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#### From the Chair

Will I ever learn? Recently I have been

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experiencing problems with a certain radio on the bench that has almost driven me mad, Murphy mad in fact. It had previously been repaired and working but rather poorly in both cases. Taking all the usual actions on this set with rebuilding of the capacitor blocks and sorting out a multitude of prior bodges, I finally had the set working reasonably well, although I was not happy with intermittent clicking noises and loss of signal. Whilst investigating this fault, which actually turned out to be the rectifier filament leads from the mains transformer shorting to chassis through the systaflex, I decided to look into the Oscillator coil can as there were signs of it being removed from chassis recently. Well on opening it up I found the remains of the original coils with new windings wrapped all over the place. The coils were re-wound correctly and this time also connected correctly. This made a very significant difference to the overall performance and tuning. All other coil cans were then investigated only to find one of the IF transformers had also been re-wound in a less than desirable way. All these things now put right the set is working very well, except for a small amount of distortion being generated around the full-wave detector circuit. Now this may sound like an easy problem to diagnose, but I can assure you that this is turning out to be one of those strange once in a lifetime faults, never to be seen on another radio. Oh well, a few more late nights may get to the bottom of the cause, but this all proves the old saying, "never trust others work done before

you" check everything and then check it again. The NVCF event in April was once again a great success for the Society with a good surplus being realised. This extra money will be used in a number of ways. A significant donation to the British Vintage Wireless and Television museum will be made for a specific

project to ensure fire safety around the buildings

and also some renovation works. Some of

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the money will also be used to pay for the production of the DVD 'Valveman' which was reviewed a few Bulletins ago. The DVD will shortly be available from the Museum directly and from the BVWS membership Secretary and Stalls so keep a lookout for it. What is left will be used for member benefits.

We recently enjoyed a very pleasant day at the Willand radio meeting which is organized by Barry Philips and Mike Butt. The event although not over subscribed with stallholders and visitors was never the less a good source of a number of useful items. A most interesting item spotted was the "Cut Price" version of a Pilot console radio that was left for dead at a previous meeting. David Bickerton had performed major surgery on its terrible cabinet and turned the set into a table model with fully restored and working chassis. What an excellent way of saving the planet with visible re-cycling. Well done Dave! Now it is just a short time until work begins on all of the arrangements and cataloguing of items for Wootton Bassett on the 1st July. This is certainly going to be another bumper event with a hall packed with stalls and visitors as usual and some very nice sets turning up in the Auction, keep a look out on the BVWS website for the pictures and I hope to see you all there! Mike

#### Late News

At Harpenden I announced that Geoffrey Dixon-Nuttall, a long standing member of the Society was critically ill and that our thoughts were with him, his wife and family as the prospects for a full recover were not good. It is my very sad duty to report that Geoffrey has passed away. Geoffrey, an extremely knowledgeable and most pleasant person will be missed by many of his friends within the Society. A special article will appear in the next Bulletin.





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# Graham Terry 26 Castleton Road



#### The Earlier Research

My interest in the circuit started back in 1998, when I decided to do an extensive restoration on the, even rarer, flat-panel version of the set. According to the advertising literature this is just a repackaged version of the more expensive cabinet set. The source of information on the circuit is the diagram given in Dowsett's book [ref: 2]. Ian Higginbottom, in his seminal Bulletin article on the GEC family of 2-valve sets [ref: 3], corrected one typographical error and this is the circuit commonly quoted.

The decision to undertake the restoration was influenced by the knowledge that David Read owned the 'home constructor' variant which I could examine and I had also found an article in the Wireless Word [ref: 4] reviewing the kit set version. The article showed a picture of the reverse of the panel and a circuit diagram – the circuit diagram was evidently for the cabinet version, as it showed the HT switch. A cursory comparison of this with the the circuit published in the Bulletin showed three main differences:

a) The wiring of the HT switch which didn't make sense now does. The connection between the LT and HT- terminals now bridges the HT battery. This is an understandable error for the proof reader to make as while the LT sockets are the input from the external accumulator, the HT sockets are output sockets to the matching LF amplifier and do not need to directly connect to the HT battery (which is internally housed in the wireless cabinet).

b) The major surprise was the LT accumulator connections. The polarity is reversed! The direct implication of this is that the grid of the RF stage is positive!

c) The filament rheostat is wired differently. I will discuss this later.

The first two differences are illustrated in



The GECOPHONE 'Smoker's Cabinet' Circuit by Martyn Bennett

The appearance of the article in the Winter 2006 BVWS Bulletin [Ref: 1], describing different people's approaches to restoring or recreating the rare GEC 'Smoker's Cabinet', reignited my interest in a dormant project – to determine the correct circuit for the set. You may say there is no need, as the circuit is known and was re-published in the last Bulletin article. However, I believe the circuit is wrong – and the purpose of this article is to publish a revised circuit and make my case for its validity. The revised circuit, which I believe GEC used, fundamentally alters the operation of the tuned RF stage to make it very stable – to comply with the GPO regulations.

excerpts from the two circuits (figs. 1 & 2 below).

To start to resolve the discrepancies I took the chassis out of my 'Smoker's Cabinet' which appeared to be original - and traced the circuit. It was a hybrid; the HT switch wiring and battery polarity were the same as the WW circuit, but the filament rheostat was wired as given in Dowsett's book. My discussions with the 'old school' BVWS members on positive grid bias were not fruitful; the received wisdom being that "It wasn't done". Undeterred I researched the topic and found that applying positive bias was indeed one technique for preventing self oscillation in tuned RF stages. Many textbooks were vague about valve biassing options, but I found Hutchinson's book unusually instructive [Ref: 5]. David Read sportingly lent me his set and I found this was also wired to give positive bias to the RF stage. I completed my restoration project, but felt a little uneasy about the whole situation.

#### **New Information**

In the intervening time I have acquired more sets, and I am in the somewhat embarrassing situation of having a 'full set' of 2-valve Gecophones and duplicates of both the 'flat' models and 'the other' (detector + LF) Smoker's Cabinet. I have also managed to acquire the GEC booklet (BC 3333 - reprinted July 1924) [ref. 6] which gives details of the 3 different variants of the RF plus Detector sets - the Cabinet Set. Model "B" Set and the Constructor's Set. The instruction booklet is unusual, as instruction manuals go, in that it covers the Constructor's Set and therefore includes a wiring diagram and a corresponding circuit diagram. As I mentioned before the circuit diagram is actually for the Cabinet Set as it includes the HT switch, which is absent on the cheaper version. Unsurprisingly the two diagrams are the ones used by the WW reviewer [ref: 4]. As such they feature positive bias on the RF-stage grid. The booklet states



Figure 2

that R5V valves are normally supplied with the set, but dull emitter types can be used – by using a 2 volt accumulator for DER valves or 4 volt accumulator for DE3 valves. The recommended HT voltage is 45 volts for the bright emitters and 30-45 volts for the dull emitters. The circuit diagram shows a higher 60 volts HT - as does the circuit in Dowsett's book. Equipped with this extra knowledge I examined my most recently acquired Model 'B' set. The set appears to be unmolested and I was relieved to find that the circuit exactly matched the one given in the GEC booklet.

#### **Bench Tests**

Having assembled the documentary evidence and convinced myself that positive bias was used by GEC - presumably to comply with the GPO regulations - I thought I should turn from 'instrument repairer' to 'radio engineer' and put things to the test. To make the tests as representative as I could I took courage and used two modern replica 'R' valves in the Model 'B' set. With 4 volts on the filaments and a 48 volt HT battery, I could receive 'Five Live' on my primitive 40 foot aerial. The volume was adequate and the quality good with no sign of oscillations. I tried the alternative plug-in coil with similar results and found some other stations at quiet, but listenable, levels. I then reversed the polarity of the LT battery - as in Dowsett's circuit. The set was more sensitive, but oscillated freely! Practical proof indeed.

#### **Revised Circuit Diagram**

I was, by now, pretty convinced that positive grid bias was used by GEC, but I needed to resolve the relatively minor issue of the different connection of the filament resistance in my Cabinet Set to that in my Model 'B' set – the 1924 circuit. With early sets there is always the difficulty of deciding if differences between examples of a model are variations in manufacture, or are later non-authentic modifications. It is unwise to be too dogmatic, but, in this instance, I think it is likely that the difference is due to a production change. I am therefore offering two circuits – one for the earlier production sets and one for later production sets. (fig. 3 & fig. 4 - opposite page)

The different position of the filament resistance in the two circuits will change the amount of positive bias. There is a potential



drop across the filament of directly-heated valves, so there is a need to define one end of the filament as the reference. There is a well established convention; grid and anode voltages are measured relative to the most negative end of the filament. Because there is about a 2 volt drop across the filament resistance – when 6 volt accumulators are used – the grid bias will be about + 4 volts for the earlier circuit. For the later circuit the grid bias is the full + 6 volts.

In order to gather more information I contacted Ken Tythacott and Ian Higginbottom who have, what would appear to be, authentic Cabinet Sets. From quick continuity tests on the rear battery terminals, they both verified that the HT negative terminal connects to the LT positive terminal – when the HT switch

is closed. This implies that their sets also have positive grid bias, but I hope to get details of the actual wiring. If anyone has an original-looking set I would be pleased to hear about the wiring of their set.

#### **Valve Characteristics**

I suppose I could have stopped at that, but I was still intrigued by the positive-bias operation so I thought I would measure the valve characteristics in that region for one of the replica 'R' valves I had used. My first surprise was to find that my rarelyused AVO CT 160 valve tester could not produce positive grid bias, so I was driven to using batteries – just as described in 20's instruction books. The test arrangement is shown in fig. 5 at the bottom of this page.

I used 4 or 5 sealed lead acid 12 volt 'Uasa' batteries for the HT supply and initially tried to use two 'Cyclon' 2 volt lead-acid batteries for the filament supply. I soon found these were too small a capacity and I had to use a stabilised 4 volt PSU. For grid bias I used 3 of the 'Cyclon' cells and switched polarity to get a range of +6 v. to -6 v. Just to reiterate; grid and anode voltages are measured relative to the most negative end of the filament.

The characteristic of the replica 'R' valve (fig. 6) shows anode and grid current for varying grid voltage. I used anode voltages of 60 v. and 48 v. as the higher voltage matched the 60 v. specified by GEC for the early production sets and 48 v. was the closest I could match the 45 v. recommended by GEC for the later production sets. The first interesting point is that the mutual conductance is sensibly constant over the whole range of positive grid voltages tested – and essentially independent of anode voltage. The reproduction 'R' valve's measured parameters and published 'R' valve parameters for comparison [ref. 7] are:

Mutual Conductance (Gm):	0.25 mAV	(0,26 mAV)
Amplification (M):	12	(9)
Anode Dynamic Resistance (R	a): 48 K ohms ( 3	35 – 40 Kohms

The most interesting feature to me is the grid current for large positive grid bias, as I have not seen measurements in this range of grid bias in print. From about 1 v. upwards it rises near-linearly to just under 0.25 mA at +6 v. bias – large but nearly an order of magnitude less than the anode current. The dynamic grid resistance is about 20 K ohms for grid bias in the range +2 to +6 volts.

#### Stability of Tuned Anode RF Stages

For the final stage in the research I wanted to understand more about the behaviour of





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the tuned-anode RF stage; why it becomes unstable and why stability is restored by applying positive grid bias. There is much mention of this tendency to instability in early wireless articles, but most do not give any insight into the behaviour. Two books I found helpful were an early classic text 'Principles of Radio Communication' by Morecroft [ref. 8] which was published in 1921 and 'Communication Engineering' by Everett [ref. 9] which was published in 1932. Everett refers to the seminal paper on the subject by J.M.Miller [ref. 10]which was published in 1920, but Morecroft's book does not; it was likely that his research was conducted in parallel.

Morecroft gives the results of experiments which show that the presence of inter-electrode capacitance between the grid and anode reflects the anode load back to the input. When the load is inductive it reflects as a negative input resistance. With negative grid bias, his results show a nett negative input resistance for a particular range of load inductance. Everett uses a simplified equivalent circuit for the triode (fig. 7) to illustrate the mechanism. I have extracted the key findings, which are reproduced below:



The input impedance is given by:

$$Z_{g} = \frac{R_{a}Z_{o} - jX_{c}(R_{a} + Z_{o})}{R_{a} + (M+1)Z_{o}}$$

For a purely inductive load, the (inphase) input resistance is given by:

$$R_{g} = \frac{R_{a}X_{o}[(M+1)X_{o} - MX_{c}]}{R_{a}^{2} + (M+1)^{2}X_{o}^{2}}$$

As the amplification of the triode , M, is >> 1 the condition for negative input impedance is approximately:

 $X_c > X_c$ 

The effect of applying positive grid bias is to produce an appreciable input resistance to counteract the reflected negative input resistance component. Variable magnetic reaction can be used to raise the gain of the stage to offset the attenuated signal.

I thought I would see how this applies to the Gecophone circuit. I measured the inductance of the two Broadcast Range coils to be about 0.2 milli H and a 0.0002 micro F anode tuning condenser is used. This gives a calculated tuning range of about 125 metres to 375 metres. The inter-electrode capacitance of the early 'R' valves is quoted as 2.5 pico F [ref. 7]. Its reactance is much higher than the reactance of the inductance at these frequencies, so there will be a negative resistance contribution when the anode is tuned below the resonant frequency for the station being received.

#### A Final Discovery

Having gone through this effort I was still surprised at the degree of positive bias used in the GEC circuit – particularly as this seems to have been increased from +4 volts to +6 volts for the later production models. I then, quite by chance, came across an article in a Wireless World [ref. 11] by the Chief Designer of Burndept Ltd. The article is an informal lecture given to the Wireless Society of London in February 1922 describing the circuit and design rationale for a three-valve receiver suitable for wireless amateurs. He advocates a positive bias on the tuned RF stage to avoid instability and the use of a reaction coil to restore performance. His circuit shows a filament resistance in the most negative filament arm, which results in a positive grid bias of approximately 4 volts – just like the early Gecophone circuit I have been considering!!

#### References

[1] John Holloway, "No smoking, please!" Bulletin of the British Vintage Wireless Society, vol. 31, no. 4, 2006. [2] H.M.Dowsett, "Wireless Telephony and Broadcasting" The Gresham Publishing Company Ltd., vol. 2, facing p. 70, 1923. [3] Ian Higginbottom, "The Classics" Bulletin of the British Vintage Wireless Society, vol. 8, no. 2, 1983. [4] Wireless World and Radio Review, Nov 28 pp. 285-286, 1923. [5] Hutchinson, "Wireless Telephony and Broadcasting" The Gresham Publishing Company Ltd., vol. 2, facing p. 70, 1923. [6] "GECoPHONE Instruction Booklet, BC 3333" The General Electric Co., Ltd., Nov 28 July, 1924. [7] K.R.Thrower, "History of the British Radio Valve to 1940" MMA International Ltd., p. 35, 1992. [8] L.H.Morecroft, "Principles of Radio Communication" John Wiley and Sons Inc., pp. 432-443, 1921. [9] W.L.Everitt, "Communication Engineering" McGraw-Hill Book Company, Inc., pp. 506-509, 1937 [10] J. M. Miller, "Dependence of the input impedance of a three-electrode vacuum tube upon the load in the plate circuit," Scientific Papers of the Bureau of Standards, vol. 15, no. 351, pp. 367-385, 1920. [11] C.F.Phillips, "Discussion on Methods of Amplification", Wireless World and Radio Review, Nov 28 pp. 285-286, 1923.



Cabinet Set Socket Panel Inside



Cabinet Set Chassis Rear





BOOK REVIEW By Jeffrey Borinsky FIEE, CEng

Crossing the Ether: Pre-War Public Service Radio and Commercial Competition in the UK Seán Street John Libbey Publishing 2006

ISBN 0 86196 668 6 Paperback with CD pp 296 £22, available from Amazon UK and elsewhere

Many of you may think that UK commercial radio began in 1973. Capital Radio and LBC indeed started then but Seán Street takes us much further back. Before the pirate stations of the 1960s, before the Radio Luxembourg that many of us grew up with, right back to the dawn of broadcasting to The Hague and Fécamp. Their transmissions were not made from the UK but they were very much aimed at a UK audience. This book shows how they and other commercial stations influenced the BBC.



#### Seán Street

Most of you will know Asa Briggs' monumental five volume history of the BBC. This is the usual starting point for any serious research into the history of UK broadcasting. Many fewer will have heard of Robert Silvey. His book, Who's Listening, is the seminal work on audience research. This may be a somewhat arcane subject but it's well worth reading if you can get hold of a copy. Seán Street draws heavily on Silvey's work to demonstrate the influence of commercial broadcasting on the BBC, not just Who's Listening but also many internal memos which illustrate just how much the BBC was concerned about Radios Luxembourg, Normandy etc. Silvey is just one of many sources, well known and otherwise, that the author uses to make his case.

The BBC's attitude to commercial broadcasting was hostile. Right up until the outbreak of war the BBC made many attempts to suppress the competition. It could be seen as a battle between popular culture and BBC paternalism, much of which derived directly from Reith himself. The BBC was clearly influenced and the outbreak of war saw the BBC breaking out of its paternalistic shell and adopting many of the tricks of the commercial broadcasters. Post war developments are a minor part of this book but the brief summary is very welcome.

As an engineer, I'm especially glad that the author does not neglect the technology that made commercial broadcasting a success. His review of sound recording techniques is a good introduction to the subject.

