NZVRS BULLETIN

Vol 39 No 1 2018 Annual

Runner-up Upcycle Competition

NEW ZEALAND VINTAGE RADIO SOCIETY INC.

A non-profit organisation devoted to the preservation of early radio equipment and associated historical information.

Postal address - PO Box 13 873, Onehunga, Auckland 1643.
Web site: - http://nzvrs.com Email address: - nzvrs@pl.net
NZVRS 2019 AGM is on Saturday 20 July at the Auckland Clubrooms from 10am.

PRESIDENT: Ian Sangster, 75 Anawhata Road, R.D.2, New Lynn, Auckland 0772
Phone: 09-814 9597 or 027 227 0426
Email: sangsfam@clear.net.nz

SECRETARY: Paul Woodcock,
2 Levy Road, Glen Eden, Auckland 0602.
Phone: 09-818 4740
Email: paul.woodcock@opus.co.nz
Paul handles general correspondence and requests for purchase of books and badges.

TREASURER: David Crozier,
P.O. Box 13873, Onehunga, Auckland 1643.
Phone: 09- 889 8293 or 022 698 7978
Email: david@nzvrs.pl.net
David handles editorial, financial and membership matters. A list of members is available on application for the personal use of members only. Please address all NZVRS monies to NZVRS, PO Box 13873, Onehunga, Auckland 1643, N.Z. or direct deposit (with suitable details) to the ASB bank account number: **12 3067 0168223 00**

NZVRS LIBRARY
The NZVRS librarians are Bruce Churcher, and James Davidson. Requests may be sent to the NZVRS Library, PO Box 13873, Onehunga, AK 1643
or Email: library@nzvrs.pl.net

THE NZVRS BULLETIN is a membership magazine only. Contributions are always welcome. Any opinions expressed by writers are not necessarily those of the Society. Any feedback, contributions, letters, suggestions etc can be sent to:

THE NZVRS EDITOR
NZVRS Editor, P.O. Box 13873, Onehunga, Auckland 1643. Email: david@nzvrs.pl.net

ASB Bank account 12 3067 0168223 00

A Calendar of Events is listed on our website at **nzvrs.com/calendar**

AUCKLAND MEETINGS are held at the Horticultural Society Hall, **990 Great North Road** (opposite Motions Road.) Western Springs, on the **third Monday** of each month except July (AGM month), from 7.30pm. Even months are auction nights, odd months are themed – see the calendar on the website or forum.

TARANAKI AREA MEETINGS are held on the second Sunday in even months. Visitors most welcome; contact either Bill Campbell, Phone 06-753 2475 or Graeme Lea, Phone 06-758 5344

WELLINGTON MEETINGS are held typically from 1.30pm the second Sunday of every month at the Petone Community House, 6 Britannia Street, Petone. Contact: Don Beswick, phone 04-383 6723,
email donaldjbeswick@gmail.com

CHRISTCHURCH MEETINGS are held on the first Thursday of odd months (not January) 7.30pm at the NZART Branch 05 Clubrooms, 5 Idris Rd, Fendalton.
For further details contact John Dodgshun, 12 Natalie Place, Christchurch 8051.
Phone: (03) 355 5308
Email: jandjdodgshun@gmail.com

SUBSCRIPTIONS:
The subscription year is a calendar year (1 January - 31 Dec). Subscription renewals are sent in the year end Bulletin. The NZ Rate is $30, with early-bird renewal reductions. An email only E-version bulletin is available at the world-wide rate of NZ $20. An email is sent with a link to the latest issue. Please note that these files are usually about 20 Megs to download.

EDITORIAL

Well another year blatts to an end and here at last another bulletin "annual". While not the ideal situation I hope you find something of interest in its 84 pages. Included with the bulletin is of course the calendar for 2019 and the annual subscription renewal notice where applicable (do check the front address label and if it says "sub = OK" then all is fine for another year. Others can use the sub[scription] number when making on-line payments.

There have been a number of changes with the society over the year that I think you will find as improvements; first of note is the new website crafted by librarian James Davidson with a little assistance from Steve Dunford. From there is a link to the NZVRS on-line forum for members (and visitors) to seek assistance, sales, discussions, information etc. Furthermore, James has continued digitising the library circuit collection (now over 1300) and the past bulletins. Both these are available to members for $20 per chip or $25 for both on one chip. See details in the For Sale section and on the website.

Again, we have a donated item (Edison model E phonograph) that will be auctioned on-line and also in person at the end of year meeting – see details towards the back of this bulletin.

This bulletin contains a range of works from regular and new contributors that is most appreciated. Perhaps slightly concerning is the number of passings and there is follow-up on the Arthur Plimley death last year. On a brighter side there a several restoration articles and construction projects. Also; some informative items, some recollections and a crossword to briefly occupy the mind - a veritable feats of delights and as it is end of year we might try for some printed colour on the cover - I hope you will enjoy it!

Wishing you the very best for 2019.

Cheers, David & NZVRS Committee

The Cover Picture:

Gerry Billman's entry in the AGM Upcycle Competition which won the vintage and design awards, gaining runner-up overall.

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New Members

B Blundell	France
K Brinsdon	Dunedin
R Firman	Whangarei
C O'Connor	Temuka
J Warren	Gisborne
R Killop	Auckland
R Rowe	Morrinsville
B Stevens	Christchurch
J Van Dijk	Rangiora
R Ramsay	Dannevirke
G McKay	Leeston

Noted Passings

Eric Carter	Te Kuiti
Noel Sargon	Auckland
Murray Hall	Rotorua
Basil Padgett	Paeroa
Garry Bold	The Morseman
Tony Maher	HRSA past president
Merv Smith	Radio Broadcaster

Notes, Queries, Passings & Obituaries:

Subject: Query about Coastwatchers AWA 3BZ Radio Sets

I don't wish to appear ghoulish or insensitive in any way, but I was wondering if in any collection of old radio sets there might be any pieces of the famous AWA 3BZ Teleradio, as used by WWII Coastwatchers in New Guinea, British Solomon Islands etc? I am very much involved in a project to build a wartime museum in the Solomon Islands and we are seeking an AWA 3BZ, or any parts thereof for a suitable tribute display.

If you happen to find anything, I would appreciate it if you might keep me posted. We are willing to pay to get our hands on an AWA 3BZ as it would be a unique and significant item in the museum. With many thanks & best wishes,
Dr Martin Hadlow <mhtravelling@yahoo.com>

Napier Display – call for exhibits.

I have made a booking for a display at The Creative Arts Centre in Napier known as the CAN for 2 weeks at the end of April / first week of May 2019 with dates to be confirmed shortly, in order to have local members display some of their collection, with a view to create an interest and possibly new members. Those contacted are in favour, however there may be one or two that I do not know. The CAN people are quite good at promotion and advertising, I hope to title the display THE GOLDEN AGE of RADIO if that is permissible as a form of tribute to John Stokes.
The building is earthquake OK, as is security but no liability.
Update: The exhibit opens Friday 26 April closes Thursday 9 May 2019. I will be contacting local members again and I can be contacted at rjohb2@gmail.com or 06-845 1558.
Regards to all, Ray Olsen

Passings:

Tony Maher, a well-liked past President of the HRSA, passed away on Tuesday, September 25th, 2018. He had been in intensive care for some time and one hoped for another recovery like from a similar predicament a number of years ago.

Tony was a huge supporter of the HRSA, a past President, and a friend to many.

In recent years Tony converted each production issue of the HRSA magazine "Radio Waves" into a print format as required by the printer.

He was technically astute, skilled and inquisitive, and had made it his mission to design and build better performing crystal sets, which he achieved very well. He also designed and built battery eliminator (inverter) power supplies for battery sets that were very popular.

Tony had run one of Australia's few remaining electronics companies, designing and manufacturing specialised equipment – like units used to "see" inside packaged products like "Mars Bars" on production-lines, automatically rejecting any with less than the stated amount.

A passionate supporter of Radio, he will be sadly missed especially by Australian members.

Tony talking to Dick Smith about the finer qualities of crystal radio

Padgett, Arthur Basil. Peacefully, at Ohinemuri Home, Paeroa, on 10th April, 2018; in his 90th year.

Basil worked for D J Reid in Auckland. He also had a home business in Howick under the name of Howick Transformers and was living in the next street. Not sure who he worked for after Dick Smith bought out D J Reid but I remember him in the late 70's when the shop was in Airedale Street next to the Auckland Telephone Centre building.

Regards, Dennis Seymour

Distractions: Radio Garden – a web-based radio "dial".

With **Radio Garden** you can click and drag an Earth globe around, and zoom in on local stations. Every dot represents a radio feed you can tune in to, and using the options in the top left of the webpage, you can switch between live streams, historical content, jingles and recorded interviews.

"Live streams are where the most action takes place with a myriad of stations to tune into. Radio Garden was launched last December 2016 and is run by the Netherlands Institute for Sound and Vision. This is a somewhat old pleasure, where we older folk, when young, could turn the dial on the family radio to tune in distant stations with delight (there was no television, you had to use your imagination to explore reaching out into a new adventure)."

http://radio.garden

A Cautionary Tale on the Death of Arthur Earle Plimley

Electric blanket malfunction sparked fire which killed elderly Thames man.

Last issue of the bulletin we reported on the death of past NZVRS member Arthur Plimley. Since then a corner's inquest has been held. It found that the retired Thames electrician died of asphyxiation after a smouldering fire ignited in a 40-year-old electric blanket the recluse had electrically modified. A sleeping Arthur Earle Plimley, aged 76, likely woke to the heat at his feet, or the smell from the smoulder that burned into the mattress of his bed at his Thames home in August last year. He likely attempted to reach the bedroom window but was overcome by smoke inhalation and was found slumped face down in a chair in the bedroom when police were called to his home.

Plimley was a retired electrician and amateur radio enthusiast, and the Coroner said he had done "creative electrical work", possibly bypassing the electrical meter. The blanket "was an antiquated design possibly over 40 years old, and had been modified to allow the voltage to be increased" he said. Given Plimley's past as an electrician, he had the experience to undertake "creative electrical work" around his home. "My guess is that he was bypassing the electrical meter." Power to the blanket likely bypassed the distribution board as well as other safety devices which attach to an electrical circuit in a home, he said.
In giving evidence, a specialist fire investigator said that the fire was a smouldering fire rather than a blaze. It had self-extinguished before Plimley was found due to a lack of oxygen. Both the door and window to the room were closed. A television that stood on a dresser and a smoke alarm on the ceiling had "all melted away" due to the heat build-up in the room.

Questioned as to why power to the electric blanket had not shorted when it faulted. The investigator said it was likely Plimley had used a distribution cord bypass. This was discovered after fire investigators found the electric blanket remained on, despite power being turned off at the address. Also, a radio was on when emergency services arrived and Plimley had power plugs coming from the mains and had deferred power from the kitchen.

Speaking after the inquest Plimley's niece said the inquest helped provide some closure. She wanted to thank everyone involved on behalf of the family. "He was a very private person - definitely." In the years before his death he had been diagnosed with cancer and cataracts, making him more of a recluse. He was not a man into family outings, but she frequently visited him in Thames. When communications technologies were introduced into New Zealand, he was right into the thick of it, she said. He was an avid citizens-band broadcaster which connected him with the world. He was by himself at home, but he was with the world.

The Coroner said the inquest was an important reminder to consider the age of electric blankets and have them checked. People can seek advice from electricians or a fire risk management officer located at local fire stations. He also said it was timely to remind the public to check their smoke alarms.

Arthur had been found dead by police in his Thames home after a CB radio friend in Te Atatu had raised the alarm. He became worried when his friend failed to keep scheduled appointments with him and other friends on the airwaves. “Earle was a well-known voice on the airways having callsign Thames 104 and we spoke every morning religiously from 6am he said.

On the Tuesday, Plimley had said he was not feeling well and had gone on air - operating from his bed where he was keeping warm with a small electric heater. Using a heater was unusual for Earle, as he had a wood stove for heating his water and for heat, so I knew he must've been feeling quite off. The head of his bed was near the window and he said he had pulled back the curtain, looked out at the miserable weather and decided to stay in bed.

He became a little worried when Plimley missed a call to another friend at 4pm that afternoon.

"When he was off air again on Wednesday morning and I kept getting a busy signal from his land line, which I had asked Telecom to check and they said no one was using the phone, I rang the police," he said.

Police visited the property and discovered there had been a fire but it had burned itself out before their arrival and that Mr Plimley had died. The investigations at that stage were on-going but Police said the death was not suspicious. The Fire Service had attended the property after police visited, to make sure it was safe.

A friend said Plimley was a clever man who had been issued his ham radio licence when he was only 15 or 16 – and not just anyone could get one. The licence tests are quite hard, as people have to know the Morse Code.

"I have known Earle for around 15 years, meeting first over the airways and then in person. I have been to his home and am amazed if there was a fire, it did not raze the house to the ground. I look forward to hearing the answers.

"He was extremely careful with electrics, even his work bench in the garage was earthed and the stool he used was on a heavy rubber mat. It is very sad to think an electrical fault could have been his undoing," he said.

Plimley had worked for the Post Office for 20 years as a radio technician and 20 years at Toyota in Thames doing electrics on cars before retiring.

"He lived alone and was a very private person."

Merv Smith QSM Radio legend, former ZB breakfast host dies 24/9/18

Radio legend Merv Smith, one of New Zealand's pillars of broadcasting, died aged 85. He had started in breakfast radio at 1ZB in 1961, aged 28, and left for Radio I when Paul Holmes fronted the Newstalk format in 1986. After Smith moved to Radio I, he achieved a further two years as number one host before Paul Holmes eventually took the top slot back for NewstalkZB. Smith had held the number one position in the country's radio breakfast ratings for 26 years.
He was also very involved in radio drama, then on TV in *Personality Squares*. His breakfast show included children's birthday calls and a spider called Hairy McHairy.
When he left Radio I, he started a country music radio station from Albany.
After retiring from radio, he immersed himself in his true love; trains, running Merv Smith Hobbies in Newmarket until he died. He volunteered for the Blind Foundation for 48 years; narrating nearly 200 books and countless magazines. He was also in numerous radio and television commercials as well as a children's video series called *Buzz and Poppy*.

Smith was first heard on the ZB station as a member of Tom Garland's school-age Friendly Road choir in the late 1940's. After leaving school, he had worked as an office boy in radio stations in Auckland and Whangarei before getting his big break on the 1ZB breakfast show in 1961.
Despite the fact that he was a bit of a comedian, he strongly believed in the production of a good voice and correct pronunciation.
In the book *ZB - The voice of an iconic radio station*, Smith's natural talent for talk, clarity of delivery, facility for mimicry, jokes, great laugh and all-round cheerfulness is said to made him the number one choice of most Aucklanders for their first contact with the world every morning. Smith's weekly conversations with his character Hairy McHairy were frequently hilarious, but well within the limits of broadcasting decorum of the day.

Apart from broadcasting, his acting roles included The Hobbit (2014), Buzzy Bee and Friends (2009), and This Great Papier Mache Boulder is Actually Really Heavy (2016). He was a passionate railway and railway modelling enthusiast. Smith had previously written of his interest in model railways in his 1977 book *Little Trains of Thought* co-written with Ches Livingstone, which detailed his creation of a model HOn30-scale layout based on a fictional New Zealand West Coast narrow-gauge line.

In the 1985 Queen's Birthday Honours List, Smith was awarded the Queen's Service Medal for community service.

