or AM.

Massive cost to consumers to replace the approx 150 Million perfectly good working receivers with inferior sound quality DAB receivers that suffer from a multitude of reception problems.

Recycling of analogue receivers will only cover modern portables, the rest will be confined to land-fill.

The Government are actively looking for ways to reduce spending so halt the building of new transmitters which will cost a huge amount of money to get full nationwide coverage, when the house of Lords report on digital broadcasting in the UK states that FM transmitters can be maintained fully for the next 20 years for £200 Million which is less than 20 pence per person each year saving listeners millions not having to buy new equipment.

Millions of listeners using built in vehicle receivers will be lost because of inadequate mobile DAB reception and no mass-produced cars yet include DAB receivers fitted as standard, and are not likely to for years to come.

You should write as a personal protest in respect to your own personal situation and how it will affect you and not as a vintage wireless collector, nor as a BVWS protest. The BVWS Committee will be sending a letter directly to the Prime Minister with these points and many more.

Bulletin of the British Vintage Wireless Society
Incorporating 405 Alive
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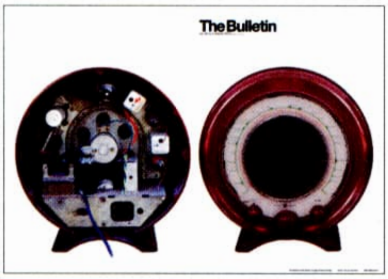
Separations and Printing by Hastings Print



Cover: Ekco A22 in red bakelite, 1946.
Photographed by Carl Glover

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Edited by Carl Glover. Sub-Edited by Ian Higginbottom
Proof-reading by Mike Barker,
Ian Higginbottom and Peter Merriman

Contents

From the Chair

Once again this year, there is no Call for Nominations form included in this Bulletin. As last year we are saving on paper and print costs as all current Committee members are within their three year terms and are willing to continue in their roles. I would invite anyone who would like to join the Committee to contact me either by phone, letter or e-mail. Over the last few months we have been working on increasing the BVWS Capacitor stocks and extending the ranges held. I have been able to get multi value dual can electrolytics made so we will soon be stocking direct replacements for Bush DAC90A and TV22 units together with several other commonly used types. A range of screw through the chassis units are also being made to replace those used in pre-war sets without the need for re-stuffing, which can be a problem with some types. Look out for these in the next Bulletin providing we receive supplies in time.

I feel it is time to say something about the forced BBC and larger commercial analogue radio switch to DAB planned for 2015. It is simply not the right time and neither is it the right digital broadcast system to use. After 12 years of UK digital broadcasting only a quarter of all radio listening is via DAB. The promise of better sound quality and better reception has just not materialised. This disappointing situation is due to the low transmission Bit rates used so that more stations can be crammed into the limited bandwidth. Analogue transmissions are easy and efficient compared with DAB and can be received almost anywhere both static and mobile, which you definitely cannot say about DAB. It would appear that the main driver for switching is that DAB has been fairly unsuccessful and the industry has invested heavily in the infrastructure and now wants to see a return, which is not entirely unfair but if DAB was actually what it was promised to be and actually worked as well as analogue then many more millions of listeners would be wanting to switch, but it is not. The nationally advertised "trade-in" schemes are just a desperate move to try and get consumers to part with their hard earned cash and make the switch to an already obsolete digital system. It is not commonly known that the large high street stores have been granted licenses to install and operate local DAB transmitters on their premises for demonstration purposes as the DAB signal is so poor inside the buildings that people refuse to buy the receivers. This is not only for metal framed and roofed 'out of town' type stores but those in large city department stores. Many of us suffer from what is known as "bubbling mud" noises from digital stations, where on analogue any deterioration of signal has significantly less noticeable effect on the entertainment value of what we are listening to. Since moving to a rural location, I can no longer use a digital receiver for this very reason. The government states that although the set date for switchover is 2015, until at least 50% of all nationwide listeners are using DAB as their main listening medium the BBC will not make the change. So the simple answer is not to buy any DAB receivers that are not at least capable of DAB+ reception which will protect your investment or also have an FM waveband. More information can be found at www.digitalradiotech.co.uk and you can register an online protest at www.savefm.org

Mike

At last! A genuine red Ekco A22

The story behind the wireless on The Bulletin cover by Alan McGregor

In January 2008 an Ekco A22 appeared on EBAY. Not unusual, you might think. However, this set was different. The cabinet was not black or brown. It was red! The seller, a French Canadian, claimed the set had been found in a garage in Pennsylvania USA, so it was a long way from home. The condition left a lot to be desired. The chassis looked a mess and was out of its cabinet. There was a back card but no dial or dial bezel. All the knobs were present and correct but not attached to the set. And, of course, the bakelite cabinet was conspicuously cracked.

The bakelite cabinet and the chassis arrived in two separate parcels. The first parcel I opened contained the chassis and a few odds and ends. The first thing to grab my attention was a circular piece of grille cloth, still attached to its card ring and its backing cloth. This was an unexpected bonus. The seller had made no mention of it and it did not appear in any of his photographs. It is quite unlike any cloth that I have seen before on an A22, being black with gold threads running through it. Scraps of cardboard still glued to the mazak spider matched damaged areas on the back of the card ring, so enabling me to establish the correct orientation of the cloth. Also present but not mentioned in the seller's description was a circular cast alloy grille. This plainly didn't belong to the set so why was it included?

I was pleased to see that the cabinet had the right sorts of dirt in all the right places. The baked-on sooty, waxy deposit inside the top and the layer of dust inside the foot were exactly what I would expect to see. The seller had described the colour of the cabinet as "red-orange" and his photographs seemed to confirm this. I can only assume that his pictures were taken in very strong light, as the real colour in normal daylight is closer to cherry red. The red bakelite has a very slight mottle to it, most evident underneath the plinth, which, I suppose would've been less exposed to the action of sunlight. It is not the same type of material that the green AD65s are made of. This is bakelite or something very like it, not urea formaldehyde and certainly not catalin. There is a stress crack on the top of the

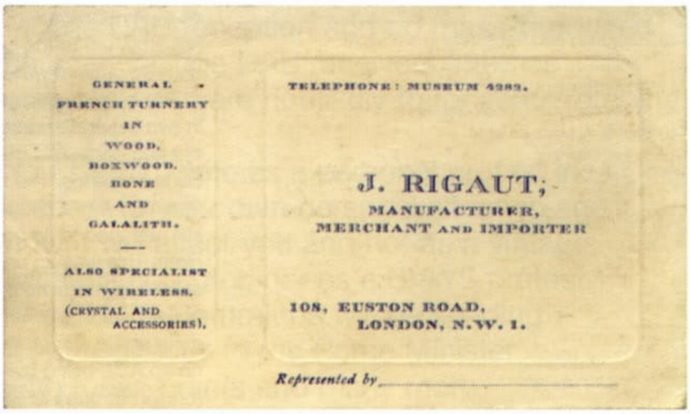
continued on page 39

Jean Rigaut, *Wireless Crystal Specialist – An Enigma?*

by Ian L. Sanders and Lorne Clark

Jean Edouard Pierre Rigaut was born in France in 1900, arriving in Britain towards the end of the First World War to take up employment with the French Consulate General[1]. By all accounts he was a natural entrepreneur and, by the mid-1920s, became a prolific manufacturer of crystal receivers. Rigaut's sets were distinctive in their design and they were unquestionably of high-quality construction. However, no known advertisements for his company's products appear in the period journals and surviving references of any kind to Rigaut's wireless company are scarce. While he is believed to have imported some materials from his native France during this period[1], the components used in the Rigaut crystal sets are generally of British manufacture, although the cabinets and/or panels may possibly have been of French origin.

Above: Sloping panel, variometer-tuned design. No model name, other than the company's trademark, but – other than the closed cabinet design – consistent with the *V-Type* listed in the 1926 *Wireless World Buyer's Guide*. Headphone connection was by means of patented Rigaut sockets. Socket for long-wave loading coil with "folded" shorting link to permit lid closure. Year of manufacture was probably 1924.


GENERAL
FRENCH TURNERY
IN
WOOD,
BOXWOOD,
BONE
AND
GALALITH.

ALSO SPECIALIST
IN WIRELESS.
(CRYSTAL AND
ACCESSORIES).

TELEPHONE: MUSEUM 4283.

J. RIGAUT;
MANUFACTURER,
MERCHANT AND IMPORTER

108, EUSTON ROAD,
LONDON, N.W. 1.

Represented by ____________

Right: Jean Rigaut's card described him as an expert in French turnery using Galalith as well as a specialist in crystal wireless. Galalith, also known as "French Bakelite" was a synthetic plastic material developed in the early 1900s by French chemist J.C.Trillat. In France, Galalith was distributed by the Compagnie Française de Galalithe of Paris and was manufactured under licence in Britain by Syrolit Limited as Erinoid. Galalith was used in jewelry as imitation tortoise shell, horn, ivory and wood. It was also used in electrical applications.

Jean Rigaut was listed as a subscriber to the original British Broadcasting Company between 1923 and 1926, taking out a single, one-pound share[2]. In February 1926, the respected journal *Wireless World and Radio Review* published their *Buyer's Guide to Sets*. The guide listed details of almost 100 crystal sets; four of these were models attributed to Jean Rigaut. A patent for an improved electrical connector, issued to Jean Rigaut in 1927 and based on an application submitted in March 1926, confirms his French citizenship.

Post Office telephone records[3] indicate that Rigaut operated from four addresses between 1926 and 1933, all within a few miles of each other in North London. The April 1926 edition of the London Telephone Directory lists Jean Rigaut's business as "*Wireless Crystal Specialist*" located at 108, Euston Road, London, N.W.1. The enterprise operated at that address until 1929, moving to 23, Eversholt St., London N.W.1. by which time the business was described as simply "*Wireless*". Between 1930 and 1933 he occupied premises at 100N. Blackstock Road, London, N.4. The final entry in the November 1933 directory shows Rigaut had relocated again to Albert Works, Spencer Road, N.8., although by this time it is doubtful if the manufacture of wireless apparatus was still taking place. This is the last record of any UK business address.

Jean Rigaut focused exclusively on

Jean Edouard Pierre Rigaut in his seventies.
Photograph courtesy of Paul Rigaut.

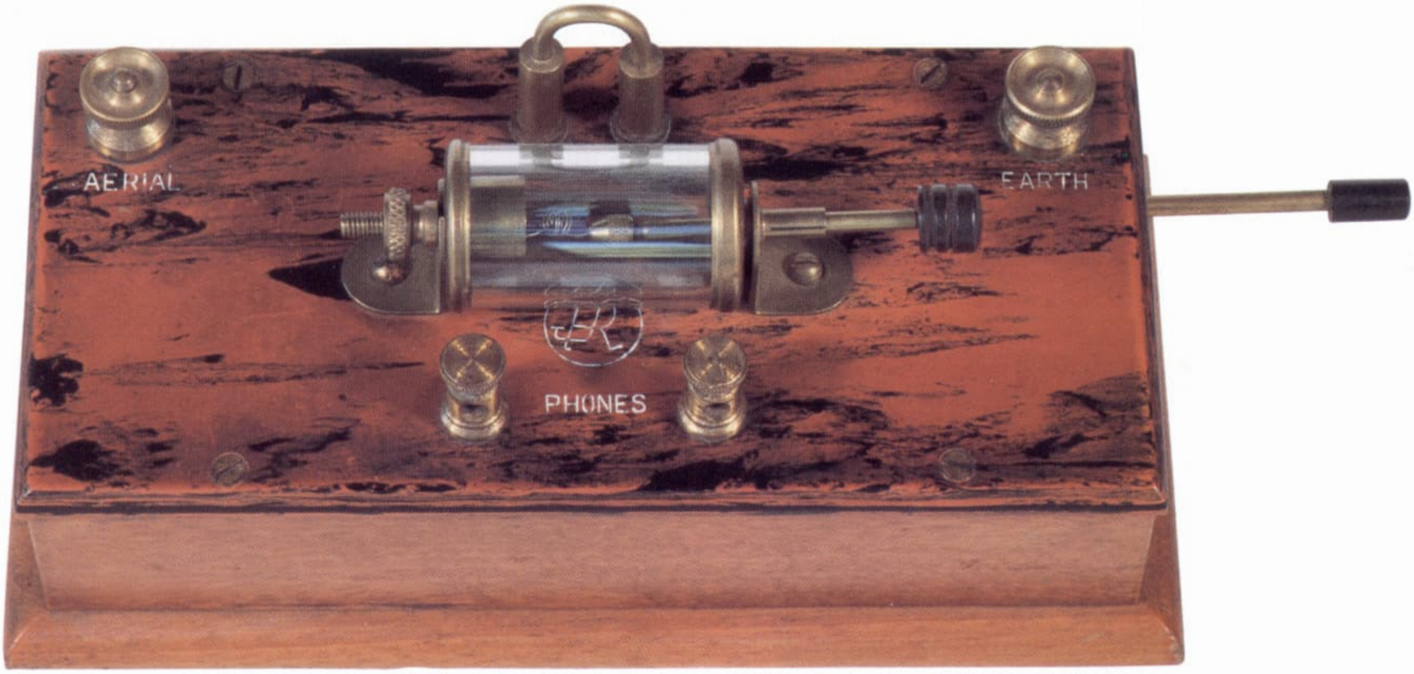
Opposite page left, left and above: Three versions of essentially the same model, employing coarse and fine tapped inductance tuning. Commonly referred to as the *BCM/JR* – after the engraved label – the closed cabinet designs with sloping panel generally match the description of the *L-Type* listed in the *Wireless World Buyer's Guide*. In any case, it is the most commonly found of the Jean Rigaut crystal receivers to be found today. (The open cabinet version with vertical panel does not carry any model name, but it is otherwise the identical set). The design features two pairs of Rigaut patented headphone sockets and the variation with cabinet-mounted terminals uses the same patented socket on the rear for aerial and earth connections. The long-wave loading coil connector was placed rather awkwardly between the tuning controls, suggesting that it may have been an afterthought. Year of manufacture was probably 1924.

Model	Type of Cabinet	Price	Description and Remarks
L Type	Mahogany, closed sloping panel.	£0 19s. 6d.	Set only. Fine and coarse tuning and tapped inductance.
D Type	Same as above.	£1 2s. 6d.	Set only. Wound for Daventry.
V Type	Imitation mahogany, open sloping panel	£0 11s. 6d.	Set only. Variometer tuned.
S Type	Flat mahogany box	£0 6s. 11d.	Slider movement.

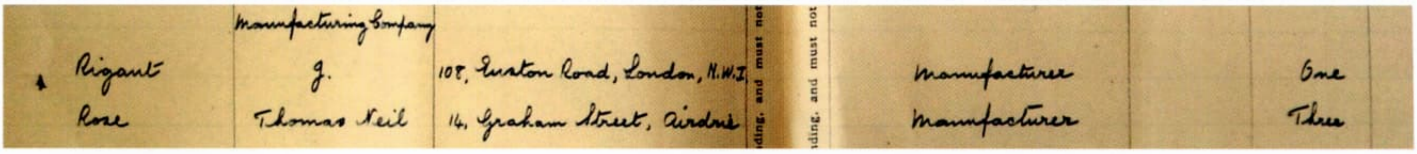
Buyer's Guide to Sets. The Wireless World and Radio Review, February 10th, 1926.

crystal receivers[1]. Cabinets of light mahogany with smoothly rounded corners, together with gently sloping panels, gave the products an unusually sleek appearance. Many of his sets employed a distinctive, marbled orange/black panel produced from the synthetic material, *Galilith*, developed in France, but also produced in Britain as *Erinoid*. Several models featured Rigaut's patented sockets for headphone connection, either mounted on the panel or on the outside of the cabinet to allow operation of the receiver when the lid was closed. No known Post-Office registration numbers exist for the Rigaut designs, although at least one model carries the BBC 'type-approved stamp'. Most carry the maker's *JR* emblem engraved on the panel.

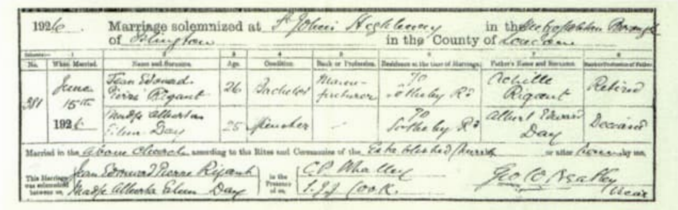
In addition to the four crystal sets listed in the 1926 *Wireless World Buyer's Guide*, at least six other models/variations are known, establishing Rigaut as one of the most prolific, albeit enigmatic crystal set manufacturers of the 1920s. The question remains – why were his crystal receivers apparently not widely advertised in wireless magazines and why did they not appear in the well-known wireless suppliers' catalogues of the day? How Rigaut marketed his



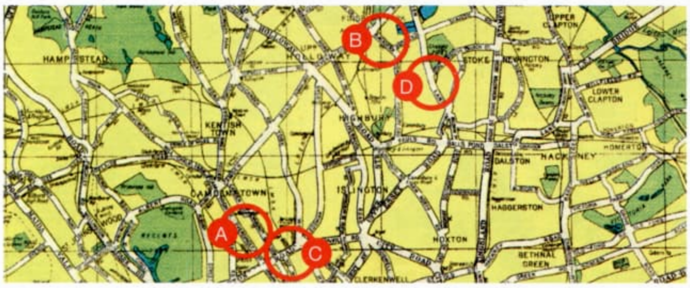
Above: Jean Rigaut model *S Type*. Tuning was by a linear slide coil contact operated by an arm projecting through the plinth. Socket for long-wave loading coil.



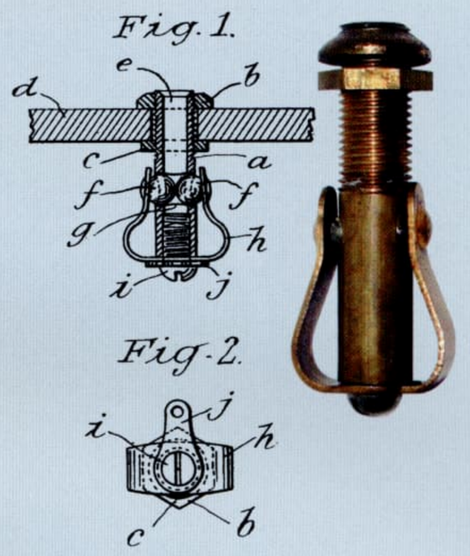
Entry dated December 13th, 1923 listing shareholders in the British Broadcasting Company, 1923-26. Jean Rigaut is shown holding one share. *National Archives, Kew, London.*



Jean Rigaut married in June 1926 at St. John's Church, Highbury. The certificate gives his occupation as simply "Manufacturer". His residence at 70, Sotheby Road was a few miles from the company's business address of 108, Euston Road.



1920s London street map showing four of the known addresses for Jean Rigaut between 1926 and the early 1930s when wireless production was likely taking place.; A: 23, Eversholt Street; B: 100N. Blackstock Road; C: 108 Euston Road; D: 70, Sotheby Road (residence).



Abstract – A socket for receiving electric conductors or plugs of various sizes is provided with a pair of balls f pressed inwardly by a bow-shaped spring h with dished ends, the balls meeting at the centre of the socket when the plug is withdrawn. The spring h is secured by a screw i that also holds the soldering tag j. The socket is screw-threaded externally to carry nuts b, c that clamp it to a panel d.

Patent no. 273,380 issued to Jean Rigaut on 1927 for an improved electrical socket. The socket was used on several of his crystal set models.

Photo: The Jean Rigaut socket featured spring-loaded balls to provide a reliable contact.

enterprise's products and through what channels they were actually sold remains uncertain. It seems unlikely – given the extent of the models produced – but perhaps Rigaut relied purely on word of mouth and on old-fashioned leg work?

In later years, Jean Rigaut became a reporter for *The Sporting Life*, and developed and patented a "going" tester for greyhound racetracks[1, 4]. During the Second World War he was a member of the Highbury Home Guard, and the Free French Organisation, and is credited with the development of a novel booby-trap device. Returning to France in 1948, following a divorce from his English wife, Madge, he was engaged in the growing plastics industry where he took out French patents, including one for a flexible vacuum cleaner hose[5, 6]. He died in 1984[1].

I. Rigaut, Paul: Private communication.
2. Lorne Clark: Shareholders of The British Broadcasting Company, 1923 to 1926. BVWS Books ISBN 0-9547043-6-3 (to be published).
3. London Telephone Directories, 1926 to 1933. www.ancestry.com
4. Rigaut, Jean Pierre Edouard: Means for Testing Ground or other Surfaces used for Games or Sports or other Purposes. British Patent 574,913; issued January 25th, 1946.
5. Rigaut, Jean Pierre Edouard: Tête de Machine à Mouler par Injection. French Patent FR973488(A); issued February 2nd, 1951.
6. Rigaut, Jean Pierre Edouard: Nouveau Procédé pour la Fabrication de Tuyaux Flexibles. French Patent FR1040099(A); issued October 13th, 1953.

The authors are most grateful to Paul Rigaut, grandson of Jean Edouard Pierre Rigaut, for providing details about his grandfather's life.

The authors would welcome any further information on this subject:
author@crystal-set.com earlywireless@ntlworld.com

Opposite page, far left: Unnamed model bearing the company's *JR* trademark, but of identical design to the *BCM/JR*, with the exception of the plain black ebonite panel, in place of the company's signature, marbled material.

Opposite page, left: Jean Rigaut model *BC/n* – identical to the *BCM/JR*, but with conventional terminals and horizontal panel. The BBC approval stamp in the lid suggests a production date of 1923 or the first half of 1924, possibly pre-dating the *BCM/JR*. *Martyn Bennett Collection.*

Right: This set, similar to the Jean Rigaut models with the exception of the absence of a long-wave loading coil socket, carries the name, *Argus*. The *Argus* trademark was used by *Anderson's Wireless Sales Agency* of Oxford Street, London. It is assumed that this receiver was offered by Anderson's, although no direct evidence has been found. Interestingly, this particular example was apparently exported to what was then Czechoslovakia for sale in Prague. *Photograph courtesy of Erwin Macho.*

Restoring an HMV 650 (Date Code P/2 = 1937) by Gary Tempest

I restored the model 561 Marconi version of this radio, (see Bulletin Summer 2005) but prefer this one. It has a glass edge lit dial rather than the now dark brown Paxolin one of the Marconi. Also, to my mind, the cabinet is nicer with its rounded corners and curved loudspeaker grille.

It is an 11 valve radio (including the 'magic eye') with two chassis. There is the main RF / IF chassis with the power and output chassis mounted above it.

For those interested, date codes are given on the model label. P/1 = 1936, P/2 = 1937 and so on. No P code means made before 1935.

There is a tuned RF stage prior to a frequency changer with separate oscillator. Following are two IF amplifiers and so 6 tuned circuits. The first two IF transformers have variable selectivity using switched tertiary windings. After the IF stages comes a D63 double diode for detection and delayed AVC. The audio output goes to an amplifier driving an inter-stage transformer. This has separate secondary windings supplying the grids of KT63's in push pull.

All this technology was expensive of course costing 24 guineas, worth more than £800 today (source Office of National Statistics).

Radio Specification

MW, LW, two SW and one "Ultra Short Wave". The SW are 11.3 – 34 and 34 – 107 metres and the Ultra is 4.85 to 12 metres. This was intended for reception of TV sound from Alexandra Palace at 7.2 metres.

There is an excellent reduction drive system, and logging scale, so tuning in anything is easy even for the ham fisted.

There is a large dial (rear lit Paxolin on the 561) and edge lit glass on the 650 illuminated by a 15W bayonet torpedo bulb. This is no longer available but a 25W torpedo picture bulb can have its base changed to be a substitute (see Bulletin Spring 2008). I found that running the converted bulb off the 200V transformer tap, consuming 18W, gives perfectly acceptable illumination and the bulb should last a long time. It also provides a much better lit dial in the Marconi 561 than the miniature neon tube that I used at the time.

The 650 dial is very well detailed, unfortunately mine once removed from its metal backing panel, faced with black felt, and a careful clean up with a soft artist's brush had some of the lettering come away. This resulted in my having to produce reproduction dials (see Bulletin Autumn 2009).

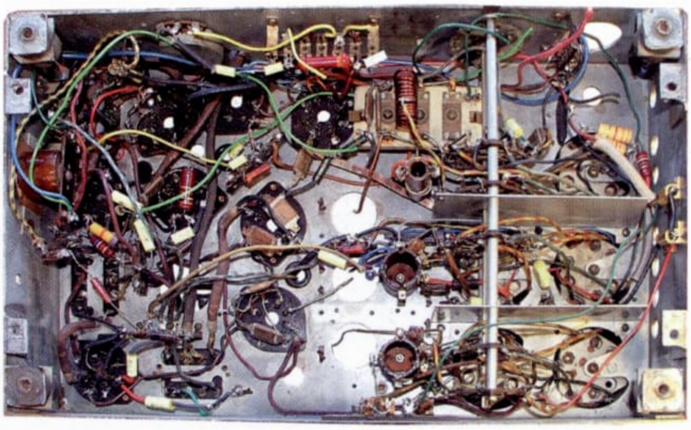
On the left hand side of the dial is an aperture for the magic eye. Balancing this, on the right, is one for a rotating disc showing the waveband. This is driven by a chain and toothed wheels from the shaft of the waveband switch.

Controls include treble and bass. That for treble (or "Brilliance" as EMI call it) is ganged to a toggle switch which selects the IF bandwidth. With the control at minimum 'cut' then the bandwidth is at its widest. Turn the control a little clockwise and the switch clicks over to reduce the bandwidth and then the control dulls the higher frequencies in the normal way.

A bass cut potentiometer, wired as a variable resistance, is across the lower half of the inter-stage transformer. The coupling capacitor and the primary inductance form a high pass filter. As the resistance reduces then the effective inductance falls and so response at low frequencies is less.

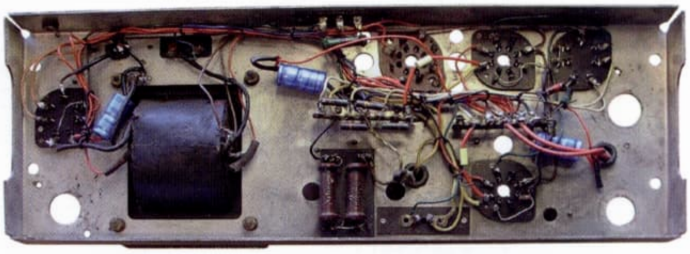
Service material

Two sources were found: Broadcaster Service Man's Manual for the Marconiphone 561-564 and the Marconiphone Service Manual Models 561 and 564.



Above: How you don't want to find them! Spare RF chassis 'before'.

Below: Spare power and audio chassis 'before'.



The Chassis
This time I was better off, than when doing the Marconi, as member Jim Taylor was kind enough to give me the original Marconiphone Service Manual. The Broadcaster information is good but the manufacturer's is more comprehensive. But it did give me something else to be concerned about as I now knew the resistance of the IF windings. Alas, some of these measured higher than they should be, see Main Chassis section.

As usual, cleaning, re-stuffing of caps, checking and changing resistors etc. It's surprising how many loose soldered joints can be found in the very deep slots in EMI tag strips.

On one main chassis (I actually had a spare pair that I restored as well) pin 5, G3, of the audio pre-amp valve base was broken off and had never been connected. Another fault on SW 2 was down to joints never having been soldered. The coil (L22), for this particular waveband, is mounted and soldered to one of a pair of rivets for its trimmer TC16. One rivet is securing the fixed plate and the other the plate that is allowed to move when adjustment is made. However, these rivets whilst being sound electrical connections to the coil, were no longer so to the plates. Once I had cleaned up and soldered the rivets to the plates, which they are on other chassis, the waveband worked again.

The spare pair of chassis had been well botched before they came to me (see pictures). On the main chassis I have already taken off the tuning gang, interconnecting cable-forms etc, but it does show what a horror story they were. I'm not being unkind here to whom ever did this but really they should be practising on simpler and less collectible radios.

Output Valves and Power Supply Chassis
Nowadays I take care not to get solvents into the valve bases and no longer clean them by squirting with contact cleaner. Several bases were removed, on the spare chassis, and opened where many of the connection pins had been broken off. They were replaced with pins from another base. Once inside, by swivelling the top, it's seen that excess cleaner may contribute to getting dirt between the layers. Better to clean the individual sockets with a small dental brush dipped in contact cleaner sprayed into a lid.

A new cloth covered three-core mains lead was fitted and the chassis earthed. I know some say that this is applying stress to the old mains transformer but I would rather have safety than unknown leakage. If it's going to break down completely, and I have never known this to happen, then it can be rewound.

The Main Chassis
Fortunately, there is very little rubber-covered wire on these chassis. One place that it occurs is on the audio inter-stage transformer. The wires exit, through a piece of sleeving, in the middle of pitch, which is used to fill the metal can. Some of these wires are long and run the length of the chassis and in my opinion can't be left. I used a better method of replacing them than on the Marconi. As before, a pair of side cutters and a small screwdriver were used to break away the pitch down to just beyond where the wires separate. The wires were then cut off and the ends joined to thin PVC wire and sleeved over. Finally the wires were fanned together, the small size of the wire allowing this, and covered with heat shrink sleeving and the can refilled with hot melt glue stick. (see picture). The wires can be used directly but it is also possible to fit extra pieces of tag strip, adjacent to the chassis exit hole, and then 'burn proof' wire of your choice from there.

There is one other area that has rubber insulated wire and that is the screened inner conductors of 'hot' wiring for the IF transformers. As for the Marconi I made up new low capacitance replacements.

Why would EMI use so much screened wiring around the IFT's when the lengths are often short? I think it was to have controlled and constant stray capacitance to earth. The leads would be made up on a jig and the strays would be independent of a wire person's routing of a piece of variable length un-screened wire. When doing the IF alignment (see below) just a few pF's change would make a difference to the waveforms.