There is no doubt that Professor Street has successfully shown how substantially the BBC was influenced by commercial radio. The one area where I'm not so sure about this book is the intended audience. It's a serious historical work. well argued and supported by extensive research and references. Could it also be aimed at a wider readership? There are a few photos and a CD with some rare and interesting clips, well worth having but not really enough to make this into a popular history. Despite this reservation I can thoroughly recommend the book to anyone who wants to find out more about how BBC radio developed from its dawn up to 1945.



The Ovaltineys, as heard on Radio Luxembourg

# In Search of Seymour by lain Wright

Crail: Picturesque fishing port, royal burgh and popular holiday town on the east coast of Scotland, ten miles from St Andrews. Red pantile roofs on whitewalled cottages, crowstepped gables, warm friendly people with musical accents. In fact, quite the last place you would expect to find the ghost of a radio manufacturer. But speak to any of the older residents and they will point you in the direction of the *Old Granary* and the last resting place of *Seymour radio*.



Assembly Line 'A', Seymour, Arbroath 1949

My first encounter with *Seymour* was two miles down the coast in Anstruther where for over 50 years Joe Urban had operated his radio and television business on the High Street. For much of that time he held the HMV franchise but by 2002 when I called in to see the collection of valve radios displayed in the old shop, it was clear that the end of an era was close. Much of the collection had already been disposed of but among the remaining items was a fairly standard table model with the name *Seymour* on the tuning scale. On the chassis the maker's plate read "Seymour Products ( Arbroath ) Ltd West Mill Wynd, Arbroath, Angus," something of a surprise since I had until then believed the Glasgow company *Allander* to be the only post war Scottish radio manufacturer. I bought the set for a reasonable £15 and felt quite pleased with my find.

Back home in Glasgow I found the Seymour A414 to be a well made offering and a strong performer. It also sported a trawler/ lifeboat/distress band, very useful in a coastal town like Arbroath, but in aesthetic terms whilst it tried to be modern it was rather uninspired. Nevertheless the set did seem to be Scottish in origin and that immediately elevated its status to the "rare and desirable" category, although there may have been a degree of patriotic bias.

Keen to learn more about the company I visited *Register House* in Edinburgh to examine the records. This elegant A-listed Georgian building in Charlotte Square can best be described as being steeped in old fashioned bureaucracy; a reader's card is required and you may not eat, drink, smoke or talk and by the way don't ask for a colour copier either. Having said all that, the staff were most helpful. The file on Seymour revealed that the Arbroath company had been incorporated on the 28rd June 1948, the certificate with the stated objectives of carrying on the business of radio manufacturing being presented by Manchester solicitors Hutton Hartley and Company. With a nominal capital of £100 the three shareholders were Robert Thomas Henry Brimfield of Victoria Park Manchester, Raymond Henderson Armstrong of Epsom Surrey and Eric Chilton Smith of Manchester accountants Bedell and Blair. Brimfield and Armstrong were also directors of Armstrong and Co (Wridale) Ltd. In March 1949 Gwendoline Isobella Lillian Brimfield became a director, with a preference share allocation of 2050 and Sidney Webster (250) a chartered accountant also joined the Seymour board. At this time the name of James McCulloch of Glenluce Wigtownshire, described as retired, appears with a shareholding of 1050. Fred Walsh, radio engineer of Barngreen, Arbroath was allocated 50 shares and since in a later return his address was given as c/o West Mill Wynd it was reasonable to assume that Mr Walsh was an employee. Share capital was increased to £25,000 which in today's money would equate to in excess of £250,000.

It seemed that *Seymour* were selling in some volume at this time for the company became liable for £12,052 -16/11d purchase tax for the period 1st August to 30th November 1949. *Seymour* paid £2052-16/11d on 9th December and a further £1000 on 16th January 1950 but the men at the Inland Revenue were not happy. Following court action it was agreed that the company should pay £1500 in February and similar amounts in March and April with the balance to be reviewed in the light of circumstances then affecting the company. *Seymour* 









Seymour console with record deck

Seymour consoles



Mr and Mrs Walker at home in Montrose with their Seymour Radiogram

did pay the first instalment but thereafter failed to pay March or April nor indeed the purchase tax due for its trading in the same months. Evidently HM Customs and Excise lost patience at this point and presented a petition for the company's winding up which was duly granted by Lord Sorn at the Court of Session in Edinburgh on 5th May 1950.

Seymour Products (Arbroath) Ltd was finally dissolved on 23rd April 1955 at the Sheriff Court in Dundee, the document being signed by Sheriff Clerk Kenneth Cullen. Interestingly the entry in the Dundee telephone book from November 1950 through to April 1955 reads: Seymour Products (Arbroath) Ltd. West Mill Wynd. In liquidation. Arbroath 2226. That then was the easy bit ; bringing these dusty facts to life was likely to be rather more difficult.

#### A railway journey.

In fact I had already established that the Seymour story had not started in Arbroath. The only reference to the company of which I was aware was to be found in that very useful booklet *Vintage Radio Valve Line-ups* which detailed the A41 models and gave the company name as Seymour Products (Ashton) Ltd, which suggested that the company had enjoyed a previous existence. A trawl of the GPO telephone books revealed that Seymour had appeared in the Spring of 1945 with an address listed as *Eider Works*, *Wellington Road* in Ashton under Lyne and in 1946 a second site at Keb Lane in Bardsley, but after 1947 the entries ceased.

Having already placed an advert in *The Bulletin* seeking to acquire a Clydelco crystal set (Clyde Electrical, a Glasgow company) I added "Seymour info" to my wants but from the handful of replies received it was plain that Seymour owners knew even less than I did when it came to background knowledge of the company. However, one response in particular proved quite surprising; Dave Lees offered not only a Clydelco crystal set and a Seymour radio but called from Ashton-under-Lyne, his home town!

Life of course is full of such coincidences, a fact which was underlined once again when in the process of a little research into Clydelco I found that I had been residing for ten years at the same address as William McClure,



the proprietor of the company, had lived in 1923. A story perhaps for another time...

Rather than risk my Clydelco to the vagaries of our postal system I opted to collect in person. I would travel by train and this would also allow for a little local research in Ashton, which at the time seemed a good idea but would soon prove otherwise.

In the days of steam a Coronation class Pacific would have stood at the head of the 8-30am Birmingham via Manchester express, its safety valves blowing off, eager to get away. Today on Glasgow Central's platform 2 however, no such drama was expected of the BREL Type 90 but a few electrical murmurings would have been encouraging. As it was the machine was ominously silent and several men in overalls were studying the locomotive, as though willing life into it. Thus I was not unduly surprised when at 9 o'clock the conductor announced that the engine had failed, somewhat superfluous for the fact was that most passengers had already noted that the scenery was not moving. At 10.15, by which time the ailing locomotive had been removed and a replacement coupled,



Assembly Line 'A', Seymour, Arbroath 1949



Two Seymour table models plus detail of dial we set off south. The improvement was only temporary for at Preston the Manchester passengers were invited to leave the train which was now going directly to Birmingham, however a service would be waiting to take us forward. It wasn't of course and indeed took another half hour to appear which meant that our arrival in Piccadilly station was no less than 3 hours late and my return train was already a third of the way home. With it went the *Seymour* research time.

Dave Lees arrived with my *Clydelco*, my *Seymour* and the next problem; the *Seymour* was a console and therefore unlikely to fit under my arm as planned. However with help from bemused but sympathetic fellow travellers I got it on and off two trains, into a taxi and safely back home to Glasgow. At the end of a very long day I was really pleased with my new acquisitions and the train was only 1 hour late which, by the standards of the railway system at that time, was nearly as good as being on schedule.

Over the next week I had a number of unproductive telephone conversations with uninterested libraries and local record offices in the Ashton area and so decided to turn



my attention once again to Arbroath. Within a few days a letter arrived from Joe Urban which would prove to be something of a springboard. Enclosed was a cutting from the Dundee Courier, following up on an earlier piece in which Margaret Lye, a reader (and Allander Symphony owner) in Perth had requested information about the company. Amply illustrating the value of publicity a response came from Hugh Walker, a former Seymour line engineer who had emigrated to Canada in 1951 from his home town of Montrose. The Courier also published a photograph supplied by Mr Walker, of the Seymour test area in Arbroath in the late 1940s and prominent in the foreground was an example of "my" console. Margaret had also traced Ian Lindsay, another line engineer now in retirement on the south side of Glasgow, which was rather handy.

#### A delay in the post

Dave Lees 'phoned later in the week to say that he had found a letter which he received ten years previously. Originally addressed to the Town Hall in Ashton it was an enquiry from a Seymour owner in Cowdenbeath, Fife, asking for any information on the company.



Knowing Dave's shop also dealt with old radios the Town Hall had passed it on but it had been misplaced and only resurfaced after my visit. He would send it to me and could I reply, albeit a little late. Perhaps the postal service in Cowdenbeath normally takes ten years for when I telephoned Adam Brown he seemed quite unfazed by the slight delay and yes, he would be most interested in my information file, such as it was then. Two weeks later Adam offered to sell his Seymour and thus I found myself with console number two, a one-owner set bought new in Dundee around 1949. This was interesting because the maker's plate clearly showed the address in Ashton-under-Lyne at a time when the company were supposedly installed in Arbroath and so raised new questions. Was this simply a case of using up old stock plates or was there another explanation?

#### West Mill Wynd

Hugh Walker was 78 when I first spoke with him in 2002 but he well remembered his days at West Mill Wynd. Following a radio engineering apprenticeship with Largs, who were later owned by Clydesdale, in Montrose and Dundee, Hugh had joined the company



Backlog of chassis awaiting cabinets, Seymour, Arbroath 1949

in 1947 as an assistant in the design laboratory under Seymour's ex-Ferranti chief designer Fred Walsh. Ian Lindsay also came to Seymour in the summer of 1947, straight from the RAF and recalled the lorries arriving with the contents of the Ashton works. "We all had to muck in and were still there at midnight" he said. "No overtime either". Quite why the company had taken the decision to move its whole operation 500 miles north to the east coast town of Arbroath is quite mystifying. Senior personnel relocated with the company. The former jute mill on West Mill Wynd contained several floors ; the ground level housed the sheet metal and engineering shop, stores, packing and despatch. On the first floor were A and B assembly lines, alignment, test and final inspection and also Fred Walsh's design laboratory. The offices, run by the accountant Sidney Webster assisted by Fred's wife Ella, were to be found on the second floor as was the works canteen. The boardroom on the top floor had a separate telephone line (Arbroath 2544) and finally, also on the top level, directors Robert and Gwendoline Brimfield lived in the "penthouse flat" - in some style according to Hugh Walker. The couples' parties were apparently legendary in Arbroath and Ian Lindsay used the very forties term "glamorous" to describe Mrs Brimfield. Their flamboyant lifestyle extended to an expensive taste in motorcars: Mrs Brimfield drove a Humber Super Snipe whilst her husband favoured an American Buick. Two dwelling houses also flanked the entrance to the works, one occupied by production manager Ted Sutton, and the second by Fred Walsh the chief designer - perks of the job, presumably.

#### The Workforce

It seems that around 80 workers were employed at Seymour, those on the assembly lines being mainly female. Training was in-house

although many had a head start possessing already a dexterity gained from experience in the local jute industry. Ted Sutton was production manager, Bill Shepherd test foreman, Bill Donaldson ran the machine shop and David Lamb managed the stores with assistants John and Agnes. Johnny Cargill, Ian Lindsay, Hugh Walker, Don Witton and "Polish Mike" were all line engineers. "Cold and difficult to heat" said Hugh Walker of the old mill, "so much so that many of the girls brought hot water bottles to work" he added. I didn't ask where they put them. The works canteen supplied hot meals and so it is comforting to note that the welfare of the workforce was not entirely neglected. But despite the chill, romance flourished for Ian Lindsay met and married Margaret Carnagie Reid, an inspector on A line. In 1950 Ian, along with Seymour colleague Don Witton moved on to set up the radio and television department of the local *Co-op*.

#### The Products

Unlike many of the smaller radio concerns, *Seymour* was well justified in describing itself as a manufacturer; the product was designed in house, the machine shop guillotined, formed and drilled the chassis, the assembly lines fitted all the components and final assembly married chassis to cabinet and tested, leaving final inspection to complete the job. Only a very few tasks were entrusted to local sub contractors such as the screen printing of the tuning scale and the chassis electroplating. Cabinets came from the Co-op furniture factory, perhaps a carry over from the Manchester days, but after some veneer lifting problems the contract was awarded to the *Fife Furniture Company* in the port of Cellardyke, near Anstruther.

Seymour products were not ground-breaking in any department



Test area, Seymour, Arbroath 1949

but they were solidly made, reliable and performed well. The range covered console and table radios in ac, ac/dc and battery forms and also included radiograms with some models at the luxury end of the market. "Good sound value" and "Made in Scotland" proclaimed the company's advertising in late 1949, but at £21-15/- for the table model and £86 for the deluxe walnut radiogram not even a healthy dose of new found Scottishness could have disguised the fact that the product was really quite expensive. Of all the Seymour offerings the console model was possibly the most attractive and is thought to have sold well ; it was also available with a record deck but this variation whilst neat involved repositioning the radio control knobs and tuning scale to the front of the cabinet rather spoiling the clean forties modernist lines. Bizarrely, the console sat on tiny Queen Anne style legs! Today however, this model is a rare find. The table models had little to distinguish them from many others except perhaps in the standard provision of a trawler band and of course, the "Made in Scotland" tag. Technically the company played safe and opted for the tried and tested 4 + 1 line-up utilising both International Octals and Mazda in the model range possibly to ensure continuity of supply as much as cost considerations. This cautious approach probably paid off for, as I will detail later, Seymour's turnover was considerable for a relatively small company. Most of the models in the Seymour range endured alpha numerical references but on at least two occasions the company broke with tradition in using the local names Angus and Montrose, after the county and the town. Is this possibly unique I wonder? Answers on a postcard please. An example of the Montrose, a table model, appeared on eBay earlier this year but very nearly met its end whilst entrusted to a national carrier although it is to be rebuilt I believe. Bakelite did not feature in the model range although with one telephone call to Plessey and a spot of badge engineering the company could have filled an obvious gap in the catalogue. Perhaps Seymour felt such an offering would harm sales of their wooden case sets or was it possibly a matter of insufficient profit margin?

For the September 1949 Scottish Industries Exhibition in Glasgow's Kelvin Hall, *Seymour* updated the table and console range, giving them an angular, modern look and the company also unveiled its first

television, a "tambour door" console. This 21 valve 12in. television was also announced in "Wireless and Electrical Trader" and was to be available "early in the new year". About this time they took full page advertising on the back cover of the monthly *Scots Magazine* promoting the 1950 model ranges, in colour, which was quite adventurous for a small concern. All this must have been well received since Seymour took orders worth over £100,000 but back in Arbroath the storm clouds were gathering. Hundreds of chassis were being stockpiled awaiting cabinets, perhaps because the supplier Fife Furniture had unsettled accounts and the Inland Revenue were demanding payment of outstanding tax bills. It all ended in tears at the Court of Session in Edinburgh when on May 5th 1950 Seymour Products (Arbroath) Ltd was wound up. And that, you might think, was that. Well no, not quite...

#### As one door shuts...

An announcement in the 19th January 1952 issue of *Wireless* and *Electrical Trader* read: "Fife Radio and Television Ltd has acquired the business of Seymour Products (Arbroath) Ltd. The new company is associated with Fife Furniture Ltd which designs and makes the cabinets"

Desmond Appleby was a lieutenant with the Royal Naval Air Station at Crail and when his service ended in 1946 he and local cabinet maker James Brown joined forces to establish Fife Furniture. They acquired a workshop in Cellardyke, on the edge of the airfield, a long low building which had previously housed a single seater aeroplane belonging to the local GP, a Doctor Armour. One of their contracts was producing cabinets for *Seymour* in Arbroath and so when that company failed an opportunity arose to expand the business. The Old Granary in Crail had been in Admiralty hands during the war so Appleby was very familiar with the building and it was also available. Thus, somewhere around the late autumn of 1950 preparations began to restart Seymour production and once again heavy machinery was transferred, this time from Arbroath, to be reinstalled in the new premises. The new company was named *Fife Radio and Television* (Tel. Crail 240) but strangely no announcement



Advertisement for Seymour on the rear page of The Scots Magazine 1949



#### The Old Granary, Crail as it now appears

of the acquisition appeared in the trade press until over a year later. With the equipment came key Seymour personnel: Fred Walsh, chief designer, Bill Shepherd, now production manager, John Wilkie and Hugh Walker with their inspection and troubleshooting experience and line engineer "Polish Mike" to name a few. Former MD Robert Brimfield was also occasionally seen on site but as far as is known he had no official involvement with the new company and acted only in an advisory capacity. As before, the largely female labour force was recruited locally and through the Crail Heritage Museum I met two of the former line workers, Jean Meldrum and Janet Martin. Today Jean owns an antique shop in Anstruther but on joining at 16 in 1950 with a wage of £3 -2/6d a week, her first job was polishing the radiograms in readiness for despatch but as flexibility was important to the small company she also had to learn the various tasks on the assembly line. The firm was apparently good to work for, although the cold and draughty nature of the Old Granary meant that hot water bottles were still the order of the day. Just as the Brimfields in Arbroath enjoyed the highlife, Desmond and Dorothy Appleby had a reputation for frequent champagne parties at St Adrians, their house in Anstruther. The workforce viewed all this with a certain amusement until the day they were called one by one by the local labour exchange office to explain why their National Insurance stamps had not been paid. "I was affronted. Champagne and no payin' the stamps!" said Janet, still outraged after 50 years.