Minutes of NZVRS AGM 21 July 2018

Attendance 26 members signed the attendance book.

Apologies: Bill Campbell, Ian Brown, Tim Flack, John Akersten, and Cliff Maxwell

Minutes: The minutes for the last AGM were summarized by the President. Russell Louden proposed that the minutes were a true and accurate record of the last AGM, Cliff Wright seconded this move.

Correspondence: The Treasurer had correspondence from several members to be discussed in General Business.

President's Report: Welcome to our 2018 AGM. It has been a busy year for us in Auckland. We have only produced one Bulletin in the last year and this has generated some discussion which will come up later in the meeting. We have begun a web-based forum for more rapid dissemination of information. Our activities continue in the clearance of the Estates of past members of the society from Whangarei in the North to Kihikihi in the Waikato, and I personally wish to thank all those who have helped and continue to help, whether physically getting the items to our auctions and garage sales or indeed buying or taking items away to clear our limited storage area. Our Librarians continue to compile our library of circuits which can be obtained on USB stick drives. They also respond to requests for specific circuits. Please continue to support the NZVRS in any way you can and try to prevent our NZ radio and electronic heritage disappearing. If you have carried out a restoration or have any other item of interest please consider writing an article for the Bulletin. Thank you members one and all.

Treasures Report: The Treasurer summarized the unaudited financial report that was handed out. Membership shows 247 only 2 down on last year. There continues to be a high value of donations and auction sales this year $2842 which is over $1000 down on last year. This is due to the items being of less value this year. Club sales were up slightly thanks to Bryan Powell's efforts approximately $2000. Bank interest rates are down. Total income $11248. Library storage $3270 The hall hire this year is $600. Web hosting $315. Total cash assets $ 42,011.41 Library value $5142.41 Stock on hand $1804.00 Total assets $48,957.82

Ian Sangster moved that the financial report be accepted and Lloyd Anderson seconded the move and it was carried unanimously.

The Election of Officers: One new committee member was nominated; James Davidson nominated Steve Dunford and Bryan Powell seconded the nomination. There were no resignations from the existing committee. Russell Loudon proposed that the Executive and committee be re-elected in its entirety, with the addition of Steve Dunford. Paul Burgess seconded this move and it was passed unanimously. The committee members now being; Bruce Churcher, Lloyd Anderson, Clarry Schollum, David Kemp, Owen Young, Daniel Hockey, Bryan Powell, James Davidson and Steve Dunford. Holding the positions of President is Ian Sangster, Treasurer David Crozier, and Secretary Paul Woodcock.

The Library. Last year Bruce received 46 circuit requests and had successfully found and sent out 42 of them, James has continued scanning circuits now up to 1300. James has also scanned past bulletins and these are soon to be available on a memory stick for about $20.

AGM Related Business The treasurer proposed the subs remain the same as last year. $20 E copy only bulletins, $25 for early bird hard copy posted out bulletins and $30 for new and late payers, David kemp seconded this move, and it was passed unanimously.

A discussion was initiated by David Crozier on what direction the Society should head. A number of initiatives were mulled over. The need to widen the audience for the Web page which thanks to David Kemp is all set to go. It will allow financial members access to areas not available to non-members where there will be circuits and bulletins. The site has a forum area that will allow members to be interactive with queries, current projects etc. This should allow out of Auckland members to get more involved with club matters. Many of the attending members felt this was a positive development. Post only members will be at a disadvantage, so if our over worked Treasurer and acting Editor is supported more with subject material and help, more bulletins may be possible again.

There was a big thank you for Elizabeth Sangster, Gerry Billman, Doug Edgar and David Crozier for their generous food contributions again today, and for Elizabeth running the kitchen.

The competition results. This year’s 2018 competition (Upcycled Product) had three entries. Doug Edger won the Merit certificate for a large glass jar nicely labelled and filled with radio related ‘goodies’, Gerry Billman won the Best Vintage and Best Design certificates for a clever ‘steam punk’ radio creation inside a glass dome. James Davidson won the Best Performing, Best construction and Overall Winner for a nicely converted intercom into a low power transmitter that uses octal valves.

Bryan Powell offered to look after the Crossley Pup for the coming year.

End of formal meeting 4.15pm. The auction is to follow.

James’ AGM entry above,

Gerry middle,

Doug’s right.

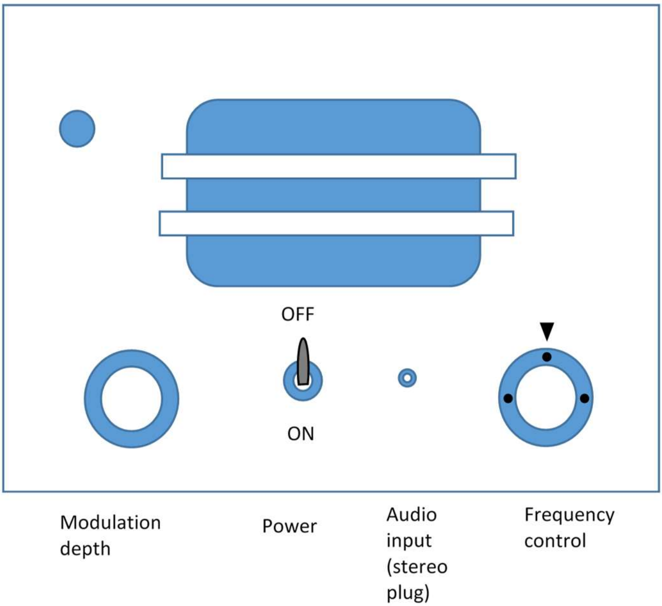
Winning Entry for NZVRS competition 2018.

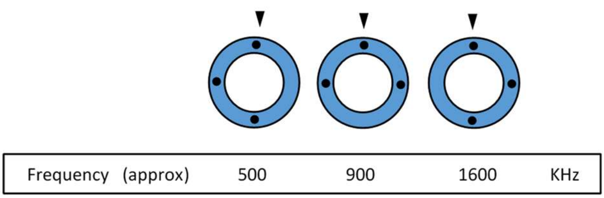
This was the Reuse Recycle Competition winning entry from James Davidson.

A Vintage Intercom Unit Converted into a Low Power AM Transmitter

The cabinet and chassis including power transformer and rectifier, of a vintage intercom unit was used to build a MATE broadcast band AM transmitter, following the circuit of P. Lankshear (Electronics Australia May 1989), with minor modifications.

The transmitter consists of an audio amplification stage followed by a triode modulator connected in series with an anode-tuned RF oscillator. An oscillator coil from an old radio together with a tuning capacitor (2 gangs connected in parallel) was used for the tuned circuit, giving a frequency range of 500-1600 KHz. The circuit differs from the original in that the oscillator is parallel-fed, allowing the tuning gang to be isolated from the HT voltage. Provision is made for connection of an independent earth, and disconnection of the mains earth, in case this is needed for prevention of modulation hum (switch is on rear panel).






"MATE"
AM TRANSMITTER
OFF
MAINS
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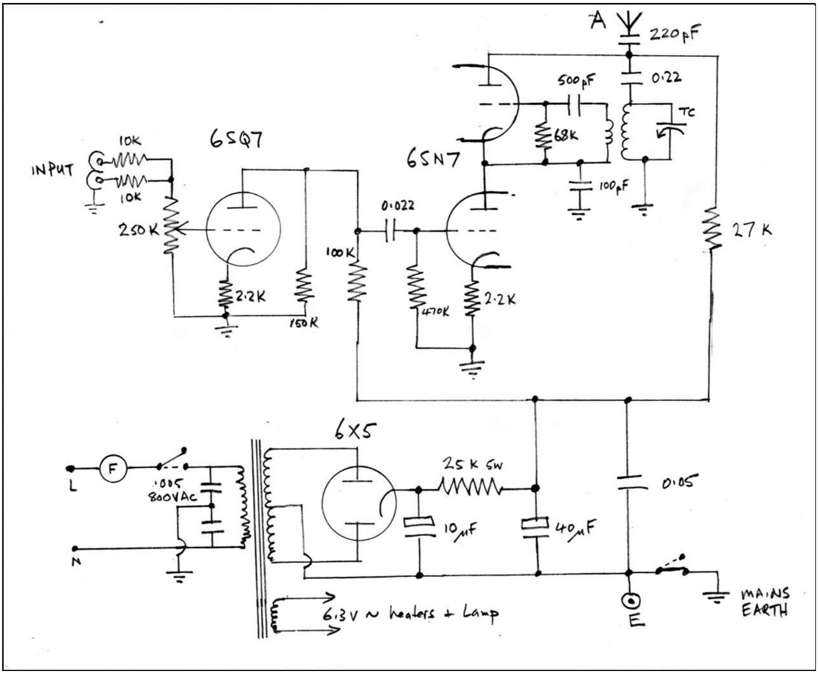
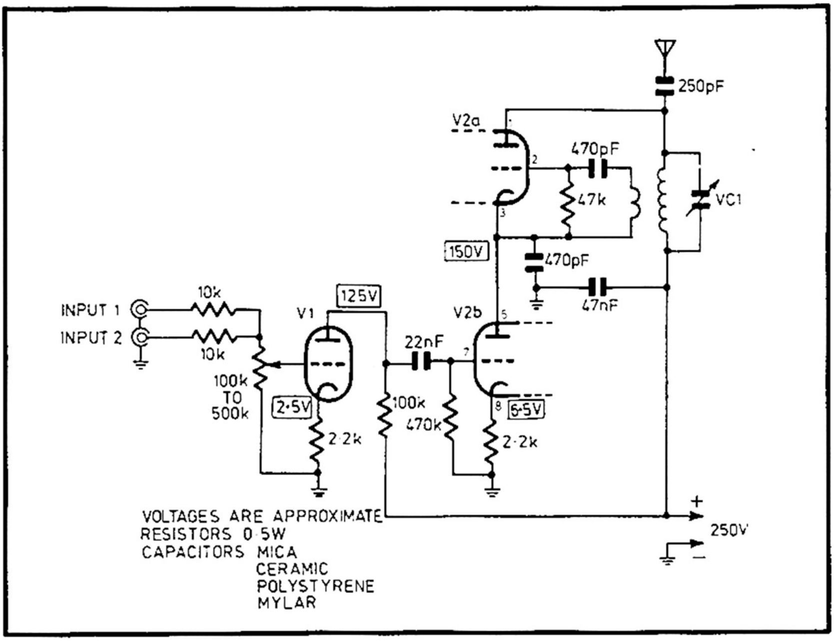


James' circuit above, Peter's below



The circuit for the 'MATE' – effectively a very low powered AM transmitter, using a triode RF oscillator V2a series modulated by V2b. Incoming audio is amplified by V1.

New Zealand WWII Coast-Watchers

Were their Remains Beneath an HF Antenna Farm?

From Peter McQuarrie <petermcq@xtra.co.nz>

On the tiny island of Betio, at Tarawa Atoll, on 15 October 1942, seventeen New Zealand Coast-watchers were executed by Japanese military forces. The group of young men consisted of seven Post and Telegraph Department Radio Operators and ten NZ Army soldiers. Along with five European civilians, they were beheaded and were buried in a mass grave. The grave site was a 'babai pit', a wet pit, previously used by the islanders for growing babai (swamp taro), situated at the western end of Betio, an area known as Temakin. Until today, no remains of these men have been located and recovered.

As the Pacific War progressed, the Japanese turned the island of Betio into a fortress; building bunkers and gun emplacements, and in the process of constructing an airfield and military fortifications, the grave site became obscured. It is believed that the Japanese built a gasoline and bomb storage area directly on top of the grave.

American Marines invaded Betio in November 1943 and during the pre-invasion 'softening up' they bombed and shelled the whole area causing the bomb storage depot to explode creating a huge crater. If this crater was exactly above the grave then any human remains would have been destroyed or widely scattered, however it is possible that this was not the case and the crater could have been to one side of the grave and that some remains could still lie buried beneath the coral sand of Betio.

After the battle, the first priority of the Americans was to repair the damage to the island and to create their own base on Betio. The Naval Construction Battalion (the Seabees) got to work with their graders and other heavy machinery to fill in the bomb craters, level the ground and make the airfield operational again. Rapidly the surface of Betio was transformed into one of flat white sand, without a coconut palm or breadfruit tree in sight. There was no trace of the babai pits.

During the period of US occupation, they built an airfield, Quonset huts, roads and many buildings. The face of Betio changed forever. The occupation ceased in 1946 and over the next three decades the western end of Betio was developed as a government radio transmitting station, operated by the Gilbert and Ellice Islands Posts and Telecommunications Department. The station had a huge antenna farm which covered much of the area that had originally been babai pits, including the site of the coast-watchers' grave. It was an HF and LF transmitting station and had some large antennas and earth-mats associated with it. There was a large 'tee' antenna and radial earth-mat for the 500 kHz of the CW Maritime Mobile calling and distress channel and another for an aeronautical NDB navigation beacon. There were large rhombic HF antennas, aimed southwards towards the Ellice Islands (Tuvalu) and Fiji, for radio-telephone and telegraph services and the aeronautical fixed telecommunications network (AFTN). One interesting antenna at the station was a 'cubical-quad' which would perhaps have looked more at home at an amateur radio station than a government one, but as it was directional and rotatable it no doubt came in handy for special requirements. There were also wide-band HF antennas for Maritime

Mobile radio telephone and aeronautical air-to-ground communications as well as smaller HF antennas for the fixed point-to-point Morse telegraphy services between Tarawa and other islands in the Gilbert and Ellice Islands.

Perhaps it is fitting that the coast-watchers remains should have been buried in the sands of Betio, beneath the radio transmitting antennas for these past decades, given that much of their coast-watching work had involved radio transmission.

With regards to the transmitting equipment at the station, there were low-powered (100 watt) HF transmitters for the outer islands service. Some of these were remotely controlled ARC-5 transmitters, small, light-weight transmitters made for use in US Navy aircraft in WWII. They probably had been left on Betio when the US occupation forces departed. They were still in use on Betio up until the 1980's. Other transmitters were more modern; British Racal equipment. The Gilbert & Ellice Islands was a British Crown Colony and so any new equipment purchased was required to be of British origin.

For the long-distance radio telephone and telegraph circuits there were larger Racal transmitters of 1 or 5 kW power. These operated in 'independent sideband' mode where each transmitter could send up to four independent channels on, two upper and two lower sidebands. There were also T1509 transmitters, which some older New Zealand radio enthusiasts may remember. These were another WWII transmitter, made for the Royal Air Force. They used a pair of 813 valves in the PA stage to produce up to 300 Watts of RF power. They were for use in ground stations, being far too heavy for use in aircraft. For a transmitter of only 300 Watts output, they were large and heavy, weighing nearly half a ton. They were built like battle ships, very well made and very reliable.

Also, on this site, attached to one of the buildings was a brass plaque, a memorial specifically for the radio operators who were executed in the Gilbert Islands in WWII. It was inscribed with the names of the seven P&T employees, plus Reg Morgan, the Australian radio operator, who died with them on Betio. In addition, was the name of their colleague, Ronald Third, also a P&T employee who was executed on Ocean Island.