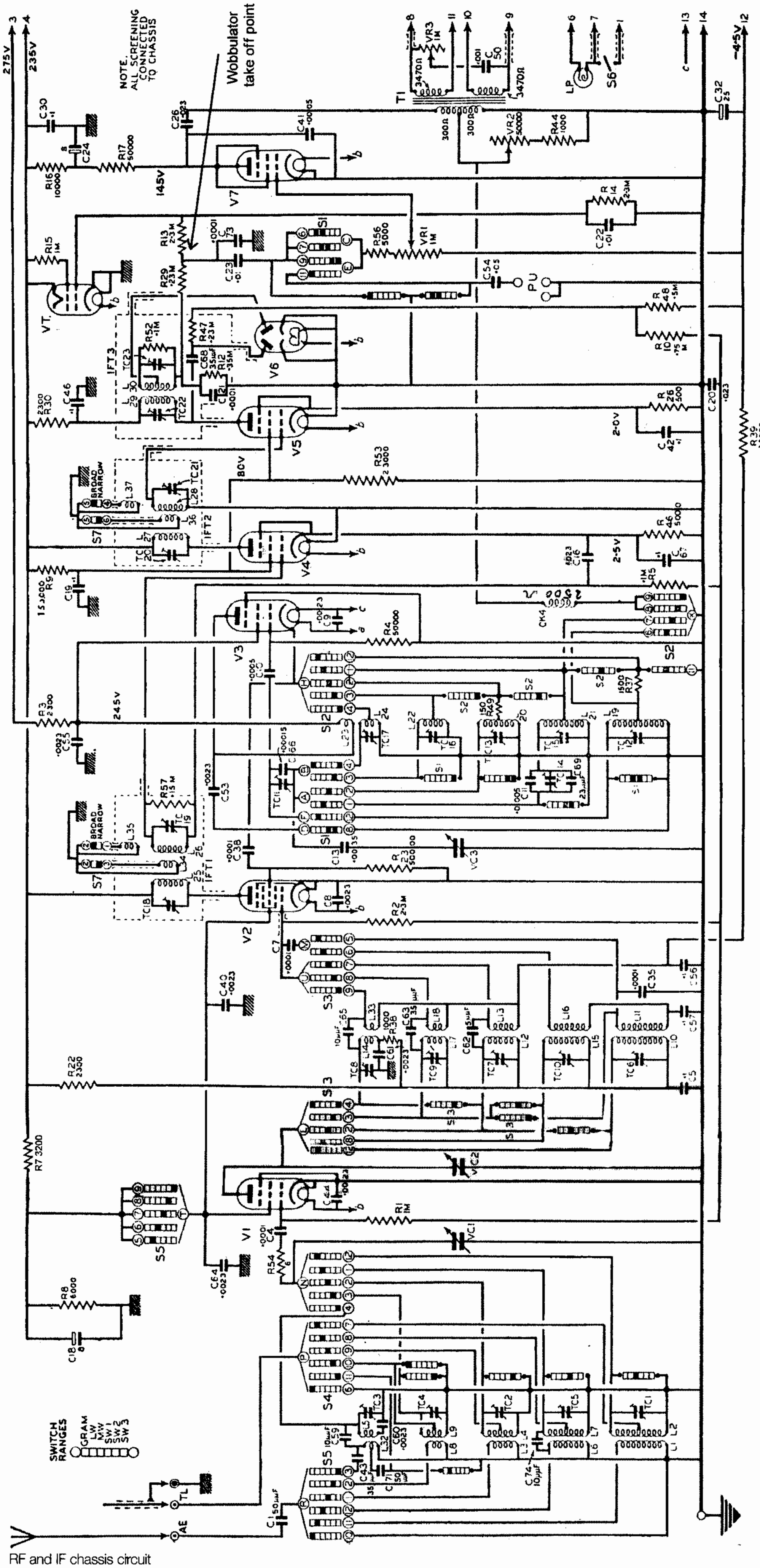
Mica capacitors
The types used on EMI chassis look awful but having measured lots I am yet to find a bad one. This is for leakage although some have been a good 20% out on value but they may have always been like this. The reason they still measure G Ohms at 500V is because there is no silver to migrate. If you take a junk one apart you find the plates are formed from what looks like Beryllium copper.

Some may need changing because of damaged connections, they are quite fragile, or if a valve base is removed as in the case of the botched chassis.

Main Chassis, The IF Transformers

Broken wire strands
Alas, IFT 1 and IFT 2 primaries were 10 and 8.7 Ohm against the 6 Ohm given in the Service manual. This could only mean broken strands in the Litz wire used for the coils. (For reference the inductance measured 1.25 mH with a typical trimmer capacitance of around 80 pF. The insulation between primary and secondary was G Ohms at 500V)

All that could be done was to disconnect



RF and IF chassis circuit

the outer ends and cut back to make new connections. What a devil of a job it is cleaning old enamel covered Litz wire that I discovered was 10 strand. For academic interest only, it was possible to identify some of the wires that were not continuous. A single strand measured as 60 Ohm so the Service Manual was correct on the winding resistance. Calculating from here it is easy to see that 4 and 3 wires respectively were broken somewhere.

They are most likely not making connection at one end, but will still be coupled to the good wires and aid conduction through the coil. Of course my re-connection efforts were to no avail. There is nothing that can be done with the inner connections as the wires are simply too short. But it set me wondering what difference it might make to performance.

Not having a Q Meter, I measured Q by the resonant frequency divided by bandwidth method. The set up was a frequency counter and signal generator, feeding a winding via a 1M Ohm resistor. The detector across the winding was a 'scope' with a 10M & 10 pF probe. For IF strips then the bandwidth is normally taken at half height, that is 6dB down, but for measurement of a single coil Q it is taken at 3 dB down.

The earthed screening can was fitted and one end of other unused windings also earthed. The Q's came out in the 65 to 70 range and from measurement I wouldn't have known which were the coils with the broken wires.

Another junk IFT was found that used three strand wire with a coil resistance of 33 Ohm, which had a measured Q of 41. With one strand cut, at the outer end, the results were 52 Ohm and a Q of 41. Finally with two wires cut the results were 101 Ohm and a Q of 33.

So the conclusion is that a few broken wires is not a disaster.

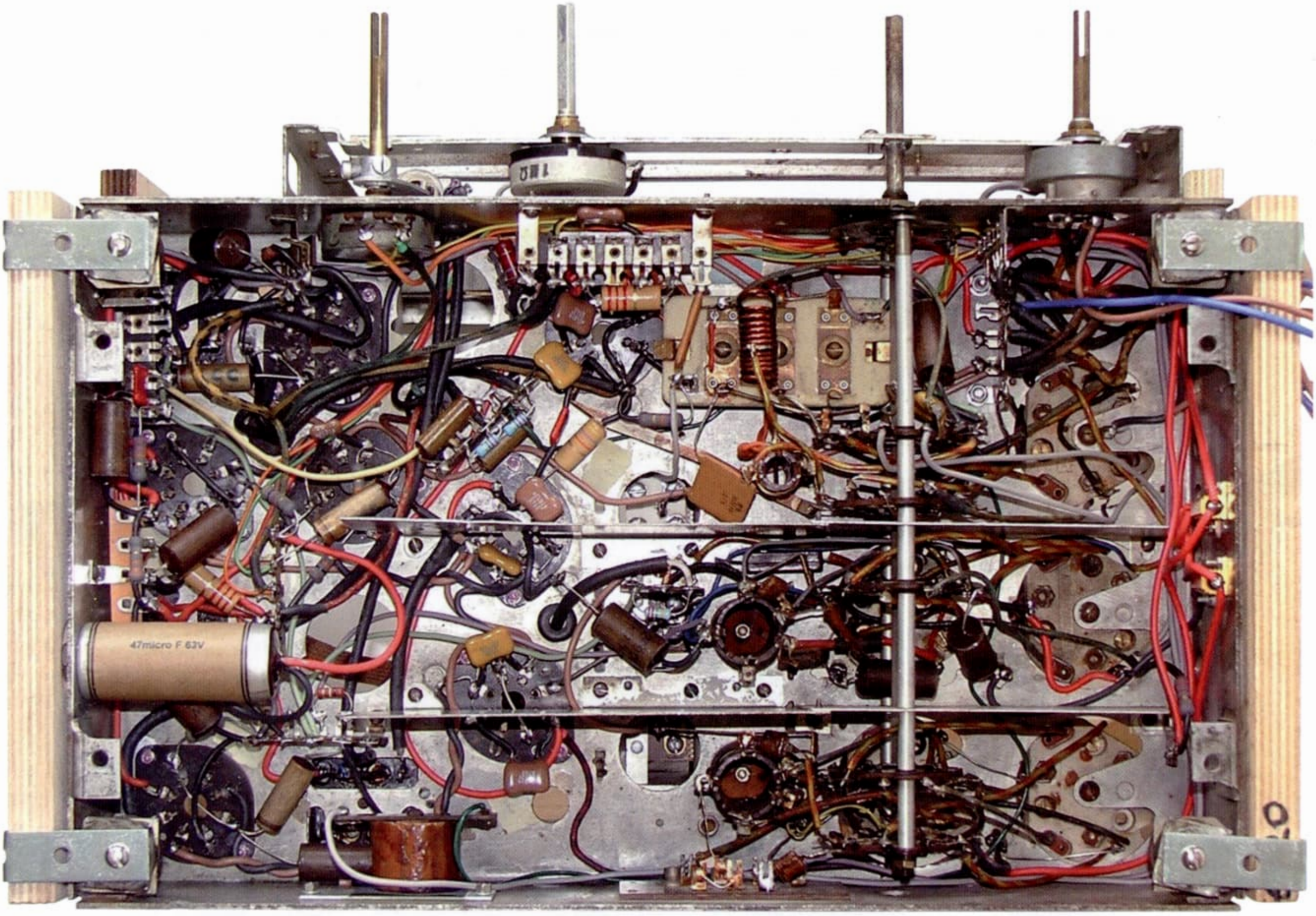
For the 650 chassis could they have been this way from new? To me it seems quite likely, would EMI have rejected all finished IF transformers that weren't perfect.

Later, I typed into Google "Litz wire broken strands" expecting to get nothing of value. Within minutes I found an article "Litz Wire - The Effect of Broken Strands", by member Alan Douglas from back in 1997. In the article he gives the percentage reduction in Q for broken strands of 3 and 7 strand wire. It really is quite astonishing that 4 broken strands, in 7 strand wire, only reduced the Q by 10% and the result was the same if the wires were broken at the inner or outer ends of the winding.

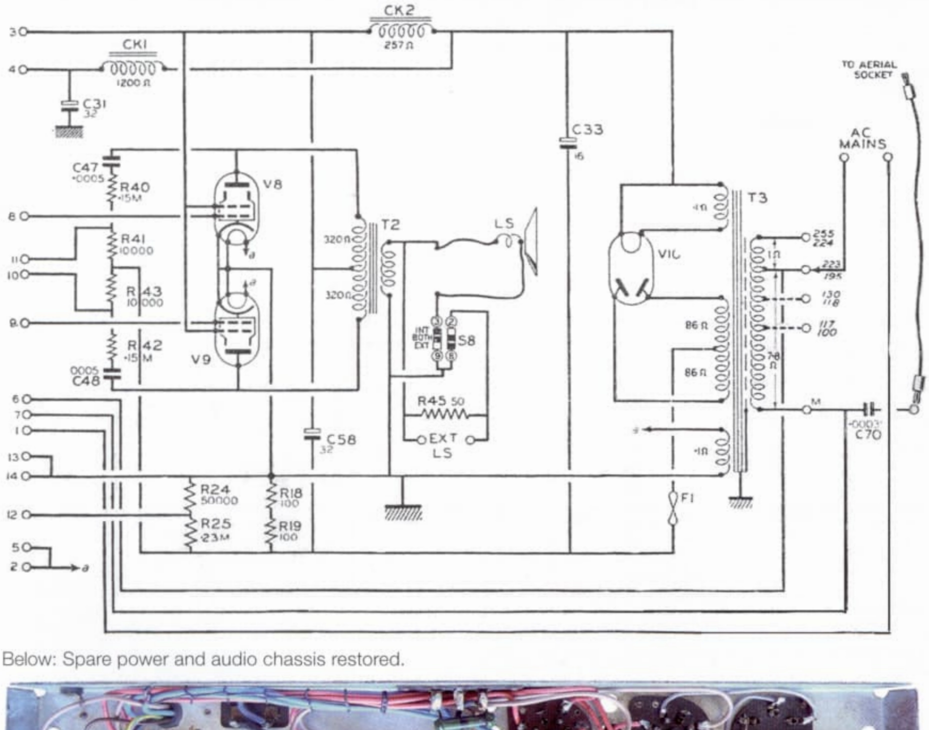
The time spent on my measurements is to me not a waste, it's always satisfying to prove things for myself and it's excellent memory reinforcement.

Q Killing resistors

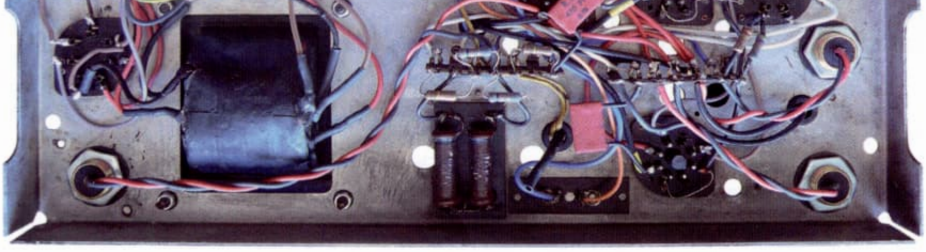
When doing the 561 alignment I had found that adding resistors across some of the windings, which were not already fitted with them, made the task much easier and stable. I fitted the resistors



Above: Spare RF chassis restored. Below: Power and output chassis circuit.



Below: Spare power and audio chassis restored.



inside the cans, which can be done without unsoldering the transformer connections but will mean removing the top caps for the first two. However, replacement screened cables will most likely need to be fitted here anyway. Whilst the cans are off do carefully check that none of the coils are loose or have moved from their original positions.

The final values used were:
First transformer (IFT1) primary, 1M5 added, with 150K across the secondary (the value R57 shown on the circuit).

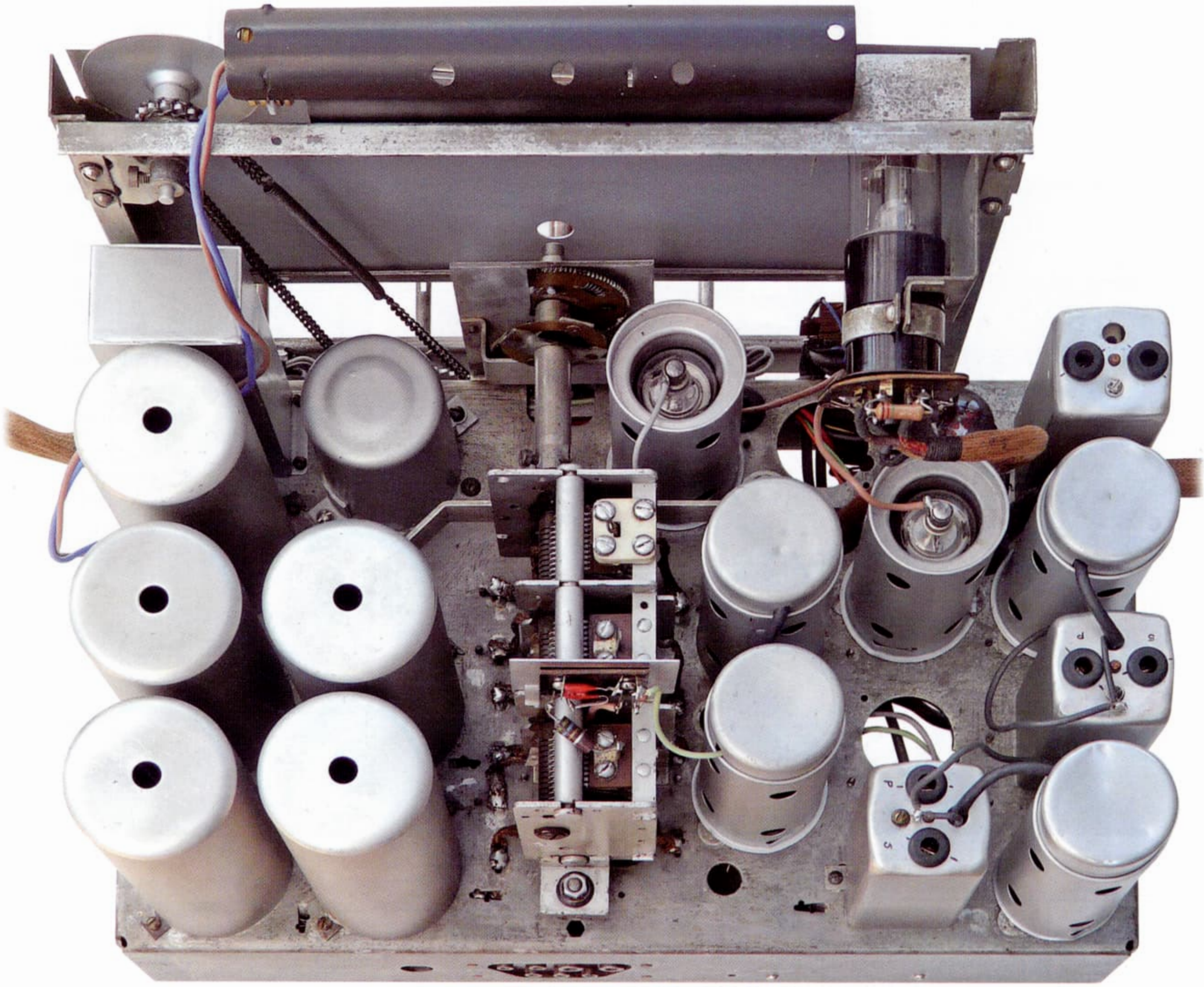
Second transformer (IFT2), 1M5 added, across both primary and secondary.

Third transformer (IFT3) nothing added to the primary and 100K across the secondary (the value R52 shown on the circuit).

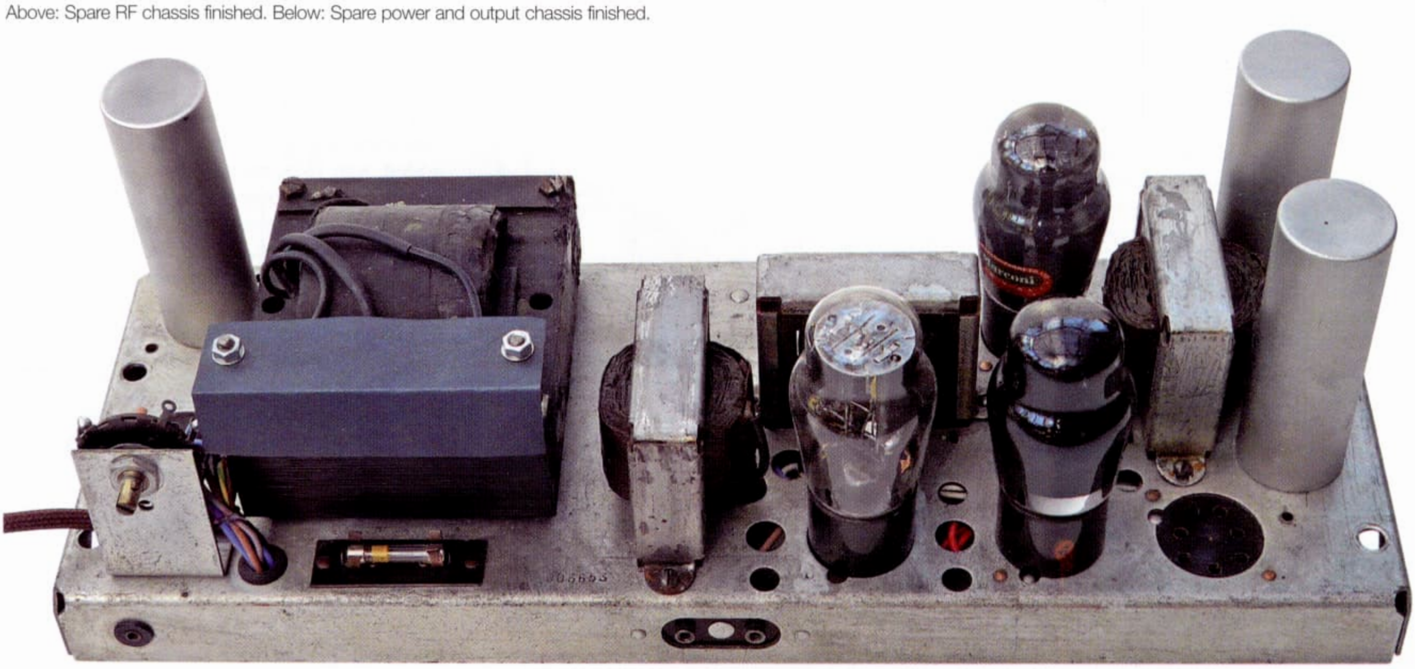
From measurements I made, windings with shunts of 100 / 150K will have Q's in the region of 25 to 30. For those with the added 1M5 then Q on the secondary side should be better than 70. On the primary side it will be less due to the anode resistance of the valve (say 1M).

IF Transformer theory
An interesting article appeared in Wireless World, Feb16, 1939 about a method of bandwidth control using two switched tertiary windings adjacent to each main coil, see the picture reproduced from the article.

On the outside of the primary and secondary windings are tertiary windings that are switched so that one is shorted and the other not, in a changeover arrangement, when



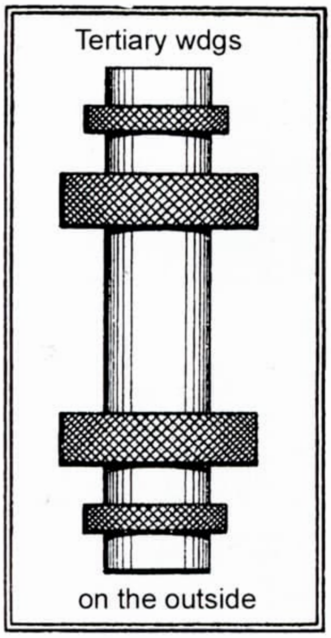
Above: Spare RF chassis finished. Below: Spare power and output chassis finished.



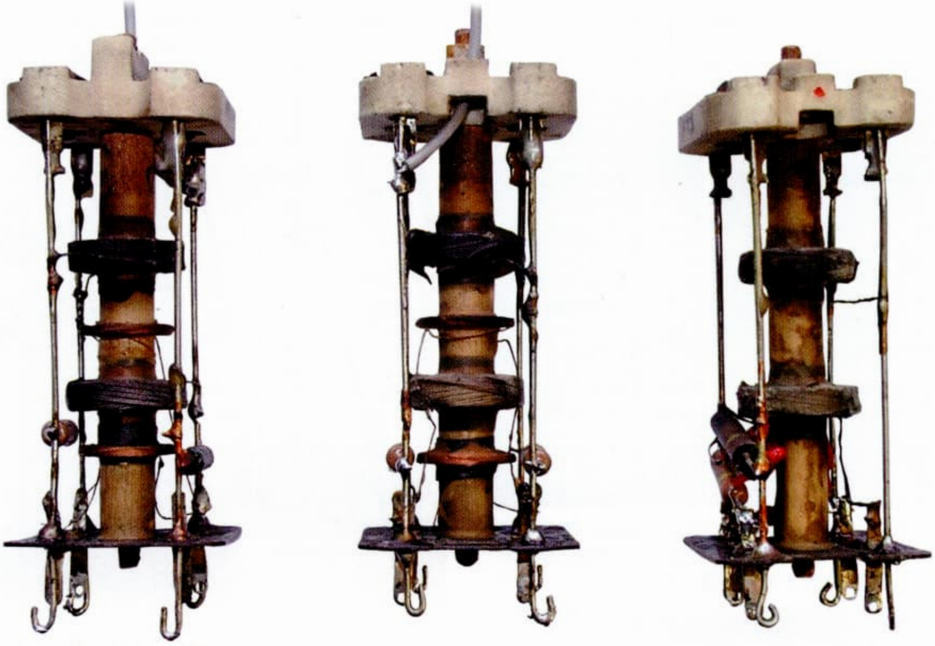
you change from 'narrow' to 'wide' bandwidth.

From WW the description is that with no coils shorted, then the two main tuned circuits, are tuned to slightly different frequencies and the coupling will be less than the critical value.

Now when one coil is shorted, it reduces the magnetic field from the tuned circuit it's nearest to. This lowers its inductance and raises its frequency and things are arranged such that the two tuned circuits are now tuned to exactly the same frequency. Thus you have a single peak for the narrow band response. Then when the switch is changed the shorted coil is opened and the other shorted. This has the effect of lowering the frequency of



Above: Variable bandwidth IFT *Wireless World*.



Above: IFT1, IFT2 and IFT3.

the first and raising that of the second, ideally by the same amount. This gives the double peak response for the wide band case.

The article makes the point that for the double peaks to be the same height, then the tuned circuit Q's in the broad band condition need to be the same. It is an advantage (without extra damping) to make the tuned circuit that has the shorted coil nearest to it, in this condition, the one with the least loading. I take this to be the secondary and this is true for the 650.

However, the 650 doesn't have quite the same physical arrangement of coils and has oddly IFT 1 with 150K across its secondary. This coil tunes noticeably flat on a Wobbulator display.

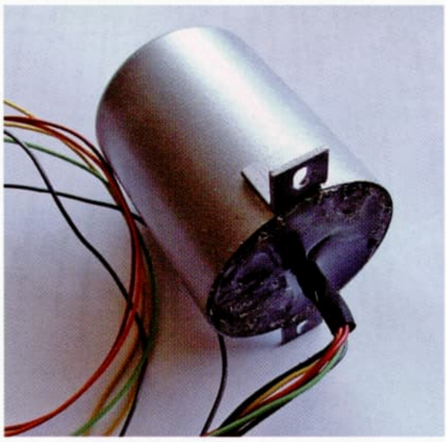
IFT 3 in the chassis is a conventional type, having just a primary and secondary and a bandwidth about 14 kHz wide.

I talked this over with my clever American friend Chuck Doose, whom I have given praise to in previous articles. He has taken a big interest in IF transformer design that started around the time that Bill William's published his enthralling article on the McMichael superhet (Bulletin Summer 2009). Mainly he has studied IFT's used in the early triode superhets and namely transformers made by Remler. This is what he had to say for those used in the 650:

"On these IFTs I believe for the narrow band mode the center tertiary coil, which will be shorted, acts like a thin conductive plate would if located at the same spot. This acts to lower the coupling coefficient, lower the inductance, and increases losses of the primary and secondary equally. Because the bandwidth is more sensitive to coupling coefficient this reduces the bandwidth in the same way as moving the coils further apart. The induced current in the tertiary coil also creates loss, which will lower the Q's, but this has less of an effect on the bandwidth change than the reduction in the coupling coefficient.

When switched to the wide band mode the center tertiary coil no longer has an effect and the bandwidth will widen. However, at the same time the shorted tertiary coil, below the secondary, lowers its Q and inductance, which increases its resonant frequency which has the effect of increasing the bandwidth further. How much can be controlled by a resistor across the secondary and in the case of IFT 1 the designers have chosen 150K. In this mode the primary and secondary have differing resonant frequencies and thus the bandwidth increases toward the high frequency side. See Radio Engineering by Frederick Emmons Terman, second edition, 1937, page 84."

Later I found a page in Coil Design and Construction Manual by B.B. Babini, reprinted February 1995, that confirms



Above: Interface transformer.

Chuck's understanding that the centre tertiary coil acts like a screen when shorted. In the picture, from the manual, the coil is shown having a variable resistor connected in series with it to vary the selectivity.

Tips on IF alignment
(this assumes the use of a Wobbulator)
See pictures of a successful alignment.

There is no point in doing a detailed alignment unless the chassis has been in the warm and dry for some months first. The coils are wax covered and the formers are a hardwood, possibly beech. Moisture content is likely to affect the result.

Secondly, measure the bandwidth switch for reliable continuity.

Start with a peak alignment on narrow band using a signal generator and an output meter (as per the Service Data).

Connect the Wobbulator to V5 grid, via an .01 mF capacitor, using a screened lead and short connections, and measure the response of IFT 3 at the takeoff point (junction of R29 and R13).

For a cleaner waveform stop the oscillator by taking off V3 grid cap.

Centre the oscilloscope display at 465 kHz. I used a frequency counter and signal generator to give an accurate 'marker' by injecting into V2 grid.

Keep the level from the Wobbulator into V5 low else the AVC will 'shut down' V2 and it will be hard to get a signal through. Once the display is centred then remove the marker signal.

Touch up IFT 3 trimmers to give a smooth curve (typically 13-14 kHz wide at half height), only a tiny 'tweak' should be needed.

Connect the Wobbulator to V2 grid, with the level set to where the AVC is just operating, and look at the narrow and wide band waveforms for the whole strip. A good indication is that they both look and sound reasonable (radio temporarily put back to receive signals). Hopefully the wide band will be a rounded curve with a little distortion but twice as wide as the narrow band.

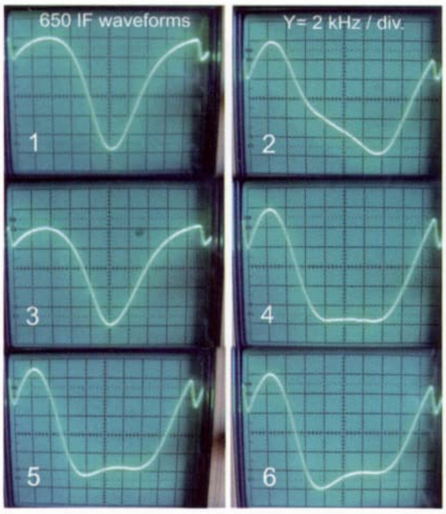
Tweak IFT 1 primary trimmer to improve the wide band. Just make a tiny adjustment and see if it makes an improvement.