Perhaps surprisingly, it seems only radiograms were manufactured at the Old Granary and then only to order but nevertheless the thirty or so workers turned out between 40 and 60 each week for delivery to customers who included *Gamages* and *Barkers of Kensington* in London and *Jenners* in Edinburgh. However, not every delivery went according to plan; Fife Radio operated their own delivery vehicle and driver, a exiled Londoner by the name of Len Black. Janet Martin recalled the morning that Len left fully loaded heading for *Barkers of Kensington*, only to return an hour later with the Bedford damaged at the front end. A few miles down the coast a cow on the way to greener grass had ambled into the path of the truck with the inevitable result and so when the rear doors were opened the



Advertisement for Seymour on the rear page of The Scots Magazine 1949



#### Fife Furniture, 2004

cargo of radiograms had been replaced by a large consignment of matchwood. The insurance payout, I was told, covered the truck, fifty radiograms and one unfortunate Ayrshire cow, name unknown!

Many of the Fife Radio employees were very young, some straight out of school and quite a few still live in the area and so I found myself in the unusual position for a researcher, of being rather spoiled for choice. In fact I could have interviewed nine or ten former workers but time did not permit and so I settled for a second trip to Fife and a meeting with Charlie Urguhart, John Allan and John Bett, all young assembly-line workers in 1950/51. They were able to confirm everything I had heard from Jean and Janet: the L-shaped factory had been laid out with the storage/despatch in the basement, final assembly on the first and chassis assembly/alignment on the second floor. Fred Walsh had his design laboratory on the top floor. Only radiograms and no production television but Charlie did point me in the direction the St Andrews Heritage Museum where he remembered seeing an article on the Seymour television in a Glasgow newspaper. One comment puzzled: the shop floor managers such as Bill Shepherd and John Wilkie were apparently not in the factory every day, a fact that Jean and Janet confirmed. A possible explanation might be however that they also were engaged in the running of the Arbroath works for there does seem to be an overlap in dates.

#### Scandalous goings on (allegedly)

Many of the former Crail employees related this tale (with a twist) of small town gossip: Dorothy Appleby was the managing director's wife, and seemingly a most attractive brunette, a fact that had not gone unnoticed among the local romeos of Anstruther. In the town, rumours began to circulate which linked the lady to one particularly infamous individual. In a modern version of pistols at dawn, an irate husband Desmond, apparently placed an intimation in the East Fife Observer to the effect that any person publicly repeating these scandalous suggestions could expect immediate legal action to be taken against them! Allegedly.



Photo article from The Bulletin, 4 March 1952

#### Television: a bright future?

In Crail, Fred Walsh continued the television development interrupted by the failure of Seymour Arbroath and had at least one working prototype on which the whole workforce had watched the funeral of King George VI in 1952. The model was demonstrated extensively and it seems likely that orders were taken but everyone I spoke to agreed that no assembly line was ever set up to manufacture sets in the Old Granary.

Seymour had already started to promote its television in the autumn of 1949, but events had of course overtaken the company and it seems history was about to repeat itself. Showing a reporter from the East Fife Observer around the factory on 28 Feb. 1952, managing director Desmond Appleby said the firm was "working night and day" in order to be in a position to begin production in March. "We are already receiving more orders than we can cope with" he added. The article stated the workforce to number "about 50" and production of "radios and radiograms at a steady output of between 60 and 70 per week" which makes an interesting comparison with the personal accounts I had already received. The paper also quoted Mr Appleby's age as being 29.

The PR department must have been in full swing, for only a week later *The Bulletin*, then a national Scottish daily, ran a centre spread on the new television venture picturing Fred Walsh and Nina Anderson working on different styles of chassis. "The only all–Scottish television sets... ...nimble fingered Fife girls kept busy assembling sets to meet the huge demand." Priceless publicity but not, I suspect, entirely accurate.

I think the reality was that Fife Radio and Television was simply running out of money and was thus not in a position to take advantage of the television sales boom that the run up to the Queen's coronation would bring. Even local dealers were preparing to cash in, such as *Gray and Pringle*, the Murphy agent in Anstruther who to celebrate the opening of the first





Reference for lain Lindsay (Line Engineer) Scottish television station on Friday March 14th 1952 "cordially invited the public to a demonstration in Watson's Tea Room at 7.30pm". These were very civilized times.

It was all over on September 11th 1952 when a meeting of the creditors of *Fife Furniture Ltd* voted to appoint a liquidator, Mr Robert Clark of Leven. Things moved quickly and within two weeks warrant sales were held at the company's Cellardyke premises and at Desmond Appleby's home in Anstruther. This elegant house would itself be on the market in a very few weeks.

Strangely, no mention is made of Fife Radio and Television in these announcements but as it does not seem to have been a limited company in its own right it is very likely that it met a similar fate.

The Old Granary moved on and became the new home of Leadbetters Homemade Sweets, (its old home having been in Mr McAughey's kitchen) and many of the Seymour girls found employment there. Later still Dr. Brennan, an Irishman with apparently dubious qualifications, ran Truview, a company specializing in rejuvenating television tubes. Eventually the old building was reborn as luxury flats, a status it enjoys to this day.

#### Back to the beginning

Whilst I felt happy with the outcome of my researches into the Crail operation and was reasonably content that I had uncovered most of the facts, it seemed that as far as the original company was concerned there were loose ends. What for example, had happened to *Seymour Products (Ashton) Ltd?* To find the answer I contacted *Company House* in London. There was indeed a Seymour file but apparently not all public records are free and this one required a substantial charge to access it.

The file, all 150 pages of it, arrived by return in a rather pompous manila A3 and made fascinating reading. It revealed for instance, that *Seymour Products (Ashton) Ltd* had called in the receiver shortly after the move from Manchester to Arbroath.

Television reaches Arbroath, 1951

On 19th August 1948, Barclays Bank had appointed Eric Chilton Smith CA as official receiver and manager, the same Mr Smith who had previously been a director of the company and had been involved in its setting up in 1942. Indeed, the very Mr Smith who owned 50 preference shares in Seymour Arbroath set up only two months earlier. Whatever happened to conflicts of interest?

The original company, Seymour Products (Ashton) Ltd was registered on the 8th of April 1942 with a nominal capital of £1000 in £1 shares with the registered office being at Eider Works, Wellington Road, Ashton under Lyne in the County of Lancaster. Initially the directors listed were an accountant and company secretary both in the employ of Manchester accountants Bedell and Blair but were replaced in September 1944 by Arthur Woodhouse and Jane Armstrong. Arthur Woodhouse stepped down in February 1945 in favour of Raymond Armstrong. Robert Brimfield ,also a director of Armstrong (Wridale) Ltd was appointed to the board in September 1946 along with Robert Sutton and solicitor Richard Attwood and in January 1947 Bedell and Blair informed the Registrar of Companies that the Seymour registered office was now at 32 Westminster Palace Gardens in London. Also in 1947 Harold Amelan, a director of Northern Wholesalers, was appointed, as was Eric Chilton Smith CA. Finally, in a return dated 17th August 1948 only two directors remained: Robert Brimfield and Ernest Blackwell.

The next day the receiver was appointed.

#### All rather confusing

As we have seen, from mid August 1948 the receiver was in charge of Seymour Ashton and it seems, running alongside was the newly formed Seymour Arbroath under Robert Brimfield, but even with the benefit of a substantial file from the records office in Kew, I quickly realised that figuring out who did what and why was not going to be particularly easy.

The payments and receipts showed that

Tuesday, March 4, 1952 .-



A busiling new industry is to be found in the quiet oid lishing port of Crail in the East Neuk of File. At a factory there the only all-Scatikh the elecialon sets are made. Nimble-lingered File girls are kept how these days assembling sets to also brought work to Anistather, for calinets to hold the Crail-made television sets and rediograms are made there.

Thus two quict little File tourns are keeping in the forchront of industry, and are playing their part in supplying TV sets in time for the opening day on March 14.



lere is a craftsman who can be proud of his work. At the factory in Grail, Fr here television sets and radiograms are made, designer and chief technician Fr Walsh works on an advance model television receiver.

Photo article from The Bulletin, 4 March 1952

the receiver was generating a very healthy turnover - £125,000 for the period August 1948 to August 1949 - with a net profit in excess of £20,000. With a total spend of over £80,500 *Northern Wholesalers* topped the sales chart followed by *Gamages* on £32,500 with numerous electricity board showrooms, co-operative societies and wholesalers up and down the country all placing sizeable regular orders. The wages and salaries bill stands at around £200. Interestingly, the receiver was also supplying the newly formed *Seymour Products (Arbroath) Ltd*, whose orders were valued at £6,500 over the period.

In the same period 1949 to 1950 *Gamages* do not seem to have placed any more orders but *Northern Wholesalers* request a further £126,000 worth of goods but in the following year this reduces to only £30,100 and only £4,000 of additional orders are recorded from miscellaneous sources. After March 1952 sales cease altogether and the receiver balances the books at £372000-9/9d. in February 1953.

The documents also reveal an interesting and unexplained association with another radio manufacturer, Raymond Electric of Perivale in London, which begins in May 1949; Seymour under the heading "purchase of goods" spends £124,000 with Raymond up to August 1950 and also pays the company £97-4/10d per week in wages and national insurance which quickly increases to £200 and then £250. This arrangement ceases in October 1951 and is replaced by Seymour paying rent to Raymond Electric of £62-10 /- per week up to July 1952. Then, in late 1951 Seymour receives £23,750 from Raymond "in repayment of loan" but as there is no previous mention of a loan it perhaps predated the receivership. Since there is no indication that Raymond Electric purchased Seymour from the receiver, it may well be that the two companies had been financially linked for some time. Seymour also spent £6000 in late 1949 with Felgate Radio, another east London company and manufacturers of the McCarthy brand. Felgate are thought to have been associated with Raymond Electric.

Confused? I was too and went to considerable lengths in an effort to shed some light but with little success. I did track down the last address, near Blackpool, of Fred Walsh but sadly he had passed away in 1998; a pity, for Fred as chief designer would have undoubtedly filled in most, if not all the gaps in my research. In the absence of dialogue with the people involved at the time and it has to be said, at the right level, one can only speculate. One does wonder however how much latterly was simply paperwork, shifting money around between companies.

Seymour continued to exist as a non trading company, posting annual returns from its registered address with Manchester solicitors *Amelan* (remember that name?) *and Roth* until November 22nd 1977 when the notice of the company's dissolution appeared in the *London Gazette*.

#### Seymour today

The East Neuk of Fife is a wonderful place to visit and if you are very keen on taking the *Seymour* history trail then the Old Granary still stands on Westgate in Crail while on East Forth Street in Cellardyke the former cabinet factory of Fife Furniture (and Dr Armour's aircraft hanger!) remains in use to this day and still in the joinery trade.

In Anstruther Joe Urban, who began my search, has retired from business on the High Street and now restores old technology in a wynd nearby. *Gray and Pringle*, who sold their radio and television business to Joe in 1952 still trade next door to his old shop in a building much as it was 55 years ago. *Watson's tearoom* on the other hand, has long gone but as you walk around the pretty little town you are sure to come across Desmond Appleby's former home at St Adrians while in the harbour area the maritime museum features a *Seymour* radio in one of the displays.

Over the Firth of Tay in Arbroath all traces of West Mill Wynd have now vanished and in Ashton under Lyne I suspect a similar fate has befallen the Eider works on Wellington Road.



Seymour Television 1949

Examples of Seymour products are not common but do turn up occasionally on *Ebay*, in particular the forties console, still a stylish and practical piece of furniture. Nor are they expensive - I recently bought an Arbroath - made late model console for 99p. Fortunately it was in Edinburgh so collection was easy and if all that wasn't enough - it was in good working order!

#### In conclusion

Did I succeed in finding Seymour? Generally speaking I think the answer has to be a qualified "yes" for I do accept that many questions remain unanswered. Tracing the people involved at the time is always the most rewarding route to successful outcomes in such research but in the end with the passage of so much time it simply becomes a matter of luck. In this respect I was very fortunate to have traced so many former employees and to have been afforded access to the superb original photographs reproduced here.

That is not to say that the story necessarily ends here; there is the possibility that a trawl of the company records of *Raymond Electric* would shed some light on the link between the two concerns and that would inevitably raise even more questions.

But who was Seymour anyway? When I began this research I had an image of a small family run business but it seems the original directors simply followed the popular Manchester tradition of celebrating the life of Jane Seymour, third wife of Henry the Eighth. There are for example, currently some thirty streets so named!

Perhaps one day I will take another look but for the moment the Seymour file goes back on the shelf.

#### Acknowledgements

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# Making a Coil Winder (mostly from the junk box) part 1 by Gary Tempest Improvements, modifications and winding an interstage transformer in part 2 (to follow)

Why make a coil winder? Well with old radios eventually you come up against open circuit components and for the one I was restoring this was the case. It had an open speaker field coil and push-pull inter-stage transformer. Yes! There are ways around re-winding such as substitution of permanent magnet speakers and other transformers. But this is really fixing a radio up and isn't restoration. It's so much more satisfying to rewind and put the set back as it was originally.



In the past I have rewound series field coils using a variable speed battery drill held in a vice. These fields have relatively few turns and a largish wire size but this radio used a shunt coil with lots of turns of 38-gauge wire. Obviously for it and the inter-stage transformer something better than the drill in the vice was needed.

#### **Basic Requirements**

The field coil in question weighed three pounds and as it used a bobbin without cheeks this was almost all copper wire. It and the feed coil, being so heavy, were going to need spindles supported at both ends. I knew from experience, with the drill in the vice, how much better it would be to have a foot pedal for start and stop and control of speed. Later I was to find that some sort of traverse, for the feed wire, made for a much more uniform winding. For the field coil I wouldn't really need a turns counter, just fill a new bobbin, but for the inter-stage transformer this would not be the case. Finally, as I wouldn't use it much I wanted it to be low cost, with parts mainly from the junk box.

#### Construction

I'll keep this description relatively simple; in the event that anyone should want to make a similar machine, the pictures should tell most of the story. However, I have given some dimensions of my effort, which should assist another constructor.

Fortunately I had a variable speed battery drill with a well worn chuck and a tired battery. The chuck no longer gripped drills sufficiently for high torque jobs but was fine for coil winding as not a lot of torque is needed. The battery would hold charge long enough and I could substitute batteries from other drills (the battery holder is less specific than an actual drill).

Once stripped down, the chuck, gearbox and motor assembly were mounted as shown in the pictures. The gearbox and motor come apart so both need to be individually clamped. The clamps were

made from scraps of plywood having a hole cut through them with a hole-saw. Once cut in half, across the hole, I put a locating key (a 'lost head' nail with its head proud) which fits into slots in both items. Then long thin wood screws were used to tighten the clamps. In the case of the motor clamp this is also screwed to the side panel.

The gearbox was best set for screw driving as it gives a much smoother start although the maximum speed is less. In practice, most drills in this mode are specified at 400 RPM, which is adequate. I included a cover over the motor end to protect it upon entry and exit from the loft where it will live between jobs.

As can be seen, the trigger and speed control are built into a simple housing, with the control best operated without a slipper! The battery simply drops through the hole with the rewired connector being attached as this is done.

The drill takes three to four amps so I used a large wire gauge between it and the foot control. The only heavy wire I had was some spare cooker cable so I stripped the red and black wires from that. At first the items were hard wired but this got inconvenient so I included a plug and socket (US line types).

The traverse for the wire feed is the piece of chrome plated tube, scrap from an old shower installation. It's simple and how I use it is described later. Well, you didn't really expect me to come up with a gear driven backwards and forwards mechanism as used on Pro. machines did you?

The frame was made from15 mm thick plywood and dimensions (which would vary with the drill used) are: overall length 15.5, depth 10.5, height 9.5 inches excluding motor cover and turns counter. The feed wire spindle is set back from the front by 2.5 inches and is 2.5 inches up from the inside base. The traverse tube is 2 inches back from the feed wire spindle and 5.5 inches up from the inside base. The motor spindle is 3 inches in from the rear and 6.25 inches up from the inside base. The centre holes, for the feed and take up spindles, were drilled with the side panels clamped together of course. The



Motor and gearbox mounting



#### Gearbox clamp

traverse tube is fixed in place by cutting two plywood discs, that fit the inside of the tube, and screwing them to the side panels.

Initially I only had a hole in the left-hand side piece for the motor spindle and therefore made this side relatively quickly detachable. It is held to the bottom with furniture blocks having a machine screw. However, in practice when trying to fit the bobbin for the new wound coil it turned out to be very awkward. The solution was to slot the hole and fit an easily removed 'bearing cap'. All bearing holes were lubricated with lithium grease.

The feed and motor spindles were cut from easily obtainable 10 mm studding. I found out that the feed and new coil bobbin need to be securely fixed so I used a wing and a full nut locking one against the other. I did the same for the end of the removable spindle for the feed bobbin and locked these up hard before starting. It's surprising how things become loose with the inevitable vibration. Slippage on the wound coil only gives a few more indicated turns, a jam on the feed means the wire breaks!

#### **Turns Counter**

#### Introduction

I looked around for some time for a rotary counter (tape recorder etc) but did not find anything. Anyway they may have been difficult to drive requiring greater mechanical input than electronic. There are electromagnetic counters but they are relatively expensive and of course they still need some sort of switch, operated by the shaft upon which the coil is mounted, to provide input. So I turned to 4000 Series Cmos, which is now obsolete although fortunately still readily available. It's excellent for low-speed applications with good noise immunity. I was lucky enough to work with it (and most other logic families) but it's now getting on for a couple of decades since I did so. I enjoyed my trip down memory lane whilst designing this useful and inexpensive circuit. It can be built for a few pounds but I had most of the components anyway.