The Golden Age of HF radio communications has long passed and with it the transmitting station and antenna farm. The use of the land has reverted to the original land owners and the site is now covered with domestic dwellings and beneath them perhaps, the Coast-Watchers' bones still lie. When the site was cleared of telecommunications buildings and radio antennas, the brass plaque was handed over to the New Zealand High Commission on Tarawa. In 2012, at the time of the 70th anniversary of the coast-watchers' executions, it was brought to NZ Post headquarters at the corner of Whitmore and Waterloo Quay, in Wellington. It is now on display on the wall in their reception area. Perhaps a fitting home for it.

Anyone further interested in the story of the coast-watchers' remains can contact Peter <petermcq@xtra.co.nz> for an electronic copy of his article: *Where Are the Coast-Watchers' Bones?* Peter McQuarrie & Kevin Menzies, "The Journal of Pacific History" (JPH), Vol. 53, Issue 2, June 2018.

Coast-watchers plaque at NZ Post Headquarters, Wellington

RDF, Magnetrons, Radar, H2S, IFF, GPS and Microwave Ovens.

From Dr Ian Thompson

The Motivation

After the Christchurch, New Zealand 22nd February 2011 earthquake, the Ferrymead Radio Preservation Society's (RPS) store room was left in a mess. However, what it did expose was a rare H2S Radar PPI (Plan Position Indicator) unit on one of the shelves, which had been heavily modified years earlier by the local Audiologist department to create a pseudo Oscilloscope necessary for their work, when such equipment was in short supply. Conversion of PPI units into Oscilloscopes or even Television sets was apparently a common fate for them when they became available on the surplus market. Finding this unit kindled a latent interest in Radar which I felt was worth investigating.

Figure 1 The Mess at Ferrymead RPS, 2011

Researching the history of H2S exposed an absorbing story of tragedy, triumph, brilliance and luck that connects many eminent and talented people involved in the remarkable development of H2S Radar and one of its many legacies; the microwave oven, which is found in most homes nowadays.

The British Radar development program in the 1930's was very much a catch-up exercise with the by now, secret and much more advanced Radar development programs already underway in many other countries. The following narrative is a distillation of many intriguing stories that collectively become the story of British Radar development that focuses on how rapidly England managed out of necessity, to catch up and in some aspects, augment the status quo of Radar evolution, in only a few years.

The Pioneers

Although there is evidence that the concept of listening to sound reflections off objects must have been used many times over the intervening eons of time, it was not until much more recently that the genius James C. Maxwell (1831 – 1879), laid the cornerstone to man's Radar by formulating his equations on electromagnetic theory. Maxwell started considering electricity and magnetism and in particular the magnetic fields created by electric currents. This seminal work led him to define "Maxwell's Equations" which mathematically rationalised many electromagnetic observations that became the inspiration for Heinrich Hertz (1857-1894). Hertz was a very practical man adept at designing and building equipment, who started investigating the electromagnetic waves postulated by Maxwell and in so doing postulated the concept of "frequency space" or the Electromagnetic Spectrum. To do this he developed a spark gap oscillator that whilst very crude by modern standards, did establish an electromagnetic field that he used to experiment on the electromagnetic conductivity of different media. Some materials such as paper would easily allow his signals to pass through them whilst others such as metallic surfaces, were not nearly so good and indeed reflected these signals. His pivotal discovery in the story of Radar is he had identified that radio signals could be used to detect the presence of metal objects, thus unknowingly sewing the first seed of Radar.

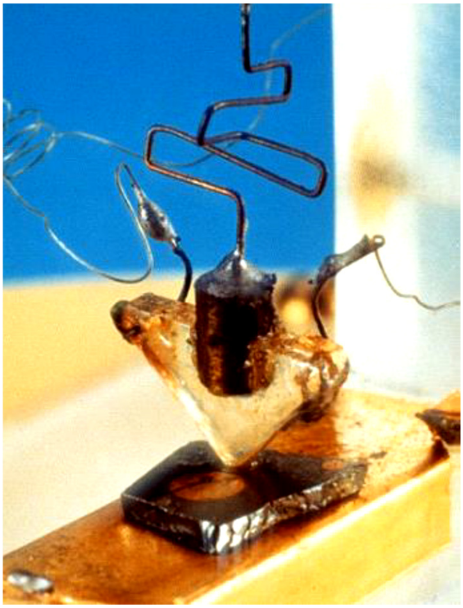


Figure 2 Bell Lab's First Transistor

Fundamental to Radar is the conception and development of the necessary electronic components and principles required to implement a Radar set. Karl Ferdinand Braun (1850 – 1918) is accredited with the discovery in 1874 of electronic rectification when metal Sulfide crystals were probed by a metal point. He then later demonstrated the concept to a wider audience, although the significance of his work was not recognised. Importantly what Braun had found was the point-contact concept initially known as the "Cat's Whisker" used in early AM radio receivers. In late 1947, AT&T's Bell Laboratory scientists John Barden and Walter Brattain performed experiments on the point-contact concept and developed the first Transistor – the precursor to all modern solid-state electronics. Braun was a prolific inventor and on the 15th February 1897 invented the Cathode Ray Tube, (CRT), although the German name for this invention was the "Braun" tube [B], ubiquitous in all display systems including Television sets until the recent advent of semi-conductor displays. A further significant advance in radio technology occurred on the 20th September 1898 [A] with the application of coupled resonance allowing impedance transformations within electronic circuits to be created. These breakthroughs in radio and visual display electronics were crucial and are fundamental building blocks in Radar and Radio electronics.

The German engineer and notable inventor Christian Hülsmeyer (1881-1957), on the 30th April 1904 applied for German (DE165546) and British (GB13,170) patents for his Telemobiloskop as a “Means for reporting distant metallic bodies to an observer by use of electric waves” aimed at ship collision avoidance. These interesting patents consider some of the key concepts found later in the application of Radar such as using a coherent [1] (radio) transmitter and receiver with a directed, rotatable beam. Surprisingly, there are claims that his work was forgotten and only later a second discovery of Radar principles, formed the foundation for German Radar development.


KAISERLICHES PATENTAMT.

AUSGEGEBEN DEN 21. NOVEMBER 1905.

PATENTSCHRIFT

— № 165546 —

KLASSE 74d.

CHR. HÜLSMEYER IN DÜSSELDORF.

Verfahren, um entfernte metallische Gegenstände mittels elektrischer Wellen einem Beobachter zu melden.

Patentiert im Deutschen Reiche vom 30. April 1904 ab.

Figure 3 Hülsmeyer Patent Cover Page

RDF Development

English Radar development is generally accepted as originating out of a request to look for a “death ray” that could be used defensively to protect against invading aircraft, as depicted in films such as Fritz Lang’s “Metropolis” (1926) alongside rumours emanating from other countries about the existence of such systems. To address these concerns Mr. (later Sir) Robert A. Watson Watt [2] was tasked with checking the feasibility of death ray technology, who in turn passed this request on to his Chief Engineer at Farnborough, Arnold “Skip” Wilkins. Wilkins calculations suggested that the signal powers required were impossible to generate but in presenting this conclusion to Watson Watt, he mentioned the annoying “fluttering of signals when aircraft were near” mentioned in a GPO (General Post Office) report commissioned in 1931 detailing a radio propagation experiment they were conducting.

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[1] Coherence describes the use of a common oscillator to drive both the transmitter and receiver. In Radar applications coherence is essential to time stamp the received reflected signal with that being transmitted to measure the time and hence distance the reflected object is from the Radar set which was especially relevant in early Radar sets where their oscillators were prone to drifting.

[2] Mr. R.A.W. Watt hyphenated his surname to Watson-Watt when he was knighted in 1st January 1942. He was a direct descendent of James Watt who revolutionised steam engine design. As will become evident before this date, Watson-Watt was already being referred to as “Watson Watt” in some of the memorandum of that period.

What they had noted was the ghosting caused by passing aircraft introducing multiple reflections of the wanted signal, similar to the effect many of us have witnessed on older (terrestrial) television systems caused by passing metal objects. Shortly after this discussion, Wilkins set-up the Daventry experiment (26th February 1935) that used the Daventry high power transmitter as a signal source and a pair of parallel mounted ground-based aerials half a wavelength long (24·5m). These were connected to two receivers (sharing the same local oscillator), with a phase adjustment added in one received signal path to null out the original transmitted signal. The aerials were aligned facing the BBC Daventry transmitter signal making it possible to cancel this signal. However, any of the signal from the BBC transmitter being reflected off the passing aircraft (a Handley Page Heyford aircraft, K4030), now travels paths of different lengths, causing them to arrive at the two aerials at slightly different times. It was this difference in time of arrival that Wilkins exploited in his demonstration. In the early 1930's the Oscilloscope (or Oscillograph as it was then known in England), was a relatively new and quite rare piece of test equipment. By connecting the two receiver outputs to the vertical and horizontal plates of his Oscillograph display, any phase difference between the signals received by the two aerials (caused by the reflection from the passing aircraft), would be apparent as a fluctuation on the Oscillograph display.

This demonstration by Wilkins [D] was only witnessed by Watson Watt and Rowe (in his capacity as Air Ministry observer), who reported a favourable demonstration to the Tizard Committee. Upon hearing of the success of the demonstration the next day (27th February 1935), Air Marshall Sir Hugh C.T. Dowding, 1st Baron Dowding (1882 – 1970), (Air Member for Research and Development) was delighted and was prepared to fund further research. Dowding was a visionary and very much a hero in this story and of course later in the Battle of Britain. He realised the efficacy of this application in his defences because what he required was some form of advance warning system that allowed his meagre fighter force to be used most efficiently against the superior numbers of German aircraft being built at that time. Further, Dowding was prepared to fund this work using the limited budget available. This was very much a leap of faith that was frequently tested over the following few years during the technology development period, with the ebb and flow of successes and failures in subsequent demonstrations. Such was his resolve and compelling desire to provide an effective defensive system to counter the threat to national security and safety, that was evidently brewing in Germany.

Arguably Wilkins calculations were the foundation and indeed the compelling argument used to develop the "floodlight" signal approach fundamental to Chain Home Radar transmissions. At this time, undoubtedly undertaken in great secrecy, the Germans had already developed "searchlight" type beam Radar systems that directed the Radar transmission in a more directional (and electrically efficient) beam they could scan the skies. Chain Home on the other hand, used a wide Omni-directional beam that flooded the whole area with electro-magnetic radiation. On the 2nd August 1939 Goering's technical advisor General Wolfgang Martini carried out a reconnaissance mission using Zeppelin airship LZ130, Graf Zeppelin II, to discover the purpose of the mysterious groups of 240ft and 325ft tall towers appearing along the English east coast. From their radio detection equipment, it was obvious that the signal overloading their equipment was indeed very strong with a low pulse repetition frequency of 25Hz. This very low pulse rate matched half the English AC mains domestic Voltage supply, but there was nothing about the characteristics of these signals that remotely resembled the German concepts of raider used in their Freya and Würzburg radar.

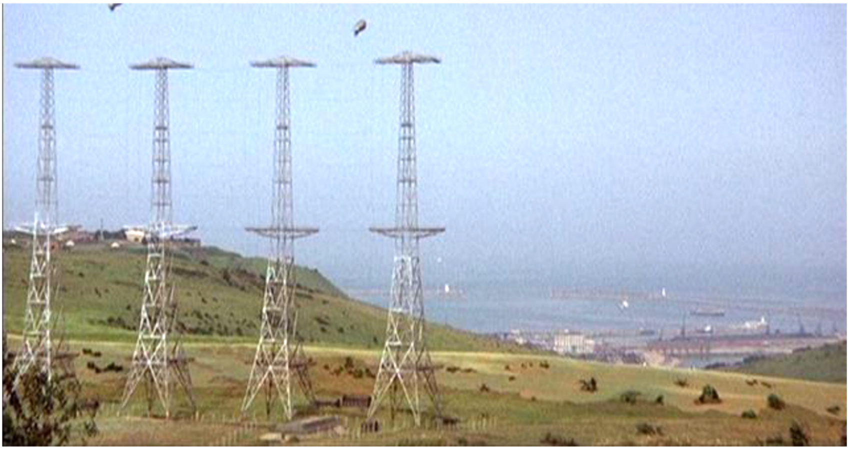

Figure 4 Chain Home Masts at Dover

Moreover, the strong floodlight signals transmitted from those towers had overloaded the delicate electronic measuring instruments on the Zeppelin, making it impossible to identify the signal's pattern and purpose. In summary, the floodlight (RDF1) [C] approach was so different to that of German Radar thinking and understanding, that it unwittingly preserved the secret of English Radar development and deployment. Intelligence information provided by Chain Home Radar (and its variations) was of little value on its own and was supplemented by information provided by the Observer Corps (later to be designated "Royal", by Royal Warrant from George VI in April 1941), whose task it was to visually confirm and identify aircraft activity.

To effectively collate, process and disseminate this information to airfields, search lights, barrage balloons, anti-aircraft batteries and air raid personal for civilian protection, requires a large well managed, structured organisation. All these systems, practices and principles had also to be developed, refined and deployed in double quick time. With the potential advanced warning that Radar promised detecting enemy aircraft

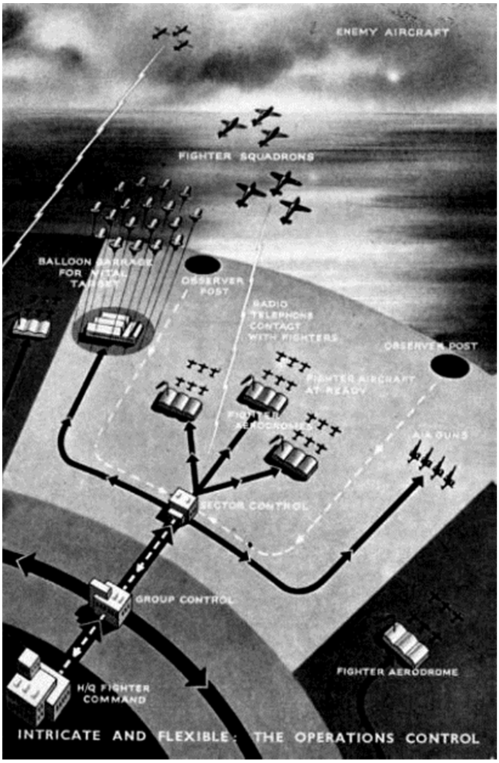

Figure 5 Dowding (Intercept) System

formations developing before being despatched from France for England, being envisioned in 1936/37, the embryonic Fighter Command system was developed. All this work was orchestrated by Dowding from his headquarters at Bentley Priory located North West of London.

RDF and RADAR Fundamentals

Traditional "Radio Direction Finding" (RDF) is a system that compares the received signal strength of a given signal by a directional aerial pointing in different directions. Using loop aerials, it is possible to detect the direction of a given transmitter by looking for a null in the signal when rotating a loop aerial with the signal null occurring when the loop is facing the transmission. Thus, by triangulating two (or more) bearings from known transmitter locations it is then possible to calculate the position of the transmitter. Initially British Radar development was deliberately assigned the same acronym RDF, which meant in this case; "Range and Direction Finding", as a cover for this top-secret work. Later in 1942 the British assumed the American Naval acronym RADAR (RAdio Detection And Ranging) [3] to standardise nomenclature.