Do the same with IFT 2 primary and secondary trimmers. Keep switching to narrow band and checking that the waveform is not going too wrong here

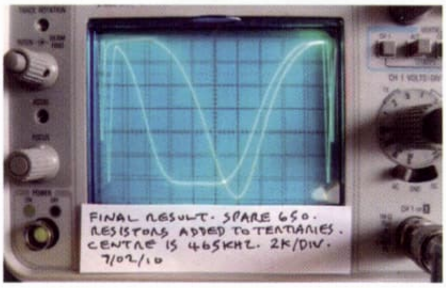
Repeat IFT 1 primary and try IFT 1 secondary as well. This normally affects gain more than shape.

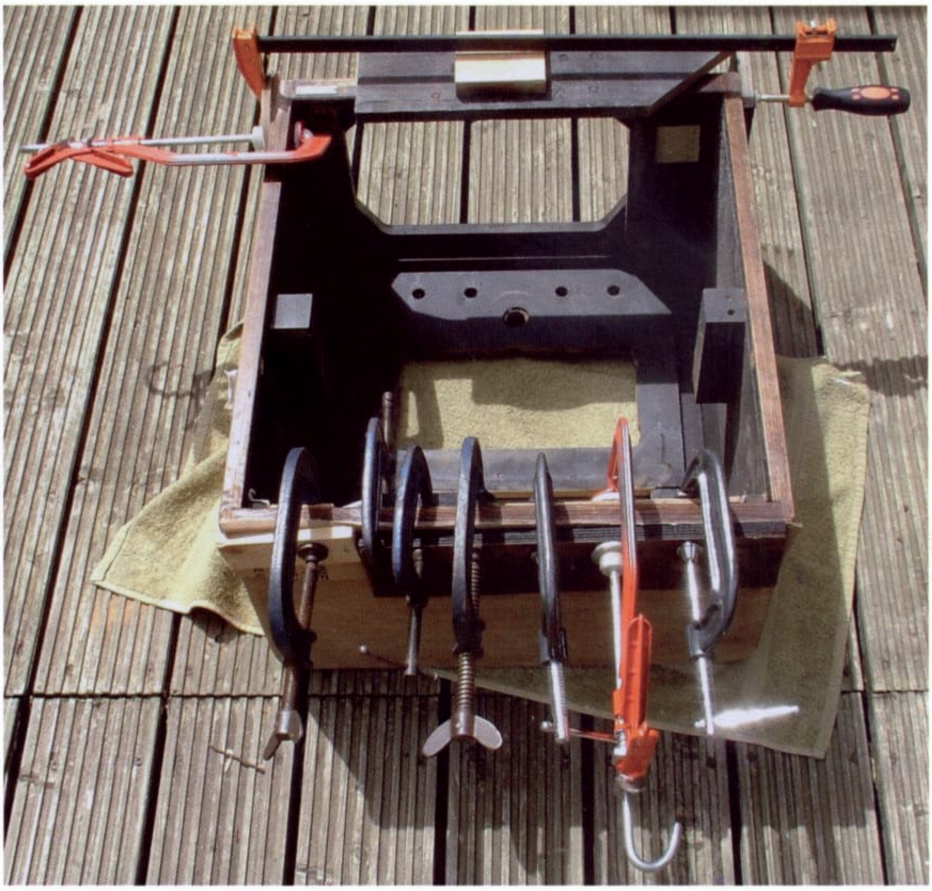
Repeat for IFT 2 and by now it should be pretty much there. Try moving each trimmer in turn, away from the ideal position, to make sure that the waveforms have not been obtained sitting on an unstable 'cliff edge'.

Note: Good waveforms should be found



Above:1 = NB no tweak. 2 = WB no tweak. 3 to 6 = tweaked. 3 = NB. 4= WB, small signal. 5 = WB, AGC operating. 6 = WB, big signal





Above: Response of the chassis with series resistors in the tertiary windings. Above, right: Cabinet repairs.

with only minor loss in gain. When switching between narrow and wide band the waveform centre frequency should remain close to 465 kHz. Typical error is 2 to 3 kHz. The waveform shapes should remain good and reasonably the same for small to big signal inputs.

The capacitance change when 'tweaking' the trimmers is small and from measurements I estimate that it is possibly no more than + or – 5 pF for a total trimmer capacitance of around 80 pF.

The alignment result can be checked from cold and after leaving the radio on for several hours over many days. I found the waveforms to be identical within a few minutes and after many hours. Whilst I was making all this effort I took the chassis out of the Marconi 561 and checked it as well, alignment had drifted off a little but it was easily tweaked up again.

Expect to do a re-alignment if any of the 'strip' valves are changed. Trying others, grabbed at random, V5 made the most difference, V4 not much and V2 in between but this might just have been a lucky choice of valves.

Above: You can get an incredible shine using Mohawk.

What to do if you can't get a satisfactory result

This can happen with transformers whose coil resistance values are much the same as others that work fine. Assuming that the position of the coils looks original, and that they were not loose on the former, then maybe they were not correctly positioned in the first place. It is only possible to speculate how the tertiary coils were set up, I doubt they were done by an electronic method but just mechanically positioned in a jig.

But understanding the operation makes finding a fix a possibility. Disconnect each wire, for the secondary tertiary coils of IFT 1 and 2, at the bandwidth switch. Assuming the chassis is correctly wired these will be the ones at the left viewed from the front. The operation of the centre tertiary coils acting alone can now be seen. In the wide band switch position the coil is open and by 'dabbing on' (earthing) each secondary tertiary wire the affect of that coil can be seen. That for IFT 2 will be the greatest as IFT 1 secondary is shunted by 150K. Hopefully it will be the case that these secondary tertiaries are having too much effect (possibly being mounted too close to the secondary). Adding series resistors fitted temporarily at the switch can reduce this. (2K2 for IFT 1 and 4K7 for IFT 2 on a sample of one). It may be that when the broad band waveform is acceptable that for the narrow band is too narrow. Low value resistors (220 Ohms on the same example) can broaden this connected in series with the centre tertiary coils (at the other side of the switch).

When the values have been established, by trial and error, it is neater to mount the resistors under the chassis, using

1/4W miniature types, with very short leads, on the pins of the IFT's.

See pictures of the final result, for the one example, with bandwidths of 5.6 kHz and 10.4 kHz. Here both waveform centres are slightly off from 465 kHz but still within 2-3 kHz. The result was stable (as good as the other two chassis) and sounded correct on a variety of programmes.

RF Alignment
This was straight forward and as per the Service Data

Funnies
(mostly academic but worth recording)
The 561, a very early radio from 1936 with a serial number of 176, has the choke CK4 on the output chassis and wired across the speaker output. In such a low impedance position a 6H choke was not going to do much. Accordingly on later radios it's been moved to the main chassis and connected across the bass control, to limit bass, but is only in circuit on SW2 and SW3. A quick modification was done by having it share mountings with a pair of tag strips in an already highly congested area. For easier restoration and by just drilling one extra hole (one spare exists) I moved it to the rear of the chassis where there is plenty of room.

Only on the early 561 chassis is a 0.1 mF mica capacitor, a completely original component, connected from S4 tag 9 to S3 tag 7. It would only have an effect on SW1, when using a balanced aerial input ("Static-free Aerial Model 72") seemingly bypassing the RF stage. Capacitor C72 is shown on the Service Manual layout sheet but does not exist elsewhere. Resistor R6 could not be found. In the Service Manual and the Broadcaster information it only appears on the Spare Parts List. Capacitor C61 is not shown on the Broadcaster sheet spares list. It is decoupling L14 used on SW3.

Waveband Switch
For those unaccustomed to reading EMI Circuit diagrams the way the switches are drawn at first sight looks confusing. It's actually clever, as are the switches themselves. Looking at the diagram then the boxes, from the top to the bottom, represent the switch positions: Gram, LW, MW, SW1, SW2, SW3. Where a box has a black fill then that wiper is connected to that contact. An easy example is the aerial input to S5.

The switches are of good quality, having strong front mounted leaves, with wiper rings on the rear face and 'pip' contacts that complete the circuit between the two. But it's cleverer than that as there are other leaf type wipers on the front side that short contacts (coil windings) to ground or short pairs of contacts that bridge the one connecting to the wiper on the other side. These are shown on the circuit diagram below the main poles used for through connections

Some wafers are easy to understand: take SW5 which, is a two-pole switch (two wipers on the rear), on a wafer able to take 12 contacts, on a mechanism with 6 positions. Simple arithmetic makes this one not hard to visualise.

However, others have more poles and up to 6 wipers which, for a two-position switch would work out nicely with the 12 contact positions. Of course it's a 6 position switch so some wipers must encroach into adjacent contacts areas so thought must have gone into making sure that this didn't cause problems. Those engineers, all those years ago, knew their stuff.

The 650 switch is a long switch with the indexing mechanism some way in front of the first wafer. Excessive contact cleaning of the switch may be counter-productive as the increased wafer friction decreases snap from the indexing. The result of this is that wipers don't always align so well and may align better in one direction than the other. I used to think that "Switch Cleaner" was different to "Contact Cleaner", by having a lubricant, but I tried spraying both onto a clean sheet of paper. Both dried completely free from residue and seem to be identical. Did the manufacturers lubricate the switch wafers? To me it seems likely. The theory about lubricating a switch is that it's soon rubbed off of the high parts of the contacts, that actually make the connection, but left in the 'valleys' (at the microscopic level) and around the moving rotors to minimise friction. There are recommendations that switch cleaner is only applied sparingly with a cocktail stick, or the like, and maybe this is the reason. Others recommend WD40 that does have a lubricant.

Cabinet
For me the cabinet needed much more than touch up. It had a splintered rear corner, with missing veneer, a cigarette burn on top, missing black inlay and dozens of scratches, with some deep into the veneer.

The cabinet had obviously been dropped on the rear corner and this had loosened up the joint between the side and the bottom. Also, the ply along the top had delaminated for about an inch in depth. So the first thing was to clean these areas, using folds of sandpaper and an aerosol air supply, before applying thinned white PVA glue and clamping, see picure.

To remove the old finish I used a mix (75% to 25%) of standard cellulose and anti-chill thinners and wire wool. This was done outdoors, up-wind and with appropriate mask and gloves.

For dents and gouges away from the edges, I used a technique told to me by an artist. Firstly they were given a rub of stain, close to the desired finish colour, before laboriously filling with Mohawk cellulose lacquer. This was done with each surface horizontal using a small brush from lacquer sprayed into a lid. When the spots were really hard (I leave the cabinet for a couple of weeks at least), they were sanded level. When the cabinet is lacquered then the surface of the dull spots must re-flow and become to me invisible.

For wounds right on the cabinet edge then car body filler has great adhesion. Of course it's the wrong colour and later would need to be coloured in with thinned model paints and sealed with shellac.

Repair of the broken corner was made using car body filler before cutting in a new piece of veneer. A veneer strip, that had been stained black, was used to replace the piece of missing inlay.

The next step was grain filling with tinted and thinned filler. This was done three times to try to make sure that every nook and cranny was filled. Next day the cabinet was sanded smooth.

I no longer use (or only if nothing else will work) dye toner aerosols (Mohawk "Classic" range) preferring a diluted mix of white spirit-based stains. Obliteration toner ("Tone" toner by Mohawk) is still my favourite for feet and other trim.

Refinishing was conventional using Mohawk cellulose lacquer, sandwiching a new HMV transfer between coats, before 'rubbing out'.

My aim was a high gloss and very smooth finish so a lot of lacquer was going to be removed, between coats and final wet sanding. Enough is needed so that there is no danger of going through anywhere.

How much lacquer can you put on? An e-mail to Mohawk gave this reply "...our recommended maximum thickness, before stability becomes an issue, using spray gun lacquer, is four thousandths of an inch. But as the lacquer in cans has less solids that thickness is unlikely to be reached with those".

In tests done by me (acrylic sheet and a micrometer) ten generous coats equals three thousandths of an inch.

Once the cabinet was smooth from the sanding then final polish was achieved by using finer lubricants such as pumice and rottenstone but even metal polish will work. It's best to use very soft cloth wrapped around a flat block for this.

With experience you can get a super finish with Mohawk lacquer (see pictures).

The Loudspeaker grille
This was laboriously scrubbed clean with an old toothbrush in a thinner mix. When dry another brush and Solvol Autosol chrome polish were used before a final clean in thinners. It needed to be "Antique Bronze", according to the Service Manual, and several Mohawk dye toners of the brown and golden variety were tried. All came out too brown, or with uneven shading or with a speckled look. Eventually I tried Amber, that is more copper than bronze, and of course it came out with a near perfect finish. For the time being this would have to do, a few days later I over-sprayed it with the semi-gloss clear lacquer.

EMI Output Transformers
This applies to the Marconi 561 and the HMV 650. It is not shown on any circuit diagram (EMI or Broadcaster Sheet) but the output transformer has a centre tap. This can be seen on a radio chassis as two wires, from the transformer, passing through a grommet, joined and sleeved over. The output, to one loudspeaker, is taken from the ends of the winding. Now on radiogram or chair-side versions of this radio the output to two loudspeakers in parallel is taken from one end of the winding and the tap. The wires are sleeved over as before but have an output wire. The unused end of the winding is taken through the grommet and is sleeved over.

article continued on page 41

Radiogram exhibition at the NVCF

photographs by Carl Glover

Murphy A8 plus record desk (1932), Lissen 'Lissenola' (1929), Marconiphone 258 (1932)

McMurdo Silver 15 valve, 6 waveband receiver

RGD 643 (1937), RGD 7511

RGD 1201 (1933), HMV 580 (1935)

Ferguson 299 (1950), HMV 800 (1935)

Decca Decola (1946)

Murphy A28RG (1935), Murphy A138 (1949)

Barker 88 (1939)

Murphy A40RG (1937)

RGD '3 in 1' (1949) with matching extension speaker

Getting the most from The AVO VCM163 Valve tester

By R.J.Grant

The VCM163 was the last and probably the most useful of a long line of AVO valve testers. It quickly and simultaneously checks the emission and gm of the valve on test and displays the results on two moving coil meters.

Over the years I have had cause to use several of these VCM163 valve testers at different places of employment and found the gm section on all of them to be unserviceable. The valves under test indicated a useful emission and the lack of a gm reading not investigated, I just put it down to the probability of the meter being o/c. If the emission of the valve was ok then probably the valve was and a lot of the earlier valve testers I have used didn't have this feature. It wasn't until I acquired one of these testers myself, also suffering from a lack of a gm reading that I looked into the problem.

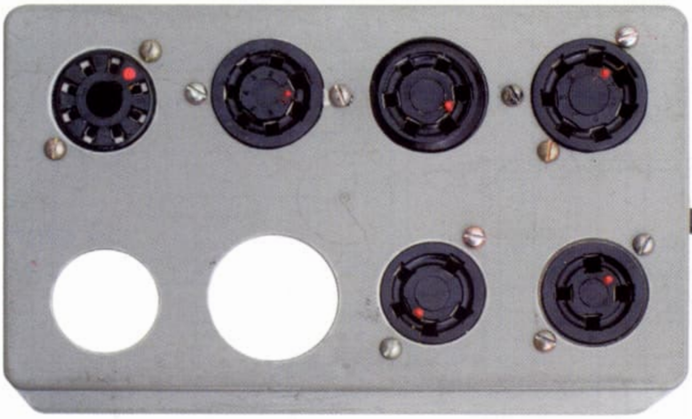
Failures in valve testers are usually confined to power supply electrolytic capacitors drying out causing the meters to rattle at 50c/s, or mechanical failures of the switches or sockets, all quite easily remedied without the aid of a circuit diagram and similar parts reasonably easy to find. The big problem is if one of the meters or mains transformers goes open circuit, obtaining a replacement or a rewind can prove very difficult. Suspecting the meter may be open circuit in my case, it was the first thing I checked, fortunately this proved ok, so with that and the very handy full circuit diagram in the manual means I was in with a chance of easily fixing it.

The gm circuit consists of a 15kc/s oscillator on its own printed circuit board with a stabilised output of 200m/V. This is AC coupled to the grid of the valve under test via a transformer T1 mounted on this oscillator printed circuit board. A tuned transformer in the anode circuit, also called T1 picks up this 15kc/s signal which is amplified, rectified and the output displayed on the gm meter, indicating the amplification factor of the valve. The amplifier also has its own dedicated PCB with an on-board regulated 12v power supply. This 12v regulated supply is fed from the 20v tapping of the mains transformer T1, that supplies the Anode and Screen voltages to the valve under test, this 12v regulated supply also supplies the oscillator. Just to remove the confusion, there are no less than three T1's in the circuit diagram, 1. the mains transformer that supplies the anode and screen voltages, 2. the output transformer on the oscillator circuit PCB and 3. the tuned input filter transformer on the amplifier PCB.

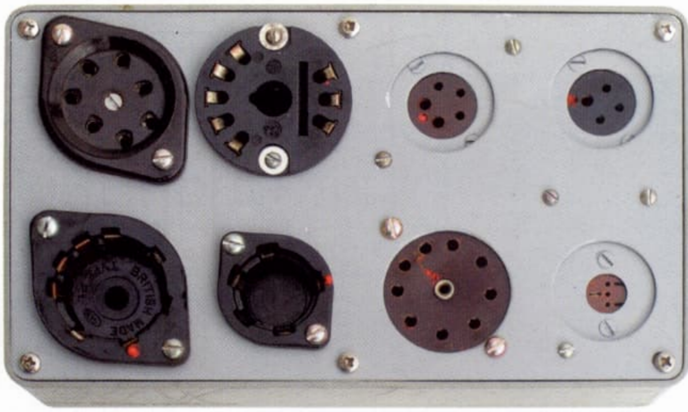
The oscillator and the amplifier both consist of a three transistor circuit and three of the six transistors in my case were found to be defective. These were replaced with equivalent types and the gm test function returned. The gm test was recalibrated as per the instructions in the manual, it wasn't far out as both the amplifier and oscillator circuits are well compensated for drift. After purchasing a large box of various valves, I sorted them into types and ran a production line style of test on them. One of them flashed over when HT was applied and blew up a couple of the transistors in the gm circuits. Duly repaired the same thing happened again a few months later when another batch of valves were tested.

This tester has an overload cut-out circuit removing the power to transformer T1 on detecting a short circuit in the valve under test. This is achieved by a relay in the return of the secondary winding of T1 (supplying the HT voltages for the anode and screen circuits), once activated this relay is latched on by a secondary supply from T2, the LT transformer supplying the heater circuit. The relay also illuminates the blue "Overload" indicator light on the front panel. This cut-out circuit should avoid catastrophic damage to the valve tester under short circuit conditions, but unfortunately the relay doesn't appear to be fast enough to avoid damage to the transistor circuits. The fast high energy anode or screen voltage pulse of a flash-over easily pops a low voltage junction transistor.

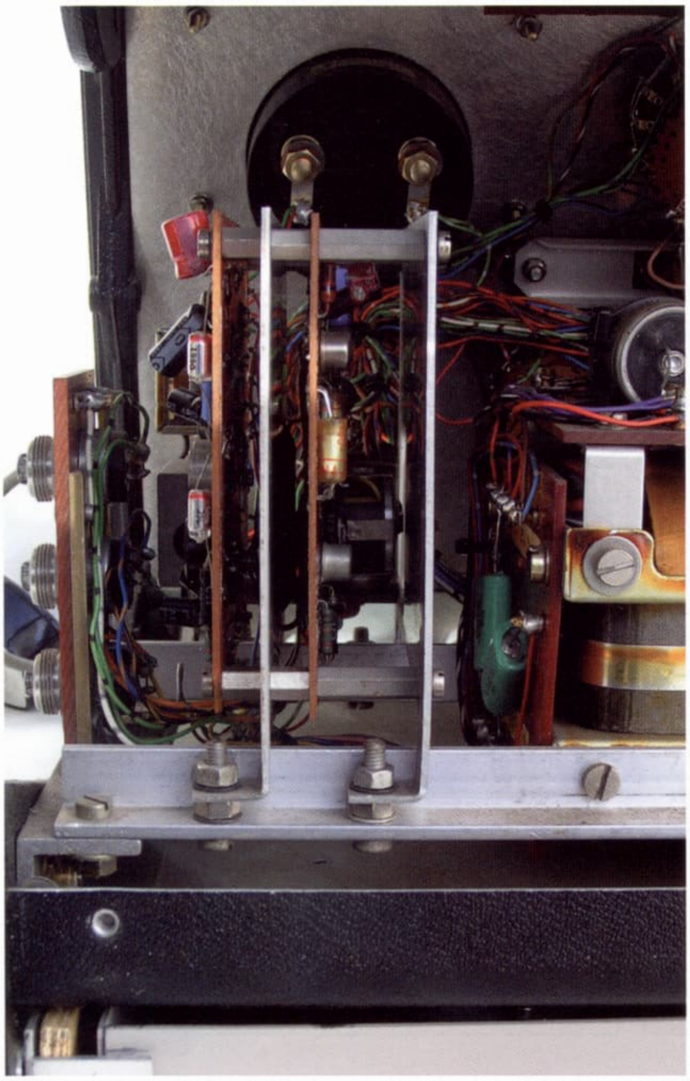
A more permanent solution to this problem was required as I didn't want to spend a lot of time continually fixing my



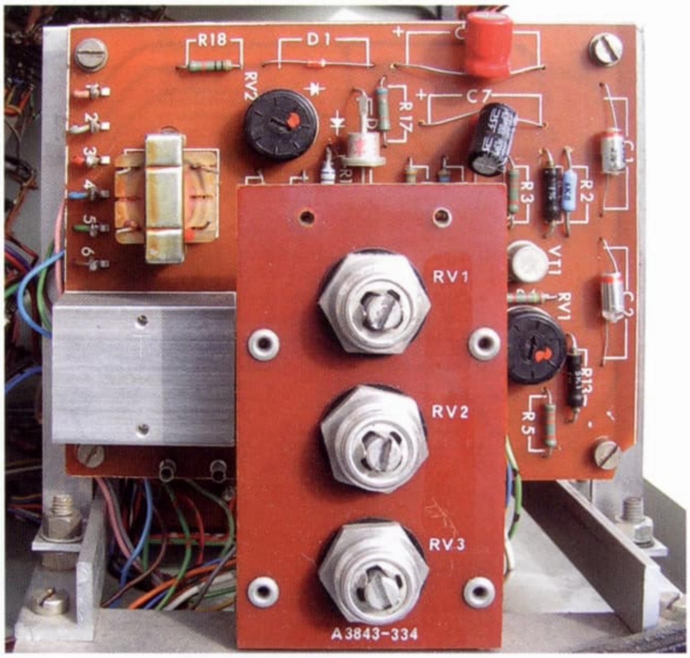
Adaptor box American side



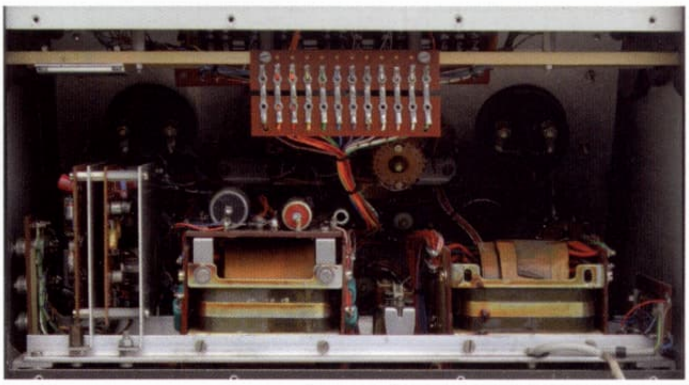
Adaptor box European side



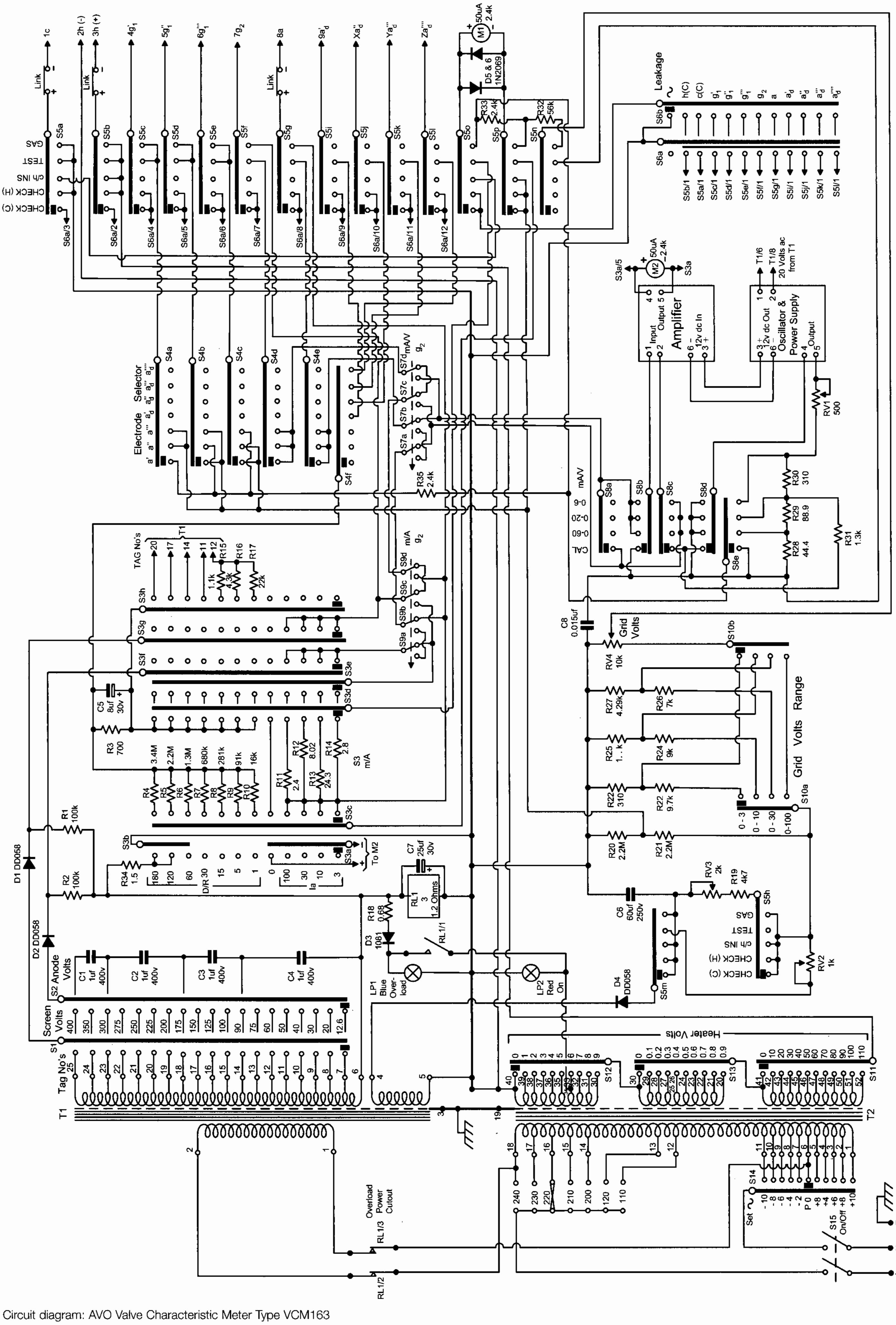
The oscillator and amplifier PCB cluster



The calibration pots

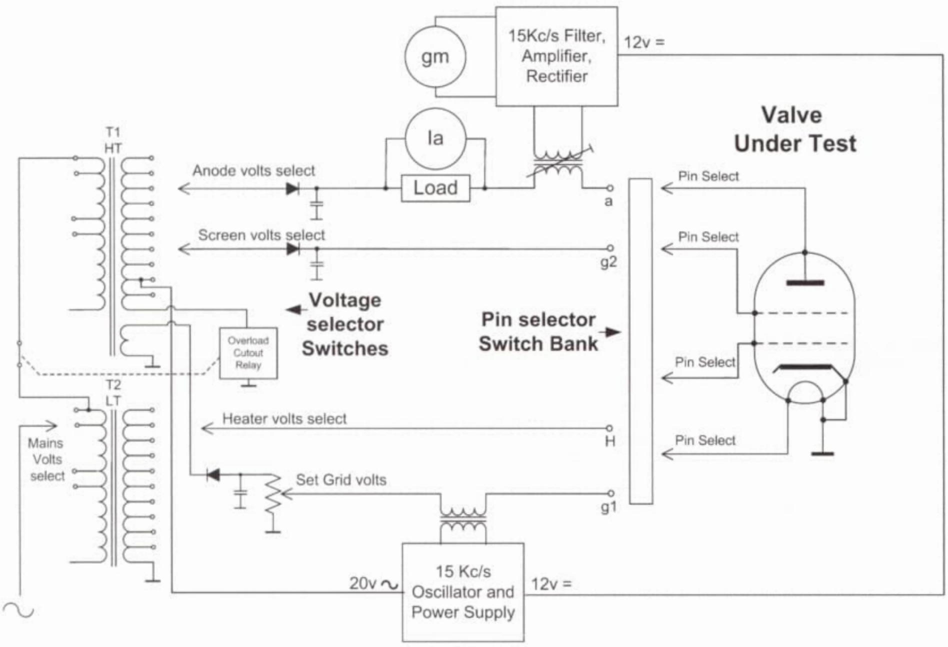


The Works: oscillator and amp far left

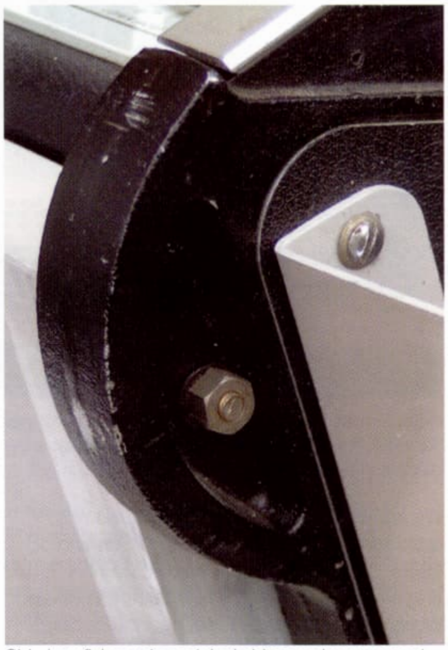


Circuit diagram: AVO Valve Characteristic Meter Type VCM163 valve tester. I looked up the spec of some of the transistors I had in stock for some that could better handle these flash-overs. I found some with a collector voltage of 300v, these were the BF 337 or BF 258 originally used in TV CRT driver circuits and better able to withstand the occasional flash over. With gain and current characteristics better than the transistors originally fitted and easily obtainable with many other equivalents this type of transistor is an ideal choice. These transistors were fitted in all six positions of the oscillator and amplifier circuits and calibrated to the spec in the manual with no problems. They have survived many sessions of bulk valve testing with many valves suffering internal flashovers and they are still going strong.