Gearbox location



Motor clamp

#### The Circuit

If you have done much work with Cmos logic then this circuit will be simple and you will rapidly move on. If not then I expect it will look daunting, but maybe with some explanation all will become clear. This 4000 series of Cmos (Complementary Metal Oxide

Semiconductor) uses p-type and n-type Mos Fets to achieve its logic functions. When looking at the schematic the first thing to appreciate is that I have only drawn one sample counter output and its associated buffer to LED 5. All the rest are repetitions and given in the 'running out' lists below. This is much easier to do than a full drawing and how we convert that information for wiring anyway.

The counter is two 4024, 7 stage ripple counters in cascade. The counter outputs are buffered and inverted (3 off 4049 devices) to light LEDs for the output display. The counters work in binary and so a little arithmetic addition (or a scientific calculator) is needed to convert the LED display into decimal for the number of turns.

The decimal values for each LED are given on the label that is glued below the display. So as an example, say LED's 8, 5, 4, 2 and 1 are lit then just add 128, 16, 8, 2 and 1 to give 155 turns. Alternatively, enter the binary number into a scientific calculator that will do the conversion. You put in 10011101, with unlit LED's counting as 0, and up comes155. Unlit LED's, of higher order than the last one lit, don't count as they wouldn't if the display was in decimal. It has a maximum count of twice the last LED minus one, which equals 16383. If you go 'round the clock' its simple to make a note (mental if you trust it!) and just add this to the total. This may seem cumbersome but I was used to counting in binary and it is something you quickly get the hang of. For an occasional use coil winder it is good enough. Another way to use it is to work out what LED's will be lit for the number of turns needed first. Then simply mark this on the label with a soft pencil that can be rubbed off later.





Foot switch without battery

Coil winder left side

Foot switch with battery



Turns counter

0

It's easy to design a counter to display decimal but it needs a lot more logic devices. To start with decade counters (cascaded), for each digit, followed by decoders for 7 segment displays. Apart from cost the greatest thing against it is the increased wiring complexity as this was going to be hand wired on IC Vero-board (which is not getting any easier!). So I was sticking with a KISS design (KISS equals 'Keep it Simple Stupid'). It's easy to dream up additional functionality and complexity until you come to wiring and then you wish you hadn't. Of course it's a different matter if you have a draughtsman and a model shop standing by to make you a printed circuit board. My wife, who is into 'high end' sewing machines, said: "Can you pre-set the number of turns and go away and leave it to switch off when it's finished". "Ugh! No it won't do that" but I had to smile. A friend asked could it count backwards if you need to take off turns following a mistake. No! It won't do that either as that would mean Up/Down counters rather than simple ripple ones. These counters are more complex, needing up and down clocks and controlling logic. The result of this is that you get less bits per device so two devices become four plus the extra control circuitry.

Back to the circuit. The only slightly tricky part was the 'slotted switch' to give one input per revolution of the motor and coil spindle. This uses an Infra-Red transmitter and receiver (obtainable from Maplin at the time of writing) with the beam mostly cut off between them by the spindle mounted 'chopper' disc. This has a hole drilled in it that allows a pulse of IR once per rotation. I reckoned, from experience, that I would need a Schimitt trigger circuit to de-bounce the receiver output. Upon initial experimentation I decided that I could do without it but I should have been guided by the past. The edges that had looked quite clean on the 'scope' certainly weren't in practice resulting in multiple counts. So in went the Schimitt and this did as expected to give correct operation.

Schimitt trigger circuits were around in valve days and were made using 'long tailed pairs' with some positive feedback. With suitable bias their output would switch at a certain input voltage for a rising edge. However, in the opposite direction, when the input was falling, they would not switch back until the level was several volts lower than before. So ragged input edges, where the voltage jitters about, are converted to unambiguous output by this hysteresis window.

40% 1024 25 124 42 15 0 4 2 1 2 2045 512 COLLWINDER COUNTER LED LABEL



Turns counter circuit

The 4093 Schimitt device used here has four, two-input inverting AND gates. But, if the two inputs of one gate (the other gates are unused) are strapped together then it becomes a simple logic inverter. The IR receiver when cut off has a high output going low when the hole in the disc passes by. This negative edge is inverted twice (IC 6 and IC 5) advancing the counter on each still negative going edge. The counters are reset to zero by a positive going pulse from the "Reset" switch. In actuality I just placed a couple of pins adjacent to each other on the circuit board for easy shorting.

The BC107 transistor provides an alternative test input for the counter board. A low frequency audio generator can be used to verify correct counting action. The 1.5 nF capacitor across it is just an RF filter, for the input wire of the 'chopper' circuit, that I put in before the 'cure all' Schimitt trigger circuit. It may be unnecessary now but it will do no harm. As the crude EMC tests (see below) were made with it I'm reluctant to take it out.

I wasn't anticipating power cuts for the bench supply I was going to use, but I do have an Earth Leakage Trip and it's easy to unplug the wrong thing so battery backup seemed good insurance. A PP3 and a couple of changeover diodes provide this.

The IR devices were not as the sensitive as I expected. The diode needs a lot of current (40 mA) to achieve good bottoming of the receiver (a transistor with an open base) and this was with only about 3 to 4 mm gap between them. The data sheet quotes a maximum continuous current of 100 mA with up to 1A being allowed, with pulse operation, for applications needing greater distances.

#### EMC

Which stands for Electro-Magnetic-Compatibility, which I'm sure we are all aware of. Basically it means my kit won't interfere with yours and yours won't affect mine, even if it is a DC to blue light generator, because mine's such a bloody good piece of design. No one who has been there would be so gung-ho of course. Before the 60's not much was known or taken into account by many designers for it. Since then a whole branch of electronics has developed around it. My first initiation was back in those ignorant days and an embarrassing incident that was



best not to be too close to, which fortunately I wasn't. It was at the start of the new digital age, whilst analogue telephony was still top dog. The US had developed T1 equipment, for putting 24 channels of speech down two, two pair, lines. Over here it was seen as ideal to expand the low grade cabling between Tandem Exchanges around London. Tandem Exchanges were at the ends of spokes of a wheel, away from Main Exchanges at the hub. Obviously there was a lot of Tandem traffic and the old (Victorian era) cabling between them was now inadequate. What a panacea this digital; put in some racks and get a huge increase in traffic capability without having to dig up the City. So the company I was with,

an offshoot of US ITT, had built on their T1 design and adapted it for use here. Anyway, after the equipment had been designed and built it was put up for trial by the then British Post Office between two City exchanges. It didn't last very long, next door to racks of Strowger (electro-mechanical switching), on the same station battery. The Alarm Card in seconds was more like someone's Christmas tree lights. So it was installed and ripped out within a few days, with much egg on face, not to return for some considerable time. A memorable culprit was a discrete transistor ring counter, used for channel selection at each end of the link. However, its noise immunity was poor and a single 'spike' into the ring

and Mrs Smith who wanted to be talking to Mrs Jones wasn't. Of course the ends lost 'sync' as well and up came the alarms.

Even later, on 30 channel equipment (approximately US T2) built to comply with European Standards, many of the lessons had to be re-learnt as it used the first logic RTL devices. This stood for Resistor Transistor Logic and I still have a data sheet of the family. All of it only takes up a few pages whilst later several books were needed for the newer families (Cmos and TTL). It's an easy logic to understand and quaintly the data sheets even have a pack circuit diagram that is understandable by mere mortals. They didn't contain much logic of course and were in a





Turns counter switch mounting



Turns counter switch from the rear

Turns counter switch





Turns counter switch construction

round can, a throwback to its transistor origins, and the lead out wires had to be shaped spider fashion to mount on the printed board. This time, when the equipment got fielded, it did its stuff without alarms flashing. However, at first I was always a little apprehensive inside exchange buildings waiting for 'glitch of the week' to light a lamp and sound the bell.

One of the development pieces of kit was a big relay with its normally closed contacts wired in series with its power. An insulated aerial, from this spark transmitter, was probed around the rack and the circuit boards and each time it caused disaster the problem had to be found and cured. Eventually it could be done and after some trepidation nothing happened.

So what's all this got to do with this simple counter for a coil winder? Well it applies equally as if you want the number given to match the turns applied. I'm happy to say on my bench supply, that's nothing special in quality, it's good but on another or a purpose built supply it would mean re-testing. If I had made a supply for it I would certainly have put it in a metal box with a filtered IEC connector, used a transformer with an electrostatic screen and had high frequency decoupling across the output.

Testing was simple (I didn't make the relay!) I just set the count to 1 and then did all I could to annoy it. This included a 1.4 kW hot air gun being repeatedly switched on and off alongside it and using the same power socket strip. Then a big soldering iron plugged in and out, which gave one change of the lower order digits (11 non-turns) but I was never able to repeat it. I left it on for 48 hours with all the normal household activity, including a computer next to it, and it never changed. So I feel confident that I will get the number of turns I want and I won't be trying to upset it either. I doubt that it will be affected by electrostatic pick up and I can say that holding another tired battery drill alongside it, with a fireworks display emitting from the brushes, had no effect.

#### Construction (for those who

may want to make one) The counter board used a piece of IC Vero board. It's always good to use IC sockets as it allows the devices to be put in later and it makes 'buzzing out' (from the sockets) less painful. I used mainly 32 SWG 'self tin' enamelled copper wire, which makes things a little easier. Best to keep it away from bare passive component leads as the idea behind this wire is that when it passes itself it would be very unlikely to have two coincident nicks in the insulation. If you are cautious you may want to use wire with greater insulation for the positive power connections.

The LED's are mounted on 5 mm centres to line up with the label.

Once wired and checked out, the logic devices can be put in place. Treat them as static sensitive and dab your fingers on an earth before doing this.

The box, to mount it to the side of the coil winder, was made from 10 mm MDF with a slot in each side to allow the board to slide in. A piece of scrap aluminium was used to make a front and have somewhere to glue the label. The box and board are quickly detachable (one screw and disconnect three wires) so they can be safely stowed when the winder is stored away.

The optical switch circuitry is mounted on a couple of small pieces of copper strip Vero board glued into saw cuts in a piece of 10 mm thick MDF. In the picture "Turns counter switch" an external resistor can be seen. This was to increase the current through the IR diode, as initially it was insufficient. If the schematic value is used then of course it isn't needed. Switch construction is somewhat complicated. It is mounted on Magtrix Magnetic Connectors, now discontinued from Maplin (like so much else at component level), that I had had for some time awaiting a job to do. They allow the switch to be quickly removed, freeing the chopping disc, when the motor shaft needs installation or taking out. An alternative would be to use a magnet (fridge type say) in the back board and have a thin piece of mild steel glued to the rear of the switch. This would allow easy positioning and it could dangle off of fixed wiring when de-mounted. An even simpler possibility would be solid mounting for the switch and make the hole in the disc a cut out. It could then be rotated to this to allow it to be moved out of the way before removing or replacing the motor shaft. I went for the hole as the disc is always in the slot and I reasoned that gross misalignment would be less spectacular! To prevent the disc inadvertently rubbing on the IR devices I put U shaped pieces of wire around them covered with 1.2 mm silicon rubber sleeving.

If Magnetic Connectors can be found, these are recessed into the MDF mountings. A wipe of super glue was applied to the outside before pushing them down onto a level surface.

Alternatives to this optical switch could be a reed switch or a Hall Effect device but both of these require a rotating magnet. I have had limited success with reed switches in the past (they need the magnet to whiz by pretty close to be reliable) and Hall Effect devices are less easy to come by for me. I would like to try one sometime though and would glue the magnet into a cut out in the disc making it less likely to fly off. It would have the advantage that the disk could be alongside the Hall device, which could be fixed mounted, with no problem of having to clear the disk when removing or replacing the motor shaft.

The Schimitt trigger is placed upon a small piece of board adjacent to the



Turns counter switch from the rear

switch. It could probably go on the counter board, which would be simpler, but being close to the sensor may assist EMC.

The 'chopper' disc was cut from the bottom of a white plastic pill box with a hole drilled through it. It is mounted on a grommet, secured with a little super glue, that is a nice push fit on the motor spindle. In use I found that the plastic allowed some IR transmission and so a quick fix was to spray both sides with matt black paint.

#### Testing

The counter board can be tested using an audio generator. Mine has a TTL output but sine-wave worked as well. Run 10 Hz into it and watch the binary sequence of the LEDs. Having checked the lower eight bits then the frequency can be increased to verify operation of the higher order. If you don't have an audio generator then it is certain to work providing it's wired correctly and actual counting can be confirmed with the 'chopper' disc input.

If you have a 'scope' then the IR receiver output should be around 8V with the light cut off and about 2V, or less, with the hole in position. If you only have a digital voltmeter then the figures I got were 7.5V and 1.5V.

Once the switch is working, the disc can be motored around to check counting but not all the way unless you don't have the audio generator and want to play safe.

Check the EMC performance in similar fashion to that given at the bottom of that section.

Before each use check the wiring between the sensor and the circuit board. An intermittent connection here, particularly on the output lead, will advance the counter.

#### Winding the Field Coil

I have included this section as to me it was interesting and it illustrates how I have used the coil winder so far.

#### **Coil former construction**

The original coil was just a tube with thin card covering each end. It had obviously been wound between temporary support cheeks and the operator had applied glue at the edges as the winding progressed. Once the glue was dry the cheeks had been removed and the structure strengthened by several pieces of cloth tape passed through the tube and tied at the outside.

I was certainly not going to use this



Wiring and motor shaft bearing

method of construction knowing that a conventional bobbin with cheeks would be far easier. The cheeks (2 mm Paxolin sheet, see picture) would take away some of the winding area but this could be offset by making the coil slightly larger in diameter. Fortunately there was a little more space inside the field coil magnet assembly.

The first thing was to find a cardboard tube of the right diameter; a nice sliding fit over the pole piece. A tube from some kitchen wrap was very close but not close enough. I got around this by cutting a sliver out of it length-wise. Once compressed and glued with epoxy it was the correct size. Then I needed to cut cheeks from the Paxolin sheet using the nearest but somewhat larger hole saw. In the coil former picture you can see the plywood support cheeks I used, which was the size that the actual cheeks started. They were reduced by clamping them together with a 6 mm (the size of the hole-saw centre drill) bolt through them and spinning them in a column drill against a sharp file (alas I don't have a lathe). A good face mask is essential when doing this. After the outside size was correct another small hole-saw opened out the centre so that they were a tight fit over the cardboard tube. Once glued in place the structure was very strong and a final touch was to paint the tube, inside and out, with a few coats of shellac.

There is an assembly trick worth mentioning. The cardboard tube was made longer than needed by approximately an inch and a half. The cheeks were pushed on and adjusted to the correct length leaving an overhang of tube at each end. Before the glue could dry these overhangs were inserted into a 1/2 drive socket, left over from my motor repairing days, that was a nice tight fit. Its perfectly square end was used to get the cheeks perpendicular to the tube. Actually I did one end at a time, allowing the glue on the first to dry, but it was easier to write it like this. Finally with both ends in place the excess tube was cut off with a sharp blade in a junior hacksaw, close to the cheek faces. What was left was removed by rubbing the cheeks over a new piece of medium glass-paper on a flat surface.

I used support cheeks although they may not have been really necessary. However, they did allow plywood plugs to be glued to them that were a snug fit to the inside of the coil former tube. The holes in the supports and plugs were drilled out to 10 mm to suit the motor spindle.



#### Field coil bobbin Coil calculations

Data Sources

Before embarking on any project it is always worth spending a little time on the Internet to see if others have come up with useful ideas. I did a search on coil winders and found a couple of interesting sites. One had a design for a coil winder, aimed at winding RF coils, using a microwave oven turntable motor and gearbox. As this turned at three RPM it was no good to me. I calculated that it would take eighteen days working twelve hours a day to wind the field coil. However, another site (University of Surrey) had some useful information on calculating the number of turns that would fit a particular winding space. I also had a small book by B.B. Babani "Coil Design and Construction Manual" which used tables to give the same parameters, so I could crosscheck. It was worth doing for the field coil, as it would give me useful data for when I really need it for the inter-stage transformer. Similarly it was good to use the turns counter in a real but non-critical situation; I could always just fill the bobbin if something unexpected happened. Nothing did and I have confidence that for the transformer I will be able to get the right number of turns for the primary and secondaries.

#### **Calculation of the Number**

of Turns (Appendix 1) This came out using the Internet method as 44,226. I adopted the same scaling (15%) for random winding when using the Babani tables. These gave a higher answer of 49,922.

#### Calculation of the Total Wire Length and Resistance (Appendix 2)

My calculation for length was 7297 m or just over 4.5 miles! This length equated to resistance was 7842 Ohms.

#### Let's Wind the Coil

I have to admit that I had a practice with the wire on the old defective field coil, hoping naively that once I got a few layers down I might exit from the glue at each end. Peeling the wire out from this was slow and laborious but I never did get out of it. It was useful though, as I could practice traversing the wire and interestingly I found three joins in the original wire. The wire actually changed colour on one join so the manufacturers were not beyond using up ends of reels. The joins were simple twisted and soldered connections each wrapped with a piece of tape folded length-wise; none of these were faulty, by the way.

The coil was wound with a very small pitch almost as if they had been attempting to lay the turns side by side. This actually gave me a wrong lead when I came to wind the coil with an unused reel of period wire. I say period wire as I don't know where to get new wire in this gauge and anyway at the length I needed it would have been very expensive. The only difference between the new and the period would have been in the insulation, the former being polyurethane and the other shellac. For the poly. I have read that using fingers to traverse it will have little detrimental effect whereas for shellac, finger acid may eat it away in fifty years or so.