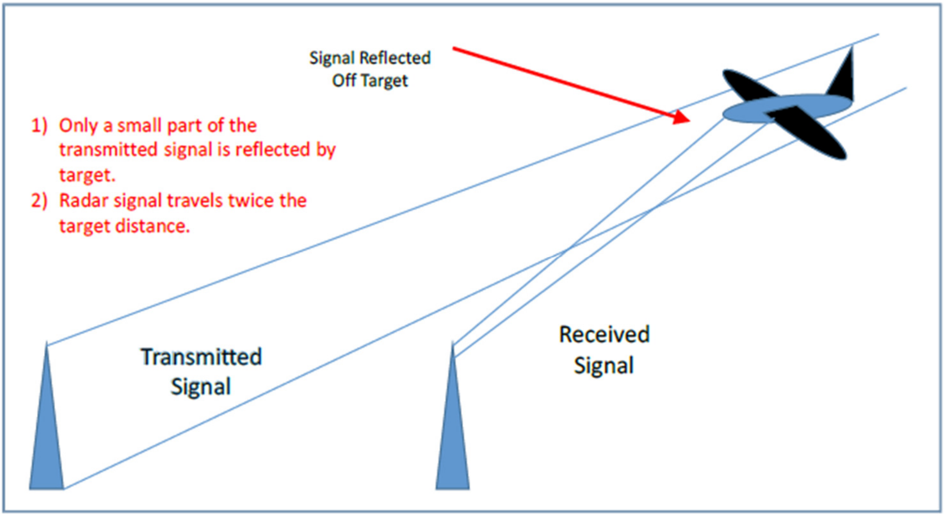

Figure 6 Radar Concept

Radar systems transmit a pulse and measure the time delay between the transmission and reception of that same reflected pulse, to determine the distance a given object or objects are from the Radar station. Of all the systems (and their variants) only CH, CHL, AI, ASV and H2S were "true" (echo) Radar; the others relied on a triggered radio response, although radio navigational aids (based on Radar principles) such as GEE, OBOE, EUREKA, BABS, Fishpond were developed by the Radar group.

[3] Occasionally to emphasis the Radar reflection property deliberately emphasised in the Palindrome "Radar", the word is typed as "RADAЯ".

11:15 AM, 3rd September 1939 and IFF

There are many interesting digressions in this story of Radar. One example occurred shortly after a defeated Neville Chamberlain (the British Prime Minister) delivered his "war is declared" speech on 3rd September 1939. So, started the "phoney war" further assisted by the particularly bleak winter of 1939/40 that offered much needed time to continue refining RDF. On 6th September with English RDF deployment and understanding still in its infancy, an English interception squadron was dispatched to intercept what was believed to be an inbound enemy raid. As it transpired it was another English aircraft squadron with the result that two allied pilots were killed – the Battle of Barking Creek. The ensuing court martial of the English pilots included Roger Bushell as part of the defending council who later went on to master mind the Great Escape as "Big X". Such is the loom of the Radar story with its many branches of equally notable stories. What is significant here is the failure of IFF (Identify Friend and Foe) electronics, still being developed and a firm understanding of its application by the RDF operators, used to distinguish friendly aircraft. This technology has progressed significantly nowadays to identify all commercial, civilian and other aircraft in the skies.

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FIRST NAZI PLANES APPROACH ENGLAND

Scout Ships Turn Back Without Battle—Pursuers Fired On by Own Artillery

Wireless to The New York Times.

LONDON, Sept. 6.—The shrieking of air-raid sirens awakened millions in London and Southeastern England shortly before 7 o'clock on this golden Autumn morning, and for more than two hours the normal life of the metropolitan area stood still until the sustained, high-pitched note of the "all-clear" signal sounded.

During the interval the first enemy planes to approach the shores of England during this war had turned back after what was supposed to be a reconnaisance flight.

The first warning signals rose and fell like the wailing of a thousand

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PARIS, communi General follows:
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Figure 7 Barking Creek News Article

The Cavity Magnetron

On the 21st February 1940, Professor (later Sir) John T. Randall and Dr. Henry A.H. Boot are credited with developing the first electrically efficient Cavity Magnetron. In their small lab at Birmingham University they built a six-chamber cavity magnetron (using the six-chamber cylinder from a Colt revolver as the mechanical template), which they energised with a high Voltage in a strong magnetic field, to generate a 400W, 9·8cm microwave signal source. This was a key step forward because they now had a high-power, high-frequency signal source that could produce almost 100 times more power than any other device and it could be pulsed on and off. The significance of this development lies in that higher frequency signals offer greater resolution in Radar applications and more importantly in those days, the Magnetron source did not require further signal amplification, which was near impossible to achieve at these frequencies. This was the difficulty with using the alternative much lower microwave power signal source; the Klystron. Although Randall and Boot are credited with this Cavity

Magnetron work it should be noted that there is a plethora of early work (and associated patents and papers), by the Czechs, Germans, Japanese, French, Dutch, Russians, Americans and British that had all worked on Cavity Magnetron concepts using variations of split anode devices. Such was the secrecy and how well it was observed, that unknown to Randall and Boot, British Nuclear research was being developed in the neighbouring laboratory at the same time. Politically the dilemma facing the use of Cavity Magnetrons operationally compared with Klystrons is they could not easily be destroyed to the point their secret would not be revealed to the enemy in the event the aircraft they were in, was shot down. The solid block of Copper comprising the Magnetron was virtually indestructible compared with the fragile glass Klystron. The argument raged on.

Figure 8 A Six-Chamber Cavity Magnetron

Then on 7th June 1942 tragedy struck the team. On a test flight Alan D. Blumlein (1903-1942) [4], was killed in a freak aircraft crash whilst testing an H2S Radar system. Blumlein was tasked with working on the Klystron as an alternative to the Cavity Magnetron. On this day he was with his team of engineers in a test flight, allowing them the opportunity to compare and understand the virtues (and vices) of the Cavity Magnetron as a microwave Radar source. The Wellington aircraft assigned to the Radar group had recently had its engines serviced but unfortunately one of the tappets in one of the engines had not been properly torqued down, resulting in it becoming loose during the flight and eventually causing the engine to fail, catch fire and

Figure 9 A Cavity Magnetron Magnet Assembly

[4] Amongst his 129 patents he invented stereo (‘binaural sound” which he tested at Abbey Road studios – long before the Beatles arrived!) and much of the associated recording techniques. In addition, he invented several key television receiver circuits, the long tail pair (which is essential to all integrated circuits), an ultra linear amplifier, high-voltage pulse forming transmission lines (used in Radar for pulsing either Klystrons or Magnetrons) and he developed the Miller amplifier whilst still referring credit to John M. Miller who first recognised the phenomena. Blumlein was a modest man.

quickly burn through the aircraft wing, bringing it down. The dreadful loss of Blumlein and his team was a devastating set-back, because it not only meant the loss of a very skilled team of engineers but jeopardised Klystron development as a viable alternative to the Cavity Magnetron. Finding the test Cavity Magnetron in near perfect condition in the wreckage, further vindicated the concerns of the sceptics.

Decisions needed to be made.
Crucial to operational performance S-band Radar (2-4 GHz) was whether to use a Klystron or a Cavity Magnetron as the exciter source. The dilemma between the choice of either a Klystron or Magnetron persisted and ricocheted throughout political and scientific circles, ever conscious of the pressing need for a viable solution to assist aircraft navigation and target finding. Eventually Churchill held a meeting at 10 Downing Street on 3rd July 1942 in the presence of Watson-Watt, Lovell, Dee, Lindemann, Sir Archibald H. M. Sinclair, 1st Viscount Thurso, (Secretary of State for Air) and other ministers, where he ultimately resolved this issue when he demanded the delivery of 200 H2S units by 15th October 1942. Those were desperate times and evidently the needs of circumstances cut across political, scientific and even personal boundaries.

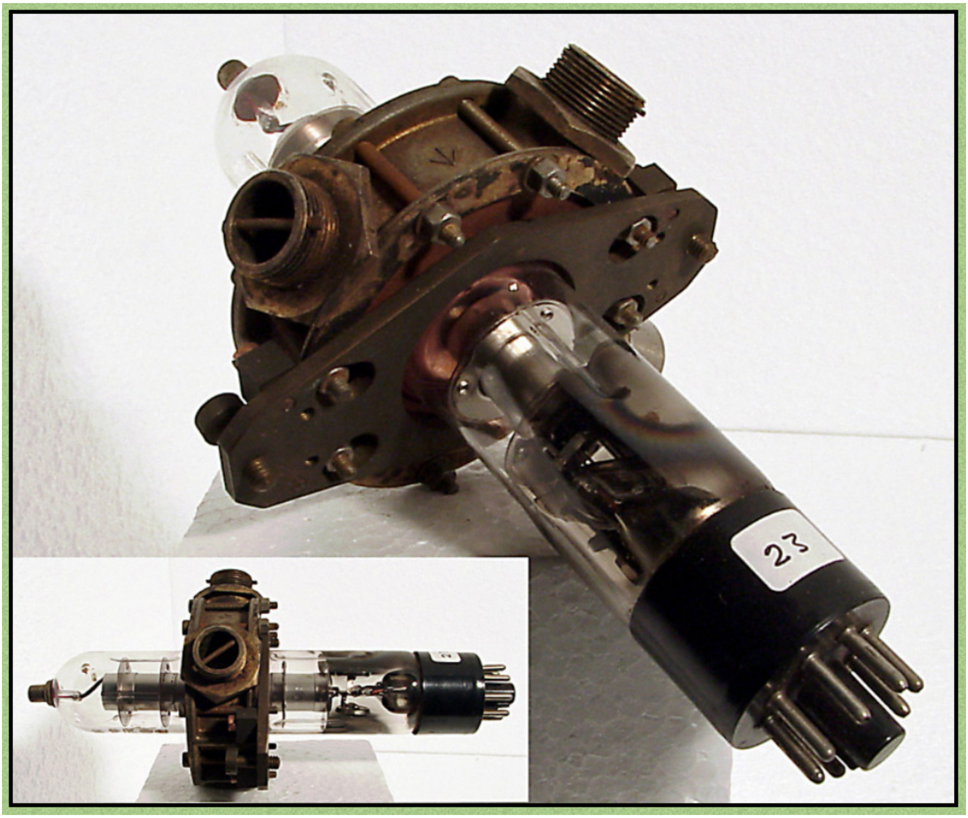

Figure 10 A CV35 Klystron (Circa 1941)

Thus, the Cavity Magnetron was released for operational use. Initially they were deployed in Coastal Command Air to Sea Vessel (ASV), submarine and convey protection aircraft activities where it was deemed that aircraft lost at sea would take the secrets of the Cavity Magneton with them. Nevertheless, Bomber Command activities were pressing for Radar to improve their operational effectiveness on long range raids, such as Berlin that were out of the reach of GEE Radar navigation aids. GEE navigation is not technically Radar but fascinating in that such a simple system could so accurately position an aircraft up to 200 miles away over its target. With the pressing need to replace Dead Reckoning (Celestial) aircraft navigation that was proving highly ineffective and costly, GEE navigation was released operationally. Subsequent navigation systems include OBOE, Eureka and Fishpond, all whose practical demonstration of long standing trigonometric principles, must have paved the way to GPS used nowadays.

During the second use of H2S on the night of 2/3rd February 1943, the Germans recovered a CV 76 Cavity Magnetron unit at Rotterdam when the demolition charge failed to go off. Shortly afterwards a second unit was captured, both of which it has since transpired were dissected by Otto Hachenberg of Telefunken, with the initial solution being that early German Radar sets were developed specifically to re-use magnetrons they captured.

The Plan Position Indicator (PPI)

Alongside the development of the Cavity Magnetron came the development of the supporting electronics such as my PPI unit to become known collectively as H2S Radar. In determining the origins of the name "H2S" there exist conflicting accounts depending upon the author (of that period). The prevailing belief is offered by A.P.Rowe who suggested that the name was coined by Professor Lindemann when he said "it stinks" [D]. The first operational use of H2S Radar was on 31st January 1943 and it was last used operationally by the British in the Falklands campaign in 1982, nearly forty years later.

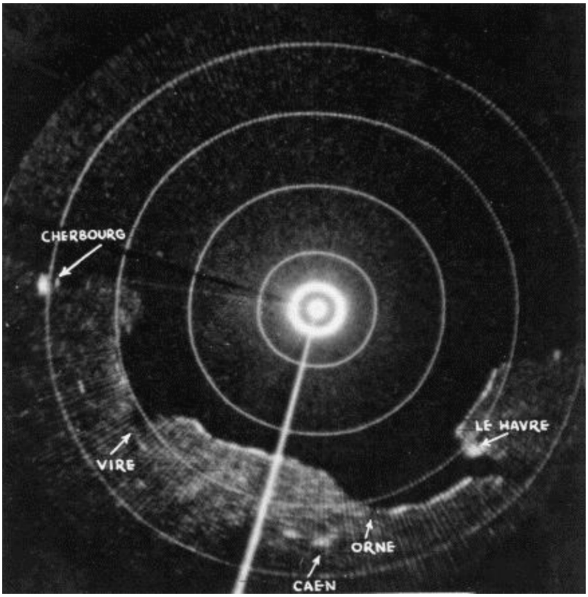

Figure 11 A Typical PPI Display

The familiar PPI display is distinct from the Oscilloscope in that the time-base in a PPI display is rotated in synchronism with the rotating aerial giving a 360° circular pattern about the centre of a circular Cathode Ray Tube (CRT), whereas the time base within an Oscilloscope is linear and scans horizontally (usually from left to right) across the display. Although Hülsmeyer conceived the PPI concept his work was forgotten until the PPI concept was resurrected jointly by Watson-Watt, Wilkins and Bowen during one of their weekend discussions in their early RDF development days at the Orford Ness, Suffolk coast site. However, with the pressure of work to solve firstly height finding and then azimuth determination within the embryonic CH RDF system, PPI development was not pursued until later [E].

Figure 12 An H2S PPI Unit

Microwave Ovens

Following the cessation of hostilities, Cavity Magnetron technology was being further investigated by O. Percy L. Spencer (Raytheon Company) who had a bar of Chocolate in his trouser pocket. What he noticed was the Chocolate had melted giving rise to the discovery that Cavity Magnetrons excite water molecules, leading on to the development of the Microwave Oven that we all now have in our kitchens with their incumbent Cavity Magnetron. This discovery led to Raytheon filing Patent US 2,495,429 on the 8th October 1945 and the birth of the domestic microwave oven operating at a frequency of 2·45 GHz.

Finally, I would like to take this opportunity to thank my French friend Jacky for the PPI photograph he supplied of his personal Radar collection and David Crozier, who unknowingly (until he has read this sentence – strategically placed at the end of this document) prompted me to write this article. Thank you.

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E. The Birth of British Radar – The Memoirs of Arnold 'Skip' Wilkins, Colin Latham and Anne Stobbs, Radio Society of Great Britain.

James Davidson's Mystery Set a Pushbutton Wonder

Any help in identifying this radio would be much appreciated. It is pushbutton ONLY (no ganged tuning capacitor) and the valves are 6A8, 6U7, 6Q7, 6F6 and 80.
Contact librarian James Davidson email: james.justjazz@gmail.com

PHILIPS 22RN686 SHORT WAVE CAR RADIO.

The first article in a series on Ross Paton's radios from Ian Sangster.

It is my intent to feature some of the interesting radios which our librarian Ross Paton collected during his time on this earth - others members are also invited to contribute.

In approximately 1971, Ross and his brother Malcolm took a holiday to Fiji. Whilst there, Ross took the opportunity to visit, in his words, "the old firm" Philips branch or agency in Fiji.
Ross found that they had in their stock two Philips 22RN686 car radios, needless to say, he bought them both. This is fairly obscure model and my recent Google searches have turned up very little on it, but Ross had done his research well and knew what they were.
Philips were not shy of engineering a little complexity into their products, here we have a transistor car radio, pre-synthesizer era, fitting into the standard dashboard aperture, with 8 shortwave bands and a medium wave band. It has rocker switches which look like push buttons but are actually 3 position switches to select the bands.