The VCM 163, being one of the last of the valve testers and built in the 1960's, doesn't include sockets for the Pre-WW2 valves, B4, B5, B7, B9, and Ct8, etc or any of the American Pre-war UX series valves. This required an adaptor Box, I already had a make-shift adaptor built for a valve tester I had previously owned but decided to make a better job of a new one. I used a plastic project box from Maplins, 19cm x 11cm x 5.5cm big enough for eight of the 1930's sized valve sockets on each side. I made one side European and the other American and the box flips over to suit the valves under test. I painted the pin orientation marks on the valve holders with a small dot of red paint, making them more easily seen as some of them were quite obscure, especially the UX types with two larger pins not very easily determined on the valve holders. The box is connected to the valve tester via a short piece of decade cable with a B9A plug on the end, this is plugged into the B9A valve socket on the main test socket panel. This worked ok but I found that the whole thing with the adaptor box perched on top, the torque in its connecting wire making it roll around, the reference and equivalence books continually being mislaid, made it awkward to use and needed tidying. The answer was to make it more self contained so I added a few extras to make the whole thing more manageable. First, I made a draw from folded aluminium sheet that fitted in the space underneath to accommodate the switch and voltage setting data book. This draw slides into a pair of aluminium angle runners that are held in place by



VCM163 Block Diagram



Side box fixing using original side panel screws and draw rail fixing bolt through side panel foot fillet

The side box fitted.

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Hobbies Weekly and Radio Construction by Stef Niewiadomski


HOBBIES WEEKLY

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SEPTEMBER 4th 1957 VOL. 124 NUMBER 3227

Hobbies

All correspondence should be addressed to the Editor, Hobbies Weekly, Dereham, Norfolk

ONE-VALVE RADIO

For short, medium and long waves

Designed By F. G. Rayer

ONE-valve receivers are popular, and also cheap and easy to build. A 1-valver which can tune all the short, medium and long wavebands should thus be of particular interest, and the set described here is of this type.

When more than one waveband is required, wavechange switching is generally used, to select various tuning coils. When there are several wavebands, this tends to become complicated, and it is in such switch wiring that beginners, in particular, are liable to make mistakes. To avoid this, plug-in coils are employed in the present design. This is efficient, simple, and has the added advantage that further coils can be made up later, for other bands. Some constructors may not require long waves, while others may wish to provide for short-wave reception only. If so, only the coils for those bands required need be wound.

The circuit appears in Fig. 1, a ·0005μF air-spaced tuning condenser being suitable for 15 to 2,000 metres. This type of condenser will have about 24 plates. Condensers of smaller capacity will do for short-wave reception only, where a tuning condenser of about ·0001μF to ·0002μF is satisfactory. But when medium and long waves are also to be tuned, ·0005μF becomes necessary.

For short wave tuning, a reduction drive is required. One of the cheapest may be made up from a cord, spindle drive and drum, and these parts can be purchased easily. Various kinds of ready-made drives and dials can also be obtained, and will be satisfactory.

The reaction condenser is about ·0003μF, with a knob of reasonable diameter — say, 1in. A ·0002μF fixed condenser, 2 megohm resistor, on/off switch, and H.F. Choke are also required, with 4 terminals, or twin socket strips for connections.

337

FOR ALL HOME CRAFTSMEN

Over 60 years of 'Do-it-Yourself'

4½D

In September 1957, F G Rayer's front cover 'One Valve Radio' TRF receiver, designed 'for short, medium and long waves'. The 'artist's impression' of the chassis looks rather crude and doesn't show the HL2 valve, plug-in coil, tuning capacitor and dial very well.


HOBBIES WEEKLY

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Hobbies

FEBRUARY 9th 1955 VOL. 119 NUMBER 3093

Detailed instructions for making a

PORTABLE WIRELESS FOR HEADPHONE RECEPTION

★ By F. G. Rayer

THIS receiver has been designed for the constructor who wishes to build a fairly compact and simple portable wireless for headphone reception. It is quite small, and contains batteries and phones, the latter being withdrawn from the case when required for listening.

There are several advantages in this method. For example, the set can be used anywhere without disturbing other people. The circuit can also be much simplified, as less power is required for phones than would be so if a speaker were incorporated. As a result, weight and initial and running costs are kept down. If, on the other hand, an external loudspeaker and larger battery are available upon occasion, then quite good speaker results can be had from the local station.

The Circuit

The circuit is shown in Fig. 1. Automatic bias is provided to avoid the need for a G.B. battery. Actually, quite good phone results can be obtained in most parts of the country with one valve and frame aerial, and if it is desired to try this, then the L.F. coupling transformer, 600 ohm resistor, 25μF condenser, and output valve, with holder, are omitted. The phones are wired from H.F. choke to H.T. positive, H.T. negative being wired to L.T. negative. 1S5 and 1S4 valves are used. A 1S5 and 1T4 are equally suitable, for phone reproduction only; a further 1T4 may also be employed instead of the 1S5. If the valves are changed, valveholder wiring must be modified to suit.

The other components required will be seen from the diagrams. A further ·0005μF variable condenser can be used for reaction, if available, instead of the ·0003μF shown. Any H.F. choke for medium and long waves is suitable. This item can be made by fitting two discs of paxolin ⅜in. in diameter on a piece of wood or bakelite rod ¼in. in diameter, spaced so that ⅛in. is left between the discs. This space is wound full of 38 to 42 S.W.G. silk-covered wire.

Results are considerably influenced by the L.F. transformer, and an efficient component, designed for this purpose,

All correspondence should be addressed to The Editor, Hobbies Weekly, Dereham, Norfolk

For Modellers, Fretworkers and Home Craftsmen

4D

PAGE 289

Front cover photograph of F G Rayer's 'Portable Wireless for Headphone Reception' in the February 9th 1955 issue. The set was neatly built into a wooden case containing a frame aerial, headphones and batteries.

We are all familiar with the 'mainstream' radio magazines of the 1940s, 1950s and 1960s, such as Practical Wireless, Short Wave Magazine, Radio Constructor, Wireless World and so on, which shaped the hobby of building radios through a period of great popularity. In fact so popular was the hobby and so great the demand for practical designs that there was a 'fringe' industry of publications whose editors thought it good business to include radio topics in their magazines. One such magazine was Hobbies Weekly, which in fact is still in business (as a mail order and internet shop, see: www.alwayshobbies.com), having started publication way back in 1895. Old copies of this magazine can still be found on eBay, mainly covering the period of the late-1940s to the mid-1960s, though on rare occasions 1930s copies come up for sale. This is where I recently bought a selection, mostly with radio connections, and was fascinated by this source of material.

My apologies if I show rather more here than just references to the hobby of radio. I also want to put our activities into the context of hobbies in general in the period, and hopefully you'll find as much fun in reminiscing about the 'good old days' as I did.

Authors' Identities

Many articles were published anonymously, which at certain times seems to have been editorial policy when no authors at all were credited. At other times articles were attributed to the designers and writers of the time who were also producing work for the 'mainstream' radio magazines. One such writer was Frank G Rayer, who became G3OGR in July 1960, and whom I wrote about a couple of years ago (see Practical Wireless, December 2007). At the time I expressed incredulity at a claim made in Modern Fiction–Writing Technique (written by FGR himself, and published by Bond Street Publishers Ltd in 1960): introducing FGR, the foreword of the book says 'Author of 1,000 published stories and articles in British and overseas periodicals and magazines'. Having seen some of his articles in Hobbies Weekly, and other magazines since I researched the 2007 article, I can now believe that the number of 1,000 could well have been true. He also had a habit of writing under pseudonyms, sometimes because it was editorial policy of the magazines in which he was being published to avoid obviously publishing more than one article by a given contributor in a single issue. He may well have also used pseudonyms in Hobbies Weekly, though there's probably no way to tell now.

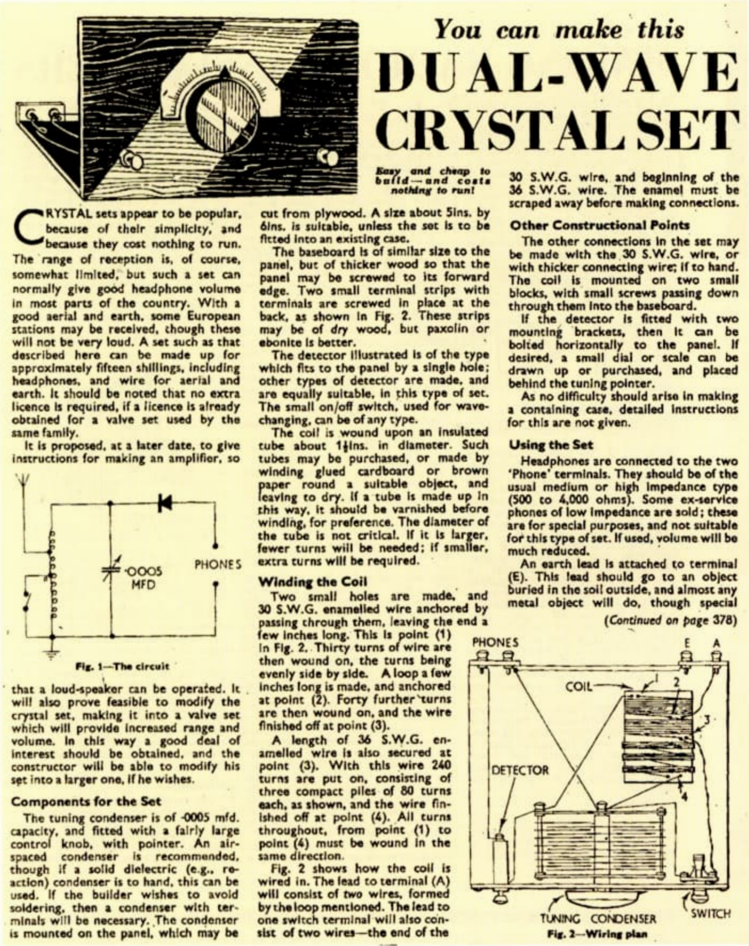
Value for Money

During the 1950s the magazine retailed at between 3d and 5d, which was fairly consistently worth about 35p-ish in today's money (based on a Retail Price Index analysis), so it wasn't expensive by any means. For that price you typically got a total of 16 pages, of which two were usually adverts, so it was always a slim volume.

On regular occasions 'blueprints' (black on white paper, and not the true blueprints we saw in older radio magazines) were inserted, typically a woodworking project, giving more value for money for that particular edition. I'm sitting here looking at the blueprint for a 'Musical Toilet Roll Holder', so maybe my last statement isn't completely true. In the mid-1950s Practical Wireless cost about 1/3d, so it was considerably more expensive. Of course you got many more pages for your money, and many more constructional radio articles, compared to the single one you typically got in an issue of Hobbies Weekly.

Basic Radio Designs

The range of radios covered was extensive, all the way from simple crystal sets to multi-valve superhets of considerable complexity. In 1952 for example, we have 'You Can make This Dual-Wave Crystal Set', by an unspecified author. The coil was wound on a 1½" former and tapped for two-band operation. Initially I was looking for the part number of the diode shown on the schematic, but the text gives details of how to adjust the crystal plunger to various positions to find a sensitive spot, so the design is intended for classic 'tickling the crystal' operation. The article brought the prospect that 'It is proposed, at a later date, to give instructions for making an amplifier, so that a loudspeaker can be operated'. Other crystal sets were described, and even as late as 1964 'Radio Mech' described a 'Crystal Radio and Tuner', this time making use of a



You can make this

DUAL-WAVE CRYSTAL SET

Easy and cheap to build—and costs nothing to run!

CRYSTAL sets appear to be popular, because of their simplicity, and because they cost nothing to run. The range of reception is, of course, somewhat limited, but such a set can normally give good headphone volume in most parts of the country. With a good aerial and earth, some European stations may be received, though these will not be very loud. A set such as that described here can be made up for approximately fifteen shillings, including headphones, and wire for aerial and earth. It should be noted that no extra licence is required, if a licence is already obtained for a valve set used by the same family.

It is proposed, at a later date, to give instructions for making an amplifier, so that a loud-speaker can be operated. It will also prove feasible to modify the crystal set, making it into a valve set which will provide increased range and volume. In this way a good deal of interest should be obtained, and the constructor will be able to modify his set into a larger one, if he wishes.

Fig. 1—The circuit

Components for the Set

The tuning condenser is of ·0005 mfd. capacity, and fitted with a fairly large control knob, with pointer. An air-spaced condenser is recommended, though if a solid dielectric (e.g., reaction) condenser is to hand, this can be used. If the builder wishes to avoid soldering, then a condenser with terminals will be necessary. The condenser is mounted on the panel, which may be cut from plywood. A size about 5ins. by 6ins. is suitable, unless the set is to be fitted into an existing case.

The baseboard is of similar size to the panel, but of thicker wood so that the panel may be screwed to its forward edge. Two small terminal strips with terminals are screwed in place at the back, as shown in Fig. 2. These strips may be of *dry* wood, but paxolin or ebonite is better.

The detector illustrated is of the type which fits to the panel by a single hole; other types of detector are made, and are equally suitable, in this type of set. The small on/off switch, used for wave-changing, can be of any type.

The coil is wound upon an insulated tube about 1½ins. in diameter. Such tubes may be purchased, or made by winding glued cardboard or brown paper round a suitable object, and leaving to dry. If a tube is made up in this way, it should be varnished before winding, for preference. The diameter of the tube is not critical. If it is larger, fewer turns will be needed; if smaller, extra turns will be required.

Winding the Coil

Two small holes are made, and 30 S.W.G. enamelled wire anchored by passing through them, leaving the end a few inches long. This is point (1) in Fig. 2. Thirty turns of wire are then wound on, the turns being evenly side by side. A loop a few inches long is made, and anchored at point (2). Forty further turns are then wound on, and the wire finished off at point (3).

A length of 36 S.W.G. enamelled wire is also secured at point (3). With this wire 240 turns are put on, consisting of three compact piles of 80 turns each, as shown, and the wire finished off at point (4). All turns throughout, from point (1) to point (4) must be wound in the same direction.

Fig. 2 shows how the coil is wired in. The lead to terminal (A) will consist of two wires, formed by the loop mentioned. The lead to one switch terminal will also consist of two wires—the end of the 30 S.W.G. wire, and beginning of the 36 S.W.G. wire. The enamel must be scraped away before making connections.

Other Constructional Points

The other connections in the set may be made with the 30 S.W.G. wire, or with thicker connecting wire, if to hand. The coil is mounted on two small blocks, with small screws passing down through them into the baseboard.

If the detector is fitted with two mounting brackets, then it can be bolted horizontally to the panel. If desired, a small dial or scale can be drawn up or purchased, and placed behind the tuning pointer.

As no difficulty should arise in making a containing case, detailed instructions for this are not given.

Using the Set

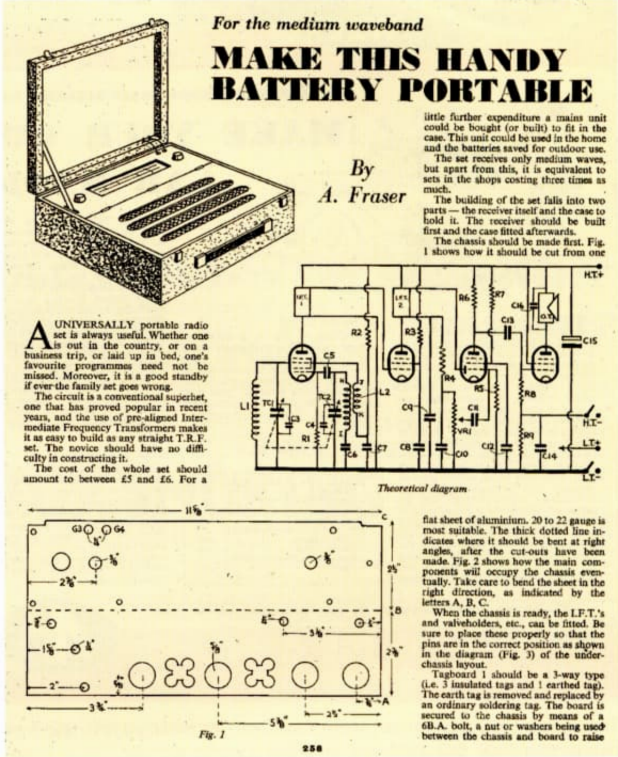
Headphones are connected to the two 'Phone' terminals. They should be of the usual medium or high impedance type (500 to 4,000 ohms). Some ex-service phones of low impedance are sold; these are for special purposes, and not suitable for this type of set. If used, volume will be much reduced.

An earth lead is attached to terminal (E). This lead should go to an object buried in the soil outside, and almost any metal object will do, though special

(*Continued on page 378*)

Fig. 2—Wiring plan

A simple starter project for the beginner: the 1952 'Dual-Wave Crystal Set', by an unspecified author. The crystal detector's mounting fits into the front panel.



For the medium waveband

MAKE THIS HANDY BATTERY PORTABLE

By A. Fraser

A UNIVERSALLY portable radio set is always useful. Whether one is out in the country, or on a business trip, or laid up in bed, one's favourite programmes need not be missed. Moreover, it is a good standby if ever the family set goes wrong.

The circuit is a conventional superhet, one that has proved popular in recent years, and the use of pre-aligned Intermediate Frequency Transformers makes it as easy to build as any straight T.R.F. set. The novice should have no difficulty in constructing it.

The cost of the whole set should amount to between £5 and £6. For a little further expenditure a mains unit could be bought (or built) to fit in the case. This unit could be used in the home and the batteries saved for outdoor use.

The set receives only medium waves, but apart from this, it is equivalent to sets in the shops costing three times as much.

The building of the set falls into two parts — the receiver itself and the case to hold it. The receiver should be built first and the case fitted afterwards.

The chassis should be made first. Fig. 1 shows how it should be cut from one flat sheet of aluminium. 20 to 22 gauge is most suitable. The thick dotted line indicates where it should be bent at right angles, after the cut-outs have been made. Fig. 2 shows how the main components will occupy the chassis eventually. Take care to bend the sheet in the right direction, as indicated by the letters A, B, C.

When the chassis is ready, the I.F.T.'s and valveholders, etc., can be fitted. Be sure to place these properly so that the pins are in the correct position as shown in the diagram (Fig. 3) of the under-chassis layout.

Tagboard 1 should be a 3-way type (i.e. 3 insulated tags and 1 earthed tag). The earth tag is removed and replaced by an ordinary soldering tag. The board is secured to the chassis by means of a 6B.A. bolt, a nut or washers being used between the chassis and board to raise

Theoretical diagram

Fig. 1

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Mr Fraser's 1959 'Make this Handy Battery Portable' article, using the 1R5, 1T4, 1S5 and 3S4 valve line-up.

crystal diode. The author wrote 'an extremely cheap surplus diode is not recommended, as it may not give very good volume. A new crystal diode, of proper efficiency, is quite inexpensive and worth using'.

As one step up from a crystal set, again in 1952, 'Make a Short Wave 1-Valver', by F G Rayer was described. The regenerative detector valve was the HL2 directly heated triode. Ready-wound coils were recommended, though the author gave winding details for 19-40m and 13-25m coils, wound on plug-in formers similar to Eddystone formers supplied by Stratton and Co. In the same issue we get 'Fully detailed instructions for Making a Sure-shot Catapult'. I'm not sure such a topic would be tackled in a 'hobby' publication today.

A few years later in April 1957, F G Rayer dominated the cover, with his neat 'One Valve Radio', designed 'for short, medium and long waves'. Rather cheekily, the circuit was almost identical to the 1952 design, again using the HL2 valve in a TRF circuit, though to be fair such a 1-valver circuit was very standard and there wasn't much else you could do with such a valve. A coil winding table for various bands was included which I suppose was a step forward from the previous article.

In 1961 the subject of the beginner's TRF 1-valver was tackled again by 'Radio Mech'. The valve was a little more up to date, suggesting a battery-type 1S4 or its equivalents, the CV884, DAF91, 1FD9 or ZD17. Again plug-in coils were described, either on ready-made formers or home-made ones using tubing and old valve bases.

Let's Try Two or More Valves

Rubbing shoulders with garden frame construction and 'An Easily Made Egg Rack', radio designs progressed onward and upward in 1954 with 'Constructing a B7G 2-Valver', again by F G Rayer. By now the valves were more modern (ie post-war), with the 1S5 (DAF91) regenerative detector and 1S4 (DL91) AF output valve, originally designed for portables, being employed. This is the only article in this edition with a named author, so it looks like FGR insisted on his name being used.

FGR clearly saw the potential for portable use of this TRF regenerative detector plus audio amplifier line-up and almost exactly a year later he described 'Detailed Instructions for making a Portable Wireless for Headphone Reception'. Using the same 1S5 and 1S4 line-up he described the set neatly built into a wooden case containing a frame aerial, headphones and batteries. The cover shows a photograph of the receiver, rather than an artist's sketch.

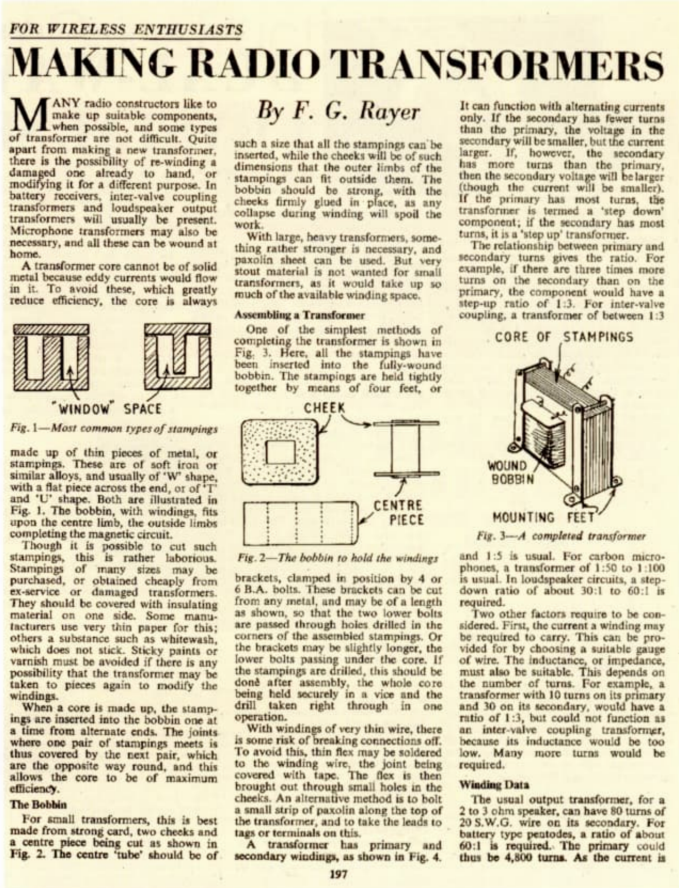
Progressing to more valves, in 1955 the magazine published 'Easy-to-Construct Four-Valve Superhet' for MW and LW by A Fraser. The set used a standard 'portable' valve line-up of 1R5, 1T4, 1S5 and 3S4, and of course ran off 90V HT and 1.5V LT. Wearite coils were specificied, though for those who wanted to 'roll their own' winding details were also given. The use of ready-aligned IF transformers was advised, available 'for only a shilling extra', or the author wrote 'the local wireless shop or service man will align your set for a very small fee'. The following week's issue contained step-by-step wiring instructions for the radio, which was fairly unusual: because of the shortage of pages in Hobbies Weekly it was not the norm for radio projects to have detailed building and wiring described. I can only guess that this article was made an exception because of the complexity of the design, and the potential for things to go wrong.

Portables

Later that year FGR wrote 'Making a Novel D/F Portable'. In fact this design was a fairly standard regenerative detector / audio amplifier TRF using 2Volt directly-heated triodes, and driving headphones. The attractiveness of these old valves was that they were readily available and cheap. The novel feature of the design seems to be the use of a frame aerial mounted on top of the case of the receiver, which gives better sensitivity because it was clear of the set's internal batteries.

Mr Fraser was not averse to re-cycling his designs. In 1959 he produced 'Make this Handy Battery Portable' again using the 1R5, 1T4, 1S5 and 3S4 valve line-up, and of course the same battery requirements of 90V HT, 1.5V LT. To be fair on Mr Fraser, the coils had changed to Osmor (for MW only) and the set was built into a neat case,

The August 1952 anonymous 'Make Your Own Car Radio', a MW-only 4-valve plus rectifier (6K8, 6K7, 6Q7, 6V6 and 6X6) superhet with AVC, including a vibrator and transformer arrangement to give the 250V or so HT voltage.



'Making Radio Transformers', by Frank Rayer, from the 29th June 1955 issue.

not dissimilar to those being produced by Marconiphone, Ever Ready and numerous other British manufacturers at the time.

I don't want to give the impression that following the magazine over the years gave a chronological progression from crystal set to multi-valve superhet. Many radio-based articles of varying complexity were published in almost random order over the years, so there was always something being published suitable for the range of skills from beginner to expert.

Car Radio Projects

The tricky subject of radio reception in cars was tackled from time to time. As early as 1949 'A 3-Valve Car Radio Set' appeared. This was a TRF design with regenerative detector (using the good old Osram HL2), audio amplifier (an HL2 again) transformer-coupled to the audio output stage (a Cossor 220HPT). These directly-heated cathode valves needed HT (about 120V), two grid bias voltages and of course LT at 2V for the heaters, so I suppose a set of batteries had to be accommodated somewhere in the car. All authors were anonymous in this issue, so we'll never know who designed this project. The author says 'used in a vehicle, it has been found to give satisfactory speaker results, and should provide at least two or three programmes in most parts of the country'. I presume this was sufficient at the time to justify the effort needed.

A few years later the subject was tackled again with 'Make Your Own Car Radio' and again no author was mentioned. This was an ambitious MW-only 4-valve plus rectifier (6K8, 6K7, 6Q7, 6V6 and 6X6) superhet with AVC, including a vibrator and transformer arrangement to give the 250V or so HT voltage. In this respect the design was similar to the sets that gradually became more popular in cars as the 1950s wore on. The valve heaters could be wired for 6V or 12V, depending on the car's battery voltage. The text, schematic, chassis layout and wiring details were crammed into just over two pages of the magazine, including details of how to adapt the receiver for use from the AC mains! Because of the lack of space, no components list was given and so the constructor would have had to derive this from the schematic, and work out himself the power rating of resistors and voltage rating of the capacitors.

Making Radio Components

It wasn't just complete radio designs that were covered in the magazine. The construction of various components was also addressed. For example, in 1955, 'Making Radio Transformers', again by FGR, appeared (see Figure 6), which covered audio inter-valve, output and microphone transformers. This included designing the transformer, assembling the core, winding the coils (with some suggested primary windings of up to 9,000 turns of very thin wire, so quite a challenge in itself) and so on. How many constructors actually attempted to wind so many turns is unknown, but I suspect the success rate was small. Winding RF and mains transformers was also covered from time to time. Interestingly, whenever issues covering transformers come up for sale on eBay, they command a high price so there are several people out there who find the subject interesting and are willing to listen to what history can teach them.

Also in 1955, 'Making Variable Condensers' by A Fraser appeared. All details of cutting and drilling the plates and frame and assembly were included. I suppose many radio constructors had reasonable workshops in which they used to manufacture the chassis for their projects and so the tools and skills for making capacitor plates and frames were already available.

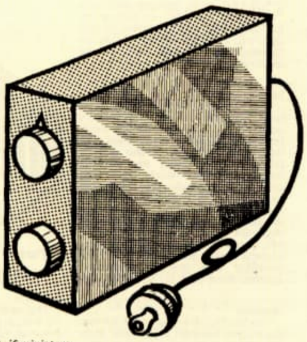
Slow-motion drives and tuning dials were also tackled. In 1954 a slide-rule type dial was described, which could be adapted for any dial length. The author wrote 'why waste money when one can make an excellent one at home at negligible cost? The tuning dial described here will only cost a few pence ...'.