Not wanting to give someone a problem, I experimented with surgical gloves but this was simply too cumbersome. What did work was to wrap a loose turn of masking tape around the fore finger and thumb of each hand. I did both as I found I was steering the wire from the feed reel with the left hand and traversing it with the right (I'm right handed). Old hands at coil winding will know that before starting you need to cut lots of short lengths of masking tape and dot them around the machine. Certainly you are going to have comfort breaks. For a coil this size, and they are needed to put a temporary stop on the coils and prevent the wire from back winding. They were also needed for re-wrapping the fingers when repairing wire breaks.

I had hoped to wind the coil in one piece but one break was caused by a feed jam (I hadn't done a good job on securing the feed coil spindle nuts) and the other was caused by the way I started to traverse the wire. If I hadn't found the joins in the original coil I would have been pretty disappointed about my two: now I could relax and say, "...it happens". I joined it in period fashion wrapping the connection with Mylar tape. Surprisingly, once fed on slowly and anchored in place by a few turns, the wire flowed easily over the patch.

As to traversing the wire and the break, this happened so quickly that I only think this was the cause. I started with a close pitch, copying the original coil, but this was wrong because what happened was that the wire from the feed coil would be at one side of the reel whilst I was attempting to lay it on the opposite side of the new coil bobbin. This puts a lot of strain on the wire; accounting for the two handed operation, and is actually unnecessary when the two coils of wire are nearly the same size length-wise. The breakthrough in understanding and easy winding was to adjust the lay on the new coil to match the pitch of the feed reel. This had been like a shallow wave-wind and once I got used to keeping the traverse roughly in step, made things much smoother.

Once I had matched the pitch of the two coils then I could use just a thumb, pressing and moving the wire, on the traverse tube. Before this it sometimes needed guidance against it by finger and thumb. Whatever method, the tube certainly made things easier. I started without it and in free space any winding uniformity is almost impossible.

I have explained how the new coil former was mounted but not the feed reel. As the hole in this was not much bigger than the support spindle I just built this up with masking tape where the ends of the reel would be.

#### Results

The total turns wound were 37,688 and the resistance was 5250 Ohms. The finished coil is seen in the picture of the coil winder viewed from the front.

The calculated turns (Internet method) was 44,226 so the actual turns were lower than this by roughly 15%.

My calculated resistance was 7842 Ohms so the actual resistance was lower by about 30%.

Knowing the original coil weight and the Ohms per Pound, from the Babani table, gave 5957 Ohms (see Appendix 3). This was after making allowances for the former and glue weight and random winding. This is only 13% high and would be a very simple way of estimating the original resistance of a field coil or choke: no good for transformers though.

Finally, the wanted resistance was 5K Ohms so the outcome was very satisfactory for the radio concerned.

#### Conclusions

An interesting project and winding the field coil came up with a lot more considerations than I would have thought. Doing the calculations beforehand was useful and I will have to allow for this margin of error when I wind the interface transformer. The space on the former will be divided into a secondary (first winding) followed by the primary and then the other secondary, taking into account the required primary to secondary turns ratio of 2.25. Obviously, if I work out the turns for each, as I did for the field coil, then when I come to the top secondary it won't go on. If I reduce the calculated numbers by 15% hopefully it will.

#### Appendix 1. Calculating the Number of Turns

First thing to know is the wire diameter and books normally give this bare. My trusty Collins Radio Diary for 1956 quoted 0.1524 mm for 38 SWG. Using the Internet method you add on 10% to allow for the coating, which equals 0.16764 mm. If the turns could be laid down side by side then the length of the former divided by this would give the number of turns per layer. But this clearly doesn't happen, so adding another 15% to the wire diameter was said to be a conservative measure to allow for random winding. This gives a 'working' wire diameter (d) of 0.1928 mm.

The former length is 67.7 mm and so the turns per layer will be 351. The depth of the former was 24.4 mm and dividing again by 0.1928 gives the total number of layers as 126. Thus the **total number of turns** will be  $351 \times 126 = 44,226$ .

The **Babani book** has a table of how many turns can be accommodated per square inch for various wire gauges and coverings. For 38 SWG enamel covered, close wound, it is 22,900. The winding space is the length of the former multiplied by the depth of the former. Converting the mm above into inches gives  $2.67 \times 0.96$  which equals 2.56 square inches. Reducing this volume by 15% for random winding we get 2.18 square inches. So  $22,900 \times 2.18 = 49,922$ . This is about 12% higher than the Internet method.

#### Appendix 2. Calculating the Total Wire Length and Resistance

The inside and outside diameters of the coil former are 28.5 and 76.7 mm. It's easier to work in terms of radius than diameters so these are 14.25 and 38.35 mm. Therefore the 'centre radius' is (38.35 - 14.25) / 2 + 14.25 = 26.3 mm.

With a diameter of 52.6 mm the circumference is 52.6 x Pi = 165 mm. This circumference would be the average turn length, so the **total wire length** will be this times the total number of turns, which equals 44,226 giving **7297** m. At 93.05 cm per Ohm then **resistance** is **7842** Ohms.

#### Appendix 3. Lessons from the Original Open Circuit Coil?

Well I had weighed it and it came to 3 pounds. If that is reduced by 10% for the former and glue then this gives 2.7 lbs of copper wire. Now Babani, in another table, gives both Yards per Pound and Ohms per Pound. These were 3058 and 2596 respectively.

So the total yards will be 2.7 x 3058 = 8257 or 7621 m. Allowing a 15% reduction for random winding gives 6478 m.

The resistance will be 2596 x 2.7 = 7009 and again factoring in 15% for random winding gives 5957 Ohms.

# A Philips 371A More of a Challenge than expected by Roger Grant

One of my colleagues at work said he was going to sort out his dad's shed at the weekend; there were a couple of old radios, a few valves and lot of associated junk. Was I interested in the radios? He thought they were around the 1950's vintage and plastic. "I'm interested in all of the junk" I said, I'm quite happy to sort through it and dump the rubbish. He said most of it was rubbish and he didn't want to lumber me with it. I just love a pile of radio rubbish to sort through I said, there are always useful bits in among it, knobs, badges, valves even if you only find a few of those odd thread sized Philips screws it's worth the trouble.



#### Above: the Finished Set

A few days later the goodies arrived, a car boot full of interesting junk among which was a Philips 371A bakelite radio, a medium sized set from the late 1940s and in reasonable condition, no chunks missing or deep scratches but very dirty. Unfortunately the badge on the front was missing as it usually is on these Philips sets, just leaving the inset where it was glued. There's a sort of lattice pattern in this inset where the badge goes, I presume to give the glue a key, obviously not good enough. The back and bottom were dangling by their screening wire but the set was otherwise complete. Having recently re-vamped my workshop I was minus a workshop radio and this next set will fill the role nicely.

With several other events happening at this time, I wasn't going to start the restoration for a couple of weeks so I just applied a drop of WD40 to the grub screws in the knobs. Having a good length of time to soak in will ensure easy removal.

The back and bottom were released from their screening wire and the speaker wires were unsoldered; these were a bit tatty and may need attention later. Most of the rest of the wiring appears to be plastic and no problem. The WD40 had done its job and the knobs came off easily; the chassis was then removed. The front chassis mounting grommets had gone very hard but were still intact so I'll leave these be, the grommets on the top of the chassis had disintegrated and will need to be replaced. I have some black ones that will do the job and will replace them on re-assembly.

The inside of the cabinet was given a good clean before the removal of the dial glass and speaker baffle board. These are held in

place with spring clips over moulded spigots in the Bakelite cabinet; these need to be removed carefully to avoid breaking the spigots. On this set Philips had the forethought to put a flat on the spigot, this makes removal very easy, you just rotate the spring clip ninety degrees with a pair of pliers and lift it off. A lot of other sets using these clips just have a round spigot and the only way to remove them is to prize them off with a fine screwdriver, releasing the tension on one of the claws, not easy and often breaks the spigot if the claw has penetrated too deeply. Before refitting, it's worth placing the spring clip on a flat surface and lightly tap it flat to re-tension the claws. The cabinet was then thoroughly inspected for cracks and scratches; just a few small scratches and no cracks. The odd paint specks were scraped of with my thumb nail as they had trouble bonding to the grime. With all the furniture removed, the cabinet can be washed in the sink with washing-up liquid and warm water, the nooks and crannies scrubbed with a cut down paintbrush; I use a half-inch paintbrush with the bristles cut to about half an inch long. Two washes were required to remove all of the grime and thick coating of tobacco tar. The knobs were washed at the same time, but these needed a soak over night to soften the now very hard mixture of dirt and sweat from mucky fingers in the fluted grip. I use another cut-down paint brush for this job, this time with the bristles an eighth of an inch so pressure can be applied to shift the grime. The worst of the scratches were treated with a mild kitchen abrasive followed by the whole cabinet being given a good polish with Brasso to bring the lustre back and then the final polish with silicone



Badge mount



#### Clips Refitted

furniture polish. Bakelite seems to like being pickled in nicotine; it protects the surface underneath, making restoration a lot easier.

I restored one of these sets several years ago: that set was a 371U – the AC/DC version, with a crack about four inches long in the middle of the top, the weakest point. This was treated by applying super glue to the back edge, drawn into the crack by capillary action. This repair is still holding years later.

There was evidence of white paint in a couple of grooves all the way round the set above and below the speaker and tuning dial, most of which was now missing. Before re-applying some paint and to ensure a good key for the new paint, I wrapped a piece of wet and dry paper around the back of a piece of broken hacksaw blade (it was about the right thickness) and ran it round the inside of the groove, just to take the shine off the surface in hope that the new paint will stay in this time. All modern white paint is too white and too glossy and needs toning down to a slightly cream off White as best could be made at the time of manufacture. This is easily done by mixing ordinary household white paint, gloss and undercoat about 50/50 then adding a very small amount of yellow, just enough to produce a slightly cream colour and remove the blueness of the modern white. The very small amount of yellow paint I used was from a modelling size tin of Humbrol I had to hand. The paint was applied with a fine artists brush but it was still quite difficult to fill the slot without overspill, this was carefully wiped off with a piece of cloth but tended to pull the paint out of the slot. This first fill was left to dry and the overspill cleaned off with Hammerite brush cleaner, this melts the excess paint and done quickly doesn't disturb the paint in the slot. Another coat was applied and the procedure repeated.

The dial glass was cleaned and un-eventfully re-fitted. The speaker on the baffle board needed some attention, the grill cloth was adrift and needed thoroughly cleaning and re-gluing, it was washed in a photographic developer tray with warm water and detergent. Several washes were required to remove the heavy



Spigot



#### The Speaker

nicotine staining, even then the cloth remained a bit patchy, but further washing was going to damage the cloth. After drying in the airing cupboard it was ironed flat and left in a humid place (the garden shed) to acclimatise. Completely drying the cloth by ironing it flat causes it to shrink and after gluing in place an atmosphere of average humidity causes it to go limp and sag. Overnight in the shed cures this. While the grill cloth was drying the speaker and its cloth bag were removed and vacuum cleaned. The speaker itself was ok and was reassembled on the thick cardboard baffle. The grill cloth was glued along one edge and left to dry over night. There's not much unseen cloth and not a great area for the glue so I used Evostick impact adhesive in this case; it gives a good strong bond for the light tension in the cloth. The opposite edge was then glued and held in place with drawing pins and again left over night to dry, then the whole assembly placed back in the cabinet. The rubber on the ends of the speaker flying leads was perished and falling off for the first half inch or so. The rubber seemed to have reacted with the solder flux, so they were just clipped an inch shorter and kept original.

The chassis had a thick layer of sticky dust and fluff; after removing the valves this layer was vacuumed off with the help of a good scrub with a cut down paintbrush. Underneath this, the chassis still had its original paint and was in reasonable condition. There were very small areas of isolated rust which cleaned off quite easily, the worst was the top-cap of the IF valve but this was not bad enough to require a replacement. The mains and output transformers are pitch impregnated and look in good condition. On the front of the chassis the on/off switch had been by-passed with a new mains lead wired directly to the mains selector switch, just a pair of single wires lashed on; these were removed. The On/Off switch is the open type separate from the volume control, this was very gooey and stuck half way (open circuit). The control steady bar was removed then the actuator pawl from the volume control shaft, the switch wires un-soldered and the two retaining screws removed: the switch then lifted off. On



The Speaker Cloth



#### On/Off in situ

inspection it looked intact, just glued up with a mixture of its original grease, nicotine and dust. The best cure for this was to give it a good wash with carburettor cleaner (Halfords), fully immersed in a metal tub and scrubbed with a stiff brush, this removes the grease and any oxide on the plated contacts and brings it up like new. The paxolin shuttle was given a closer look as these are prone to breaking but this was ok. A small smear of grease was applied and the switch re-fitted. I replaced the missing original mains lead with one salvaged from a wrecked set: this is the black braided type with rubber insulated wires. The rubber looked tired so I pulled through some new modern wires just keeping the period braid sleeving. While the control steady bar was off I refitted the drive cord. As the scale pointer went in the opposite direction to the control knob, the drive cord was in good condition and didn't need replacing. The smoothing blocks are Radio Spares replacement types with the little man logo, 50's - 60's vintage and look like they are properly fitted which makes a pleasant change, a vintage repair I'll try and keep intact although there is another smoothing block under the chassis. The other capacitors in this set are the typical Philips black pitch types and are usually quite reliable even after 50 years, if so in this case, I kept them as well.

Time to get out the AVO and have a look round electrically, aided by the trusty Trader Sheet No 895. On closer inspection the Radio Spares smoothing blocks were found to be disconnected with another fitted under the chassis in a proper mounting clamp and wired in their place. The Radio Spares capacitors were checked just out of interest and found to be very leaky as expected; these were left in place as a typical vintage repair. The replacement smoothing block under the chassis was checked, and although only 24mfd – 24mfd instead of 32mfd – 32mfd, found to be reasonably good, over 2megs leak. I felt this second previous repair was good enough and left it, the only error was that its negative end was connected to ground instead of grid bias negative, so this was corrected. The only other electrolytic is the grid bias smoothing capacitor. This is 25mfd 30v and read



On/off switch cleaned



#### Radio Spares S/Block

around 10k on the AVO. This is wrapped with insulating paper to isolate the can from the chassis, the grid bias voltage being negative. Although the electrolytic has both connections isolated from the can this is probably an extra precaution. When the wrapping paper was removed the capacitor revealed its date of manufacture, Oct 47 which fits nicely with the release date of the set 1948 making this an early set in the production run. The can was cut in half with a hacksaw for easy access and a new electrolytic fitted inside. The end connector rivets were drilled through with a 0.5mm drill for the connecting wires. The two halves of the can were put back together and held in place with Sellotape and then re-wrapped and re-fitted into the chassis, the cut unseen, under the wrap and also under the retaining clamp about the middle. The new capacitor wires were wrapped round and soldered to the original capacitor tags. On checking the rest of the capacitors, the black pitch type couplers and de-couplers were all found to be very leaky, some as low as 10k. This amount of leak is going to seriously change the bias voltages so they all need replacing, about ten of them. In my capacitor stock I found a recently acquired bag of 0.13mfd 600v (around a hundred or so, a real treasure trove) and these are about the right size for the de-couplers. They were first painted with Humbrol matt black modelling paint and when fitted did not look out of place, the only difference from the originals was the lack of conical ends. The couplers were also replaced in the same way using lesser value capacitors, the mica and ceramic capacitors were left as original: it's rare to have these cause a problem. With all the main capacitors replaced a final check with the AVO before switch on and all looks ok. For the first switch-on I usually leave the rectifier valve out of AC sets; this checks the mains transformer, heaters and dial lamp and warm up for ten minutes or so before the rectifier goes in. The HT checked ok, crackles from the speaker and a good buzz from the top cap of the EBC33 AF triode looked promising but nothing else. The circuit is typical of the time used by many manufacturers and being very familiar with the valve line up of



New Badge negative



New Badge Artwork







New Badge filled





LESSET 0-13#F±10% VKG VOLTS 85°

Capacitors, one painted one not

#### New Badge fitted

ECH35, EF39, EBC33, CL33 and AZ31 it should be easy to sort out. All the anode and screen voltages were checked against the table in the Trader Sheet and about right. Starting from the AF triode grid and working back to where I lost the signal, I found a switch isolating the radio when the PU socket is in use. Kicking myself for missing the obvious I switched it over and got lots of RF buzz and mush. Tuning around the scale just gave whistles and rumbles where the stations should be: more work here methinks. A yellow wire hanging in space from a pair of beehive trimmers in the RF section had a short length of relatively modern wire soldered to it, as if the previous repairer was using this as the aerial connection. The circuit shows this connected to a switch on the aerial socket and then to some aluminium foil glued to the inside of the cabinet via a leaf spring, this being the plate aerial which is shorted to ground by the switch when a wander plug is pushed into the aerial socket. This yellow wire is sensitive so there is some RF activity, the aerial socket being less sensitive.