When he returned to NZ Ross passed on one of the radios to his good friend Richard Cotton, who installed in his Rover car. The radio in my photos is the Richard Cotton one. Styling is typical of the era, a mixture of brushed metal and black finishes, matching the car dashboards of the time.

I have not been able to locate the Philips service data for this radio, I would think Ross would have had it somewhere, but I do have service data on a Philips N6X16T/00/43 which is an earlier multiband car radio with similar band coverage and AF and OC series germanium transistors. The 22RN686 on inspection has BF194 and some Motorola plastic cased small signal transistors as far as I can see into its somewhat crowded interior. The output transistors are AD161 and AD162 pairs.

To me the interesting part of the radio is the front end and bandswitching arrangements, being a tour de force of Philips engineering, so am going to include a scan of the circuit of the older N6X16T/00/43 and who knows, maybe a reader will be able to come up with a 22RN686 circuit?

The Philips 22RN686 front panel view with its rocker buttons.

Inside the case of the shortwave car radio.

RADIOS

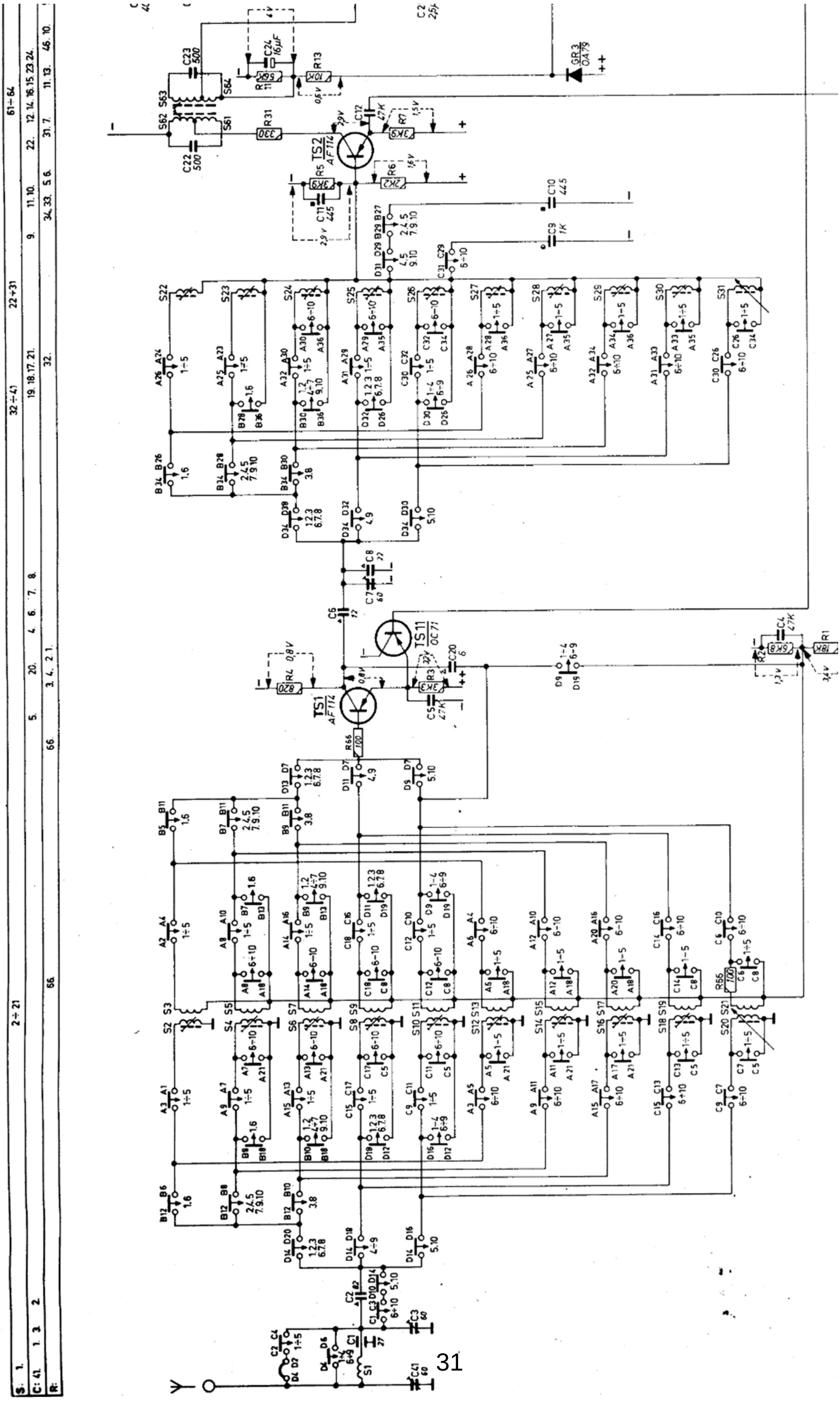
BENTLEY 'T' : SILVER SHADOW

The following are part numbers of radios which are now being currently fitted on the above cars, together with the necessary mounting brackets and finishers etc., used in the front console and division console.

The parts are not interchangeable and the numbers are as follows:-

DISPLACED			NEW
UD.15501	Philips Radio 22 RN 686 (Built-in balance control)		UD.16658
UD.15239	Philips Radio 22 RN 681/89 North America		UD.16716
UD.16102	(Philips Radio 22 RN 681/86	Med/Short	UD.16715
	(Philips Radio 22 RN 681/87		UD.16717
UD.16333	Radiomobile Radio 1080/VRR Med/Long		UD.16736
	Assy. Mounting Bracket Radio } Used in Centre Division with Philips & Radiomobile radios		UD.16710

Above; a note on Bentley car radio installations.
Following page; a circuit of the similar car radio Philips model N6X16T/00/43 indicating the band switching complexity (but without the additional info of the switch configuration tables).


TS1
AF114
TS2
AF114
TS11
OC71
GR3
OA79

Philips 352A Radio Receiver (serial number 1762) restoration by S G Bick via John Dodgshun

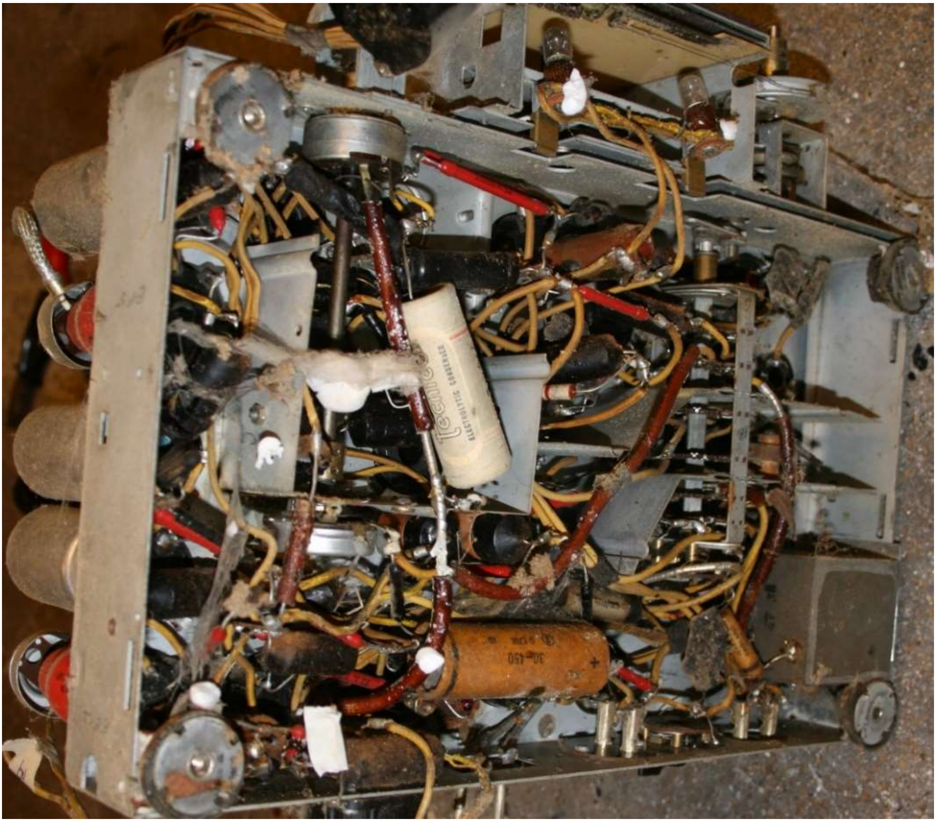
Origins:

1762 is the Serial number of this Philips 352A Radio receiver. It was designed and built in the UK about 1937, or shortly thereafter. New Zealand was the target market. The scale dial of this set was definitely tailored for the New Zealand market. Although the stations marked on the scale are not familiar to a 'Brit' – the code 'NZE' in the bottom left corner of the dial is a bit of a give-away.

Further evidence of its target market comes from the Victoria University of Wellington Library; which has a copy of an advertisement that appeared in the 'The Spike or Victoria Review' of 1937. This particular advertisement announces the launch of the Philips 352A Radio and extols the special features which had been incorporated and specifically tailored to meet the needs of the New Zealand market. Some evidence which ties the radio to NZ was found on a piece of paper which had been glued to the base cover to hold it intact and this shows that the 'District Office' of the 'Transport Division PO Box 355 in Auckland' was issuing paperwork to the repair

engineer who had this set in his safekeeping at some point in time. How the radio ended up back in the UK is a mystery. It came to me by way of an antiques dealer in the city of Gloucester. So although I said ‘no, not my sort of beast’ - as I take quite a lot of his sets for restoration projects - he was not going to say ‘okay’ to my protestation. After some banter I ended up saying a qualified ‘I’ll have a look at it and see what comes to mind.’
(The ironic twist to the history / location of this radio; is that the nearest town to the UK city of Gloucester (nine miles, centre to centre, by road) is Cheltenham. Fate seems to prevail that this set ends up, yet again, close to a conurbation which presumably gave its name to Cheltenham Beach - a district of Devonport.)

Information*:*
As soon as it landed on the bench; a quick look was taken behind the back panel to check that all of the major parts were still there – which they were - albeit in quite a state. This cleared the first hurdle.



The next step was to take the model number from the ‘info’ plate and obtain a circuit diagram / service sheets. This proved to be far more difficult than any radio previously encountered. None of the usual sources in the UK had ever heard of this model. Checks were made against similar Philips model numbers and also Philips radios with a similar number of valves. All of this work proved fruitless. A quick search in Europe also drew a blank. Clearly, Philips never released any technical information about this model in any other territory than their New Zealand target market. Salvation came from an internet search and eventually contact with: - Mr. John Dodgshun, Secretary of the Christchurch, New Zealand Vintage Radio Group. Without John’s invaluable help I would have had to admit defeat, salvage any useful parts and consign the remains to the scrap bin. The service sheets retrieved from the Society library included nearly all of the component values, component layout drawings and also the alignment notes. All very useful!

A phrase frequently used by a number of UK based, ‘old-time’ service engineers; when talking about acquiring components for this set, was “I expect you have one of the birds-nest / spaghetti drawings” which Philips was famous for back in the day. How right they were!

Now was the time for the first important decision to go ahead - and probably spend a lot of time and money, with some doubt over the degree of success / failure, or to abandon the project.

Despite some concern over the height of the mountain which would eventually need scaling; it was decided that a little more research would do no harm. Once investigated a little deeper, it became obvious that two features of this particular radio made it especially suitable for the New Zealand market. They were;

- Plenty of amplification, which made it possible to pull in distant stations.
- The extent of the wave bands, which range continuously from 22Mc/s to 517Kc/s.

The scale dial for the shortwave band (6.6 to 22Mc/s) was probably the key; in that it covered all of the far flung (presumably previous homeland) territories; which people who had immigrated to New Zealand were likely to want to listen to.

Appraisal of parts:
Cabinet: The cabinet showed signs of a significant woodworm invasion on every panel. It was liberally coated with 'killer', given plenty of drying time then it was polythene wrapped and stored for latter attention. There was, admittedly, the thought that if the chassis could not be restored, then no matter what the cabinet looked like; it was of no further use.
Speaker board: The only other piece of wooden structure was the plywood speaker board. This was more woodworm hole than timber; so it was discarded immediately after a template had been made.
Speaker Grille cloth: The speaker grille cloth was not torn (as yet) but badly faded and looked fragile; so may not have survived removal from the home of the woodworm. It therefore met the same fate as the speaker board.
Back panel: At least the back panel was present and in reasonable condition. Thankfully, this looked like one item that would just need a touch of TLC.
Due to the state of the circuitry, it was thought impossible to do any preliminary live electrical tests.
Chassis corrosion: The top surface of the chassis was coated in a layer of dust, a large proportion of which had then formed into a paste by the output of acid from a hole which had erupted from the top of a can type electrolytic capacitor C3. The result of this 'eruption' was to make a mixture which had done its best to heavily corrode / 'pit' some of the surface of the plated steel chassis. The worst damage was found around C3 but the whole surface had sustained at least some damage.
Wires:
The original interconnecting wiring was yellow, rubber covered, single core and every bit of it was perished.
Capacitors: All of these capacitors, including the replacement electrolytics, but excluding the silver mica ones, were in need of replacement.
Resistors: Quite a few of the resistors looked, and initially checked out to be passable.
Choke No.2: Disappointingly, Choke 2 was open circuit.
Tone control: The tone control had a big hole blown in the track.
Valves: The valves were bench tested and; other than the EM1 magic eye were okay although one showed very low emission.
The isolation switch for the internal loud speaker, was mechanically broken – suggesting 'the phantom fiddler' had been happily at work.

Other items in need of replacement:
Many other items were at the end of their useful life and would therefore need replacing.
As would be expected, the list was extensive and included;

- The ‘Mains On/Off’ switch; which had burnt stubs for contacts.
- The track of the Volume control; which still looked ‘rough’ after cleaning and which proved ‘crackly’ when bench tested on an amplifier.
- The spring contacts in all of the valve bases were corroded / deformed.
- All of the inter-connecting plugs / sockets on the back of the chassis were degraded in some way and beyond further use.

Some good news was the loud speaker, when tested on a proven amplifier, produced a lovely tone. Also, the power transformer showed continuity on all windings and this proved justified as when isolated on all secondary windings it produced reasonably sensible looking voltages throughout.

Proceeding:
Decision time number two: A nice speaker, plus a working power transformer; seemed a good enough reason to confirm the previous decision to *look a little deeper*.
Even though this thought is flying in the face of the advice from a lot of engineers who restore old valve radios for a living; who say such things as “no CD players; no car radios and definitely no Philips radios of any sort.” Normally the reason they give is that Philips used too many novel circuit features and non-standard components. The 1762 does, regrettably, qualify on both of these counts – and with a vengeance!

A circuit diagram:
As so much of the set needed to be disassembled and re-built from scratch, it was thought unwise to proceed without a conventional circuit diagram. The only way to overcome that problem was to reverse engineer a drawing using the Philips data to hand, the chassis as it stood, plus a meter and a lot of tenacity. Individual components, such as every valve, IF transformer, switch wafer etc were traced through and a circuit sketched for each. These mini circuits incorporated all of the other components radiating out from the central piece. Then, finding the over-laps / interconnections, the sub-circuits were taped together creating a patchwork quilt. This eventually grew into larger and larger sections and the whole assembly started to make sense.
Once fully assembled, a picture formed which could be reproduced onto drawing paper. It was so large when completed that it became two A1 sheets!