Mains Eliminators

During the 1950s the construction of HT/LT battery eliminators was popular as a way of doing away with HT and LT batteries for portable radios. FGR had 'How to Construct an Eliminator' published. This was what we call today an 'AC/DC' arrangement in that it didn't use a mains transformer, but rectified the mains directly, using a UX6-base 25Y5 rectifier-doubler valve. Because there was no transformer to produce the 25V at 300mA for the rectifier's heater, a mains dropper resistor was incorporated. 4μF and 8μF condensers were used to smooth the rectified mains, and a series resistor gave the HT voltage needed by the radio being powered. Note that only the HT batteries for

Personal listening:

A POCKET TRANSISTOR 2



By 'Radio Mech'

THIS receiver is self contained, for personal listening, and has an internal ferrite rod aerial. It is not built to the smallest possible dimensions, because this tends to make construction more difficult. The actual size is a little over 5 in. by 3 in. by 1 in., with the control knobs on the end, and this can easily be slipped into a pocket.

The circuit is shown in Fig. 1, and the first transistor A is a regenerative detector. This type of detector is sensitive to weak signals. Regeneration is controlled by the 50k potentiometer, which also has an on/off switch.

The second transistor B is an audio amplifier, and the output works a single personal phone, or an ordinary set of headphones. The personal phone can be carried in the receiver. A 6V, 7½V or 9V battery is used.

Receiver case

This can be of any material except metal. Plastic boxes with hinged and snap-on lids can be obtained from various well known stores. Transparent lunch boxes of this kind can be given a good finish by painting them inside. Enamel or oil paint of any colour can be used. Small trinket boxes with hinged lids are usually tinted. If the box is 5 in. long inside, this allows a 5 in. ferrite rod to be fitted. For a smaller box, a shorter rod is necessary.

A case can also be made from perspex, Paxolin sheet, or thin wood. The actual dimensions do not matter, if all the parts can be fitted. In fact, if miniature transistor type components are used throughout, the receiver can easily be made in a box which is smaller than the size mentioned.

Ferrite rod

This is 5 in. long and ⅜ in. in diameter, and is wound with 26 s.w.g. double-cotton-covered wire, turns being side by side. The winding is shown in Fig. 2.

Winding begins at point 1, about 1 in. from one end of the rod. Fifty-five turns are wound on, and a small loop is twisted, point 2. Ten more turns are then wound, and another small loop is made, for point 3. Winding then continues for eleven further turns, and the coil ends at point 4.

Ends 1 and 4 are left a few inches long, to reach to the fixed plates tag F of the 150pF tuning condenser, and trimmer tag T. Insulation is scraped from loops 2 and 3. The 0·05μF capacitor is soldered to loop 2. A lead to reach moving plates tag M is soldered to loop 3.

Sealing wax or adhesive will hold ends 1 and 4, or they can be tied with thread, or secured with adhesive tape.

If a different rod is used, or wire of different s.w.g., the number of turns may need changing. The receiver should tune from about 300 to 500 metres (medium waveband.)

Transistors

Transistor A should be for radio frequency circuits. An OC44 or NKT152 may be used here. With cheap surplus transistors, or a transistor in poor condition, or not intended for RF circuits, it may be impossible to obtain regeneration.

Transistor B is an audio amplifier, and thus less important. An OC71, NKT252, or similar good quality audio transistor will be satisfactory.

The NKT and many other transistors are shaped as in Fig. 2, and have three wires. One wire is Emitter, the central wire is Base, and the remaining wire is Collector. These leads are marked E, B, and C in Fig. 2. Emitter and base wires are close together, and there is extra spacing between base and collector wires.

OC44 and similar transistors are round in shape, and there is no extra spacing between base and collector

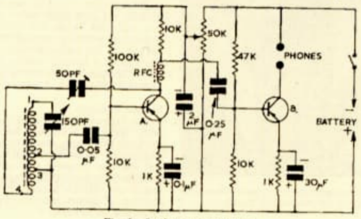


Fig. 1—Pocket receiver circuit

A Pocket Transistor' with a regenerative detector OC44 (or the NKT152 Newmarket equivalent) and an OC71 (NKT252) audio amplifier, driving headphones. Published 3rd June 1964.

Advert for 'Hear All Continents' Short Wave Products short-wave receivers and a Stop Smoking advert below it. These adverts appeared regularly over many years.

the radio were eliminated, there was still a need for an LT accumulator. I suppose this made sense because the LT battery could still be re-charged, presumably at minimum cost, and hence the cost of replacement non-rechargeable HT batteries was saved.

In 1954 DC mains were clearly still around in many areas because the magazine published 'Making a DC Battery Eliminator'. The basic design had no mains rectifier, but was simply a capacitor/choke arrangement to smooth the ripply and fluctuating DC mains 'which would be heard in the receiver as hum or noise'. A couple of dropper resistors then dropped the mains DC voltage down to those (maybe 120V and 60V) needed by the radio. The circuit could be enhanced by adding a metal rectifier to operate from AC mains. Again, only the HT supply was being generated.

In 1955 FGR again tackled the subject, this time incorporating a mains transformer, thereby making the arrangement rather safer. Again a metal rectifier as used. Useful advice was given on the value of the series resistor to generate the correct HT voltage for typical 1-, 2-, 3- and 4-valve receivers.

On a similar subject 1964 saw a 'Charger and DC Supply' by 'Modeller' which generated about 16-18V DC from the mains, suitable for charging 'motor cycle, car or other vehicle batteries', or for using as a general purpose DC supply for driving model motors, for example in trains. The circuit was not recommended for supplying transistor circuits, presumably because the regulation was very poor, relying as it did on the user adjusting a series wire-wound resistance.

Testing and Test Equipment

Useful test equipment was also featured in the magazine. For example 'Making an IF Signal Generator', by A Fraser, using a single 1S4 valve, was covered over two successive weeks. The generator operated around 465kc/s, which was of course the IF commonly in use in most domestic radios.

'A Signal Tracer' described a blocking capacitor, passive crystal diode detector and RC filter arrangement, which was plugged into the gram socket of a test receiver, or an audio amplifier via a screened cable. Working from the aerial towards the loudspeaker, the probe of the tracer was systematically attached to the stages of a faulty receiver until a signal disappeared, indicating where the faulty stage was.

A complete series on Radio Servicing ran in the mid-1960s. Even today these articles make interesting and useful reading. 'Testing an AC/DC Circuit' described a typical mains transformer-less AC/DC power supply and showed how to trouble-shoot it if a radio wasn't working and the power supply was suspect. A previous article had shown how to carry out similar checks on a battery set, starting from the HT and LT batteries and working your way through the faulty set.

Transistors

In the early 1960s, when transistors were becoming more popular, they started to creep into the odd article in the magazine though many valve-based radio projects still appeared. The theory of transistor operation was covered in 1961, as well as a few simple, single transistor radios.

The miniature aspect of transistors gave us 'Matchbox Radio', with an OA81 detector, followed by a single OC71 driving headphones, and 'A Pocket Transistor' with a regenerative detector OC44 (or the NKT152 Newmarket equivalent) and an OC71 (NKT252) audio amplifier, again driving headphones. This receiver was self-contained and used a ferrite rod aerial. Interestingly the subject of a matchbox radio had been tackled in the magazine as far back as 1949, with the use of an ex-radar crystal diode in the classic crystal set configuration.

Radio Adverts

Adverts for radio products weren't all that common, maybe reflecting the view of potential advertisers that the market wasn't huge via the magazine, and advertising budget was better spent in other, dedicated, radio magazines. One advert that did appear regularly is shown in Figure 8: Hear All Continents with H.A.C. short-wave receivers. One-valve kit, price 25/-. Two-valve kit, price 50/-. These designs used Denco coils, presumably from the green range, with regeneration feedback windings.

Another common advert was 'Make a radio set! No soldering' from Blanchard's Radio, based in Manchester. The company offered a range of radios, from four different crystal sets, and on to one and two valve sets, ultimately capable of driving a loudspeaker.

On the educational side, EMI Institutes offered complete experimental courses in radio engineering and servicing, by what we would call 'remote learning' today. A practical kit of parts was supplied,

th YEAR OF PUBLICATION

APRIL 23rd 1952

Hobbies WEEKLY

VOL. 114 NUMBER 2947

Start now building this

GRAND CLASS 'A' TEAM RACER

Accurate Scale Plans are on page 63

THE official Class 'A' for control line team racers calls for a minimum wing area of 70 sq. in. and a maximum motor size of 2·5 c.c. A maximum fuel tank capacity of 15 c.c. is also specified, and the official line length is 42ft. There are also minor regulations governing the size of the fuselage and 'pilot'. All team racers have to carry a dummy 'pilot'.

High Speed

Our Class 'A' team racer has been designed to meet all these requirements and also to be capable of taking any suitable motor of between 1 c.c. and 2·5 c.c. Fastest times will, of course, be recorded with the 2·5 c.c. motors, but the smaller motors will have a longer flight duration on the 15 c.c. fuel tank. With a good 2·5 c.c. motor, top speed should be in the region of 70 m.p.h.

Study the plan and the constructional sketches carefully before commencing construction. The plan is reproduced one third full size, and so full size drawings of the wing and tail unit must be prepared by scaling up, or you can purchase a full size plan separately. Build the wings first as these are probably the easiest component and also the one in which the control system is housed.

The wings are built by pinning out the leading and trailing edges directly over the plan and then cementing in the tips and rib stock. The ribs are simply lengths of ⅛in. by ⅛in. balsa cemented in notches in the spars. The tip is a piece of 1in. by ⅛in. balsa cemented in place. Note that you will have to block up the trailing edge ⅛in. above the plan to get correct alignment of the ribs.

When the wing has set you can form it to a symmetrical aerofoil section entirely by glasspapering—Fig. 2. Note, however, that the centre section which fits through the fuselage is left square.

At this stage you can fit the control assembly.

The bellcrank is cut from 18 S.W.G. aluminium, or similar material. Mount on a small piece of ply which is cemented between the two centre ribs. The position of this is given on the plan. The pivot point should actually come 2¾ins. back from the leading edge of the wing.

Couple up the 20 S.W.G. lead out

Another superb control-line model specially designed for *Hobbies Weekly* by R. H. Warring

All correspondence should be addressed to The Editor, Hobbies Weekly, Dereham, Norfolk.

THE MAGAZINE FOR MODELLERS, HANDYMEN AND HOME CRAFTSMEN

4D

PAGE 49

The April 23rd 1952 front cover features a 'Grand Class-A Team Racer' control line airplane.

AMATEUR SHORT WAVE RADIO

Part 7

ACTIVITIES ON VARIOUS BANDS

SHORT wave listeners who have become interested in picking up transmissions from Amateur stations will probably welcome more information on the bands used, and the results expected.

160 metres

This band is actually 1·8-2mc. Amateurs may only use transmitters with a power of up to 10 watts on this band, and many beginners use it when they start transmitting. It is also quite a favourite with mobiles, who transmit from a car or other vehicle. It is usually quite active at week-ends. Local contacts arise, with ground wave signals heard at 25-50 miles generally, and sometimes farther, during daylight. At night, the range approaches 500 miles, with conditions sometimes allowing contacts at even greater distances. Some weekdays there may be almost no Amateur activity.

80 metres

This band is 3·5-3·8mc, with 3·5-3·6mc particularly intended for Morse. Most days there is some activity, and at week-ends very many stations may be using phone (speech). Contacts are usually up to a few hundred miles. Long distances are sometimes covered. Late in the day European QRM (interference) may spoil the band.

40 metres

This band is very narrow, being only 7-7·1mc. It resembles the 80m band, but Amateur signals are often blotted out by commercial stations. Long distances are sometimes covered. Occasionally no Amateurs may be heard.

20 metres

This band is from 14-14·35mc and is regarded as the best for DX (long distance) working. Reception varies with time of day, sunspot activity, and season. When conditions are good, distant areas heard may include Australia, etc., with American and similar areas coming in many afternoons or early evenings. Local stations are not usually heard.

15 metres

Extending from 21-21·45mc, this band is similar to 20m, but even more influenced by sunspot activity. Some days it may seem dead. On other days remote stations may be heard at good strength. Generally less activity than on 20m.

10 metres

This band is 28-29·7mc and can give long distance reception if conditions are suitable, but is sporadic and generally disappointing during the present stage of the sun-spot cycle, which is likely to be little changed for some years.

Band chosen

From the list, it will be seen that DX stations are most likely to be heard on 20m and 15m bands. The areas of the globe most probably received depend on the time of day and season, etc. On the other hand, a listener wishing to log G (Great Britain) stations would probably choose the 80m band, or possibly 160m.

Listener's activity

SW listeners follow their hobby in many different directions. Some listen to obtain QSL cards, described previously. Others never bother to send in reports, and listen to Amateur and commercial stations. Some compile logs showing results on various bands. Or tape recordings of distant or interesting transmissions may be made.

An Amateur station assembled with aerial tuner, wavemeter, receiver, transmitter, and other equipment for receiving and transmitting on the amateur bands.

F G Rayer is shown operating his amateur station in part 7 of the 'Amateur Short Wave Radio' in the 16th December 1964 issue. The series was written by the anonymous 'Radio Amateur', but I suspect the writer and the amateur shown in the photo were the same person.

enabling the student to learn how to 'design, construct and service' TRF and superhet radios, TVs and oscilloscopes.

You may have been (un)lucky enough to be bought 'Britain's First Rocket Spaceship', capable of 'a romantic ten thousand miles an hour trip to the moon'. Of course you would have needed the 'New Interplanetary Space Suit' so that you could be 'the first Earth Man to Jupiter'. O happy days!

Control Line Flying and Radio Control

These days we are used to seeing radio controlled model aircraft but before radio control was practical, flying models tethered by a control line was popular. I well remember when I was a boy seeing these models being 'exercised' on our local open space, flying endlessly round in circles at a great rate and controlled up and down by manipulating the two wire control lines, until the fuel supply ran out. Speeds up to 70mph were possible with 2.5cc 'motors' and Hobbies Weekly occasionally featured articles on the subject as illustrated on this page.

A huge variety of radio control models are very easily and cheaply available to us today. In the 1950s and 1960s this was not so and many magazines (for example Practical Wireless, Practical Electronics and Radio Constructor) regularly published constructional articles on the subject. Hobbies Weekly followed suit with the odd radio control article, culminating in a long series in 1963-64 covering 'boats, aircraft and ground models', by FGR of course, who was a well known expert on the subject. The series was comprehensive, not just describing the electronics needed

The advert for 'Britain's First Rocket Spaceship', capable of 'a romantic ten thousand miles an hour trip to the moon', and the 'New Interplanetary Space Suit' to wear inside the spaceship.

(mainly still valve-based transmitters and receivers, but also introducing a few 'crystal diodes' and OC71/72 type transistors) but also the actuators, escapements, motors, gears, aerials and batteries necessary for making a complete system.

Various Hobbies

The hobbies covered were wide and wondrous. Here's a small selection of the more 'off the wall' projects that appeared over the years: 'Keeping Mice as a Hobby'; 'Father Christmas Money Box'; 'A Box for Collars'; 'A Theatrical Mirror'; 'Underwater Vortex Rings'; 'Winter Care of Watches'; 'Why Not Try Typewriter Pictures?'; 'Chinese Jumping Frogs'; 'Vinegar as a Home Help'; 'A Holiday with Bicycle and Tent' and 'Cycle Lamp Maintenance' to keep the cyclists happy; and how about 'A Brooch from a Toothbrush'?

In one edition the project of 'A Sleeve Ironing Board' appeared. The author noted 'this addition to the ordinary ironing table is a straightforward job for the young fretworker. It is sure to make a pleasant gift for mother'. Yes, probably safe as a gift for mother, but maybe not for a wife.

Smoking

During much of the life of the magazine smoking was an acceptable habit and smoking-related projects often appeared. Many designs for cigarette boxes were published: how about a 'Big Ben Musical Cigarette Box', covered in a free design supplement, 'Gothic Gateway Cigarette Box', 'Cigarettes of Enchantment' (a magical trick involving cigarettes and live birds), or even a 'Combined Lamp and Ashtray'? If you wanted to give up the habit then advice was offered how to do this in 'the only scientific way – no will power necessary' in the advert mentioned earlier and reproduced on page 25.

Photography

Amateur photography was clearly a favourite pastime for many, and I suppose we benefit from this today as we look through albums of old black and white photographs of our young selves and relatives. The magazine regularly covered aspects of the subject: for example, 'Learn About Cameras' and 'Meths – the Photographer's Friend' featured in 1952 issues by an anonymous author. Please don't ask me to explain why meths is so useful to photographers.

Our old friend F G Rayer seems to have been the magazine's regular 'correspondent' on all things photographic. Over the years he had many articles on the subject published, including: 'If you have an old photographic Flash-gun, Convert it to Capacitor Flash'; 'Try Colour Films'; 'Photographing Models' (definitely of the wooden and plastic type);'Understanding Film Speeds'; 'Try Flash Photography'; 'Information for Photographers: Your Lens Apertures'; 'Making a Viewfinder' and 'Learn About Cameras'. He was even able to turn his hand to more general optical matters with 'A Simple Microscope'.

Chemistry as a Hobby

For those who wanted to experiment with chemistry a January, 1957 issue gave us 'Chemistry in the Home: Making Acids'. Other typical articles on the subject were: 'Experiments with Lead Nitrate', 'How to Colour Metals', 'Some Special Reagents', 'Cadmium and its Compounds', 'Experiments in Mercury Compounds', 'Electroplating Unit' and 'Interesting Facts about Water'. Apart from the last article, I find it difficult to imagine these subjects being covered in a magazine today because of the safety aspects of dealing with these chemicals. The 'Chemistry at Home' series ran for many years, so it was always a popular subject.

In the same vein, do you remember chemical flowers and gardens? The 'planting' of 'seeds' of copper sulphate, iron sulphate, manganese sulphate and cobalt chloride into a chemical solution causes 'odd-shaped shrubs, bushes and trees to grow'. Using the right chemicals a coloured Union Jack could even be produced.

The Swinging Sixties

Not even Hobbies Weekly was immune to the rise of pop music in the 1960s. During this era the magazine would regularly dedicate a whole page to featuring a couple of pop stars or groups in 'Disc Break', alongside the more traditional, and less 'cool' traditional hobbies of stamp collecting, train-spotting and woodworking. Some of the artistes mentioned lasted longer than others: the music of The Swinging Blue Jeans is still heard today, but what happened to Shirley and Johnny, the Downliners Sect, or Lee Castle and the Barons? Round about 1964 it became clear that The Beatles were exceptional, and going to last the course, and so several marquetry 'pop-pics' of the group were described.

A long series ran entitled 'Amateur Short Wave Radio', by the anonymous 'Radio Amateur' ran in the mid-1960s. The series covered receivers, aerials, activities on the bands, learning Morse code, reports and QSL cards, and so on. Though there's probably no way of checking this now, I suspect this was our old friend F G Rayer again. I say this because of the picture published in the 16th December 1964 issue, showing a radio amateur operating his station (see page 26). The well groomed (and wearing a tie of course) amateur is definitely Frank Rayer himself.

Stamp Collecting

Stamp collecting was a very popular hobby in the 1950s (and beyond of course). Many adverts in the magazine refer to free stamps on offer. I well remember these adverts myself: when you sent off your 3d stamp, indeed you did get some free stamps, but you also received a booklet of higher quality stamps 'on approval', which you had either to buy or send back. Not having too much pocket money I always sent the approvals back, but it was a good way to get some unusual stamps for next to nothing.

Letters

Like any respectable magazine, correspondence with readers was encouraged with a 'Replies to Readers' section. Some subjects covered were 'Denture Cleanser', and rather more on theme for this article: 'Changing DC to AC' and 'Auto-Bias' where the reader stated 'I have converted a T/R9 receiver, and would like to fit automatic bias to the last two valves. Could you inform me of the values, and laws to calculate them? The 3rd valve is 1.5 GB, 4th 4.5 GB.' A detailed answer was given by the magazine.

The Handy Boy's Book

On a similar 'hobby' theme, I recently came across a copy of The Handy Boy's Book, by John Barnard, published in 1951. Written in a similar vein to Hobbies Weekly, it gives useful advice on the skills needed to make yourself useful to society, and how to participate in many pastimes. To quote the preface: 'Today the handy boy has come into his own. Whether at work or at play, the lad clever and smart with his fingers is bound to score. He can make and mend, or at least advise; he has at all times the proud consciousness of being a useful and popular member of society, and no one is better pleased than himself to find that he can render useful service'. Good advice for the youth of today?

Sadly, the Wireless section only contains general advice on 'First Principles' rather than specific projects. The subjects covered are too numerous to list: amongst the less politically correct today (and in fact now illegal) are: from 'Collecting Birds' Eggs' I quote: 'The nature-loving boy will always remember that nest-robbing is a very different thing from egg-collecting …. blackbirds, thrushes, rooks and crows usually lay four or five eggs to the clutch and if in the nests of these birds we find only a single egg, we should wait until others have been laid'.

The famous model engineer Henry Greenly contributes 'How to Make a Cardboard or Wooden Model Locomotive', 'Model Work in Metal' and 'How to Make a Model Steam Locomotive'. Although the construction of all parts of the model, including the boiler, the cylinders and connecting mechanism, the wheels, frames and running gear are described, there is no mention of the safety aspects of the boiler.

Conclusions

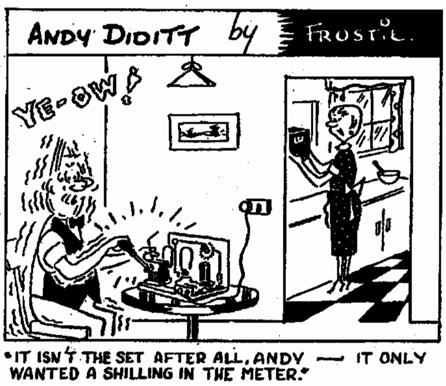
Hopefully you can see that a wide range of radios were described in the magazine over the years. Designs ranged from crystal sets, one-valve regenerative TRFs, then two- and three-valve TRFs, and ultimately to four-valve superhets for domestic and car use. Portable and direction finding sets were also described and so the art of radio was pretty well covered. In the 1960s transistors circuits were introduced, though valve sets continued to be popular. The slim format of the magazine often meant that few constructional details were given, and therefore there must have been the assumption that relatively experienced constructors were building the more complex projects.

Because of editorial policy for many years not to publish authors' identities, and the use of pseudonyms, it's difficult to accurately judge how many different authors regularly wrote for the magazine. However on the occasions when authors were credited, the prolific designer and writer Frank G Rayer comes up often. In addition to his radio articles he also covered many aspects of photography which was also his keen interest.

The editor occasionally found space to include the odd cartoon and I couldn't resist the temptation to reproduce a radio-related 'Andy Diditt' one below. Do you remember putting a shilling in the meter to keep the electricity on?

As well as showing us lots of interesting radio designs of the time, the magazine also reminds us how seriously we used to take the concept of 'hobbies'. The implication was that we should be pursuing a hobby, or even several hobbies, in our spare time, rather than just sitting around and doing not very much. As TV became more popular, the pursuit of hobbies tailed off and today even the word 'hobby' has largely disappeared from use. I think if you were to suggest to a regular user of Facebook or a Wii fanatic that they are indulging in a 'hobby', they might want to dispute that.

When you see some of the things that the magazine suggested we should be doing, such as the chemistry experiments described, you might wonder how we survived the pursuit of these 'traditional' hobbies. If you get the chance to browse through a few issues of Hobbies Weekly, I'm confident you'll enjoy all the content and not just the radio aspects. For myself, I'm thinking of taking up breeding mice in my spare time, and I might make a pull-along nodding elephant for my grandson Tom!

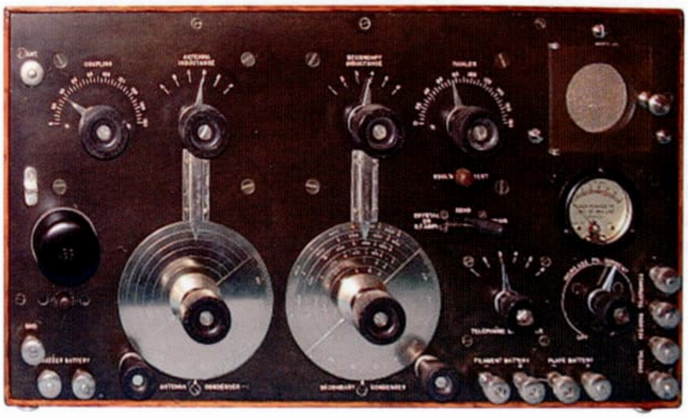


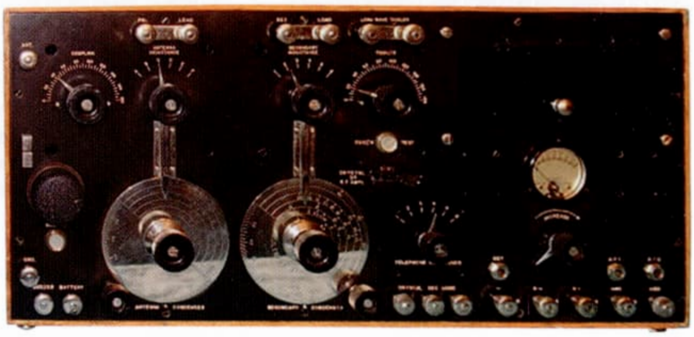
'Andy Diditt' gets a shock when a shilling is slotted into the meter.

The SE1420, IP501 and IP501-A Marine Receivers

by Peter Lankshear

Professional and communications radio receivers are understandably much more expensive than mass produced domestic radios. They always were. Top shelf communications receivers often cost as much as a small car, and their complexity, quality of construction and performance warranted this sort of price.





Above, left: the SE1420: This was the original Hazeltine design. Apart from 6 terminals at the top for connecting long wave coils, the IP501 was identical. What other one valve radio would have weighed 55 lbs (25kg)?

Above, right: the IP 501A which combined the IP501 and Two Stage Amplifier in one cabinet. The pointers for the dials were raised or lowered by cams on the switch shafts above them. The bridged terminals at the top were for connecting to the IP503 Long Wave unit to extend the tuning range down to 19000 metres (15.75 kHz; a frequency within audibility). At the extreme left is the black cover of the buzzer, used for checking crystal sensitivity. The door above the filament voltmeter provided access to the three type '01A valves.

There was once however a much less complex radio that cost a lot more. A one valve receiver, its original design dating from World War 1 the RCA IP 501, with its associated two valve audio amplifier, was in 1922 priced at $645 when a contemporary Ford car cost $290! Furthermore this pair, and the combination in one cabinet, the RMCA IP501A could be found still in service at the beginning of World War II, by which time the high performance super-heterodynes from well known names like National, Hammarlund, RCA, and Hallicrafters had been available for some years. The IP 501 was surely a special receiver.

In the Beginning

At the commencement of World War One, radio communication had been a commercial reality for more than a decade, and it had long been known that for a given radiated power, the lower the frequency, the greater the range of transmission. Technological limitations meant that traffic was confined to frequencies from 13kHz to around 1.5 mHz or in the nomenclature of the time, wavelengths of 23 kilometres to 200 metres. (from audible to the top of what is now the MF band). Trans - oceanic traffic was concentrated in the lower frequencies whilst shorter range and shipping used the rest. Receivers were usually dependent on some sort of diode detection, often a crystal, and without any means of amplification. As these receivers were dependent solely on the energy intercepted by the aerial, efficient tuning was essential, requiring large high Q coils.

As was found a decade later in Britain's early broadcasting days, a simple tuned circuit and aerial, connected to a diode, sufficed for the basic crystal set. Whilst there was only one transmission to be received, an aerial connected to a tapped or adjustable coil, a crystal diode and a pair of headphones could be adequate. However, with multiple transmissions, simple receivers were insufficiently selective, and tuning became more critical.

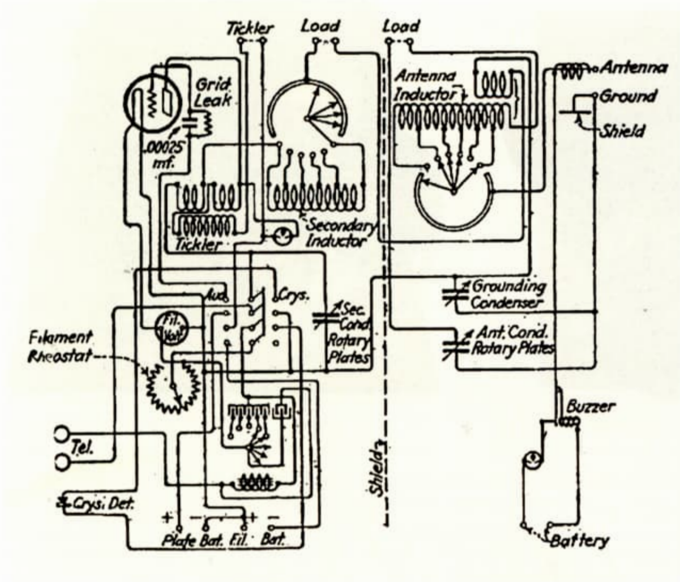
One method commonly found in commercial wireless and in amateur receivers, was the use of two tuned circuits, one to resonate the aerial, the other the detector section, with adjustable coupling between them. This combination was generally known as a loose coupler, with coil spacing adjusted by having the second coil on rails, often driven by rack and pinion.