Looking back at the Trader Sheet there are a couple of low value capacitors in the RF tuning circuit, also black pitch types that didn't get checked with the couplers and de-couplers. C2 and C3 are 1500pf and 3300pf respectively and on

removal were found to be slightly leaky; only around half a meg or so but too low a capacity to show any kick on the AVO needle. After replacement the sets performance improved, medium and long waves were guite lively but switching to short wave produced another problem: there appeared to be no control over tuning at all, several faint stations coming through at the same time with the tuning gang having no effect. The local oscillator was running ok (slightly negative volts on the triode grid) and on checking it on the oscilloscope, found to be varying in frequency with the tuning gang. Looking around for some RF open circuit, I found part of the wave change switch difficult to get at, protruding through a slot in the chassis. The contacts were black with oxidation. I assumed one or more of these contacts were open circuit. As short wave was probably little used, it was not being wiped clean by wave-change action and permanently exposed to the atmosphere. It's a bit difficult to prove with the AVO, back reading through the coils, so the next job was to carefully clean the wave-change switch. Too many connections to remove: I decided to do this in situ with carburettor cleaner on a stiff artists brush, with tissue paper stuffed in to soak up the excess. (Avoid getting it everywhere as it softens plastic, dissolves

Under Chassis

paint and is also highly flammable). This improved the situation and stations could now be tuned in on short wave but this set still suffers from a lot of background noise. Although medium wave works, there's whistling when slightly off station, some sort of feedback. I suspected the AGC de-coupler but this was now new as were the rest of the paper capacitors. I still feel there's some RF open circuit. On short waves there still appear to be un-tuneable stations in the background: these should never get through the IF stage so that's the next place to look. I didn't have to look far for as soon as I placed my hand within an inch or so of the EF39 IF amplifier, the background noise changed. On connecting a jumper wire between the chassis and the metalising of the EF39 the noise disappeared. On checking the EF39, the metalising was open circuit to its base pin, so I fitted a cosmetically nicer valve as some of the metalising was missing on the one fitted, rather than a repair. Now a brief run through proved the alignment to be reasonably good. The scale calibration when checked with the signal generator proved to be spot on without any adjustment and with plenty of IF gain which is just as well as the IF tuning adjusters look well glued in and very user-unfriendly. The volume control was a bit scratchy so it got a short squirt





New spring clip



The New Clip Fitted



#### **Clips Refitted**

of WD40 through the wiper slot in the side of its outer case. The set was now in good health and back in its cabinet the last problem being the missing badge. These are lacquered brass with coloured enamel inset: they remind me of the Robinsons Golly badges I collected as a child. Other Philips sets of this period had very similar enamelled brass badges, with slight differences like the font type and size of the word "Philips", the size of the stars on the globe etc. As the badges on these models were only glued on, most of the sets I have seen have them missing and they are as rare as spare knobs for round Ekco's. On the previous set I restored I struck lucky as I had previously found a Philips badge that fitted, in a box of military badges in a collectables shop: this wasn't quite the right size but would do. This wasn't going to happen again so I had to make one; an interesting challenge.

I started by doing a generic type drawing on my PC, copied from photographs. It was drawn at a workable size and reduced when I'd got it about right. The final size is determined by the recess it fits into and I had the badge on the other set as an example although it wasn't a perfect fit and probably not the right one for this model. Next was to make one in brass, etching like copper when making printed circuit boards. I printed my drawing on to

some clear acetate, making a negative. Thin brass strip from my local model shop (0.6mm) was sprayed with photo-resist (RS Components or CPC). Following the instructions on the can, this was exposed using bright daylight on a sunny day, developed using weak dilute caustic soda, and then etched with Ferric Chloride. This process worked very well. Ferric chloride for etching and caustic soda for developing are highly corrosive chemicals and need handling with great care, rubber gloves are essential. I made a batch of about eight as there were bound to be some mishaps and this allowed for some experiment to get it right. The fine details varied considerably with the chemicals and products used. Exposure, developing and etching times along with dilution levels were all very temperature sensitive, so it was necessary to closely adhere to the manufacturers instructions. Even then quite a lot of experimentation was required. When a reasonable depth of etch was achieved the badge was washed in water and the photo resist removed with cellulose thinners. The badge was cut out with a pair of tin snips, the edges tidied with a file and fine grades of cutting paper. The face of the badge was polished with very fine cutting paper and Brasso and then washed before painting. The etched insets were then filled in with Humbrol model paint. I found a very

good colour match for both the red and blue, Clear colour 1321 for the red and met 222 for the blue. The word Philips with blue and the globe with red. The face of the badge was then re-polished to remove any overspill and the whole thing protected with a coat of clear varnish after the other paint had fully dried. I used oil-based varnish to avoid a reaction with the metallic paint. The badge was finally glued in place with Evostick impact adhesive after lightly abrading its inset for a better key. Out of my batch of eight I obtained three good ones; I shall replace the wrong sized badge in the other set and I've got one in stock.

There's always one more problem: the back retaining clips were broken. The claws that grip the self tapping screws had broken away. Having come across this problem before, I already had in stock some spring clips that fit over the top of the originals quite nicely. These were obtained from a car accessory shop. Used for retaining the covered cardboard panels in cars, they clip over holes in the metal work, doing a similar job to holding the backs on radios. The job is now complete and this nice little set is in regular use in my workshop. I didn't know if the grooves in the front knobs were filled with paint: the side knobs were as they still had some evidence of this so I assumed they were and I refilled them.

# Invicta Recovered

Some months ago a fellow member, Bill Milne, mentioned that he'd picked up a rather sad looking Invicta Model 30. He wondered whether I might be interested in re-furbishing the cabinet as it had suffered some water damage and was generally rather tired. I've known Bill for quite a few years and never found him to underestimate the condition of a set but this time I was a little unprepared for what appeared from under the dustsheet in the corner of his workshop. It had been sitting on a garage floor for quite a few years and water had been scoring direct hits on the cabinet which even when it left the factory around 1946 was not of the very best quality.

However in the best traditions of the BVWS I agreed that I'd 'have a go' and having had some experience restoring classic cars as well as working on cabinets I decided to combine the two disciplines and apply them to the Invicta.



#### Figure 1

As it first appeared. Note the veneer lifting off the centre section. The dial is ok though! Bill removed the chassis and speaker prior to handing over the cabinet



#### Figure 2

The spray-on finish was badly scratched and the plywood had started to de-laminate so all areas were examined and where necessary a layer of lamination was removed.



#### Figure 3

As can be seen here there were quite a few areas that needed this treatment. Based on the old ethic born of dealing with rust, if it looks dodgy cut it out, nothing was left to chance.



#### Figure 4

At the same time the original blocks that held the cabinet in shape were re-glued and the strut that ran across the back of the cabinet was glued and screwed in place.



Figure 7 Sections that support the central panel were smoothed down to remove the uneven surface. A new top section would be needed to replace the original which had taken the brunt of the water damage.



#### Figure 5

Using automotive body filler, the damaged sections were built up over a period of time, allowing each layer to dry before sanding down.



#### Figure 6

Along with filling, the original sections were rubbed down to give a good key to the adhesive. All these surfaces were sized before being glued and applying the veneer.



#### Figure 8

The first two sections of new veneer just after the clamps were removed. An exterior wood glue manufactured by Unibond was used and the veneer was dampened slightly in order to cope with the curves.



#### Figure 9

The veneers were protected by a piece of clean white paper between the cabinet and a piece of MDF. Any glue that oozed through the veneer would stick to the paper and could be peeled off by dampening the surface. These two sections of veneer were left slightly overhanging to provide an edge with which to line up the veneers for the side panels.



#### Figure 10

The edges were trimmed, rubbed down and French polished. It was decided that a semi-matt finish would be preferable to a high gloss one. Similarly the off white bars that frame the dial and speaker apertures were spray painted and the gloss finish softened by gently rubbing with wire wool.



#### Figure 11

A new centre section was found and veneered in a contrasting wood and as can be seen here the edge joins and the matching of the two pieces of veneer on the side panel has been quite successful.



#### Figure 12

Meanwhile, Bill had been busy on the chassis replacing some leaky capacitors. He also discovered that the feed to the output valve grid was shorting to the chassis and the AZ31 rectifier was low with 250 volts at the reservoir capacitor. A replacement for this latter item was bought from Gerry Wells which brought the HT back to around 330 volts.



#### Figure 13

The SW band was not performing due to a faulty switch in the antenna circuit. This was cleaned and adjusted. The grid stopper and cathode resistors for the mixer valve were both replaced with the correct values. Finally, the set was aligned which, with the work on the switch, brought in the short wave stations.



#### Figure 14

Bill also spent some time sourcing some suitable period style fabric for the speaker. An old cushion rescued from a charity shop seemed to be in keeping with the period of the set and this was spray-glued to the original baffle which was refitted along with the now working chassis. As can be seen, the set is now looking better than when it left the factory just after the war and is ready to go to a discerning new owner.



#### Figure 15

The only area that has partially defeated both of us has been the reproduction of a good quality copy of the Invicta logo. Combining some examples from old magazines and brochures, we then enlarged the image, modified it by hand and reduced again to the correct size. We then made a transfer using a product called Lazertran. As can be seen in this last picture, taken after the main photo-shoot, it was applied to the finished surface which had been suitably masked and sprayed with a little mounting adhesive. Finally we used a light covering of laquer. We leave readers to make up their minds as to its acceptability.

#### For those interested, Vale Veneers of

Aylesbury (www.woodveneersuk.co.uk) offer a huge selection of veneers in manageable lengths and at reasonable retail prices. This company appears on ebay from time to time with special offers. There are also numerous wholesale veneer merchants located in East London who provide uncut lengths in differing widths and are extremely helpful with advice and matching. Not surprisingly, some of the lengths are as long as a tree is high so it's as well to know what your maximum length is before you go. In any event, it's worth a visit just to see all the different types of veneer laid out in the warehouses.

# Vintage televisions sighted in Tokyo mall

Tucked within the man-made island complex of Odaiba facing into Tokyo harbour is a loving re-creation of 1960's Japan complete with televisions and the occasional radio.

If you happen to be in the area, it is in the 'Decks' complex (Odaiba Kaihin-Koen station). Follow the signs to 'Daiba–Itchome Shotengai' on the fourth floor and you will be transported to a Japan in the early stages of post–war economic growth with the technology to accompany it.





# Letters

#### **Dear Editor**

May I thank Terry Martini for adding so much to my knowledge of the history of recording and may I be permitted a modest plug for, as I recorded in 'The Tannoy Story', the first commercial use of the Tannoy Dual Concentric loudspeaker was in the Decca Decola. This was the result of 'Stan' Livingstone's visit to Norman Mordaunt at Decca who then asked for a 12" model as the original 15" speaker did not fit into the Decola cabinet. I also recorded, rightly or wrongly, (please put me right Terry), that the Decola was originally produced as a gramophone as these were not subject to purchase tax while radios were. It was designed principally to take advantage of greatly enhanced performance from their famous Decca 'ffrr' records and it cleverly incorporated a compartment in the cabinet for a radio chassis that was available as an optional extra to cheat the tax man! Incidentally a few readers may remember where I first experienced the Decola for it was in a bar in Katherine Street, Croydon called 'Batty's Bar'. It was owned by a rather large gentleman who was always referred to as 'W.J. Batstone Esquire' and a Decola stood just inside the entrance. A great deal of serious drinking, accompanied by some fine music, was done in Batty's Bar!

Yours sincerely, Julian Alderton.

#### Dear Editor,

Allow me to confirm safe arrival of the Pat Leggatt Award plaque. Actually, it arrived over a week ago, but my feet have only just touched the ground again after a rather hectic period.

Quite unexpected, and in my opinion, undeserved, compared with some of the other scholarly works that it was up against.

Convey, if you can, my thanks to those who voted for it, and to those who didn't,

tell them I understand completely. I suppose I'll just have to join the BVWS now. Please let me have details.

Regards Ray Cooper

# Plasticity - 100 years of making plastics From Bakelite to biodegradable cars: a century of plastics goes on display at the Science Museum

The story of how plastics have changed the world will be told in a major new Science Museum exhibition to open on 22 May 2007.

Plasticity – 100 years of making plastics, will celebrate the centenary of the world's first entirely synthetic material, Bakelite, invented by Leo Baekeland in 1907. The free-to-enter exhibition will trace the proliferation of plastics during the past 100 years and discuss the current environmental issues surrounding this family of materials.

The exhibition will cover the history, development and future of plastics and present some of the most practical, ingenious and strange uses of polythene, PVC, nylon, polyester and many others in fashion, the home, design, transport and more.

Plasticity, supported by SITA Trust and Defra, will look at the environmental issues surrounding plastics and some of the ways that plastics can become greener as natural resources become more scarce. Plastics are still overwhelmingly produced from non-renewable sources, and more than 90% are not recycled. In this more environmentally aware age, with pressure on landfill sites and the earth's resources, demand is growing for new plastics to be sustainable. This issue will be brought to visitors through a stunning installation showing the range of plastics the average person uses in Britain, and a thought-provoking interactive exhibit. A look into a green transport future will be provided by Toyota's astonishing i-unit vehicle, seen for the first time in Britain. And the exhibition will show the revolutionary effect of the humble plastic bucket in the developing world.

Among the 400 exhibits are design classics such as Ekco radios and Art Deco mantle clocks, beautifully engraved cigarette boxes, the 1960s Finnish Futuro House whose design was inspired by the Apollo space mission craft, a 1960s PVC mac and boots, a polyurethane 2006 World Cup football, a working chandelier made from hundreds of Bic biros, an ergonomically designed Herman Miller Mirra office chair, made from recyclable and itself 96% recyclable, and even an extremely rare Bakelite coffin together with a phone made from plant-based plastics.

The exhibition will reveal the simultaneous but separate work of Baekeland and British scientist Sir James Swinburne to discover the formula for Bakelite – Baekeland pipping Swinburne to the patent by 24 hours – and will draw on the Museum's collections to present an array of Bakelite products.

Dr Susan Mossman, Science Museum exhibition curator and author of a history of early plastics, said: "The story of plastics is a key story of the material world over the past century. Plastics allowed a consumer revolution with the cheap mass production of an array of goods such as radios, televisions, computers, synthetic clothing and disposable biros and razors. However, whilst we have become reliant on plastics for a variety of consumer goods, this exhibition will enable visitors to consider the changes needed in the production, reuse, recycling and disposal of plastics to continue enjoying them in the future."

free of charge to all visitors. Exhibition opens to the public at 12pm Tuesday 22 May 2007 and runs until January 2009. Science Museum is open daily from 10am – 6pm. Nearest tube is South Kensington. For more information visit http://www.sciencemuseum.org.uk or call 0870 870 4868.





Various bakelite and catalin items for home and work are on display.



Steel mould for making Tupperware jugs



Rare Michelin ash tray



Modified Bush television showing short films on plastic



General Electric L570 with cabinet made from Catalin



Wireless was mainly represented by examples from Ekco and Philco.

#### A - Z of BBC-2 trade test colour films - part 1 by Malcy B

ACROSS THE STREET. ACROSS THE WORLD Rank Organisation Special Features Divison. Sponsored by the Red Cross. 30 minutes duration First showing 18th January 1964 Final showing 17th April 1964 This film shows the work of the British Red Cross at home and at its overseas branches in Hong Kong, Kenya and Uganda. Commentary by Tony Bilbow. Made In 1963.

AFRICAN AWAKENING World Wide Pictures Sponsored by Unilever 36 minutes duration First showing 11th January 1964 Final showing 11th April 1964 Developments in science, education and technology taking place in the independent West African nations of Nigeria, Ghana and Sierra Leone. Made In 1962.

#### ALGERIAN PIPELINE

A BP / Greenpark Production 28 minutes duration First showing 9th February 1970 Final showing 14th August 1973 A typical industrial type film showing the construction of the Algerian pipeline laid across the Sahara desert land in the late 1960's. Made In 1967.

#### AMONG THE PELICANS A BP film

17 minutes duration First showing 22nd December 1969 Final showing 16th September 1970 A look at the pelicans in Rumania

#### AMSTERDAM

A film by Herman van der Horst Contemporary Films 21 minutes duration First showing 27th January 1969 Final showing 26th August 1970 The flavour and character of Amsterdam in the 1950's. With no commentary. Just the flavour of the church bells and the hurdy-gurdy music makes this film a little gem !

#### AN ACT OF FAITH A BBC film.

#### 23 minutes duration.

First showing 13th December 1962 Final showing 27th November 1963 A film version of a BBC programme about the story of the new Cathedral at Coventry. Starting with the blitz that destroyed the mediaeval church, it moves through all the stages of rebuilding and visits the studios of the artists concerned. Commentary

by Leo Genn. Directed by John Read. BLOOD CAN WORK MIRACLES Made In 1962.

ANCIENT MONUMENTS - 1 Public Announcement Film Unit 7 minutes duration First showing 7th November 1968 Final showing 14th February 1970 A selection of shorts pieced together focusing on Ancient Monuments around the British Isles

ANCIENT MONUMENTS - 2 Public Announcement Film Unit 12 minutes duration First showing 30th October 1972 Final showing 31st May 1973 A further selection of shorts pieced together showing Ancient Sites around the British Isles

ATLANTIC PARKS A National Film Board Of Canada Film 17 minutes duration First showing 29th August 1968 Final showing 9th April 1973 A surreal sort of film focusing on Canada's National Parks Made In 1967.

#### BEAUTY IN TRUST

A Random Film Production for National Benzole Part of "Our National Heritage" series of films 21 minutes duration First showing 8th November 1962 Final showing 3rd August 1971 Sir John Betjeman narrates this and its sister film A Journey Into The Weald of Kent with his usual intimate style. A splendid documentary looking at National Trust properties. Very stylish !! Some of the places and properties visited: - Pentire Point, North Cornwall, Claydon House, near Aylesbury, Bucks, Wicken Fen, near Cambridge, Laycock, Wiltshire Brandelhow, Lake District, Cumbria, St. Michael's Mount, Cornwall, Ickworth House, Suffolk, Avebury, Wiltshire. Made In 1959.

BEHIND THE SPACEMAN United States Information Agency 16 minutes duration First showing 17h April 1972 Final showing 16th May 1973 A look at the American space missions. Produced and Directed by William C. Jersey. Made In 1967.

**BIRTH OF A RAINBOW** New Zealand Film Unit Music by Bill Hoffmeister 18 minutes duration First showing 9th July 1968 Final showing 8th August 1973 The story of Rainbow Trout on the fish farms in New Zealand. Made In 1967.