Restoration:
Restoration of the chassis and circuitry proceeded slowly and with caution.
Metal work: Before the clean-up and renewal of electrical components started; the steel chassis was cleaned of all visible rust, treated with rust killer for good luck and then the pitted areas filled with car body filler then painted.
Wiring: Having gone through the process of tracing the original cable runs, where bunched wires of one colour made life very difficult; it was decided that best use should be made of varying colours during the rebuild.

Drawing check: A few points on the circuit diagram did need amending – mostly due to connections which were initially hidden from view; typically, vertical tracks on support pillars which were shrouded by components.

Capacitors: A decision was made to use 1,000 Volt Polypropylene capacitors as the replacement in every case for the paper / foil items. This was not only because there could be no questions to answer concerning working voltage (as many were to be installed before the circuit had been confirmed) but also, the package size would look more in keeping with the original items.

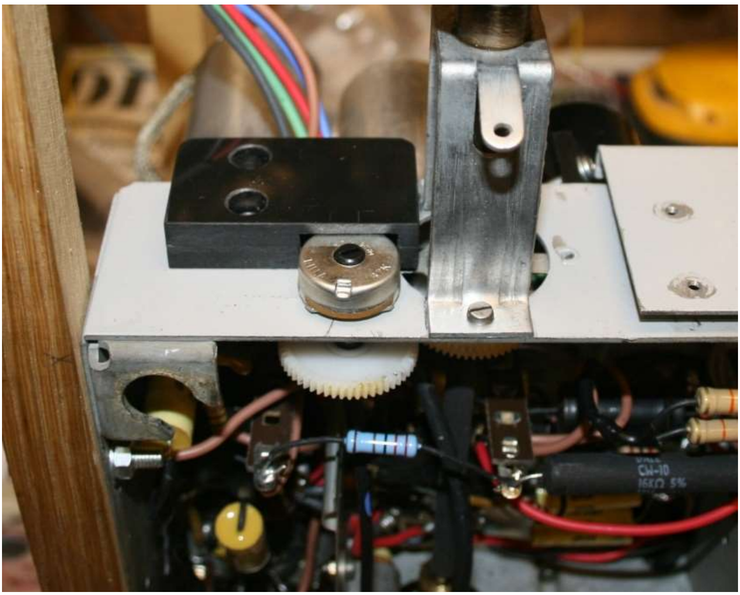
External connection points: While the mantra of 'conservation / restoration' always heads the list; in this case, as the end user of the radio was unknown; 'safety' trumped the lot. Many of the sockets, plugs and terminals, along the back face of the chassis, were obsolete and clearly unsafe and so were replaced with modern items.

The Earth / Aerial switch was however, only in need of a little refurbishment.

The extension speaker socket, which used to reside higher up in the cabinet, was discarded and the corresponding hole in the back cover 'blanked off'.

Mains 'On - Off' switch: The contacts of the mains switch were burnt beyond reclamation. It was therefore decided that a modern unit should be installed in the designated place; which is on the end of the wave-change array. A conventional 'Off/On' switch could not be used because the shaft rotates to further wave-change positions after the switch has closed. The problem was overcome by removing the track connections from a 'switched potentiometer' and then 'grafting' the assembly into position by the use of a few purpose made parts. The finished product worked very well.

Tone control: Although the track of the Tone control was virtually parted into two pieces; a vain attempt was made to re-join it using silver paint designed for repairing car screen heater elements. This was a spectacular failure. As this was a very special item, with a hole through the centre to allow a drive shaft for the volume control to pass through; and as no such thing has been seen on the UK market for many years, a conventional 'pot' was mounded to the front of the chassis and a pair of Delrin gears used to create the necessary drive system. The system works well.



Choke 2: The choke and the output transformer, both needed extracting from their 'pitch-filled' steel box before re-winding of the choke could commence. This was a messy and time-consuming job using a hot air gun and then extracting both items. The pitch was discarded and modern 'foam-based plastic' insulators made to 'pack' both the choke and output transformer back into their original home. The finished sub-assembly was tested and proved to perform well.
Valve bases: Advantage was taken, as and when components were disconnected, to remove all of the spring contacts from the valve bases; then clean and reshape them before re-installation.
At this point it may be worth mentioning the pros and cons of the Ct8 valve connector. It depends who you talk to as to whether the message comes across as 'a really quite reliable device' or 'a bit a failure with too many drawbacks'. As the design was fairly short-lived it can be assumed that the more conventional 'pin' configuration; which contains fewer parts, fits better to the smaller package of later valve designs, and retains the valve to base quite reliably, was an obvious choice during the evolutionary process.
Valves:

- L1, L4 and L5 were specified by Philips as EF5. These are now almost impossible to find – but the EF9 is a direct replacement, with slightly better performance and are a lot more plentiful, many even in 'as new condition' and so EF9s have been fitted in all three positions.
- Philips must have had a really good reason to specify an AH1 valve for the L2 position. Maybe they saw special properties in this particular valve, or possibly they had a vast stock in the stores which this set could help absorb. Going to the trouble of providing an extra 4 Volt heater winding on the power transformer shows determination. However, as there were only a few examples available on the internet – all of which were in Europe - it was thought prudent to buy one as a spare. So it is now a good spare but almost unique. A 6L7 was therefore acquired and an adaptor manufactured to convert the base Ct8 to 7 pin Octal. The 6L7 requires a heater wiring change from 4 Volts to 6.3 Volts. When tested, the radio worked just as well as with 6L7 as with the AH1. The set was put back to run for the time being on the 'original' AH1.
- L3 is an EF6 and must be kept as such, or a direct equivalent. L6 an EBC3 needed replacing.
- L7 the EL3 bench tested 'as new' so continues to be used. (The EL3N is a plug-in replacement for the EL3. It has an improved cathode.)
- L8, the EZ3, bench tested as having a heater to cathode short – but this does not matter as it has its own heater supply.
- The original L12, an EM1 'magic eye' had no output. (What EM1's there are available on the UK market and are advertised 'as new', are being offered (as of 2017) at prices over £100 each!)

Commissioning:
Visual checks: A visual check was carried out for compliance to all available data and also the new circuit drawing. This exercise was repeated on the following day with, hopefully, a fresh pair of eyes. The exercise was to ensure that all components were back in place and nothing looked untoward.

Set Up: The input voltage selector was set at 245 Volts and a batch of 'bench tested' valves installed. Then the loudspeaker, plus its transformer box, aerial, mains supply etc were all connected.

Applying power for the first time: Due to the radical re-build and some concern that 'unknown' factors could be lurking in the undergrowth, power was applied gradually using a Variac. Monitoring input amps constantly, and starting at 50 Volts, input power was slowly increased, delaying for a short while at 50 Volt stages, until eventually a full 240 Volts mains input was achieved; thankfully without incident. Voltage readings were taken at a number of points to see if everything looked 'sort of right' and all seemed to be what would normally be expected.

First 'Gram' sounds: 'Gram' was selected and a very small signal from a battery driven sound source was applied to the appropriate port. The result was encouraging with excellent sound reproduction. Good volume was obtained using only a small turn of the control, as well achieving a full Bass / Treble range from the tone control.

First radio reception: Switching to the M2 wave band; stations could be heard strongly, throughout most of the travel of the tuning range. The public broadcast network in the UK goes down to only 558kc and even some of that is not available in the Gloucester area, so a portion of the band to 517kc's is silent.

Wave bands M1 and S do work: Initially, nothing could be heard when either M1 or S was selected. A dummy aerial and the transmission of appropriate signals from a signal generator proved that the wave bands of the radio were active but there was simply nothing to receive.

Further tests using a home-made, very low output, medium wave radio transmitter proved that the M2 waveband does work to the full extent of its travel and that the M1 waveband is also working, end to end, So at least some measure of success!

Then the set went completely dead! Many, many, hours of testing circuits and connections, injecting signals at various places, and changing a few silver-mica capacitors (just in case) brought no success. Then the sound returned - at least for a short while, before disappearing again. Even after a lot of effort had been expended; no consistent, reliable, performance could be achieved. Eventually, almost by chance, it was discovered that two of the famous Philips 'bee-hive' capacitors; used as part of the chain of IF transformers were 'iffy'.

Because the problem was present in two components; and the fact that they would stop working at random times and then start again just as randomly catching the total problem was quite a challenge. It was never discovered whether the beehives were shorting out or going open circuit because as soon as the device was touched / adjusted, the fault disappeared. When eventually it was positively confirmed which capacitor adjusters to 'tweak' to make the set fail, and then work again; the IF cans for C33 and C35 were in turn removed from the set, eased apart and eventually rebuilt installing modern variable capacitors. These were items originally designed as tuning capacitors for transistor radios.

A drawing was prepared for the restoration of C33. The re-work of C35 was identical to that of C33.

Moving on: All IF's were adjusted back and forth a number of times to prove reliability. None of the remaining original capacitors showed any sign of unreliability.

The IF's were then adjusted in sequence in accordance with the schedule shown in the Philips data sheets. The Magic Eye then woke up and started to make a reasonable attempt to show when a station was correctly tuned.

Cabinet: Attention was then turned to the cabinet. Wood worm holes punctured all faces; a lot of them in very obvious, eye catching, places. Also, the veneer was not only exposed through the original lacquer in large areas but it had 'lifted' to form ridges – without, however, becoming un-glued from the plywood carcass. An attempt to do a 'fill – polish' job made things look even worse. It was then decided that an attempt should be made to sand the surfaces flat, fill where necessary, and re-varnish the whole of the outside of the cabinet.

After applying roughly the same colour varnish as the original; it still looked amateurish as the underlying repair work still showed through. So a medium mahogany varnish was then selected. About eight coats and a lot of intermediate wet and dry flattening later, a reasonably presentable finish was achieved – albeit, the set looked nothing like the blond veneer finish it started life with. As the two base cover panels were in a sorry state and glued together by a couple of pieces of paper, it was thought essential to make a single replacement panel from plywood. A coat of stain brought about an acceptable finished article.

Final assembly: Surprisingly, twelve months after disassembling the chassis and all of its attachments, the bits and pieces were not too difficult to sort into the right configuration. Of course, the sketch book and photos taken at the time did help a lot.

An essential piece of kit:

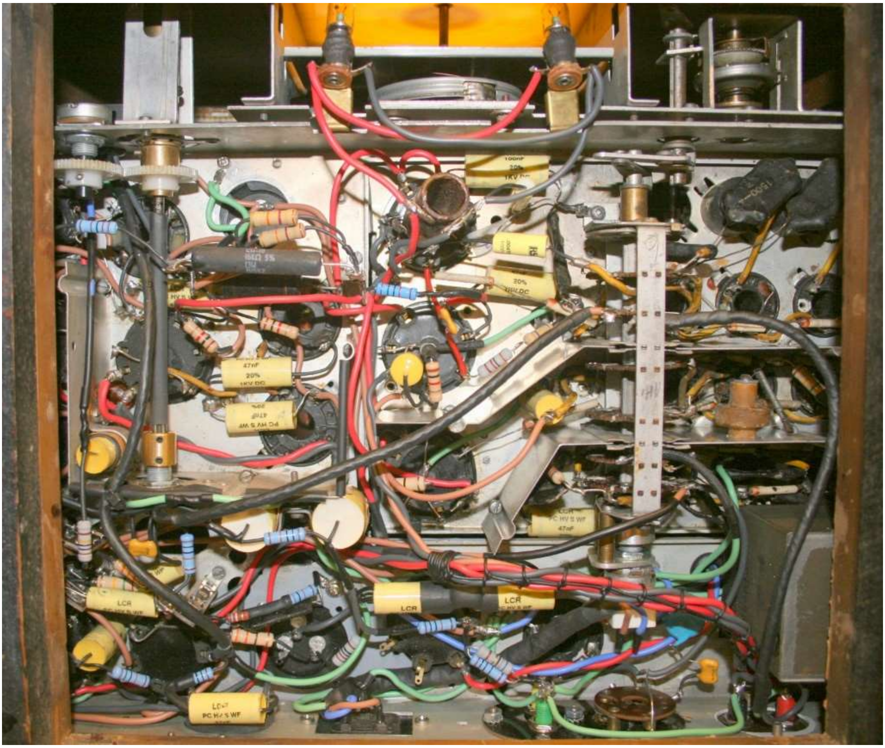
The Philips service notes made mention of a chassis support mechanism designed to assist in any service work which entails the chassis being removed from the cabinet.

Removal and re-fitting of the chassis to the cabinet is not something to undertake lightly but if it is essential to do so; because the work entailed cannot be achieved through the openings at the back or base of the cabinet; a 'fixture' of some sort needs to be constructed. This can be attached using bolts through the slots in the sides for the chassis. Taking this approach is the only way to control the beast, as without such a device the chassis will not sit securely on any face. Two individual loop-frames can easily be made from hardwood and, provided they are adequately sized, the chassis can be turned over onto any face without damaging components.

Conclusions:

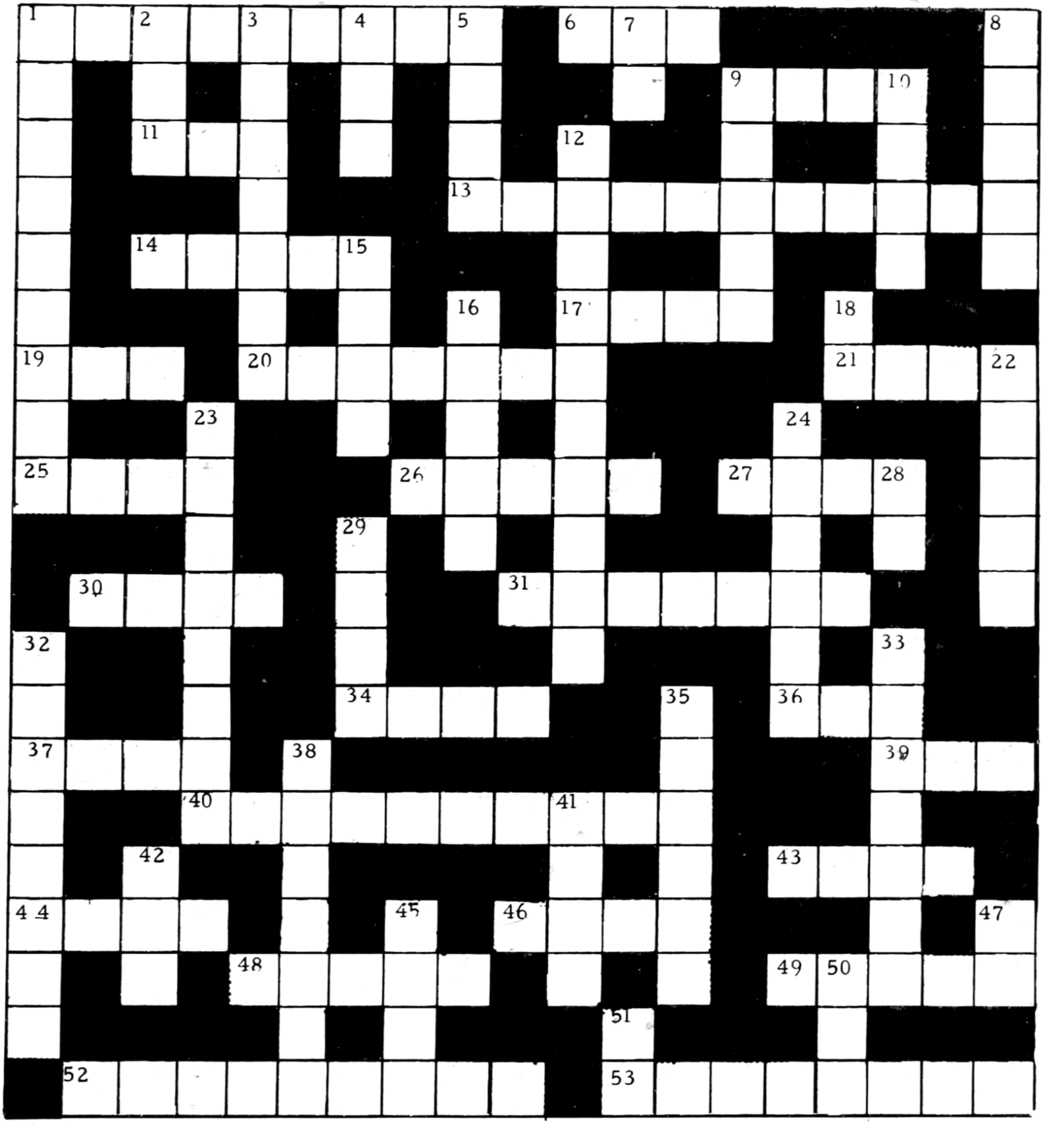
Having spent over 1,000 hours – spread over about a twelve-month period – and probably more cash than was first envisioned, it is a pleasure to confirm that the restoration of the Philips 352A radio receiver, number 1762, is now complete. The finished product is a robust radio, producing lovely sound, with clear station separation. Having obviously given many hours of service over its first eighty years of life, it is now ready to repeat the process for another eighty years – or until there are no more signals transmitted on the AM waveband.