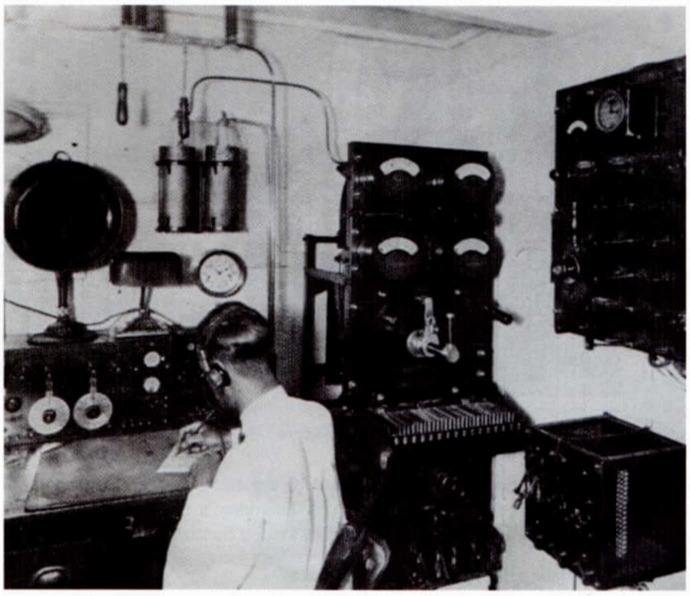
As Bulletin readers will know, two coupled tuned circuits, resonant at the same frequency, have interesting properties. As is shown in the selectivity curves in figure 1 of the IP501A instruction manual, when they are well separated, the coupling factor (K) is small and have a sharply tuned response to a single frequency, but as they are progressively brought closer, K increases and the response becomes broader until at the critical coupling point, the gain is maximum. Still closer coupling results in less transfer at the tuned frequency, but new peaks in response either side of resonance appear and selectivity widens. This was the basis of the operation of the loose coupler, (and, later, I.F. transformers) and when used in crowded commercial bands there was a trade off between gain and selectivity. It was, however, possible for a skilled operator to make good use of these characteristics.

More Selectivity Needed.

By 1918, with the wartime increase in traffic and direction finding, there were demands for even better receiver performance, and the U.S. Navy Steam Engineering Department commissioned Professor Louis Hazeltine to design a new receiver, to be called the SE1420, with the ability to operate in the proximity of high powered arc C.W. transmitters and with spark transmitters, notorious for their broad spectrum and rough signal. This was a demanding requirement and called for increased selectivity. Professor Hazeltine realized that with a standard variable coupler, there were small residual capacitances between the two coils, degrading selectivity. Complete rejection of unwanted signals depended on the elimination of this capacitance. The whole of the SE1420 case was lined with copper, with the aerial tuner in a separate shielded section. Variable electromagnetic coupling of the two tuners used a variometer pickup coil to transfer the signal, rather than physical coupling.

It is of interest that during his research on this receiver Hazeltine developed his Neutrodyne system of neutralizing the grid/plate capacitance of triode amplifiers, the best method of stabilizing triode high frequency amplifiers and with the big market for T.R.F. broadcast radios about to arrive, the Hazeltine Corporation was set to make its fortune in royalties.





Circuit of RCA 501

The section to the right of the shield is the antenna tuner. The small coil is the variometer which provides the coupling to the detector tuning coil in the left side compartment. The triode detector valve was called an "Audion", a term invented by Lee de Forest. To prevent unwanted resonances, the multiple moving arms on the switch rotors short out the unused coil sections. The multiple capacitor known as the "telephone condenser" below the Crystal/ Audion changeover switch tuned the choke in the headphone lead to improve the audibility of the received Morse signal. The buzzer, a common fitting in crystal receivers, was used to provide a signal to check that the crystal was working. Early versions did not have a grid leak as they were not necessary with the early somewhat "gassy" valves then in use. The SE1420 had the same circuit but was without the 6 terminals at the top for frequency extending IP503 coil unit.

Above, right: An SE1420 in Operation A "Bible" for marine radio officers in the 1920's and later, was George Sterling's "Radio Manual". This photograph from the 1930 edition features an SE1420. At its right hand end under the clock is a Kennedy two stage amplifier, very similar to the RCA model. The equipment to the right of the operating desk is the ship's transmitter. What looks like a shelf on the front of the transmitter at table height is the spark gap.

Valves Accepted

The Navy, with some justification, had previously considered valves to be too temperamental, inefficient and fragile to be used in their receivers. They favoured crystal diodes, especially rugged and reliable carborundum. However they accepted that valves were now sufficiently reliable to be used in the SE1420, although they still wanted provision for a backup crystal.

With regeneration, also controlled by a variometer coil, dramatically increasing sensitivity and selectivity, the SE1420 was a star performer. Used by the Navy and merchant services in large numbers, as can be seen in the photograph of a ship's radio cabin, it was commonly used with a two stage audio amplifier. A major manufacturer of the SE1420 was the Wireless Specialty Company , who in 1921 became one of the principals of RCA, the newly fledged product of a U.S. Government sponsored takeover of American Marconi.

Probably the reason for the ultimate retirement of these sets was not inadequate performance, but that regenerative detectors could provide a homing–in signal for U boats. It is reported that in inland waters including the Great Lakes where there was no U Boat threat the IP501A remained in service beyond 1942.

Wireless Specialty made some minor modifications to the SE1420, extending the frequency coverage by adding six terminals at the top of the panel for external loading coils to extend the lower frequency to 16.5 kHz. This modified version was renamed the IP-501. By 1922 the IP501 had incorporated the two stage audio amplifier in a single, longer cabinet, to become the IP-501-A.

I have left the detailed description of the IP501A to the instruction manual which provides a comprehensive description of its technology and operation. These receivers were definitely not for the domestic market. Using the tuned variable coupling combined with regeneration called for skill and knowledge.

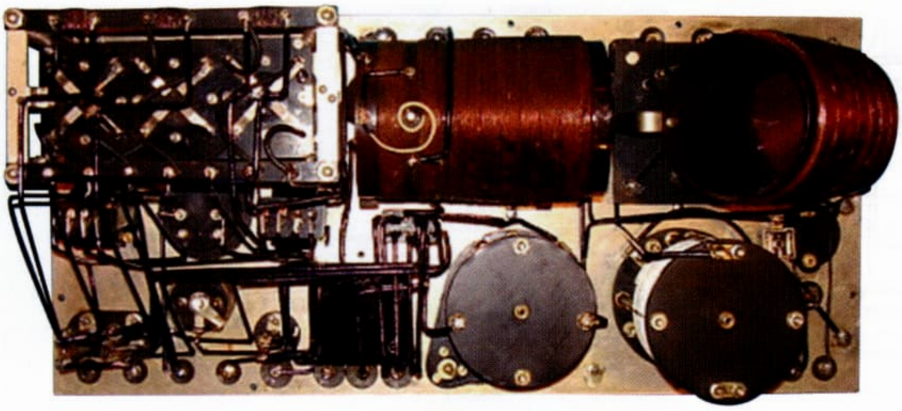
In taking over American Marconi, RCA had inherited considerable marine work, to be the responsibility of the Radio Marine Corporation of America. RMCA provided IP501 and IP501A receivers in its ship installations for many years. They were in use right through the 1930's and into the 1940's. That this edition of the Manual is dated December 10th 1936 confirms the IP501A as being still current equipment. Probably the reason for the ultimate retirement of these sets was not inadequate performance, but that regenerative detectors could provide a homing–in signal for U boats. It is reported that in inland waters including the Great Lakes where there was no U Boat threat the IP501A remained in service beyond 1942.

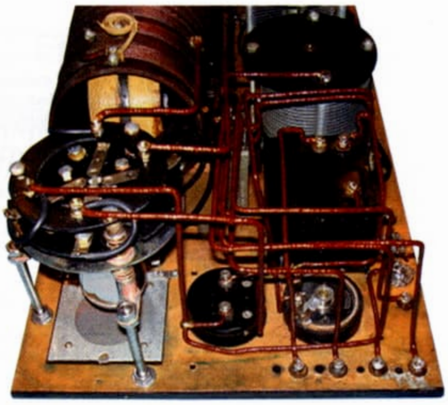
Recently Henry Rogers of the Western Historic Radio Museum in Nevada tested the performance of a SE 1420, fed from a ham radio antenna, by receiving low powered airways beacons with some astounding results such as a 2kw Puerto Rican beacon on 391 kHz 3,500 miles distant. On the low frequency bands where atmospheric noise was the limiting factor and the input was from a ship's large aerial, sensitivity would have been quite adequate. It is likely that a mid 1930's superhet communications receiver could not have provided any better results.

What was the Longevity Secret?

What then were the factors that made the IP501A preferable to other marine radios? After all, a three valve regenerative receiver was hardly the cutting edge of technology, even in the middle 1920's., and by the mid 1930's was considered to be suitable only for "hams' and hobbyists? The answer of course was the careful and uncompromising design. The heart of the IP501 were the efficient tuned circuits, far bigger and better shielded than those that would be found in later receivers.

Although there may have been an economic factor in keeping these receivers in service for so long, it is also likely that operators preferred them. When researching this article I came across an Internet chat session between "sparkies" who had only recently retired when marine radio was taken over by satellite and it was clear that they preferred regenerative receivers right to the end. It is probable too that as the 501A was capable of doing all that was required of it, the rule of "if it ain't broke, don't fix it" applied. Its simplicity too meant that it was very reliable, an important factor when a ship was a long way from service facilities.





Above, left : The 501A Interior
The sockets for the 3 valves are at the top left. At the centre are the main tuning coil and variable capacitor. The spiral lead is a connection to the regeneration variometer coil. At the right is the aerial tuning coil with its variometer coil. When in the cabinet there was a copper shield between the two coils. The wiring was standard for the time-varnished fabric sleeving over the carefully formed busbar.

Above, right: Detail of SE1420
At the lower left is the anti-microphonic valve socket made up of more than 60 components! This was changed to a simpler type in the IP501 and IP501A. In the foreground are the window for checking filament brilliance, back of the filament meter and the filament rheostat. Beyond the valve socket, the receiving coil and the regeneration variometer coil is visible.

TWO-STEP AMPLIFIER, TRIODE B

THIS two-step amplifier is a compact unit of the resonance low-frequency type. It provides a maximum of amplification due to the transformer design, which is greatly superior for radio reception to other types on the market. The input impedance of each tube is automatically controlled by the filament rheostat.

The apparatus consists of two vacuum tube receptacles, two filament control rheostats, and two amplifying transformers. Shock-proof mountings protect the vacuum tubes from "noise" due to mechanical vibration.

The apparatus is mounted on the rear of a Bakelite-dilecto panel and enclosed by an oak box. At the bottom of the panel are terminals for connecting the 6-volt filament and the 40-volt plate batteries. At the lower left of the panel are the two input binding posts for connection to the receiver equipment. At the right of the panel are two binding posts for connecting telephones.

TWO-STEP AMPLIFIER, TRIODE B **$95.00**
Overall dimensions: 11⅜ in. x 7½ in. x 6¼ in. Shipping weight: 12 lbs.

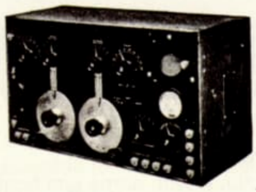
RADIO RECEIVER, IP-501

THE **IP-501** Receiver shown in the accompanying illustration is a compact unit containing the radio frequency and detecting circuits in a single case.

Normal wavelength range: 300 to 7,500 meters. This receiver is equipped with six binding posts (normally short-circuited for 300 to 7,500 meter reception) to which loading coils may be attached for the reception of wavelengths up to 21,000 meters. The proper loading coils are: Primary, 50; Secondary, 100; Tickler, 30 millihenries.

The receiver is similar in mechanical design to the **IP-500,** with the untuned circuit omitted. The capacity coupling between primary and secondary circuits is eliminated in this type by heavy sheet copper boxes separately enclosing the two circuits.

The panel is of Bakelite-dilecto. The coils are bank-wound inductances, of high frequency cable wound on threaded Bakelite-dilecto tubes, impregnated and baked.



RECEIVER, IP-501, INCLUDING HIGH GRADE CRYSTAL DETECTOR **$550.00**
Overall dimensions: 20 in. x 11 in. x 9 in. Shipping weight: 55 lbs.

These items were in the 1922 RCA Catalogue. Later, they were combined in a single case to create the IP-501A. Their 1922 total price was $645, more than two Ford Cars!

RADIO RECEIVER TYPE IP-501-A
INSTRUCTION BOOK

INTRODUCTION
This receiver was designed for the reception of radio telegraphic signals over the wavelength of 250 to 8000 meters (1200 to 37.5 Kc.). This band may be extended to include 18,000 eters (16.7 Kc.) by the addition of a type IP-503 loading unit.

*The receiver comprises an inductively-coupled tuner, a vacuum tube detector and two-stage amplifier. Except for the compact grouping of these components in one cabinet this receiver differs only slightly from the well-known IP-501 receiver.**
The popularity which the earlier model (IP-501) enjoys is due to the following features:

1. Excellent sensitivity, resulting from the use of a regenerating (or oscillating) detector, low-loss tuned circuits, an efficient A.F. amplifier, and well-designed coupling control.

*2. Wide wavelength range without changing inductance coils and without serious "dead-end" losses.***

3. Rugged construction, reliable operation and good appearance. These same features with additions and simplifications are found in the Model IP-501-A receiver.

THE ANTENNA CIRCUIT:
The antenna or primary circuit consists of a primary inductance coil and avariable air condenser connected in series. The inductance of this circuit is varied by a 6-point switch which has blades arranged to short-circuit unused portions of the coil, thus reducing "dead-end" losses.

The variable condenser (capacity .00008 mfd. to .0015 mfd.) is of the self-balanced type. The knob used for fine tuning rotates the condenser through reductiongearing. Besides being engraved with 0-180 degree graduations, the condenser dialcarries concentric half-circles, over which a pointer is lowered or raised in response to the setting of the primary inductance switch. This arrangement allows the operator to make calibration marks on the antenna condenser dial which helps in later tuningto a desired station or wavelength. Such a calibration holds good, of course, only forthe particular antenna used while calibrating, and the dial should be marked with India ink or other removable substance only.

**The IP-501 radio receiver was the commercial variant of the Navy Model SE-1420 receiver,originally built by the Wireless Specialty Apparatus Company, about 1920. It used a detector tube inthe cabinet but had a separate cabinet with a two-stage audio amplifier. (NA4G) **"Dead-end" losses are those losses associated with floating ends of coils that increase stray capacitance across tuned circuits. Special shorting switches that dead-shorted across unused coil portions reduced such stray capacitances. (NA4G)*

THE SECONDARY CIRCUIT:
The secondary inductance coil is similar in construction to the primary loading coil in that both are band-wound, using radio frequency cable (Litzendraht) on threaded bakelite cylinders. Each winding is impregnated with a moisture-proofcompound. This secondary coil, with its 6-step switch is shunted by a variable aircondenser, similar in construction to the primary condenser, except the capacityvaries from about .0006 mfd. to .00075 mfd.

The scale on each secondary condenser has been individually calibrated in wavelength at the factory. This calibration is correct when the receiver is used underthe following normal conditions. Loose coupling between antenna and secondarycircuits, detector tube of the 201-A type, tickler adjusted so that detector just oscillates.

PRIMARY TO SECONDARY COUPLING:
One of the reasons for the good selectivity (sharp tuning) of this receiver liesin the design which gives easily controllable electromagnetic coupling between thesetwo circuits with practically no undesirable electro-static coupling.

The secondary coupling coil is so mounted and rotated inside the primarycoil, by the knob marked "COUPLING" that the magnetic coupling is continuouslyvaried from a maximum value to zero when the pointer swings over the 180 degreescale.

THE TICKLER:
The tickler in this receiver is of the variometer type, inductively coupled to a portion of the secondary winding and so proportioned as to effectively control regeneration and oscillation over the entire wave-length range of the receiver.

By rotating the TICKLER knob, mounted on *the shaft of this variometer, the amount of energy fed back from the plate to the grid circuit of the detector is under the control of the operator. In this way, maxi-mum signal strength can be obtained by regenerative reception of spark or ICW signals or by autodyne reception of C.W. signals.*

The push button marked "OSC TEST", when depressed, short circuits the tickler, stopping oscillations and producing a loud click in the telephones. If no click is heard when the butten is pressed, it indicates the tickler has not been advanced far enough to cause the detector to oscillate.

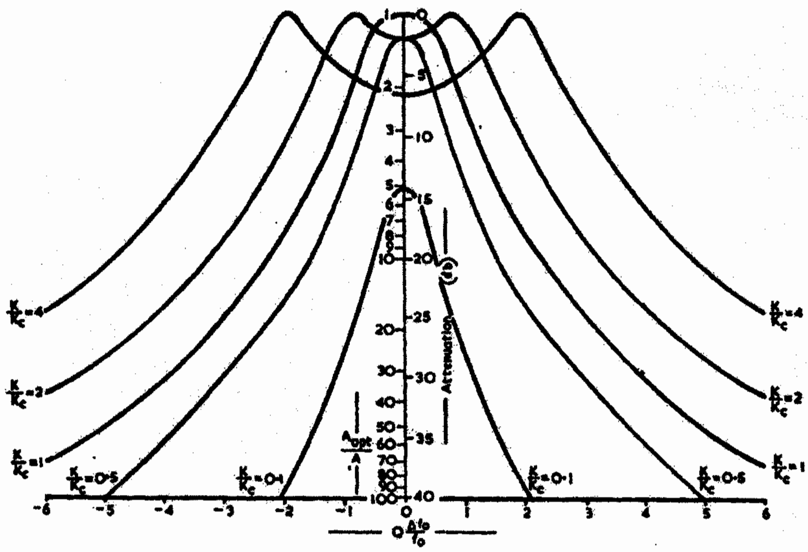
USE OF CRYSTAL DETECTOR:
In the emergency resulting from the failure of all vacuum tubes or batteries, it becomes necessary to use an external crystal detector connected across the binding posts marked "CRYSTAL". The anti-capacity switch is thrown to the "CRYSTAL" position and the telephone plug is inserted in the "DET" jack. To assist

voltage as indicated by the filament voltmeter should be read-justed when necessary after inserting the telephone plug in the desired jack. The rated filament voltage for 201-ARadiotrons is 5 volts. this rating should not be exceeded. Many operators obtain satisfactory results at 3.5 volts, and thus greatly prolong the life of the Radiotrons.

INSTALLATION OF RECEIVER:
The antenna and ground connections are made to the proper binding posts. The following batteries should be provided: Filament, or "A" battery, a storage battery giving 6 volts at .75 amperes, a "B" battery furnishing 45 volts. The "C" battery binding posts should be short circuited. (If desired, a 90 volt "B" battery with a 45 volt tap may be used, connected so that the wire from the +90 volt terminal runs to the farthest right-hand post now marked "+45". In this case, a -4.5 volt "C" battery must be used.

After the proper connections are made

Figure 1



Selectivity Curves for Two Identical Coupled Circuits, Showing the Variation in Maximum Gain, Band Width and Depth of Valley with K/Kc

in adjusting the crystal detector, a buzzer is provided.

THE BUZZER CIRCUIT:
The pearl push-button switch mounted near the buzzer closes the circuit through the buzzer and an 1-1/2 or 2 volt external battery connected to the posts

"BUZZER BATTERY".
Do not use more than 2 volts. A lead from the buzzer is capaci-tively coupled to the antenna circuit so that whilst the buzzer is in operation a fairly loud note is heard in the telephones when the crystal detector is in adjustment.

THE VACUUM TUBES:
Raising the metal door in the upper right-hand corner of the panel gives access to the three tube sockets. These are supported on a shock-proof mounting to reduce noise due to vibration. From left to right the tubes service as: detector, first-stage audio and second-stage audio amplifiers. It is intended that UX-201-A or UV-201-A Radiotrons be used with this receiver.

THE FILAMENT CIRCUIT:
The filament rheostat acts as master rheostat to regulate the filament voltage on all of the tubes. The telephone jacks are equipped with filament control contacts so that the insertion of the plug in any of the jacks lights the filaments of the desired tubes.

There is a small fixed resistor in series with each tube so that voltage changes due to plugging tubes in or out are not serious. However, the filament

the vacuum tubes should be inserted in their sockets.

OPERATION:
Throw the transfer switch to the "TUBE" position. Place the telephone plug in the desired jack and adjust the filament voltage to 5 volts by means of the rheostat.

TUNING TO A KNOWN WAVELENGTH.
Assuming the wavelength of the desired station is known:
1.Set Secondary Condenser at this wavelength.

2. Set Coupling pointer at maximum, 180 degrees.

3. Advance tickler control until detector just oscillates.

4. Place Primary Inductance switch on same point as Secondary Inductance switch. Rotate Primary Condenser until "double click" in telephones indicates the antenna circuit is in tune with the secondary circuit.*

5.If autodyne reception is not desired, stop the detector oscillating by reducing the tickler setting.

6.Slowly move both the primary and the secondary condensers back and forth for the loudest signals. For sharper tuning, decrease the coupling to say, 60--90 degrees and retune both the primary and the secondary condensers.

PROPER ADJUSTMENT OF COUPLING:
Radio operators know that loose coupling gives greater selectivity, and sharper tuning. Many of them believe that loose coupling also means reduction in signal strength. This is not necessarily true. For every wavelength within the range of the receiver there is a degree of coupling which will give the most satisfactory results from the combined viewpoint of signal strength and sharpness of tuning. This is called "Critical Coupling". Figure 1 illustrates how selectivity and received signal vary for different degrees of coupling. The conditions under which these curves were taken were with the tickler at zero and with both the primary and the secondary circuits tuned to 800 meters, then coupled as marked on each curve. The conclusions drawn from Figure 1 are:

1. The looser the coupling, the sharper the resonance curve (the greater the selectivity) but looser than critical coupling considerably reduces the signal strength.

2.Close coupling makes the receiver resonant to two wavelengths at the same time; one below and one above the desired wavelength, 800 meters. Such broad tuning is useful for "stand-by" reception.

Critical coupling occurs at that adjustment at which the primary circuit produces no reaction on the secondary circuit. This fact fortunately makes it easy for the operator to test the receiver adjustment to ascertain if the coupling is approximatelyat this desired critical value.

**Double click is explained in a later paragraph.*

TO TEST FOR CRITICAL COUPLING.
*Assume that the secondary condenser is set at the desired wavelength. Advance the tickler slightly beyond the oscillating point. Rotate the primary condenser slowly back and forth, noting the "double click" in the telephones as the primary passes through resonance with the secondary circuit. As the coupling is loosened these "double clicks" will merge into one faint click. At this setting the receiver is adjusted for critical coupling.**

**This critical coupling point is that point at which the detector is not overloaded and pulled out of oscillation as the primary tuning is swept past the desired wavelength. Critical coupling is then that point at which the primary is sufficiently uncoupled from the secondary so as to have no effect on the detector oscillation, and thereby giving maximum signal strength for any particular received signal. Looser coupling can be advantageous if the desired signal is sufficiently strong, and will increase the selectivity of the detector at the expense of signal strength. In general, for maximum selectivity, use the minimum coupling possible to still adequately receive the desired signal. (NA4G)*

Observe that the value of critical coupling changes with wavelength. "THE DOUBLE CLICK" is familiar to operators of oscillating receivers. This sound in the telephones results from the sudden change of plate current whenthe detector stops and starts oscillating due to the primary wavelength being varied through that at which the oscillating secondary is set. The greater the distance, on the primary condenser dial, between these "clicks" the closer the coupling between the circuits. Before we obtain this "double click" indication, we must have (a) antenna connected so that the primary circuit is complete and can be resonated to the secondary; (b) the tickler so set that the detector oscillations are neither too strong nor too weak; and (c) the coupling adjusted to be at least greater than critical.

CALIBRATION OF PRIMARY CONDENSER DIAL:
This should be done only after the receiver is installed, permanently wired, and connected to the antenna with which it is to be used. While calibration is often carried out by tuning to distant transmitters, the entire primary dial may be calibrated by the "double click" method. With the secondary dial set at the desired wavelength, advance the tickler until the

detector is oscillating. Adjust for critical coupling and mark the primary condenser at the point where the "double clicks" merge into one faint click, using India ink or other removable substance. Repeat the procedure for the principal wavelengths used.

GENERAL:
1. When a powerful, nearby transmitter suddenly starts to transmit, the operator needs a quickly operated volume control. Use the filament rheostat.

2. The factors affecting regeneration (after the secondary condenser is fixed at the desired wavelengths) are:
The tickler.
The tuning of the primary.
The coupling, primary to secondary.
The filament rheostat.

3. If using a break-in system, care should be taken to see that the spacing of the receiver protective gap does not exceed the thickness of a sheet of newspaper. If this gap is too wide, the high voltage may jump inside the receiver and burn the primary winding and switch.

4. If the vibration of the ship causes tube noises, try interchanging the detector and amplifier tubes.

5. The buzzer battery, when used, should be insulated from ground and from the filament source. Use a single dry cell.

6 RECEPTION THROUGH STATIC. Loose coupling, 40--60 degrees, slight detuning of the primary, and an oscillating detector helps. Dimming the filaments to a point where the sensitivity does not seriously suffer, helps to limit the noise from the loud crashes.

REACTIVATION OF VACUUM TUBES.
If the filaments of any of the 201- A tubes are accidently subjected to excessive voltage, the tube may fail to function although the filament may not be burned out. Such tubes often can be restored to normal usefulness by re-activating their filaments. With the plate battery disconnected, burn the filament of the tube at 15 volts for 1 minute, then reduce the voltage to 7.5 volts for 10 minutes.

MAINTENANCE:
The bakelite panel may be wiped off with a cloth moistened with a light machine oil, followed by a dry cloth. Keep all connections tight and storage battery terminals clean. Do not remove the receiver from the case unless absolutely necessary. Do not use metal polish on the nickel plate fittings. Rubbing with a soft dry cloth should keep the nickel bright.

Valves for the SE1420/IP501

At the time of the completion of the SE1420, the US valve situation was chaotic and convoluted, with Marconi and de Forest stalemated in litigation over patent licensing. Marconi held the Fleming diode patents and de Forest those for the triode with the result that with the exception of Western Electric, no one in America could legally make triodes! However, with wartime needs the U.S. Government had suspended patent restrictions for manufacturers with military contracts. In San Francisco, Otis Moorhhead, a one time de Forest employee, had a contract with the U.S. Navy for the supply of a large number of valves to be known as the SE1444. and it is likely that this was one of the valves used for the SE1420 . Although with the 4 pin bayonet "Shaw" base and tubular bulb, the SE1444 was internally the same as the Continental based R valve which Moorhead had been making for a British contract. The SE1444 was typical of the valves made during the final years of WW1. By later standards it was a very modest performer with an amplification factor of about 8 and a transconductance of 180 micromhos. Other types would likely to have been the similar Moorhead type ER and with a transconductance of 300 micromhos, the more advanced Western Electric VT1 used by the U.S. army.

RCA was established at the close of 1919, and one of their early projects was to commission General Electric to develop a general purpose triode. The UV 201, with a plain tungsten 5 volt 1 ampere filament, and an amplification factor of 8 was released in November 1920.

During 1922, an improved version, the UV201A with a .25 ampere thoriated tungsten filament and with a transconductance of 800 micromhos, about five times that of the SE1444 became available. The 201A was an immediate success and remained in the valve catalogues for more than 20 years. As can be seen from the photograph of some of the writer's collection, there were four different physical changes in the envelope and base during its lifetime. A major change was in 1925 from the Shaw or UV base to the long pin UX type. When RCA took over the SE1420/IP501, their recommended valve was the 201A

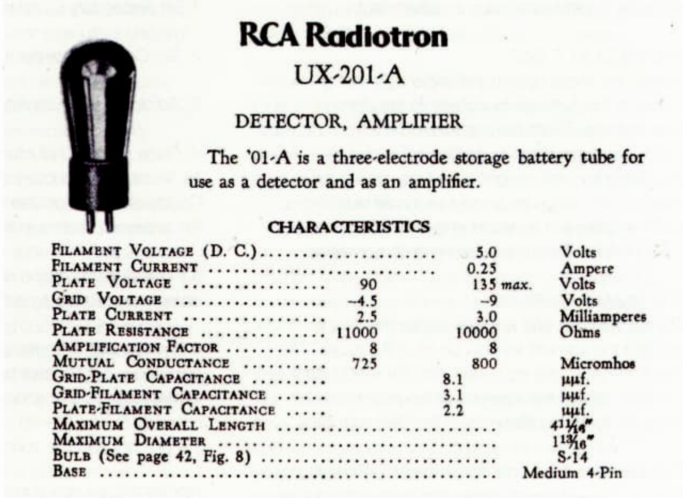
The 201A became the mainstay of the mid 20's American radio industry. Antique Wireless Association researchers estimate that more of the "01A" in its various forms were made than any other type of valve. They identified a total approaching 100 different makers, brands and names. Significantly, apart from their filament/heater ratings, valves with similar characteristics to the 201A continued to be introduced throughout the 1930's. The Raytheon valve manual for 1938 includes types 26, 27, 30, 37, 55, 85 and 1H4G, all with triode characteristics similar to the 201A. It was definitely a "Useful Valve".

Acknowledgements.
Special thanks go to Henry Rogers WA7YBS for permission to use the receiver photographs and information from his Western Historic Radio Museum web site. This site is well worth a visit as it deals in considerable depth with several classic communications receivers and equipment. The address is: www.radioblvd.com/ip501.htm

Other sources of material are:
"Radiola The Golden Age of RCA"
Eric P. Wenaas Sonoran Publishing
"The Radio Manual" George E.Sterling.
Van Nostrand
"Saga of the Vacuum Tube" Gerald F.J.Tyne
Howard W.Sams
"Radio Enters the Home"
Radio Corporation of America
"70 Years of Radio Valves and Tubes" John Stokes
Sonoran Publishing
Receiving Tube Manuals RCA and Raytheon

1922 1924 1925 1932

The Various Forms of the UV and UX 201A



RCA Radiotron

UX-201-A

DETECTOR, AMPLIFIER

The '01-A is a three-electrode storage battery tube for use as a detector and as an amplifier.