A Shell Film

12 minutes duration First showing 25th November 1967

Final showing 14th December 1967 Whilst appealing to all in normal health to act as regular blood donors, this films shows the ways in which blood is used to save life in accident surgery; open heart surgery; childbirth emergencies, etc. Made In 1961

BORGO AND MOZZANO A Shell Italiana Film 25 minutes duration First showing 11th March 1968 Final showing 20th March 1968 A record of an experiment in agronomy devised and executed by Shell Italiana, centred on the community of Borgo a Mozzano, Tuscany, which comprises a small town and 16 outlying hamlets. A jeep, carrying two men drives along a Tuscan road. One is the designer of a forthcoming agronomic experiment, the other, later to be known by the villagers as "il dottore", will have the task of persuading the peasant community to use new and better methods of farming, etc. Made In 1958.

BOTH WAYS TO BALLYMENA A British Travellers' Association Film. Telstar Productions. 13 minutes duration First showing 6th November 1969 Final showing 24th July 1971 A scenic tour of Ireland. The film shows Northern Ireland as a peaceful place for a motoring holiday. Made In 1969.

#### BRITAIN

A B.O.A.C. Film Music by Herbert Chappell Duration 26 minutes First showing 25th August 1969 Final showing 22nd August 1973 A travelogue of Great Britain.

#### BULONG AND BOLA

A Shell Film Music by Gus Steyn 16 minutes duration First showing 24th August 1969 Final showing 21st August 1973 A film showing the Iban people of Sarawak in Western Borneo, S.E. Asia. Bulong, a Sarawak farmer, takes his produce to market by river with his son, Bola. With an outboard motor they can make more journeys and more money, gradually improving their standard of living whilst the mobile clinic brings medical aid to all. Made In 1964.

CANADIANS CAN DANCE ! National Film Board of Canada 21 minutes duration First showing 23rd January 1968 Final showing 9th September 1971 From a festival of folk dances at the Canadian National Exhibition, a selection of dances by some of Canada's amateur groups. Selection of folk dances at the Canadian National Exhibition. Made In 1966.

#### CANTAGALLO

A Rank Short Films Group presentation for B.P. Produced by Ray Elton Written and Directed by Jeff Inman Music by Kenny Graham 21 minutes duration First showing 29th March 1971 Final showing 24th August 1973 Located between Milan and Rome in Italy is Cantagallo a busy motorway service station where we see a glimpse of everyday life in the hustle-bustle of the late 1960's. Made In 1969.

#### The CAPTIVE RIVER

A Shell Film 28 minutes duration First showing 9th November 1962 Final showing 7th April 1970 A film about the building of the Kariba Dam, its effect on the people and animals of the Zambezi Valley, and the rescuing of the animals. Made In 1960.

#### CASE HISTORY

New Zealand Film Unit 15 minutes duration First showing 4th March 1968 Final showing 2nd May 1970 Apples galore! A film about the growing of, picking, processing, packing and exporting of New Zealand apples.

#### The CATTLE CARTERS

A BP/Greenpark Production Music composed by Don Banks Played by The Sinfonia of London conducted by Marcus Dodds Theme sung by Frank Ifield 28 minutes duration First showing 3rd May 1971 Final showing 13th August 1973 The story of an Englishman named Wal Featherstone who travels to a town in Western Australia in the hope of finding a job. He meets up with a character called Brocky and their adventures begin... Made In 1962.

#### The CHOICE

A Millbank production for I.C.I. Directed by Ronnie Whitehouse Produced by Gordon Begg Music by Johnny Scott 25 minutes duration First showing 24th May 1971 Final showing 21st August 1973 I.C.I. commissioned this mind-provoking documentary in the early 1970's which examined our environment and concern about the preservation of a healthy, clean world to live in.

#### CLEAN AIR

A Shell Film 21 minutes duration First showing 15th November 1962 Final showing 16th March 1967 Deals with clean air and the action taken to fight against smoke in big cities. Made In 1962.

#### The COACH TRAVELLERS A Shell Film

20 minutes duration First showing 10th May 1967 Final showing 9th September 1967 This film promotes travel by coach by showing a cross section of passengers who explain in their own words why they go by coach in preference to other forms of travel. Made In 1965.

#### COLOUR

An I.C.I. Film 13 minutes duration First showing 7th July 1969 Final showing 31st December 1970

#### COLOUR TELEVISION

A Mullard Film 15 minutes duration First showing 4th December 1967 Final Showing 27th July 1968 TV manufacturer Mullard produced this film about the construction and technical aspects of assembling Colour Television sets as a forerunner to the more user friendly "It's The Tube That Makes The Colour". Not to be confused with "The Colour Receiver Installation Film" which was 12 minutes of animation narrated by Michael Aspel and shown three times a day!

#### THE CONTROLLERS

A Central Office Of Information Film 25 minutes duration First showing 8th February 1964 Final showing 18th April 1964 Looking at air traffic controllers in the control rooms at Prestwick and London airports. Showing the intricate workings co-ordinating movement of civil and military aircraft over Britain and the emergency procedure when an unscheduled landing is made. Music by Wilfrid Josephs. Made In 1963.

#### COUPE DES ALPES A Shell Film

Music by Malcolm Arnold 36 minutes duration First showing 5th November 1962 Final showing 7th November 1968 This film was scheduled to be the final Trade Test Colour Film ever at 3.30pm on Friday 24th August 1973. But due to the Cricket coverage starting earlier at 3.05pm the last film ever shown was Giuseppina at 2.30pm. This film follows the progress and formal gardens. A look at the of the 1958 Alpine Cup rally across southern Europe. Made In 1958.

#### CRANWELL

A Central Office Of Information Film 27 minutes duration First showing 4th January 1964 Final showing 6th April 1964 A film about the life and training of an air force cadet at the Royal Air Force College, Cranwell. Made In 1961.

CROSSROADS OF CIVILISATION A Shand Pictures Production 19 minutes duration First showing 25th January 1971 Final showing 20th August 1973 A Film about Cyprus. Starting in 8000 bc. at Khirikitia, the film tells the story of the history of the island to the present day, and traces the various civilisations which contributed diesel coach. Made In 1959. to mould the Cypriot character. Made In 1968.

CROWN OF GLASS A Shell Film Music by Misha Donat 15 minutes duration First showing 11th April 1968 Final showing 17th August 1973 The design and construction of Liverpool's Roman Catholic Cathedral. The co-operation between artists John Piper and Patrick Reyntiens and the architect and engineer is shown, and also the use of an industrial epoxy resin to bond the glass. Made In 1967.

The DAIRY INDUSTRY New Zealand Film Unit 14 minutes duration First showing 15th November 1971 Final showing 21st August 1973 A look at the dairy industry in New Zealand showing butter production and the co-operative farming and milk production. Made In 1970.

#### DETERGENTS UP TO DATE A Shell Film

19 minutes duration First showing 22nd August 1966 Final showing 22nd August 1966 (Only The One Showing) The uses and advantages of modern synthetic detergents. The problems of foaming and the scientific remedy proposed by further research. Made In 1964.

#### DEVON- COUNTY FOR

ALL SEASONS Production By Westfilms Of Bristol For The Devon Tourist Board. 22 minutes duration First showing 25th September 1972 Final showing 21st August 1973 The county of Devon, with its variety of coastline and scenery and its contrasting resorts and picturesque villages, quiet moorland attractions of the County of Devon for a holidaymaker. Made In 1972.

#### DIAVOLEZZA

A B.P. Film 13 minutes duration First showing 7th November 1962 Final showing 11th May 1968 Following the work of a conductor on one of the cable cars of the cable railway in the Engadine, Switzerland. Narrated by Bernard Miles. Made In 1958.

**DIESEL TRAINRIDE** A British Transport Film 10 minutes duration First showing 3rd October 1968 Final showing 27th January 1969 A train ride through the English countryside, as seen through the forward windows of a

DISCOVERY OF A LANDSCAPE A BBC film 29 minutes duration First showing 18th March 1963 Final showing 5th November 1963

#### DIVERTIMENTO

Verity Films Production For B.P. 7 minutes duration First showing 29th December 1969 Final showing 20th August 1973 With the music Divertimento for flute. oboe and clarinet from Malcolm Arnold composed in 1952, the visual content of this film is explained only by the caption at the start: "To those seeking wider knowledge of the ways and uses of oil, the microscope An I.C.I. / Millbank Production reveals a world of beauty". This film is also known as "Oil Under The Microscope". Made In 1968.

DOWN TO THE SEA A BBC film 29 minutes duration First showing 2nd April 1963 Final showing 24th November 1963

A DREAM OF NORWAY A British Transport Film 18 minutes duration First showing 11th March 1968 Final showing 3rd August 1968 With the music of Edvard Grieg this tour of the western fjords attempts to attract the British public to holiday in Norway. Commentary By Paul Le Saux. Made In 1961.

#### ELECTRON MICROSCOPY An AEI Film.

22 minutes duration First showing 13th January 1964 Final showing 16th April 1964 This film shows the purpose and construction of an electron microscope and a number of its uses in research and industry. Made In 1961.

#### ELECTRONS IN HARNESS

Produced By Verity Films For Mullard. 50 minutes duration First showing 27th August 1965 Final showing 2nd December 1965 (Only Two Showings) A film showing the research into electronics at Mullard's factory. Commentary by Michael Hordern.Directed by Michael Cons. Made In 1965.

THE EMPTY SEAT A Random Film Production Sponsored by Shell-Mex and BP 23 minutes duration First showing 22nd August 1966 Final showing 23rd August 1966 (Only Two Showings). Three different types of driver reveal their faults to an invisible driving instructor. A demonstration of safe driving and car care is given by the Metropolitan Police driving school at Hendon and the offenders are seen applying these methods to their own driving. Commentary by Robert Raglan. Made In 1965.

The ENCHANTMENT OF CAPRI An Aldolfo Pizzi Film 18 minutes duration First showing 5th January 1970 Final showing 27th November 1971 Showing the beauty of the island of Capri.

The ENGLISH GARDEN 21 minutes duration First showing 28th December 1968 Final showing 6th March 1969 A film about the preparation of the gardening centre at Syon Park, Osterley, Middlesex described by Percy Thrower, where Britain's first permanent horticultural exhibition was opened in June 1968. On display are large ranges of bulbs, plants, shrubs and gardening equipment and machinery. Made In 1968.

#### **EVENTFUL BRITAIN**

A British Travel Association Film. 25 minutes duration First showing 25th March 1967 Final showing 23rd August 1967 Reviews many of the events in the tourist's "Calendar" in Britain - including Trooping the Colour, Henley, Cowes, Royal Tournament, Goodwood, Old Crocks Race and the Cup Final. Made In 1954.

#### **EVOLUON**

A Carillon film for Philips 12 minutes duration First showing 17th February 1969 Final showing 14th August 1973 A trip around the state of the art technological exhibition at Eindhoven in Holland. Vocals and electronic sound effects take preference over

# DTN Williamson and his famous amplifier by John Howes

The Williamson amplifier design published in April and May 1947, was to become a landmark in the evolution of High Fidelity. This article was an instant success and appealed to the enthusiast, home constructor and also as a commercial product selling successfully worldwide.



Fig. 1. Circuit diagram of complete amplifier. Voltages underlined are peak signal voltages at 15 watts output.

 $R_{14}, R_{19}0.1M\Omega$ 

 $R_{15}, R_{20}, 1,000\Omega$ 

 $R_{16}, R_{18} 100 \Omega$ 

 $R_{17}, R_{21}100\Omega$ 

 $\frac{1}{4} \text{ watt} \pm \frac{10\%}{20\%}$ 

 $\frac{1}{1}$  watt  $\pm 20\%$ 1 watt  $\pm 20\%$ 

2 watt wirewound

R1	1ΜΩ	1 watt ± 20%
R2	33,000Ω	1 watt $\pm$ 20%
Ra	47,000Ω	1 watt $\pm 20\%$
R.	4700	1 watt + 10%

David Theodore Nelson Williamson was born in Edinburgh in 1923. Later he studied mechanical and electrical engineering at the University of Edinburgh.

In 1943 he went to work for the Marconi - Osram Company in Hammersmith as an engineer in the development laboratory. He soon moved to the applications laboratory under the management of Graham Woodville. Williamson's job was to test new valve designs in various circuitry and the writing of application reports for these valves.

Williamson was interested in improving sound quality and in his spare time worked on amplifier design and a light weight pick up. His hard work matured into an amplifier having a 20 watt output with less than .1% harmonic distortion, unheard of in those days. Williamson was eventually asked to demonstrate his amplifier to the M O Valve Company Board and to write a report on it.

After Williamson had left the company, a director of the parent General Electric Company took this report to the editor of the Wireless World with a view to publish. Due to Williamson specifying the Company's valves in his design, this led to a huge demand in G.E.C. valve sales. Williamson did not gain financially from the Wireless World article but found instant fame worldwide.



The publication of the 'Williamson amplifier' must have sold many thousands of KT66 valves worldwide for G.E.C. Also transformer manufacturers such as Partridge, Woden, Gilson, Gardners and Savage must have benefited greatly. The original article

in the Wireless World outlined six basic requirements for a perfect amplifier:-

 $0.25\mu F$ 

8µF

200pF

30H at 20mA

C6, C7

C9

C10

CH.

350V wkg.

600V wkg.

350V wkg.

Negligible non-linear distortion. Linear frequency response over the range 10 HZ to 20 KHZ. Constant power handling capacity for negligible non-linear distortion at any frequency within the audible frequency spectrum. Negligible phase shift over the same range. Good transient response. Low output resistance. Adequate power reserve.

The specification of the output transformer was given paramount importance and to quote from the original text 'The output transformer is probably the most critical component in a high fidelity amplifier'. Information on constructing the output transformer was given in the text: several keen amateurs wound their own!

Typically in 1949, the cost of a commercially made output transformer was six guineas compared to the mains transformer at four guineas and chokes at one pound each. Complete kits were offered for sale by Stern and Tele-Radio priced between nineteen and twenty one guineas, depending on the manufacturer of the transformers.

Many commercially made 'Williamson'





amplifiers were produced by Radford, Rogers, Goodsell, Heathkit and many more.

In America the 'Williamson' circuit gained instant success: an article in the November 1949 issue of Audio Engineering described it as the 'Musicians Amplifier'. This was based on the 'Williamson' circuit but using 807 valves instead of KT66's in the output stage.

A further article entitled 'Gilding the Lily' appeared in the July 1952 issue of Audio Engineering. This article outlined some modifications to values of coupling capacitors and used an output transformer with ultra linear connections.

Williamson's working life after leaving the M.O.V.Company in 1946 was with Ferranti until 1960, between 1961 - 1973 with Molins Machine Company Ltd and Rank Xerox between 1974 - 1976. During his lifetime he was the sole or joint inventor of approximately one hundred patent applications concerned with machine tools and cigarette machinery. In 1979 the Williamson family moved to Italy, the property having superb views over Lake Trasimeno.

Many Williamson amplifiers are still in use today, providing their owners with high quality sound. David Theodore Nelson Williamson died on 10th May 1992 leaving a legacy not forgotten to this day.





• Heathkit Williamson-Type Amplifier. Audio enthusiasts with whom economy is an item which must be considered along with quality will be enthused over the newest "Heathkit" — a Williamson-type amplifier complete with power supply and preamplifier-control unit. Priced remark-ably low, the amplifier follows closely the circuit of the Musician's Amplifier, de-scribed originally in the November, 1949 issue of Æ. The preamplifier contains three input channels, two low-gain for crystal pickup and tuner, and one high-gain with equalization for magnetic pickup. Selector switch provides choice of turnover for 78 r.p.m. or LF recordings. Bass control permits up to 15 db boost or cut at 20 cps, and treble control provides p to 15 db boost or cut at 20,000 cps. Frequency response of the power ampli-



fler is flat within one db from 10 cps to 100 kc. Harmonic distortion is less than 0.5 per cent between 20 and 20,000 cps at five watts is 0.5 per cent using 60 and 3000 cps. The Heath Company, Benton Harbor 25, Mich.



'The Musician's Amplifier'



#### The Amplifier With Real **Presence** Effect

The SMA-12 is an all-triode, fixedgain, 2-chassis power amplifier for use with tuners or other front ends containing their own volume and tone controls.

Designed by David Sarser, it uses the classic Williamson circuit. Complete kit is sold by Sun Radio. Can be wired in less than 3 hours. All capacitors and resistors in the audio amplifier chassis are already mounted and wired on resistor board for simple installation. Chassis punched to accommodate all components.

#### SPECIFICATIONS:

Peerless transformers used exclusively

throughout. Tubes: 2- 807's tied as triodes in push-pull output, 2- 6SN7's, 5U4G rectifier. Output: 12 watts with less than 8% inter-

modulation distortion. Source impedance: 0.75 ohms.

Intermodulation distortion less than 8% at 12 Woutput using freq. of 40 & 2000 cps. Frequency response: ±0.5 db, 20-80,000 cps. Absolute gain: 70.8 db.

20 db of feedback around 4 stages & the

output transformer. Cathodyne phase inverter.

On 2 chassis, each  $5'' \times 10'' \times 3''$ , each properly punched and cadmium finished. Kit comes complete with tubes, punched

chassis, prewired resistor & capacitor board, sockets and all necessary parts.

NET PRICE \$89.50

Lab wired & tested, complete with curves of tests run on that individual amplifier. Tests include 3 curves showing frequency response, power output and harmonic content. NET PRICE \$119.50

Order by mail today!

adio ND ELECTRONICS COMPANY, INC 122-124 DUANE STREET New York 7, N.Y. BArclay 7-1840 2 BLOCKS NORTH OF CHAMBERS ST. STORE HOURS: 9-6 Daily, 9-4 Saturday.