Completed pictures



Abridged – the detailed writeup is available from John Dodgshun; jandjdodgshun@gmail.com

Quick and Easy mid 1970's style Crossword



Answers near the back page.

Across:

1. General term for any electronic working part of a VT*
6. Nickname for a wire "whisker" in early-day diode
9. Wires exit through these at base of tube
11. Special type of transistor (abb)
13. Tetrodes have an advantage over triodes because they don't have to be _____
14. Rectifier tube
17. Laboratory state of crystal before doping
19. Second syllable of tube name (and a form of verse)
20. Transistor element corresponding to a VT cathode
21. Plate current flows through this after leaving the tube
25. prefix for half
26. What this puzzle is but hope you're not
27. Wire mesh electrode in VT
30. Common name for negative voltage control on grid
31. Grid which determines number of electrons reaching the plate
34. Which line on a battery symbol indicates the positive side?
36. If you say semiconductors do not exist in natural form you _____
37. Pentodes provide high amounts of this
39. Is it true that the trend today is toward solid-state equipment?
40. Three-part solid-state device
43. Important element in FET
44. Name of atoms that have lost or gained electrons
46. Transistor element corresponding to VT grid
48. The flow of these in semiconductors is like their flow in Chinese Checkers
49. Germanium is a ____- state material
52. Transistor element corresponding to VT plate
53. Type of charge placed on plate to attract electrons from cathode

* VT = vacuum tube (abb)

Down

1. A cloud of these makes up a space charge
2. Another name for voltage (abb)
3. A VT with four electrodes
4. In diodes, current flows in _____ direction
5. + and – charges try to _____ things out
7. Rectifiers change this to DC
8. Technical name for VT plate
9. Common name for VT anode
10. The small _____ of transistors makes them valuable for portable equipment
12. Grid that turns back electrons bounced off the plate
15. The cathode can do this to electrons
16. In this primer VT are considered the _____ of active technology
18. Radio operator of the fairer sex
22. Semiconductor crystals get _______ with chemicals in the laboratory
23. Emits electrons in directly heated VT
24. VT with 3 electrodes
28. Prefix meaning "two" and used in name of rectifier tube
29. Turn the regeneration control too far and the circuit will _____
32. Type of charge on grid to repel electrons from cathode
33. Semiconductors grow in this form
35. Grid which prevents interaction between plate and control grid
38. Part of the VT that emits electrons (general term)
41. Filter for suppression of unwanted signal
42. Transistor sandwich with negative filling
45. VTs require ______ for the emission of electrons, transistors do not
47. Observe safety rules with high voltages or you'll become this fast (abb)
50. From the top of a VT conducting wires lead _____ through a cap
51. The amount of current through a semiconductor goes this way when heated

Some early "Insights" into Dunedin's "B" Stations.

From Bill Marsh (& ODT August 1935)

WORK OF THE B STATIONS

To the enthusiastic band of amateurs who have established and now operate what are known as the "B" class stations, every listener owes a debt of gratitude. Filling in as they do the silent hours of the "A" organisations, these stations are performing a service in the broadcasting world which cannot be estimated too highly. Since 4ZL, 4ZB, 4ZO, and 4ZM came on the air, set owners are no longer at a loss to find entertainment when the YA studios are silent, for at all times one or other of these little stations is ready to provide a programme. When one considers that the owners depend entirely on voluntary contributions to keep their stations going - receiving not one penny either by subsidy or from listeners' license fees, one cannot but wonder how they manage to send out programmes of such uniformly high standard entirely gratuitously. In addition many events of public interest have been broadcast by these stations with complete success.

STATION 4ZL

A station with an excellent record of transmissions is 4ZL, owned by the Radio Service Ltd., which, although it has been on the air only a little over 12 months, is well and favourably known to most listeners in Otago. After the Exhibition, permission was obtained for 4AK to work on the broadcast band and a few tests were made. These turned out so well that an immediate application was made for a transmitting license for this company. The company was allotted the call sign 4ZL and it immediately commenced to make a good broadcast transmitter. This was completed in June 1928 and the station was put on the air. Difficulties were met at first but one by one these were overcome and although the station is only low powered it has had several reports over good distance. It has been received in the middle of Australia at 6 p.m. in daylight and also in Los Angeles and San Diego. In recent years the station, with the installation of new equipment, has been put on higher power and some extraordinary reports of reception from every corner of the world have been received. The manager and engineer-in-chief of the station is Mr Lawlor A. Shiel, one of the foremost authorities on radio construction and practice in New Zealand, and a pioneer of the wireless movement in Otago.

RADIO 4ZM

In September 1927, the Post and Telegraph Department allotted the call sign 4ZM to Mr J. M'Kewen at 418 Anderson's Bay road, Dunedin and about one month after this the station, with Mr J. Stone as operator, commenced activities. In the granting of the license, it is interesting to note that one of the conditions was that the station must not interfere with 4YA. That this possibility could even have been contemplated may give the reader some idea of the unformed state of the broadcasting art at this period. In common with most "B" stations, 4ZM from the day of its inception experienced many changes, both in design and location. In September 1929 the owner, for business reasons, transferred the station to the premises of Messrs Chas. Begg and Co., in Princes street. Here its broadcasts attracted an ever-increasing number of listeners, perhaps the most appreciated being the programme of popular recordings broadcast each Sunday evening. 4ZM continued a regular schedule of transmissions from the same location until September 1932, when Messrs M'Cracken and Walls acquired from the original owner Mr M'Kewen, the whole of the plant and accessories comprising the station. A transfer of the station license was granted by the Post and Telegraph Department and a new chapter in the life of 4ZM had begun. Initially the transmitter at 4ZM remained in its original condition, but coincident with the appointment of Mr J. P. Pickerill as station engineer, it was decided to dismantle the old plant entirely and build a new transmitter of as modern design as was possible. A small stand-by transmitter was placed in commission to carry on while the main constructional work was being completed, and in due course a new 4ZM commenced broadcasting. This transmitter has remained practically unchanged until the present time, and has given splendid service. Briefly, the transmitter is of the master oscillator power amplifier type, using pushpull stages throughout, with final stage high level modulation. This method of modulation has been found to be extremely efficient, much more so than the use of Heising modulation, or the use of linear stages in the radio frequency amplifiers, and very favourable comment has always been received on the quality of the transmissions from 4ZM since this method was used. However, the radio art is always advancing and once more it has been decided to take advantage of many new developments in broadcast transmitter technique. To this end new high fidelity transmissions will soon be heard from 4ZM when the constructional work on the new studios and control rooms is completed. Although the power of the station cannot, owing to Government regulations, be increased, both the modulation percentage and the range of musical frequencies transmitted will be much greater than heretofore. The whole work of designing and building, the transmitters and associated equipment such a relay amplifiers, etc, has been done in the workshops at 4ZM under the supervision of the station engineer and it has always been found to perform as satisfactorily if not better, than completely built imported equipment. It is hoped to have the new station on the air early in September, and reports from listeners with high fidelity receivers will be awaited with much interest by the technical staff at 4ZM. It will be of interest to listeners to learn that from September 1 the station will operate on a frequency of 1010 kilocycles instead of 1050 kilocycles as at present.

STATION 4Z0

Another station that has provided efficient service for listeners is 4Z0 (which is maintained by Messrs Barnett's Radio Supplies, Ltd.,) and, as is the case with Dunedin's other B stations, receives no financial assistance from any outside source. The transmitting unit is the new plant which has just been completed in the company's workshop by Mr Frank Barnett, jun., the operator, for use in the station. The unit includes all the major stages for modulation and transmission in a very compact form and is built in five sections which are easily removed from the unit in case of breakdown. Commencing at the bottom they are as follows; (1) Power supplies and rectifiers for all stages and overload protection device (2) Filter chokes and condensers for smoothing of rectified alternating current from (1), (3) Modulation stage, comprising two stages of push-pull audio class AB, capable of driving the final transmitter stage to a high level of modulation, (4) Push-pull, electron coupled oscillator and push-pull buffer amplifier stage where the transmitting energy is generated, controlled, tuned and amplified, (5) Push-pull, class C modulated radio frequency amplifier stage, and antennae coupling and tuning unit. The transmitting unit is completely A.C. 230-volt mains operated, no batteries being used whatever. The power is 25 watts.

Listeners have reported reception of 4Z0 from as far away as Brogo Brogo and Woolongong in New South Wales, from Whangarei, Northland to Half Moon Bay, Stewart Island and good reports have been received. The wavelength of the station is at present 1050 kilocycles, but from September 1 it will operate on a frequency of 1010 kilocycles to fall in with the new allocations of wavelengths as arranged between Australia and New Zealand, which will come into force on that date. The new announcer at 4Z0 is Mr Owen M'Connachie, and the assistant announcers are Mr J. B. M'Connell and Mr J. Anderson.

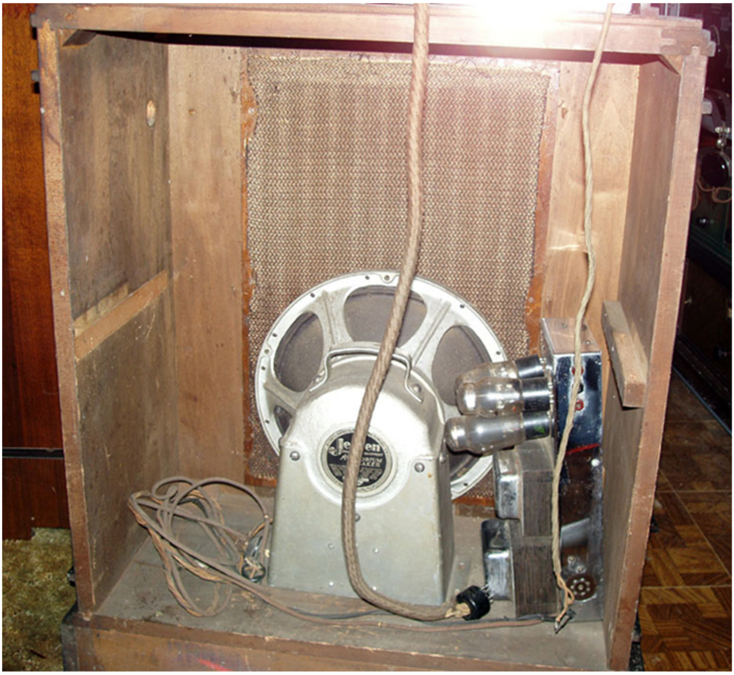
STATION 4ZB

To 4ZB, the efficient little station of the Otago Radio Association, belongs the honour of being the veteran of Dunedin's B stations. It was as far back a 1922 when, following the formation of the association, the station received its license and commenced operations. In the early days of the station the association had an uphill struggle, but despite all difficulties it managed to carry on. Today its evening session, every Wednesday, is as eagerly looked forward to by all juvenile listeners, as is its Sunday morning transmissions by those who wish to tune in to something besides a church service.

A Nothing to Lose Speaker Cone Repair Project

or how I repaired a 1934 Jensen - Model M-20 Auditorium Speaker.

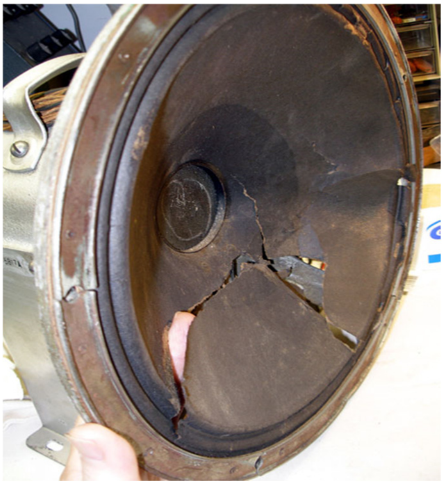
From NZVRS member Robert Lozier, Monroe, NC, kd4hsh@juno.com



After 25+ years, it was time to clean up my 1934 McMurdo Silver, Inc. 'Masterpiece III'. For years I had no information on how to make the missing baffle board and amplifier shelf until the spring of 2014.

Why these parts were missing I'll never know, but from a posting on the Antique Radio Forum I made contact with a guy who was elated by his new find. It showed the missing parts I was needing and after e-mail exchanges I was able to make an exact replica.

Over time, both the loose speaker and amplifier had done this heart-breaking damage to the speaker cone:



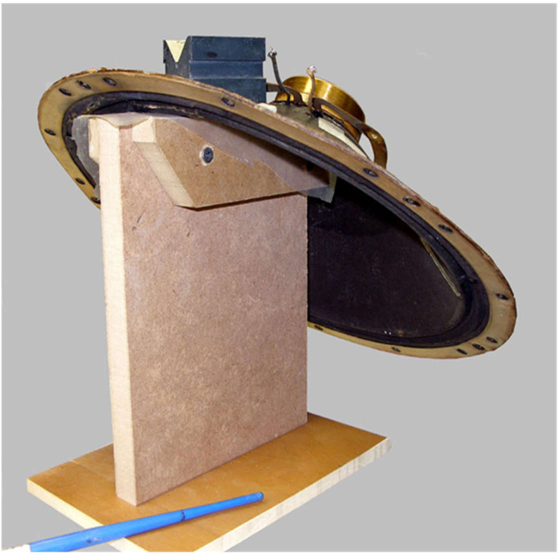
Correct replacement cones are apparently unavailable, but good examples of the Jensen M-20 speaker were selling in the price range of $2,000 to $4,000 on eBay and other venues. So I was either going to fix what I had or do without. This is the story of how I tackled it:

First the paper cone had to come off;

Right: There are 5 stamped steel flange segments riveted to the frame. These semi-tubular rivets can easily be cut out using a #39 dental burr in your Rotary-Tool.