CHARACTERISTICS

Filament Voltage (D. C.)			5.0	Volts
Filament Current			0.25	Ampere
Plate Voltage	90		135 *max.*	Volts
Grid Voltage	–4.5		–9	Volts
Plate Current	2.5		3.0	Milliamperes
Plate Resistance	11000		10000	Ohms
Amplification Factor	8		8	
Mutual Conductance	725		800	Micromhos
Grid-Plate Capacitance		8.1		μμf.
Grid-Filament Capacitance		3.1		μμf.
Plate-Filament Capacitance		2.2		μμf.
Maximum Overall Length				4 11/16"
Maximum Diameter				1 13/16"
Bulb (See page 42, Fig. 8)				S-14
Base				Medium 4-Pin

UX-201-A characteristics from the 1932 RCA Tube Manual

Photographs from Gerry's garden party

by Carl Glover

Short Wave on your Transistor. Pye P444 "Cruiser" and Perdio PR73 "Continental"

by Henry Irwin

Pye and Perdio had each made a fairly auspicious early entry in the commercial transistor radio stakes not far behind the pioneering companies in America and Japan. Pye of course started the whole thing in 1956 while Perdio provided the first true pocket radio in the UK in 1957 so they both had a pedigree in this field which one would have expected them to build on.

Context

Already in 1957, Zenith, one of the major players in the US, had designed and marketed a sophisticated multiband transistor shortwave portable. In Japan, Sony, struggling with their in house "grown junction" transistor technology, had to progress through an intermediate radio with restricted coverage but by late 1957 they had a receiver covering the major shortwave broadcast bands up to 18 MHz.

The two transistor radios which are the subject of this piece make an interesting pair for comparison since they represent the first attempt from two British radio companies, one long established and the other embryonic, at extending the coverage of the transistor receiver beyond the standard long and medium wavebands. However it has to be said that this was a very tentative venture into the shortwave spectrum since the coverage of both radios extended no higher than about 4 Mhz. This covered the old "Trawler" band, the Amateur "Top Band" and the lowest of the Tropical broadcast bands.

There was however another rather unlikely player in the field, Bush, who also in 1959 introduced a more comprehensively specified transistor shortwave receiver, the ETR 92, with coverage up to about 25 Mhz in two bands. This used the case design of the ubiquitous TR82 and was apparently only for export. An interesting point concerns the RF transistors used in the ETR92 to achieve this performance. Bush would appear to have been the first British manufacturer to use the Philips / Mullard HF OC170 diffused base transistor. Generally this device only started to appear in the UK in 1960. I would have liked to have included the ETR 92 in this comparison but I have never been able to obtain one and it seems to be extremely rare in this country.

PYE P444

This radio was introduced in 1959 with an extended long wave band, the medium wave and coverage from 1.8 to 4 Mhz. With its inclusion of long wave navigation beacons, trawler band and its designation as the Pye Cruiser, it is tempting to see it as aimed at the leisure boating and nautical fraternity.

Presentation

The styling, unlike most other larger Pye portables of this period, is quite adventurous with the use of bold simple shapes and an asymmetric layout. The most unusual aspect at first sight is the case construction which uses a substantial wrap around ribbed aluminium alloy section with a beefy leather handle on top. This forms the surround for a front panel that contrasts an expanse of black anodised metal, surrounding a slide rule dial, with a large perforated gold grille. The positioning of orange push buttons and two large grey smooth knobs against the black satin metal and the use of a sudden angled step down in the interface between the grille and the black dial section creates a striking and dynamic appearance.

Advert for PR 73 in a contemporary domestic setting

When I first saw this radio at a local Boot Sale I was convinced it was from a more recent decade and nearly walked past. The combination of colours was unusual for 1959 and reminded me of a range of cassette players and radio cassettes marketed by ITT during the 1970's. These used orange coloured keys and expanses of black and silver grey plastic.

Circuit

This is a fairly conventional 6 transistor superhet (fig 1) with single tuned IF stages but uses a newly designed circuit board, different from other contemporary Pye portables, which could accommodate the extra coils and switch mechanism required. However the transistors in this set are unusual in being marked with a violet circle. This essentially meant that the mixer transistor was a specially selected sample which had a higher cut off frequency than Pye's previous mixer transistors, type V6/R4 or V6/R8. By this means Pye were able to ensure that the mixer would oscillate reliably and produce useful conversion gain at the highest frequency in use, plus the IF, that is at around 4.5 Mhz. Radio and TV Servicing lists the mixer in the violet circle series as being equivalent to the later Newmarket Nkt 151 which was described as a "mixer for medium wave and short wave".

A critical look at L4 the short wave aerial coil on the circuit (fig 2) shows what is a very odd arrangement. In addition to the main tuned winding of 36 turns a second winding of 220 turns is also coupled to the tuning capacitor via a 6.8 pf capacitor. Was the combined effect of all this to provide some image rejection? I am not sure and perhaps someone more professionally informed about the interaction of coupled tuned circuits could enlighten me.

Layout

The printed circuit board is mounted upside down horizontally and attached to a metal frame which is part of an assembly

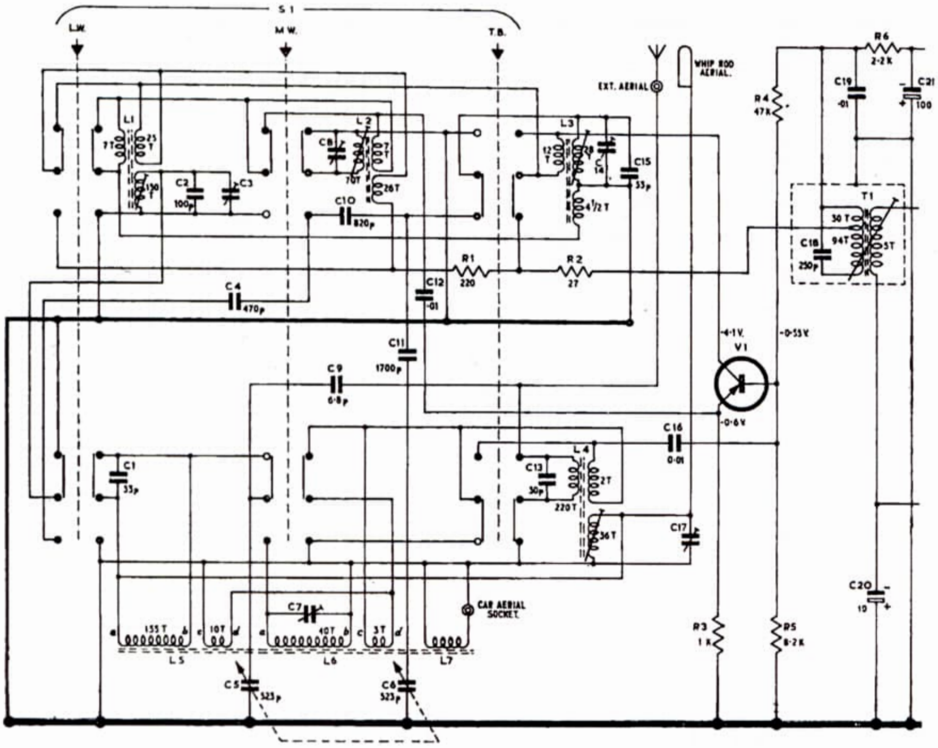


Fig1: Pye 444 front end. Remainder of circuit is conventional

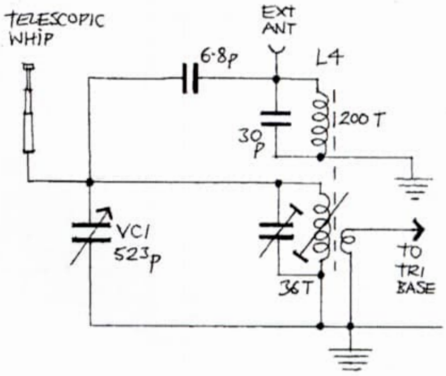
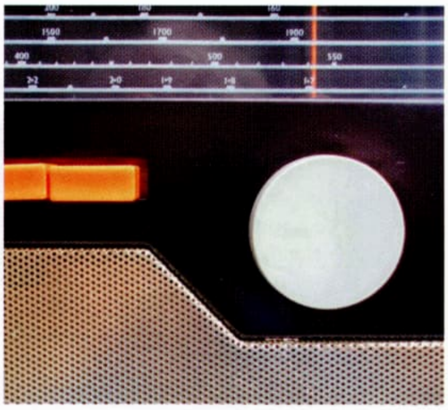


Fig 2: simplified circuit of L4 on trawler band minus switching


Pye 444


Pye P444 fascia – the abstract design approach


P444 Cruiser as it might have appeared in a Pye advert

comprising tuning condenser (with split gear reduction), the cord drive mechanism for the slide rule dial pointer and a substantial pushbutton wave change mechanism. Three oscillator coils and one aerial coil for short wave along with associated trimmers for the various bands are grouped around this switch mechanism. The ferrite rod carries the remaining aerial windings for LW and MW, the latter curiously in the form of a narrow pile winding which is less efficient than a solenoid winding. Wiring is to Pye's usual untidy standard with long transistor leads spanning widely spaced points on the board. Although this doesn't look very neat there is I suppose a logic to it since it simplifies the layout of the printed track.

The output transformer is fixed to the 5 inch round speaker while unusually the driver transformer is also mounted off board, bolted to the metal frame assembly and covered in pitch! Even with a PP9 battery in place there is a lot of internal space inside this set.

Faults

This radio gave me a lot of trouble and headache trying to sort out its multiple faults. Firstly there was instability at the top end of medium wave and across the "shortwave" band. Amidst the whistles and the racket careful listening revealed that strong stations had weak replicas 40 to 50 KHz either side of the main transmission. Here was the clue. For this to happen the local oscillator has to be modulated with an ultrasonic signal, a classic case of "squegging". The solution, as always, was to replace the emitter bypass capacitor which had gone high. Usually a "Hunts", in this case the culprit was a nasty little lozenge shaped device of unknown manufacture which Pye used a lot.

Secondly there was gritty distortion only on strong signals which sounded very like overload. A check on the AGC voltage at the base of TR2 confirmed that it remained static even when tuning through a strong signal. Moving the meter leads along the copper track to a point nearer to the detector diode showed the correct voltage variation with signal level. Voltages were at different levels at opposite ends of the printed track even though I could not see the minutest break! Another example of early Pye printed boards with invisible hairline cracks. A short piece of wire bridging the offending section restored normal AGC action.

On eventually clearing these problems, although the set functioned reasonably well, there was still some residual instability up around 4 MHz which cleared as battery voltage dropped. This was the type of instability where the mixer tends to oscillate at the frequency of the input coil due to in-phase feedback from the collector. Designers using the early alloy junction RF transistors with their high internal feedback capacitance often had this problem as the frequency increased. A look at R1 and R2 on the circuit (fig 1) shows they are used as "stoppers" in the collector to suppress parasitics. With variations in capacitance and gain close to the cut off frequency of individual mixer transistors R2 (27 ohm) really should have been selected on test. Perhaps this was a very active mixer transistor or perhaps R2 (20%) was abnormally low in value. As an experiment I replaced it with the closest similar type resistor I had to hand, 56 ohm and the instability was gone.

The questions remain did this radio ever work correctly at the top end of shortwave from the day it was bought and how did it leave Pye in this state?

PERDIO PR73

Also introduced in 1959 this was Perdio's first "large" transistor radio, in fact at its

Perdio PR73

launch it was one of only three models in the company's range. Perdio seem to have seen this very much as a domestic portable and their advertising of the time portrays it in a domestic setting of contemporary furniture and emphasises its ability to compete with table models in terms of volume and tone. It provided standard long and medium wave bands but also coverage up to about 3.5mhz.

Presentation

The construction and styling of this radio is much more conventional than its Pye contemporary being assembled in a substantial wooden case which is covered in beige rexine. The front panel is divided into three sections, separated by thin brass beading. The lower area is of lightly patterned speaker cloth and the two top sections of coloured plastic, one of which encloses the tuning scale and associated controls. This proportioning breaks a sort of ad hoc design rule that elements should be broken into thirds or at least into unequal parts. However the front is lifted from the mundane by the design of the control panel which is a classic piece of fifties kitsch, the subsidiary knobs appearing to orbit the ostentatious tuning knob like planets around a sun or like electrons in the atom.

Circuit

Electronically the PR73 (fig 3) is more adventurous than the Pye. It uses an AGC overload diode in the first IF stage and a separate winding on the ferrite rod rather than a telescopic aerial for shortwave. The audio stages have four transistors overall and went through two versions. Early sets had a pair of stud mounted Pye V15/10P output transistors but when these became unavailable it was redesigned to use OC81's. This is the first outing of Perdio's "split load" output stage with direct coupled driver. Both the collectors and emitters of the OC81's have windings on the output transformer. A version of this was also used by Bush and correctly set up it will give lower crossover distortion with low battery voltage. RF transistors were either OC44/45 or equivalent GEC devices.

The real fundamental difference between this and the Pye is in the way it achieves

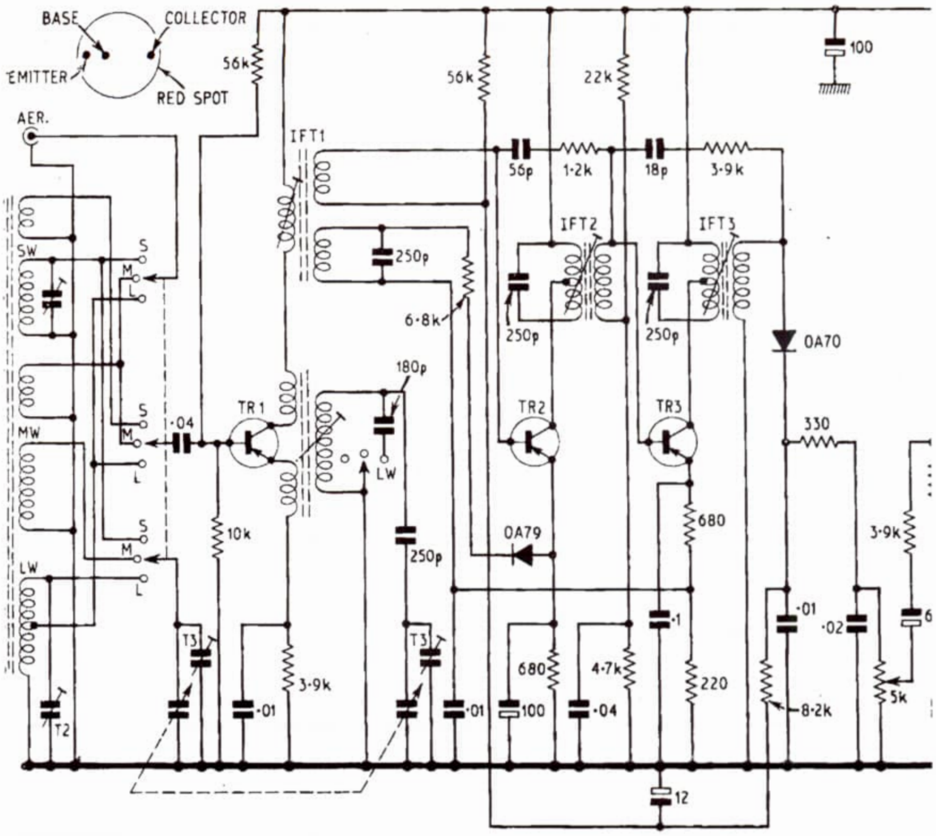
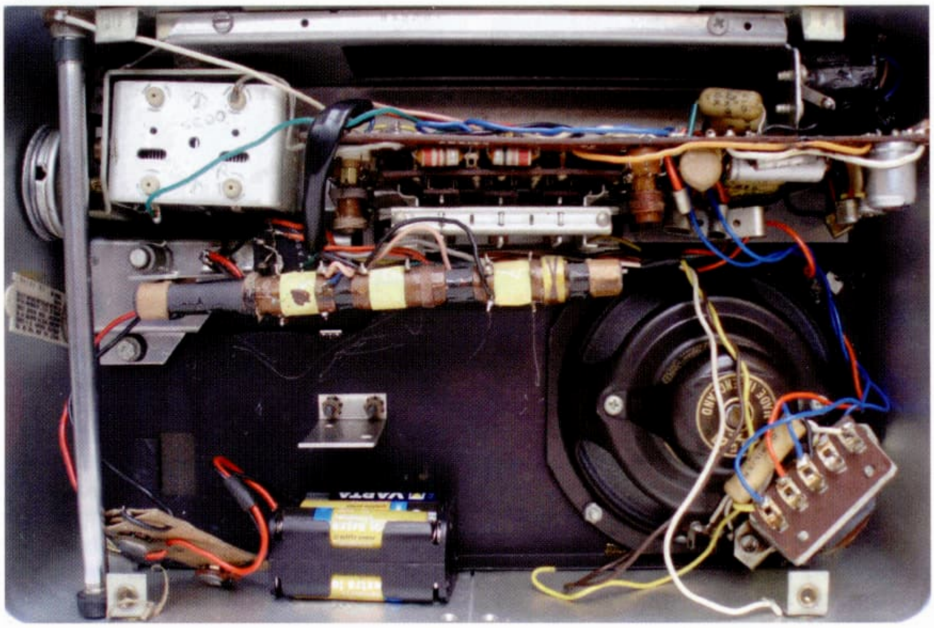


Fig 3: Perdio PR 73 RF section

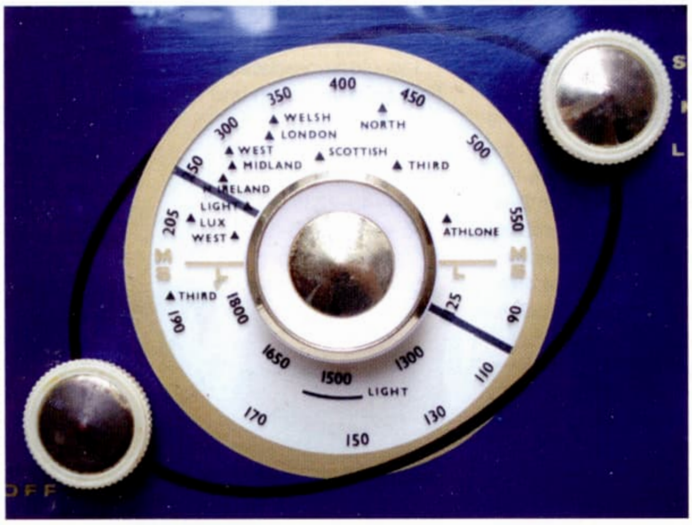


Pye internal layout with switch assembly in centre

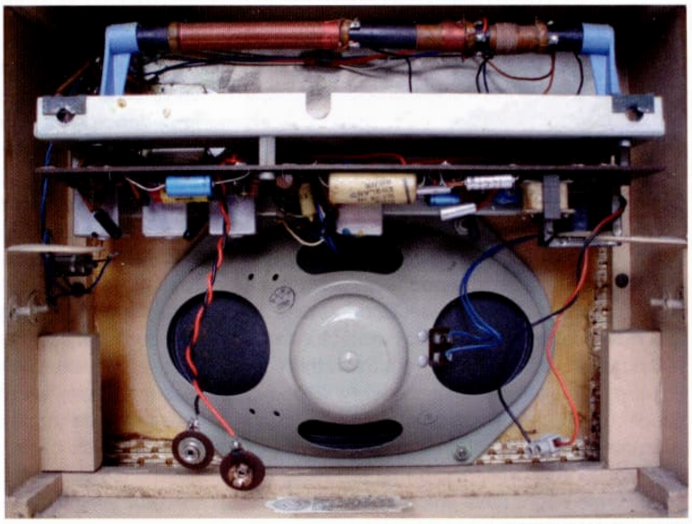
coverage up to 3.5Mhz. Whereas the P444 has an extra switched oscillator coil for the higher frequencies the Perdio uses "Harmonic Mixing". This means that when the trawler band is switched in the MW oscillator coil is left in circuit. Only the aerial circuit is switched to the higher frequency and the 2nd harmonic of the oscillator is used to mix the signal down to the IF. Described at the time as "novel" it is in fact the radio's "Achilles Heel", but more of that later.

Layout

This radio also has a printed circuit board mounted upside down along the top of the cabinet and attached to a metal chassis which carries the control and switch assemblies and acts as a heatsink for the output transistors. Here the similarity with the Pye ends since it uses a less sophisticated tuning system with an integral epicyclic reduction drive and a plastic disc rotating behind the printed scale surrounding the tuning knob. While general circuit board assembly is neat the production engineering of the chassis gives the impression of not being fully thought out. Removing the output transistors from the chassis heatsink to allow board removal is made very awkward and access to the trimmers on the tuning capacitor is impeded by stiff wires directly above them.



Perdio PR 73 dial looking like a fifties futuristic fantasy



Perdio PR 73 internal layout

Faults

Surprisingly once the Hunts bypass capacitor in the emitter of Tr1 had been replaced to remove some traces of instability there appeared to be no further faults.

Comparing Performance

The Pye having had its extensive makeover performs reasonably well with average sensitivity and selectivity on medium and long wave. However it shows its superiority over the Perdio between 1.8 and 4mhz with relatively few spurious transmissions and useable sensitivity on the telescopic whip aerial. The long calibrated slide rule scale has a degree of mechanical bandspread which displays only slight backlash and again proves superior to the Perdio.

Audio, although not as powerful as its competitor, is pleasant enough but a little constricted. This is due to pronounced roll off at higher frequencies and a disappointing level of bass considering the cabinet size. The sound therefore is noticeably mid prominent.

The Perdio performs well on long wave although the coverage is more restricted than on the Pye. The sensitivity and selectivity is also quite good on most of the medium wave; however it's on the Trawler band that real problems start to appear with spurious pickup of strong medium wave stations. This unfortunately is inherent in the system of harmonic mixing used. A calculated example will make clear the nature of the problem or as they say in the States, "do the math".

My BBC 100Kw "regional" is on 1341Khz.
1341Khz + 470Khz places the Local Oscillator on 1811Khz.
Switch to Trawler band and the harmonic of the L.O. is 3622Khz.
Only the aerial circuit has now been switched.
Harmonic mixing gives 3622 - 470Khz ie 3152Khz.

However when I tune to the 3152Khz frequency the 1341Khz station is still clearly audible since the L.O. is still running on the fundamental. To compound these difficulties the medium wave coverage stops at 1540Kcs. The remainder of the high end of medium wave is included at the bottom end of the Trawler band range. So the poor unfortunate listener who wanted to listen to the old "Third" programme or one of those naughty pirates above 200 metres had to switch bands and put up with a mess of heterodynes because of the problems just described. As an added drawback, since the oscillator harmonic is lower in level than the fundamental, less conversion gain is available on the higher band.

On the audio front the sound is big and loud. What you would expect from a large cabinet and an alleged output of 1 watt although I suspect this is peak power. The bass, although not as lacking as the Pye, is still a little disappointing given the large 8 x 5 inch speaker.

What could be heard on trawler band in 1959?

There were still many trawlers, boats and coastal radio stations using AM well into the 1960's although the change to single sideband (SSB) had begun. I well remember listening to Port Patrick Radio on a modified transistor radio around the mid 60's. On the Amateur bands of 160 metres (Topband) and 80 metres there were many local nets and also mobile operators on AM. In theory it would also have been possible to listen to broadcast stations on the 120 and 90 metre Tropical Bands in those parts of the world that used them because of high static levels on medium wave, ie parts of Australia, Asia, S America and Africa. However in the UK this would have required a good external aerial.

And in 2010

Today a lot of Maritime traffic has moved from single sideband on these frequencies to VHF and satellite communications. The Amateurs are still there however and there is a minor resurgence in AM nets by those who restore old military radio and those who are weary of the un-natural sound of SSB. By using a small outboard BFO (Beat Frequency Oscillator) with the Pye P444 I was able to copy many Amateur stations as well as some Volmet aviation weather transmissions, foreign trawlers and of course Radio China!

Conclusions

It has to be said that neither manufacturer acquitted themselves particularly well with these offerings in comparison to some of the more sophisticated overseas competition. Perdio had some excuse since it was still a young company but nevertheless it should have been raising its game at this stage. The extra band on the Continental has the feel of a hastily added gimmick

The Pye has more sophisticated styling and the added waveband is better thought out however this company had greater resources at its disposal and should have done even better. Despite its robustness when examined closely the ergonomics could have been better and for a radio seriously considered for use around boats it should have had a closing front to protect the vulnerable grille. Ironically the Perdio seems to have been the better seller of the two while the Pye P444 appears to be a rare beast.

Having groused at these failings, in mitigation, I now have to say that both companies did produce more sophisticated transistor shortwave radios within a year or so, Pye the Pam TB81 and Perdio its Multiband 102. In a sense the Cruiser and Continental are transitional radios representing a snapshot in time just before improved HF transistors made a different approach possible, Of the two the Pye is the more useable. Why Pye didn't use their new HF graded base "drift" transistors for this radio is a mystery but their struggle to obtain adequate performance with their own under resourced semi conductor technology along with the atypical styling means the P 444 has a particular fascination for me. After sorting out its faults, for all its shortcomings, I have grown to quite like it.

Letters

Dear Editor

I want to thank everyone involved in the radiogram display and demonstration at the NVCF on May 9th. It was wonderful to see and hear so many examples. It must have taken quite a bit of effort to get them there; I believe, for example, that the HMV 800 needs about four people to move it. The alternative, of course, is partial dismantling and reassembly on site, but that too takes time. Some might have shied away from the idea because it was too much trouble. So it was a credit to the organisers and the owners that it happened. Thankyou.

Yours sincerely,
Professor Jonathan Dollimore

Dear Editor

Having finally got around to joining the BVWS, something I have meant to do for years, I was overwhelmed by the members 'Starter-pack' and the sheer quality and content of the Spring Bulletin.

I received it just a few days after posting my application, and thus was most impressed when it arrived so quickly... on April 1st.

Apart from my interest in vintage radio & television I am also involved with music, and have restored/repaired various older electronic organs. As I also play the piano, I was particularly interested in the General Television model 534 Piano Radio restoration described on page 4 of the Spring Bulletin. Gary has done a fantastic job, it really is a credit to him. Thanks again for such an excellent bulletin,

Yours sincerely,
David Stone

Dear Editor

I was interested in Stef Niewiadomski's article on audio output transformers (Summer 2010 bulletin). It's a solid, practical article, however there are a couple of matters that I'd like to correct if possible!

First, the matter of the reflected impedance of the speaker. This is, as Stef says, the speaker's impedance multiplied by the square of the turns ratio (modified by a few subsidiary effects which he alludes to). He goes on to derive a reflected impedance of 3675 ohms for a worked example - fine. However, he then presents his Figure 7, in which the 3675 ohm effective load is driven from a valve, itself modelled as a voltage source with internal resistance 3675 ohms also. Unfortunately, no!

Most pentode and beam tetrode valves behave as a voltage source with far higher internal series impedance (or alternatively, as a current source paralleled with a high-value shunt resistance). In fact, an ideal pentode would have this internal resistance infinitely high. It's a fallacy to think that an output valve is properly loaded when the load impedance equals the internal impedance. The ideal load is governed by the basic limits that as the grid goes more negative the anode current can swing to zero but then stops changing; when the grid swings in the positive direction, the anode voltage swings to near zero but then hits a 'knee' in the characteristic so stops changing; and finally (although it's not usually a limiting factor), a third constraint that the grid can't go positive else it severely loads the driver stage. With these constraints, the ideal load turns out to be almost nothing to do with the valve's source resistance ra (which although less than the ideal infinity, is still many tens of kilohms for a valve with optimum load 3675 ohms. So, the model he uses to derive HF and LF cut-off frequencies will be inaccurate.

Secondly, he has a section headed 'Combined Output Transformer and Smoothing Choke', and describes a system where a tapped primary winding works as a choke to smooth the HT supply to earlier stages. Unfortunately, this is wrong. There's no way a transformer's windings can simultaneously have an AF voltage (the wanted output) AND a hum-frequency voltage, independently. In Stef's defence, I've seen this quoted by manufacturers in their own service literature. But, it's wrong. What actually happens, is that the system neutralises hum in the output stage's anode circuit itself. Any ripple voltage present on the primary tap, gives rise to ripple current flowing through the two sections of the primary in opposite directions. Some current flows towards the downstream smoothing capacitor, and the magnitude of this current is defined by a series resistor (which is an essential part of the scheme). Some current flows in the other direction, in the anode circuit of the output valve itself (and the magnitude of this current is defined by the valve's anode resistance ra). If the ratio of these two currents is exactly equal to the ratio of the turns of the two sections of the primary, the currents will exactly cancel in terms of the fields they can generate, with the result that the secondary has zero hum present. In practice, the valve anode resistance is a bit variable from sample to sample, so complete cancellation is rarely achieved. Nevertheless, a significant reduction is possible. It's one of the most beautiful and elegant ideas in the whole field of hum reduction. It was invented by an engineer working for Philips, and although they are noted for oddball and wacky ideas, this one redeems them all!

Peter F Vaughan

Dear Editor

I am a relatively new member and my main interest is the early television period, and I would like to know how many of the first wooden 'Baird Televisor' are known to exist today.

Does the BVWS team or any specialized member have a listing available? Or can you ask in your magazine?

I would appreciate very much to hear from you soon and I remain

With very best regards,
Uwe H. Breker
Tel.: ++49-2236-38434-0
Fax: ++49-2236-3843430

Dear Editor

I feel sincerely humbled and honoured to be awarded The Geoffrey Dixon-Nuttall Award for Best Restoration Article 2009 AVO Wave Winder Restoration.

It was a pleasure for me to restore the winder and be allowed to share my story with fellow Society members; I must confess to being taken totally by surprise when Graham Terry very kindly telephoned me with the good news; as usual at the time I was involved in a big project as I was taking down a large Scots Pine to the side of our bungalow and it took quite a while for the news to sink in.

I would like to thank everyone concerned and will always cherish this most welcome award.

Kindest regards
Colin Wood.

Dear Editor
Having worked for 50 years in the radio industry I have been following with concern the push to get the public to scrap their AM/FM radios for digital (DAB) radios, originally a Labour policy. We hear, of course, a lot about 'extra choice' with more channels on DAB, and sometimes we hear criticism of the unreliable signal reception, but what the public doesn't hear about are the substantial costs they will have to bear in changing to DAB. There will be no 'choice' in this.