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# Images from Harpenden auction, March 2007



























![](_page_37_Picture_1.jpeg)

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![](_page_39_Picture_6.jpeg)

# Ain't no Dummy

In the best tradition of John Logie Baird, Dicky Howett proves that black and white tv is alive and well. Pictures are still being produced (3/3/07) by his EMI 203 4-1/2" 625-line image orthicon camera, despite some components having a sell-by date of 1959!

![](_page_39_Picture_9.jpeg)

![](_page_39_Picture_10.jpeg)

# Audiojumble 2007 www.audiojumble.co.uk 2nd September 10.30am - 4.30pm

Angel Leisure Centre, Tonbridge, Kent

Stalls £25, 10.30am Standard entry £4, 9.30am £10 Bookings/Enquiries 01892 540022 info@audiojumble.co.uk

Refreshments available all day. Mainline railway station within walking distance

Valve Amps • Turntables • Records • Speakers • Components • Books • Tuners • CD Players • Tape Recorders • Vintage Radios

A brief resumé of British (and several overseas) finished goods & component manufacturers (as at May 2005) part 13 by Dave Hazell

**Oceanic.** Brand name of a French manufacturer of consumer electronics. In 1963, their transistor radios were imported into the UK by H K Harrison & Co Ltd, 1-3 Jacob's Well Mews, George Street, London, W1. Oceanic was later a part of ITT's European consumer electronics operations.

Oki Electrical Industries, Tokyo, Japan (in 1967). Manufacturer of domestic tape recorders. Handled in the UK (1967) by Denham & Morley (Overseas) Ltd, Cleveland Street, London, W1. Established in 1881 by Kitabaro Oki, to make telephones in Japan.

Oldham & Son Ltd, Denton, Manchester (in 1950 & 64). A battery manufacturer, established in 1865. It is believed Oldham was taken over by Mirlees Blackstone (a manufacturer of large diesel engines) – possibly in the 1960's. MB was then taken over by Hawker Siddeley. By 1982, Oldham Batteries Ltd (same address). In 2002, Oldham Crompton Batteries Ltd, Edward Street, Denton, Manchester – a Hawker Energy Storage subsidiary (itself part of Enersys, USA).

Oliver Pell Controls - see Varley.

Olympic Lamps Ltd, 32 Palace gardens, Enfield, Middx (in 1964).

Omega Electric Lampworks Ltd, Albany House, Burlington Road, New Malden, Surrey (in 1964). Low cost lamp manufacturer. Formed in 1918 but acquired by Thorn in 1957.

**Opperman (S E) Ltd**, Borehamwood, Herts (in 1955). Maker of TV aerials, FM tuners and Band 3 converters. Used the "Stirling" brand.

**Orega**. French TV and radio component manufacturer in the 1960's. In 1961, it was a subsidiary of CSF.

Ortophon A/S, 5 Trommesalen, DK-1614, Copenhagen V, Denmark. In 1981, Ortophon Manufacturing A/S, 11B Mosedalvej, DK2500 Copenhagen-Valby, Denmark. Maker of cartridges and record cutting heads. At some point, they were owned by Harman International.

Orxy Electrical Laboratories Ltd, Dominion Road, Worthing, Sussex (in 1958). In 1960, they relocated to Industrial Estate, Meadow Road, Worthing, Sussex. Maker of lightweight soldering irons. By 1969, name used by W Greenwood Electronics Ltd, 21 German Street, Chesham, Bucks. In 1964, W Greenwood Electronics Ltd was at 677 Finchley Road, London, NW2. Then, Greenwood Electronics Ltd, Portman Road, Reading (in 1975). Currently, Oglesby & Butler, Carlow, Ireland.

**Osborne**. In 1947, Morgan, Osborne & Co Ltd, Southview Road, Warlingham, Surrey. Maker of coil pack units (ready assembled L, C + switching RF assemblies). In the 1960's and 70's, there were "Osborne" branded "mains droppers" (Thorn 1400,1500,3000 etc) and wirewound resistors. Nothing further known.

**Osmabet**. Osmabet Ltd. of 14 Hillside Road, London, N15 in 1959. At 46 Kenilworth Road, Edgware, Middlesex (in 1964 & 68). Manufacturers of mains and audio transformers, bulk tape erasers and radiogram chassis. Still going in 1970 (and 1982?).

**Osmor**. The brand name of Morgan, Osborne & Co. Ltd., of Warlingham, Surrey (in 1947). Later on, they were known as Osmor Radio Products Ltd, Bridge View Works, Borough Hill, Croydon, Surrey (in 1950) and Osmor Ltd, of 418 Brighton Road, South Croydon, Surrey (in 1958 & 64). Also in 1964 "Trader" yearbook: Osmor (Windings) Ltd, Crunden Road, South Croydon, Surrey. Manufacturer of "Q" coil packs and wound components. In the 1950's – kits to make Band 3 converters, FM tuners, etc.

**Osram.** Until the 1950's, this was the brand name used by GEC for valves. GEC also owned the Osram brand for lighting products in the UK and commonwealth countries

(whereas Osram GmbH had rights to the brand in Germany and many other countries). In 1911, Osram Lamps were advertised by GEC in the UK. Osram was originally a trademark (from 1906) of a German company-Deutsche Gasglühlicht - for its electric lamps. The name Osram was coined in 1906 by the original manufacturer, Deutsche Gasglühlicht AG, and is derived from Osmium and Wolfram (Wolfram being the German name for Tungsram). The German Osram company was formed on 1st July 1919, when three German companies, Siemens & Halske, AEG and Deutsche Gasglühlicht AG (Auer Gesellschaft) merged their lighting interests. Later on, it became a wholly owned subsidiary of Siemens. GEC sold its Osram lighting interests [Osram (GEC) Ltd] back to Osram of Germany a few years ago. Today, Siemens AG is the sole shareholder in OSRAM GmbH. Osram bought the North American Sylvania lighting business from its parent, GTE, in 1993. In North America, Osram own the rights to the Sylvania brand name. In most other areas, SLI does.

In 1968, Osram (GEC) Ltd (a wholly owned subsidiary of GEC) had the following principal subsidiaries:

Pope's Electric Lamp Co Ltd. A sales company, using mainly the "Elasta" brand.

Ascot Lamps & Lighting Co Ltd. Acquired by GEC in 1965. A sales company, mainly for "Ascot" branded products. This company was originally known as Tungstalite Ltd and formed in 1923. Tungstalite was acquired in 1957 by Radiation Ltd and renamed. Radiation manufactured Ascot branded gas water heaters (believed to be under licence from, or originally connected with, Krupps of Germany)..

Lumifax Ltd. Phosphor manufacturer.

**Oxley**. Oxley Development Co., (Priory Park in 1967-70), Ulverston, Lancs. (in 1948). Founded by Robert Oxley in 1942. Makers of connectors and trimmer capacitors. Later on, a subsidiary MARL, made an enormous range of LED replacement lamps for filament types. Oxley took over Beck Electronics in 1996. Beck can be traced back to Erie Resistor, Great Yarmmouth. any commentary which isn't really development of the country. needed as the pictures speak for themselves Made In 1968. FISHERFOLK OF BOMBAY

#### EXPO '70

Australian News & Information Film Unit 10 minutes duration First showing 5th February 1973 Final showing 14th August 1973 A look at the Expo 70 exhibition held in Osaka, Japan.

#### FACES OF AUSTRALIA A Josef Geesink Production For Caltex Petroleum. 27 minutes duration First showing 18th January 1971 Final showing 16th August 1973 An Australian travelogue looking at life in modern Australia and at the people from many nations, cultures and backgrounds, who are creating a future for the

FISHERFOLK OF BOMBAY A Burmah Shell Film / Art Films Of Asia. 19 minutes duration First showing 7th January 1964 Final showing 11th April 1964 This film looks at life amongst the Kohli fishermen of Bombay. (A Film In The Folk Dances Of India Series). Made In 1957.

A FLIGHT OF FANCY Market Films / Film Centre International for B.O.A.C. 6 minutes duration First showing 4th August 1969 Final showing 23rd June 1972 A compilation of air-to-air sequences of a VC10 intercut with air-to-ground shots of a series of widely differing landscapes, suggesting an escape to a sunnier world! Made In 1968.

FORTH BRIDGE A Random Production for Shell-Mex/B.P. 20 minutes duration First showing 11th March 1967 Final showing 11th March 1967 (Only Two Showings) A description of the building of the Forth Road Bridge explaining the engineering principles involved, and the intricate work which had to be carried out in situ in all weathers. Music by Wilfred Josephs. Commentary by Alec Clunes. Made In 1967.

#### FOUR MEN OF INDIA

A World Wide Picture for Unilever. 36 minutes duration First showing 3rd September 1968 Final showing 29th March 1969 Four employees of the sponsor's associated company Hindustan Lever are seen living and working in the Rajasthan Desert, tropical Kerala, the Kulu Valley and Calcutta. Some of the country's customs are shown against the background of slowly advancing industry. Made In 1967.

#### FOR SALE: VINTAGE RADIO GRILLE CLOTHS Many patterns to choose from • Large and small quantities

**NEW CLOTHS NOW AVAILABLE** Cabinet fittings • Rexine coverings

Samples available (please send £1.00 stamps for post/packing)

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![](_page_41_Picture_15.jpeg)

#### British Vintage Wireless Society

Statement of accounts - year To 31st December 2006

	Year ended		Period ended	
	31st December 2006		31st December 2006	
Receipts		2		٤
Subscriptions		33,895		5,603
Sale of publications		2,943		2,649
Meetings		3,480		3,400
Estate sales receipts		23,639		18,545
Bank interest		624		289
Advertising		896		
Miscellaneous		202		808
NVCF profit		4,112		- desite bains
Recovery of NVCF support costs		1,000		
Total receipts		70,791		31,294
Payments				

General expenses	10,698	8,030
Meetings	1,990	1,869
Bulletin costs	19,636	13,998
Estate sales payments	15,720	8,893
Other publication costs	3,176	734
Museum appeal		1,678
30th Anniversary	5,056	
Support costs for NVCF	35	1,000
NVCF loan written off	-	7,488

Total Payments	56,311	43,690
Surplus for the period	14,480	(12,396)
Total assets at beginning of period	24,784	37,180
Total assets at end of period	39,264	24,784
Assate		
A33013		
HSBC current account	8,507	7,725
HSBC deposit account	26,678	17,059
NVCF assets	4,079	
Total assets	39,264	24,784

At 31st December 2006 £1, 704 was owed by the BVWS to the authors of various publications that the BVWS sell on behalf of these authors. This liability is not recognised in the accounts.

The accounts of the Society reflect the receipts and payments on a cash basis and do not reflect any prepaid or accrued income and expenditure. as an unincorporated club, all surplus is passed on to members by way of bulletins, supplements and events. At the same time a prudent asset balance is maintained in order to provide for the unexpected.

Treasurer Some

#### Auditors report to the members of the British Vintage Wireless Society

We have examined the above Accounts for the year ended 31st December 2006 together with the accounting records and supporting documents and vouchers and conting the same to be in accordance herewith.

Shay Keens Limited chartered Accountants

Christchurch House Upper George Street Luton Beds LU1 2RS

12th March 2007

# Minutes

#### Minutes of the BVWS Committee telephone conference meeting held on Tuesday 17th April 2007 at 7.30 pm.

Present: Mike Barker (chair), Graham Terry, lan Higginbottom, Carl Glover, Guy Peskett, Paul Stenning, Terry Martini, Jeremy Day, Jon Evans, Martyn Bennett.

1. Apologies for absence: none (all present).

2. The minutes of the meeting held on Friday 5th January 2007 were approved.

#### Matters arising:-

Item 8; the content and format of the material for the 2007 Christmas DVD were discussed.

3. The Membership Secretary, GT, reported that the membership stood at 1497 leaving 180 yet to renew.

4. The Treasurer, JD, reported a satisfactory state of affairs with the Society's account balances standing at £38,859 (deposit) and £2,279 (current). Almost all the auction accounts have been cleared and there are no significant creditors.

5. Due to a lack of articles and the Editor having only just returned from Cyprus the Bulletin mailing has been delayed. Every effort will be made to get it out before the NVCF. The Chairman will talk to the printers and he also called for volunteers to help with the mailing operation at the Museum. CG reported that he was now working on the summer issue as he will be away for some time in the summer.

6. BVWS parts. On CRT masks, JE reported that the manufacturers he had spoken to could not work from an example but required a CAD drawing. He will contact others. JE and GP will sound out engineers with CAD expertise. The Chairman reported that he had received a stock of 1500 0.1 $\mu$ F 630V metallised polyester film capacitors and had ordered 5000 0.01 $\mu$ F 630V (on 18 weeks delivery). It was agreed that the 0.1 $\mu$ Fs would be offered to members at £2 for 5 and to non-members at £2.50 for 5. The next parts to be considered would be dual electrolytics.

7. GP reported on preparations for the NVCF. All is proceeding smoothly and 185 tables have been let so far. Eight loading door stewards will be needed from 7am to 9am. At 9am six of the doors will be closed leaving open only one door on each side so two stewards will be needed until these doors are also closed (10.30am). From then on loading will be only via the main entrance. Preparations for the Telegraph exhibition are also going well with good communication with the exhibitor Fons Vanden Burghen. 8. Membership cards. The chairman reported that our stock covered only this year. It was noted that named and dated cards would reduce wastage (of predated cards). PS will investigate ways of printing names and dates on cards.

9. CDs/DVDs. Most of the data CDs have run out. PS has transferred the data to one DVD. The stock of films on DVDs is also nearly exhausted; it was agreed to let them run out. TM suggested that a better transfer should be made to preserve the Ultra film which was deteriorating. The Chairman will make another attempt to gain access to BBC copyright material.

10. A discussion took place as to how to reach vintage wireless and television enthusiasts who may not have heard of the BVWS. Various suggestions were made.

11. It was proposed that the Society should produce a map of the UK showing the density of members. It was noted that this might turn out to be more difficult than expected. GT will investigate.

12. AOB. None.

13. The next meeting will be a conference call on Thursday 21st June at 7:30 pm.

# We want your articles! Share your interests with your fellow BVWS and 405 Alive members.

We accept: Type, handwriting, fax, email, floppy disc, CD

> Send your articles to: Carl Glover, 33 Rangers Square, London SE10 8HR Tel/Fax: 020 8469 2904 bulletin\_editor@bvws.org.uk

![](_page_43_Picture_23.jpeg)

# Obsession by Gerald Wells

AVAILABLE NOW!

Free to BVWS members £6 for additional copies

available from Graham Terry, Membership secretary

![](_page_43_Picture_27.jpeg)

1 copy free per member collected at all meetings or by post at £2 UK or £4 overseas

#### WADAR valve amplifier

Stereo

Made at the Vintage Wireless Museum

#### No miniature valves • No Transistors • No Chips No printed circuits• No Oxygen free cables required No gold plated peoples plug• 15 Watts per channel (real watts)

Choice of colours: Chelsea front door Yellow, Lambretta Red and Bronze

Get that nice warm valve sound. Ideal for grown up music.

£500 each.

![](_page_43_Picture_36.jpeg)

Wells Amplifier Development And Rentals 23 Rosendale Road, West Dulwich London SE21 8DS Telephone 020 8670 3667 Eighth page advertisements cost £22.50, quarter page advertisements cost £45, half page: £90 and full page: £180. Cheques made payable to 'BVWS' please

![](_page_44_Picture_1.jpeg)

## Back issues

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

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

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

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

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

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

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

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

![](_page_44_Picture_11.jpeg)

# The Bulletin

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

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

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

Vol 21 Numbers 1, 2, 3, 4 Inc. Marconi in postcards, the Defiant M900, GPO registration No.s, Personal portables, the transmission of time signals by wireless, the Ekco A23, historic equipment from the early marine era, the birth pains of radio, inside the BM20, plastics, Ferdinand Braun, pioneer of wireless telegraphy, that was the weekend that was, the first bakelite radios, BVWS - the first five years, the world of cathedrals, Pam 710. Vol 22 Numbers 1, 2, 3, 4 Inc. Another AD65 story, the Marconiphone P20B & P17B, listening in, communication with wires, the story of Sudbury radio supply, French collection, Zenith Trans-oceanics, Farnham show, Alba's baby, the first Murphy television receiver, AJS receivers, Fellows magneto Company, Ekco RS3, Black Propaganda.

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

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

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

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

#### Supplements:

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

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

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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.

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

#### 2007 meetings

1st July Swapmeet at Wootton Bassett
8th July Gerald Wells Workshop British Vintage Wireless and Television Museum
22nd July Radiophile Swapmeet Sambrook
17th August Friday Night is Music Night, British Vintage Wireless and Television Museum
2nd September Audiojumble at the Angel Centre, Tonbridge
16th September Table top sale, British Vintage Wireless and Television Museum
23rd September Radiophile Swapmeet Shifnal
30th September Swapmeet at Harpenden
21st October Gerald Wells Workshop British Vintage Wireless and Television Museum

#### 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

#### West of England Vintage Wireless Fair:

Willand Village Hall (J27/M5). Doors open 10:30. Contact Barrie Phillips, 01392 860529

NVCF: National Vintage Communications Fair

See advert in Bulletin. www.nvcf.co.uk

Wootton Bassett: The Memorial Hall, Station Rd. Wootton Bassett. Nr. Swindon (J16/M4). Doors open 10:30. Contact Mike Barker, 01793 536040

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

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# From Big Band to Broadband The story of home entertainment

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The all-new summer exhibition at the **Museum of Communication** 131 Main Street, Burntisland KY3 9AA

For dates and times see www.mocft.co.uk or e-mail mocenquiries@tiscali.co.uk

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