DAB radios are more complex than AM/FM radios so cost more to buy. At a conservative estimate there are 100 million home AM/FM radios – not counting Walkmans, stereo systems, car radios etc that will also need changing.

If only half the home sets are replaced with DAB radios the listening public will have to find some £2.5 billion at a time of continuing financial austerity. (Much of this £2.5 billion will go to overseas manufacturers – not exactly helping our balance of payments).

There is more, however. Running costs on DAB radios are high compared with AM/FM radios as they are heavy users of energy. On like–for–like quality radio sets AM/FM uses less than 10% of the battery energy needed by DAB radios. For example, someone using an AM/FM radio will enjoy some 375 hours of listening on a set of batteries costing £6 whereas a similar quality DAB radio will need new batteries, at £9, after just 32 hours. Mains use is of course also higher for DAB radios. Radio listening via your TV set or computer is higher still.

So, to get more choice of channels we not only lose a reliable countrywide AM/FM service but all of us will have to pay significantly more for a DAB service where many people will get poor reception and some people will receive no signal at all. Most of the public, I suspect, do not know this is the case. There is still time for the new government to put a stop to Labour's unnecessary and wasteful, digital policy on radio; they should do so.

Yours faithfully,
Gordon Bussey

At last! A genuine red Ekco A22 continued from page 3

cabinet near the front, which is associated with one of the internal moulded ribs that run from front to back. This minor cosmetic defect is a common fault with round Ekco cabinets and is a good indicator that this cabinet is not a fake.

There is evidence that a paper label was affixed to the inside of the case. Some black resiny glue and a shred of paper is all that remains of it. A pity. It would be very interesting to know what information was printed/written on it.

The cabinet is damaged in a way that is consistent with the heavy steel chassis tearing itself loose from its fixings as a result of the set being dropped. The top left chassis fixing lug (when viewed from the back) is cracked longitudinally through the threaded fixing hole and the crack goes right through to the outside of the cabinet and divides into two, spreading toward the back and front of the case. Right above the lug is an "island" of bakelite completely encircled by cracks and very slightly raised as though levered up by the chassis fixing screw. The top right lug had a sizeable piece broken clean off leaving nothing to screw into. The bottom right lug is intact, but a crack has formed between it and the hole for the wavechange switch. The bottom left lug and the surrounding material is undamaged. Perhaps that particular chassis fixing screw was missing when the accident occurred.

I think it likely that the tuning dial and bezel parted company with the set a very long time ago. The pattern of dirt inside the cabinet does not show a witness mark where the felt covered outer edge of the circular tuning dial would've been in contact with the bakelite. The mazak spider had three 6BA screws and nuts attached to it. These were rusty and looked as though they'd been there a long time. The bezel could not have been attached with these screws present. I discovered that the mysterious cast alloy grille could be made to sit on the three bolts, nicely centred in the circular opening in the cabinet where the dial would've been.

The chassis was a dilapidated, corroded mess that harboured some nasty surprises. In particular, some truly appalling modifications had been made to the front-end circuitry, most of which had been completely disconnected and bypassed by a single add-on coil, which was connected between the aerial socket and the grid of the mixer valve. A tapping on the coil was connected to the AVC line. One half of the tuning gang was still in circuit so some rudimentary tuning might have been possible on one waveband. The ball bearings in the wavechange switch detents were missing but this would hardly have mattered since it wasn't in circuit anyway. The trimming capacitors were corroded to the point of disintegration and someone had attempted to patch them up with solder. I find it hard to believe that the set could have worked with these modifications. It seems someone was desperate to keep this set working.

The replacement mains transformer lacked a centre tap on its H.T. winding and the rectifier (5U3 GT) had its anodes strapped for half wave rectification. The original Ekco voltage adjustment panel had been retained but rewired as a makeshift circuit breaker. The transformer primary winding consisted of two separate untapped 110 volt windings connected in series. So it was wired for 220 volts even though it would've been quite capable of working at 110 volts. This makes no sense if the set was ever used in the USA.

Some old repairs had been carried out using components that were marked up in an oriental language. These included the volume control potentiometer and at least four of five replacement capacitors. I'd assumed these parts to be Japanese but photographs posted on Paul Stenning's internet forum brought forth an English translation, which proved that the components were in fact Chinese. Thanks again "Vicboduk" and your Malaysian colleague.

All of this seems to suggest that this set spent a large part of its working life in some other foreign country before it ended up in the USA. China? Malaya? Hong Kong? India? There can, however, be little doubt that the chassis is the standard UK version with the usual three wavebands including long wave. The serial number stamped on the chassis plate is 020017.

Repairing the chassis necessarily involved a lot of work. The R.F. subchassis had to be painstakingly rebuilt and many major components needed to be replaced. Proper A22 replacement parts proved hard to obtain so I made do with whatever "near fit" components I could find.

The cabinet presented a different challenge. I really wanted to leave well alone but, unfortunately, there was no satisfactory way to fix the chassis inside the cabinet without repairing at least one of the two broken top chassis fixing lugs. I chose to rebuild the one that had a sizeable chunk broken clean off with no cracks. This I did using some proprietary resin filler compound and a threaded brass insert. I've not dared try to repair the other top fixing lug because to do so would entail interfering with the cracks that are visible on the outside of the case. This is a can of worms that I have no intention of opening.

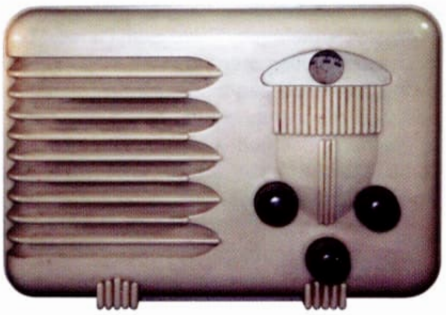
Making a replica dial bezel proved to be practically impossible but, eventually, a damaged brown A22 came to my rescue, providing both the bezel and the dial. If the grille cloth had not been present, I would've assumed that the set had originally been fitted with a chromed bezel and silver cloth as the standard black and chrome version. However, I felt that neither chrome nor Florentine bronze would look right with the black and gold cloth and the red bakelite so I decided in the end to paint the bezel to closely match the colour of the cabinet.

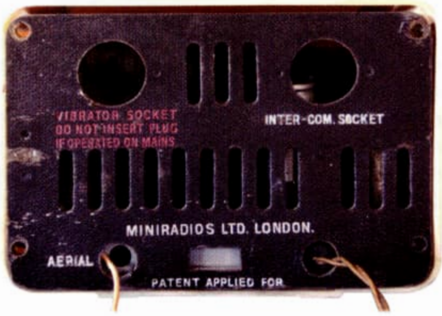
I've delayed writing this article for a long time in the hope that more information about this enigmatic set would come to light. And now, thanks to Steve Harris, I can report that another red A22 has been sighted at an antique fair in north Lincolnshire. This example is even more badly damaged than mine, having lost its feet, although more complete, having kept its original dial and chromed bezel. The cloth is one of the standard types that I've seen on brown A22s and very dirty. The colour is difficult to determine from the cameraphone picture supplied but it looks silver to me. Interestingly, it appears to be an export model with two short wave bands.

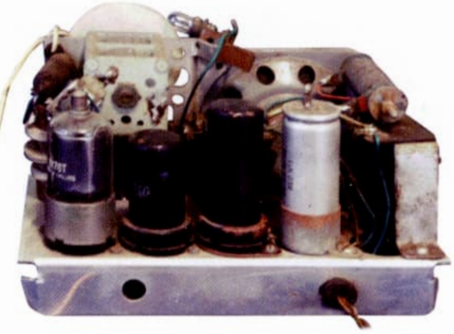
Restoring and Researching a 3 Valve Miniradios Ltd TRF Receiver

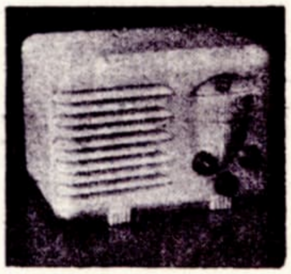
by Tony Jordan

I purchased the radio recently on Ebay, It's small, stylish design intrigued me. The style and design of the case, chassis and of the circuit bear a remarkable resemblance to the American Detrola Pee-Wee model 197 from 1937.





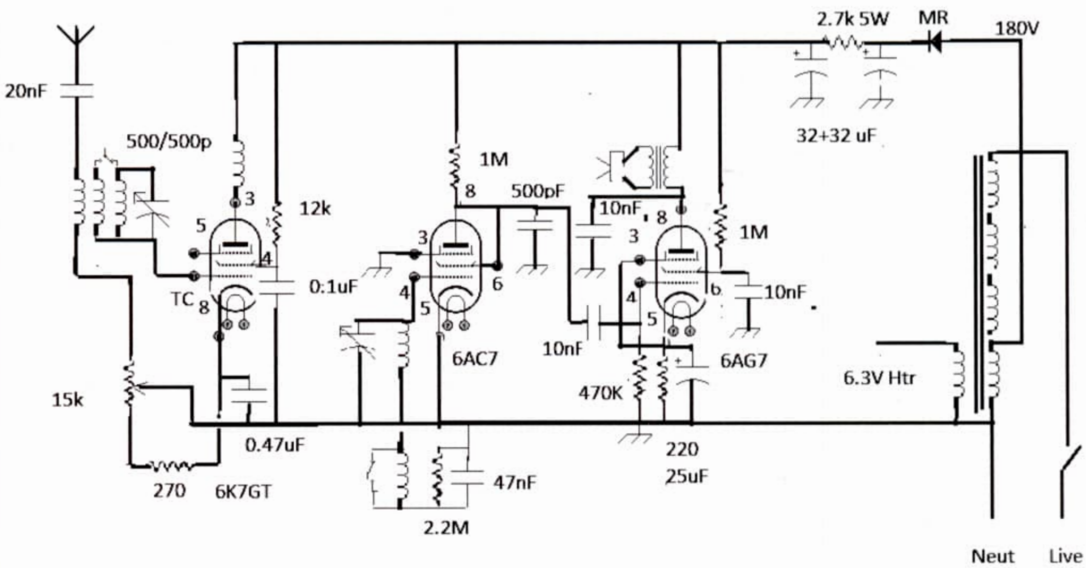




COST UNDER £4

MINI MAINS

Uses high - efficiency coils, covers long and medium wavebands and fits into the neat white or brown bakelite cabinet —limited quantity only. All the parts, including cabinet, valves, in fact, everything, £3/19/6 plus 2/- post. Constructional data free with the parts, or available separately 1/6.



I have always managed to find some information and schematics for all other small valve radios that I have purchased (Czech, Austrian, US etc), but I could find only scant information on Miniradios Ltd.

Various threads on the Vintage Radio Forum and on other sites suggested that the radio existed in several forms (3, 4 and 5 valves) and with various valve line ups (all TRF). Most have a rectifier valve, mine has a metal rectifier. One was built onto in intercom base

The case is white Bakelite (Urea Formaldehyde, also known as Plaskon); small, stylish and obviously made using good quality moulding tools. The words " Miniradios (London) Ltd – patent applied for" is moulded into the plastic inside of the case. The tuning dial slot has been milled out, suggesting that the case was meant for another purpose, and then modified for a tuning dial.

The rear cover has the words" "Vibrator socket. Do not insert plug if operated on mains" and "Inter-Com Socket". After some searching, I found a picture of the radio, on an intercom base. It had been marketed in South America under the name "Supertone Intercomm/radio".

The chassis has been punched out for 5 valves and fits the case perfectly. Again, it looks professionally made. The on/off – gain control obviously didn't fit the chassis, and the chassis was "hacked " to accommodate it. The build quality poor, the soldering was "amateurish" (worse than mine!), suggesting that the radio was bought as a kit.

I eventually found an advert for the radio in a 1955 copy of Practical Wireless. A company called Precision Engineering Equipment of Croydon, who sold MoD and other surplus electronic equipment, were marketing the radio in kit form for £3.19.6 +2/- postage. The radio could be bought with a white or brown case. The advert states "limited quantity only" which suggests these were the last of the Miniradios.

Where did it start life? Case tooling is expensive. Who originally designed it and for what purpose? The circuit is a standard TRF radio with no provision for intercom or battery converter.

The valve line-up is 6K7GT, 6AC7 metal and 6AG7 metal. HT is provided by a small mains metal rectifier. A 6.3 volt transformer provides the heater power.

The 6AG7 output valve is capable of delivering 4 Watts, but the 3 inch speaker looks as if it would only handle a few hundred milliwatts. The 6AC7 valve (according to the RCA spec sheet) was designed primarily for radar video use.

Resistors and capacitors are an eclectic mix of styles and manufacturers, with 2 watt – 1% 1MΩ resistors used where ½ w 20% would have sufficed. This radio appears to have been engineered from whatever was lying around!

I sketched out the schematic (I hope it's correct) and set to work debugging it. Most of the capacitors were either leaky or OC. I replaced the metal oxide rectifier with a 1N4008 diode and series resistor. Once replaced, the set showed signs of life.

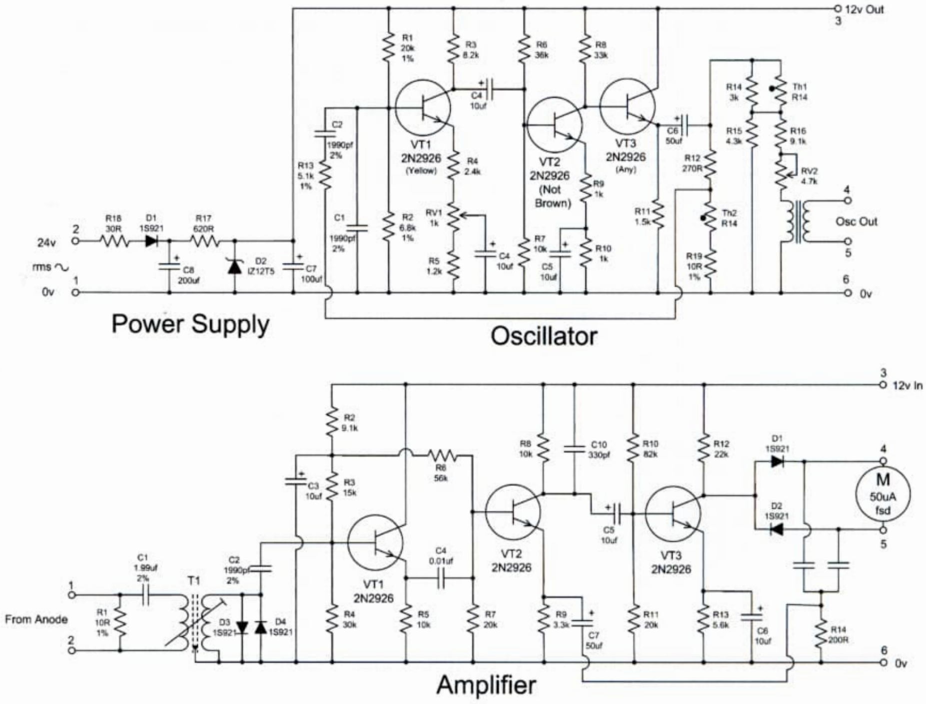
Performance was poor. With a long aerial and with the gain set on the point of oscillation, stations could be heard faintly. An extra AF stage was definitely needed.

The radio, however is smart and in my opinion, very stylish. However… Who were "Miniradios – London Ltd? Where and when did this type of radio start life? If anyone has any ideas, contact me on amj8857@hotmail.com

Getting the most from The AVO VCM163 Valve tester continued from page 21

The data book tray

some 2BA bolts through the fillets of the feet. These are unseen in the middle of the feet which are part of the aluminium side frame casting. I even found some grey spray paint very close to colour of the front panel to spray it with, and a small chrome handle to finish it off. Next, I made a folded aluminium side box to accommodate the other data and equivalents books, this side box has a top shelf for the adaptor box extending the valve socket range at the same level as the other sockets. It fits quite snugly here avoiding the torque in the connecting wire rolling it around and makes it a lot easier to use; it's now firmly held in place on a piece of rubber mat to stop it moving about. There's a hole in the back for the connecting wire making it easily rotated by 180 degrees between the European or American socket set. The side box is fitted to the main chassis of the VCM163 using the existing screws that retain the side panel. There's no need to modify or drill holes and the VCM163 can easily be returned to its original condition. This side box was also sprayed grey. The adaptor box was already a similar grey



The VCM163 gm Circuit

from new and looked like a reasonably good match. Now everything is to hand in one place and ready to test the odd single valve easily without a lot of getting out and putting away of accessories and reference books. While batch testing lots of valves after sorting them into batches of the same type, I use my old adaptor box as a pre-warmer. The lead-out wires are colour coded using the resistor colour code, Brown pin 1 etc. The relevant heater pins are connected to a local variable power supply so the next valve is warming while the previous one is being tested. This speeds up the process enormously and improves the detection of internal shorts. The heaters have had a chance to fully warm up and are more likely to show-up an internal short on the initial cold checks before the HT is applied.

Restoring an HMV 650 continued from page 15

If a transformer is salvaged from a radiogram, or a complete chassis is used in a table radio, then rewiring is needed otherwise the transformer will be operating with a mismatch to the output valves.

Audio performance and the Chassis Interconnecting cables

I was quite surprised upon measuring audio performance from the gramophone sockets. Into a resistive load it's 3dB down by 4 kHz. On radio, with the selectivity switched to wide band it doesn't sound that treble deaf to me. I'm told that the brain does a kind of treble boost, if some treble is there in the first place, and that may be the reason. When on "Gramophone", apparently most 78 rpm records didn't produce much output beyond 4-5 kHz, so the response could have been thought quite adequate by EMI engineers. The interconnecting cable, between chassis, may account for some of the loss. Each output valve screened grid lead measures 80 pF to ground.

Whilst looking at the interconnecting cables I thought about those that carry mains to the ON/OFF switch. According to the schematic, and it would seem a reasonable thing to do, these are screened as well. How was the insulation after all these years? The cable which still appears in excellent condition is of a heavy gauge and cloth–covered over rubber, inside the cotton sheath. But to be sure I did a long insulation test at 1000V and all remained well at thousands of M Ohms. Of course it's wise to always fit a low current fuse in the mains plug and switch off at the wall when the radio is unattended.

Performance and Conclusions

Another long but very interesting restoration. For the chassis the best parts were gaining a full understanding of the bandwidth switching of the IF transformers (thanks Chuck), correcting the spare chassis with series tertiary resistors and making this well hacked chassis look reasonable and work as good as any other.

Regarding the cabinet, I can say that it's the best result achieved so far. Some may say that is too flawless and shiny but I love it this way. I'm not totally happy with the grille colour and this may get changed at some future time.

The reproduction dial, with artwork by me, and with glass cutting and silk-screening done by professionals, looks beautiful. I wouldn't want to repeat the expensive exercise but did enjoy it immensely.

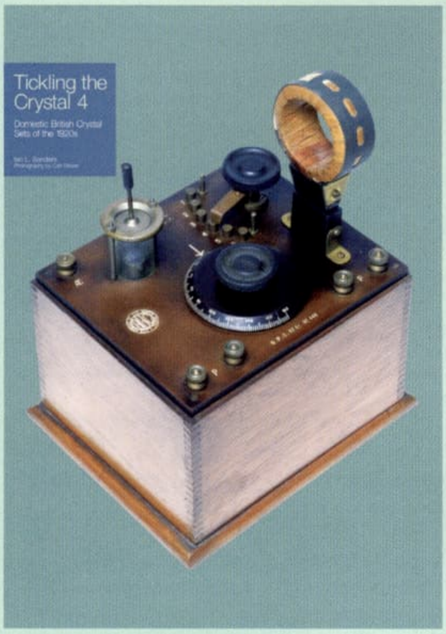
The performance of the radio seems excellent, during the day I can listen to lots of stations with wide IF bandwidth but at night, on many stations, it may sound better with the bandwidth reduced. Of course CD (or some FM stations) re-transmitted from a low power house transmitter is the best of all for programme content and quality.

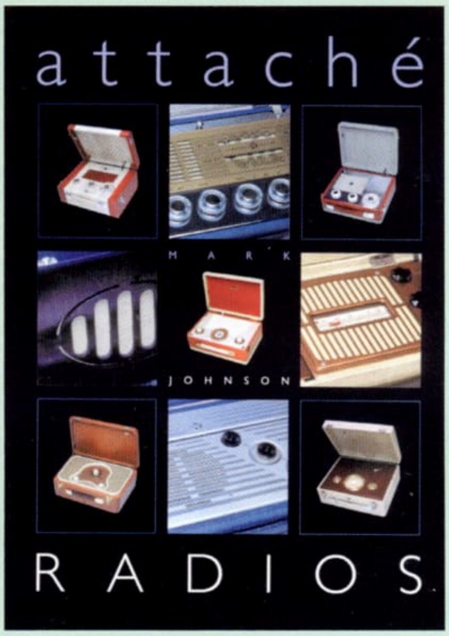
As can be seen, in one picture, I have an HMV gramophone connected to it for playing 78's which is a new thrill (try telling that to most under 50 year olds; they would reckon you're ready for the old folks home). It would be good to marry the spare chassis (I do have all the cabinet hardware) with a cabinet sometime, so if someone has a cabinet, or if someone wants the challenge of making one from scratch then there's an opportunity.

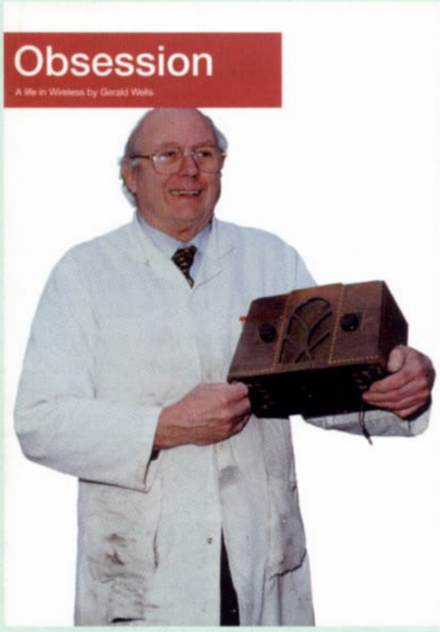
But last words: a very fine radio, certainly the one I would have bought back in 1937, assuming I was rich enough. I try to imagine what it must have been like, without the distraction of television, moving the vernier dial around on SW's listening to the World and particularly the USA. When WW2 started were they going to pitch in and fight with us? They did, and like the radio it's all history now.

BVWS Books

Out Now!







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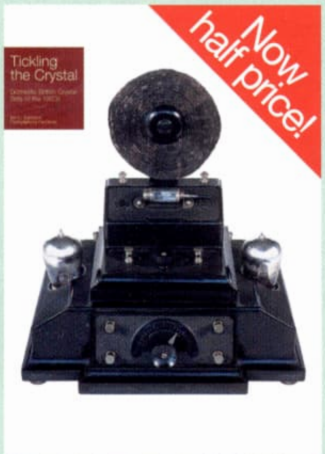

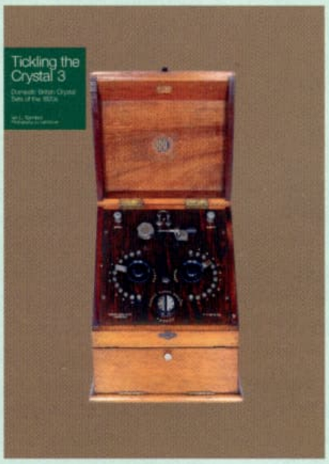

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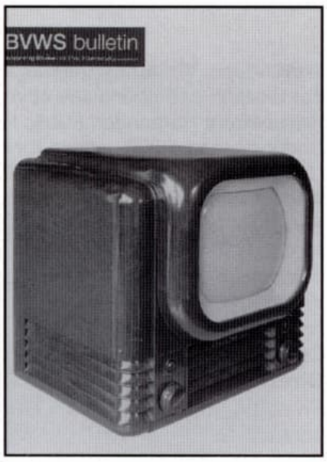

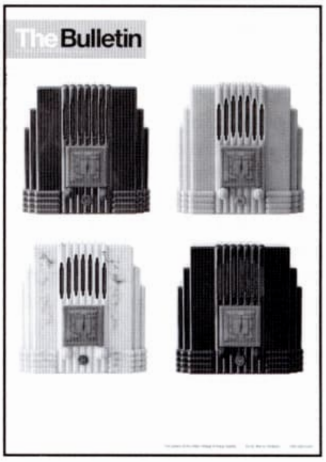

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News and Meetings

GPO registration Numbers

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

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telephone: 01252-613660 e-mail: martyB@globalnet.co.uk

August 13th Friday Night is Music Night at The British Vintage Wireless and Television Museum
September 12th Table Top Sale at The British Vintage Wireless and Television Museum
September 19th Murphy Day at Mill Green Museum
October 10th Audiojumble
October 17th Harpenden
November 21st Golborne "North West of England" NEW VENUE!
November 26th Festive Music Night at The British Vintage Wireless and Television Museum
December 5th Wootton Bassett

Workshops, Vintage Wireless and Television Museum:
For location and phone see advert in Bulletin. 11:00 start.
Harpenden: Harpenden Public Halls, Southdown Rd. Harpenden. Doors open at 10:00, tickets for sale from 09:30, Auction at 13:30. Contact Vic Williamson, 01582 593102
Audiojumble: The Angel Leisure Centre, Tonbridge, Kent. Enquiries, 01892 540022
NVCF: National Vintage Communications Fair
See advert in Bulletin. www.nvcf.co.uk
Wootton Bassett: The Memorial Hall, Station Rd. Wootton Bassett. Nr. Swindon (J16/M4). Doors open 10:30. Contact Mike Barker, 01380 860787
Golburne: Golborne: Golborne Parkside Sports & Community Club. Rivington Avenue, Golborne, Warrington. WA3 3HG contact Mark Ryding 01942 729005
For more details with maps to locations see the BVWS Website:
www.bvws.org.uk/events/locations.htm

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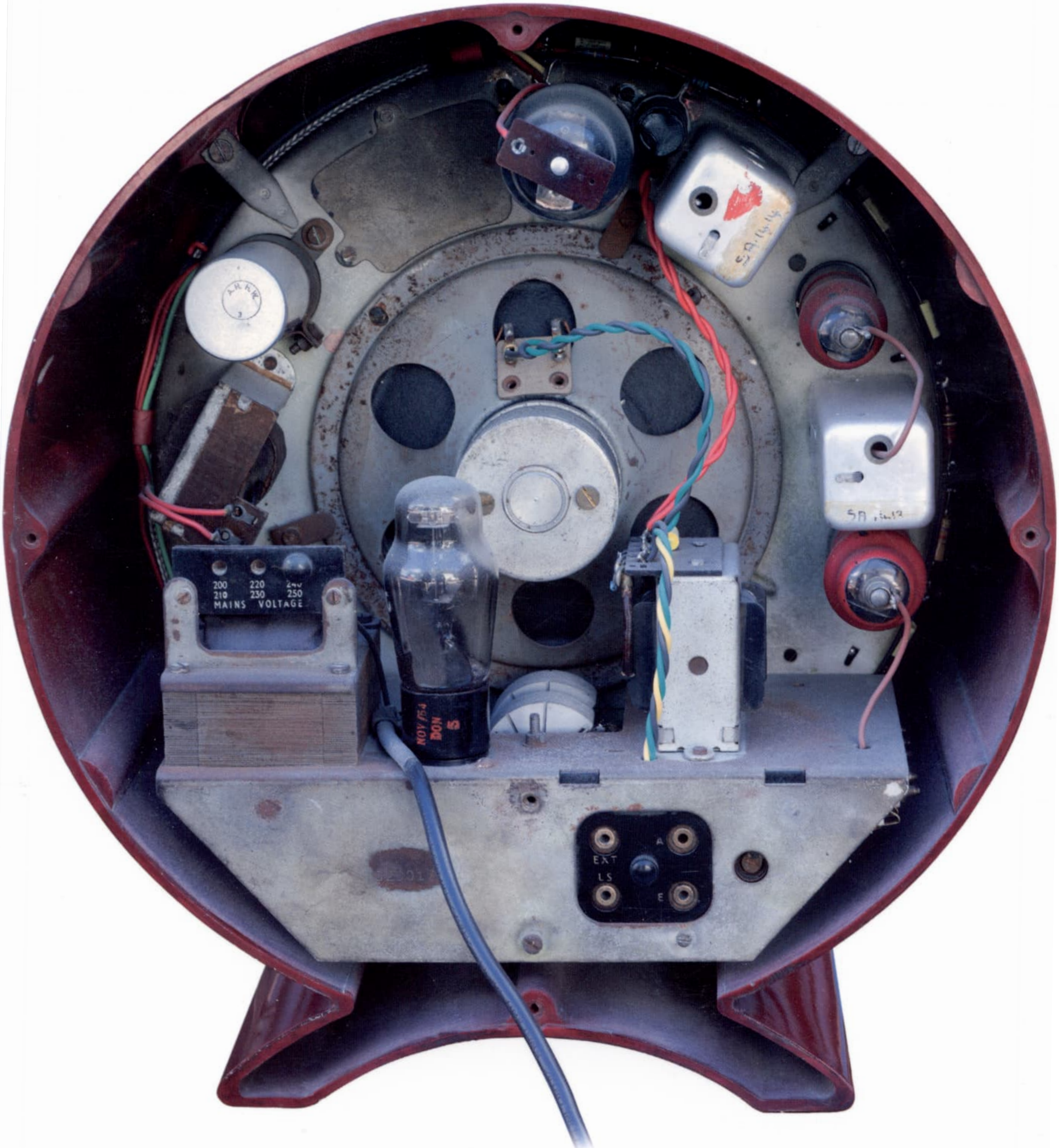
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