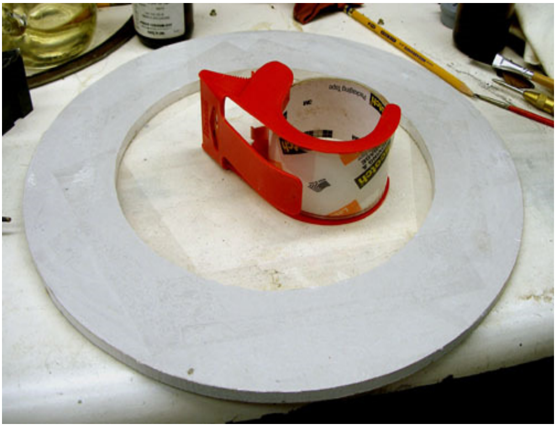
Left: There are three nuts that secure the spider. Careful when unscrewing these as the spider may twist and break.

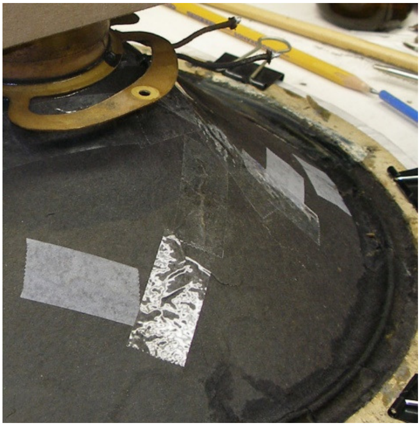
Next to flatten the warped parts of the cone I made a jig like this out of MDF, using a wood rasp and sanding block, to match the curvature of the cone. Below right.



Left: Now I was able to wet the warped segments and place a weighted pad over the cone till it was dry.

I then fabricated a rigid support ring out of some scrap of ½" sheet rock, covering the surface with packing tape to make it non-stick. Below left.
As I flattened the segments on my cone stand, I found I could precisely butt the tears and secure them with Scotch tape. Scotch Crystal Clear or Magic Tape worked just fine. I burnished it down good, and was amazed at how easy it was to remove later. Below right.





I clamped the cone to the ring and worked on the outside suspension.

I applied a small weight (MDF board) to the apex of the cone. I then used a level to make absolutely sure the cone flange and apex were parallel. I then wet the flange and proceeded to

work on the tears, teasing them back into position with tweezers, checking occasionally that the cone was still level.
In the 'olden days' (last month), I'd have said to use coffee filter paper and diluted wood glue to make your repairs - not speaker dope. That method is OK-ish but the paper cannot follow curves and it certainly does not work on the corrugated suspension at the speaker flange.
When you are trying to work with diluted glue, you often get inconsistent results and a reduced working time. It's better to get a bottle of Titebond II Extend slow set glue.

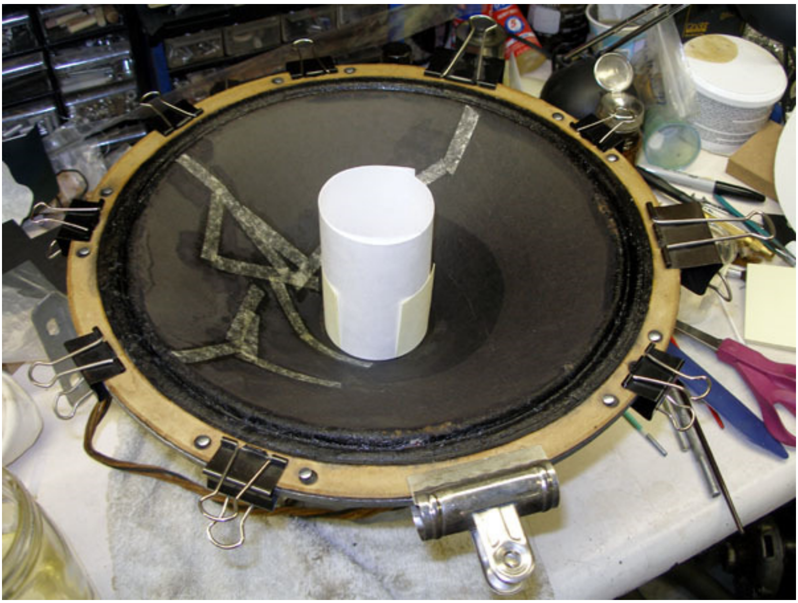
Remember that Scotch tape? ell after I had glued the inside of the cone, it was time to remove the Scotch tape. I have found that wood glue and paper are not affected by lacquer thinner. I simply saturated a camel hair brush with the thinners and brushed along the edges of the tape. Within a second or two I was able to simply lift the tape off with tweezers. The tape adhesive just loosens its grip and does not melt into the paper.
Worked like a charm.

Now, onto my secret weapon; Pellon #865F Interfacing. It is available at any fabric shop, even at big Walmarts (this is USA!). This very sheer fabric material that must be cut 'on the bias' (45 degrees to the warp and weft.) The easiest way to do this is to place the fabric on a cutting mat and slice strips using a wickedly sharp razor blade (or similar blade) as you apply firm pressure with a steel rule. Note: There are three grades of this material. Get the "Bi-Stretch Lite" grade. This material "drives like a dream"!
I painted on a thin layer of the slow set glue along the tears. Dredge strips of Pellon fabric through the glue and put in place with tweezers. There is plenty of time to brush out excess glue and any air bubbles. The bias cut fabric easily conforms to the corrugated suspension.

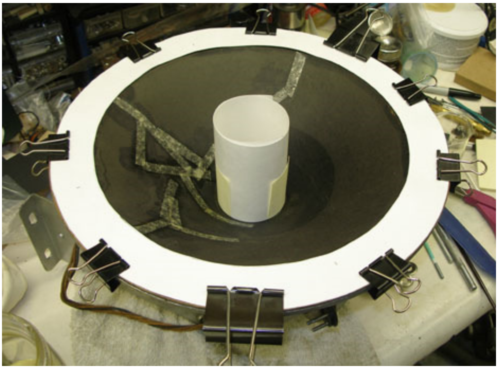
The suspension still needed more help, so on to the other side.
Now for another 'secret weapon'.

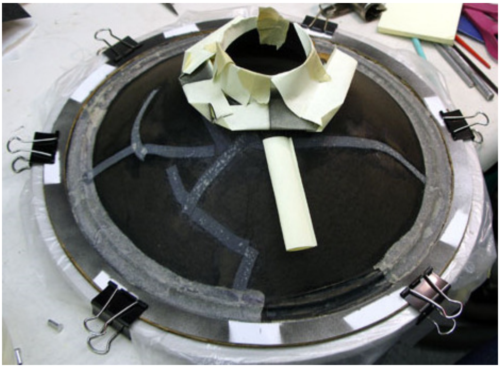
Another layer of Pellon on this side would make the corrugations far more rigid than desirable, but the damaged paper needs more support. There is a pretty good solution to this problem.

Permatex® Flowable Silicone Windshield & Glass Sealer – (available from any auto parts store.) This material soaks into voids better than any other easily obtainable product I've seen. Just work quickly on your brush-out before it sets!



Time now to hide the repair work - a very light coat of flat black is fine but being careful not to add much weight to the cone.

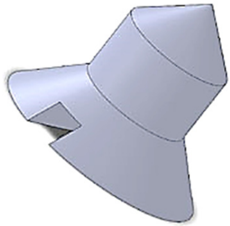




Above: Cone masked for spray paint "cover up".

If I had it to do over, rather than use a spray can of flat black, I'd use my spray gun and mix a little bit of grey primer into the flat black to give it a more accurate coloration.

Putting it back together, after temporarily clamping the cone back in the basket, I adjusted the spider and tested the speaker.
The flange segments (five of) were riveted back onto the speaker using replacement rivets made from cut down #10 wood screws



Was it worth it? I think so – it looks OK and works well, and I learnt a few things along the way!

Restoring a 1920s Three Valve Radio

From Foss Leach, ZL2JKP and Bill Cousins, ZL2AYZ

Initial Cleanup and Disassembly

When this radio was acquired it was in a filthy condition, and appears to have been sitting in an open shed for many years. Everything was covered in dust and baked on grime. Some components were rusty, and others corroded. Clearly, a major cleanup was needed, and that meant disassembling everything and starting again from scratch.

However, before taking everything apart it was necessary to trace all the wiring so it could be replicated later (Figure 1). The outer surfaces of the original thick copper wiring (1.4 mm OD) was coated in various colours, presumably as a form of insulation. Insulation was particularly important with this set because construction was in the form of breadboard with criss-crossing of wires underneath, many of which were touching others. Corrosion and grime prohibited clearer identification of exactly what this insulation is, but it was not silk thread, and far too early for most flexible plastics. It was assumed it was painted on. Each wire was terminated in a very neat solder lug with wrap around metal tube, something no longer available.

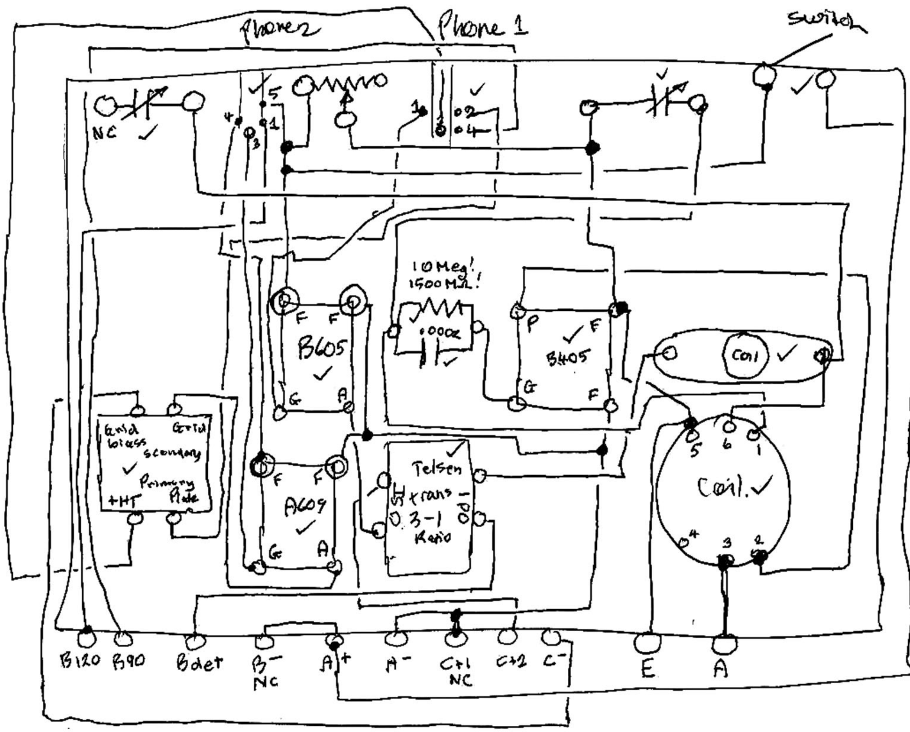


Figure 1: Tracing the original wiring

All surfaces of the two phone jacks had a thick layer of baked on grime and had to be completely taken apart and cleaned. A Repco product called *Autosol Metal Polish* was used to help clean all the surfaces. This product is a very effective cleaning agent for brass and other metals, and only tiny amounts are needed. The substance quickly loosens grime and the surface can then be polished. The list of ingredients mysteriously mentions aliphatic hydrocarbons (15-30%), aromatic hydrocarbons (5-15%), and soap less than 5% anionic surfactants. This was used to clean most metal components; however, in some cases mechanical cleaning was required and a Dremel tool with small rotary wire brushes proved effective.

In bad cases of rust, such as the transformers, a CRC rust converter aerosol was used several times which lifted both paint and rust. The Dremel was used on the newly exposed surfaces, which were then cleaned with acetone. Areas with gold painted labels and terminals were covered with masking tape and an aerosol spray paint was applied, to bring them up to “new looking” (Figure 2).

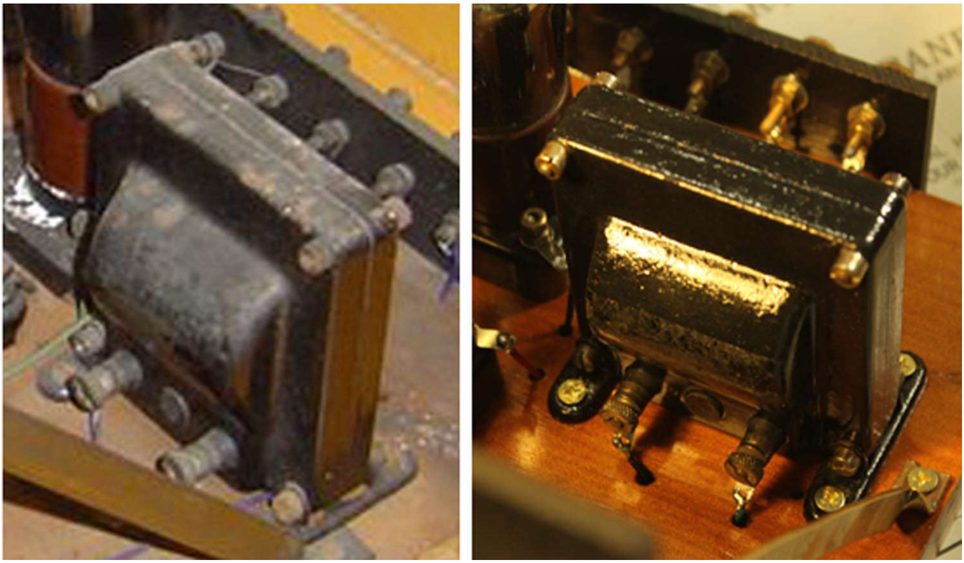


Figure 2: One of the transformers, before and after

The two variable capacitors had surface spotting of aluminium oxide. High pressure water blasting removed these, and after washing in warm soapy water and using the bristles of a hearth brush, the inner surfaces cleaned up nicely. Some adjustment was needed to get the leaves centralized, and after a little *three-in-one oil* was applied to bearing surfaces, the condensers were brought back to near new condition.

The front of the radio is made from black polished *Formica* laminate and required little work on it except *Brasso* and elbowgrease to bring it back to the original bright sheen.

The cabinet base was riddled with borer and was replaced with mahogany, in line with the rest of the cabinet. This was left unvarnished, as per the original. The rest of the cabinet had a deep patina, and all that was required was an application of furniture polish. The final effect while not pristine, suitably reflects the age of the radio.

The breadboard was made of unmistakable New Zealand Kauri, proving that the radio had been made in New Zealand. Whether it was a commercial kitset, or homebrew is another question. The underside was partly painted with white enamel paint, showing it was recycled from some other use. A belt sander was used on both sides until clean wood appeared, and this was then sanded down by hand with very fine sand paper. Four light coats of polyurethane were applied, with light sanding between coats.

Evaluation of Components

The filament of one valve, the detector, a *Philips* triode B405, was blown, so a replacement for that had to be found. Fortunately, one was available at the *Tubeshop*, courtesy of Sven Syré (info@tubeshop-24.de) for NZ$82.87 including shipping. Surprisingly, this had a different pin configuration than the original in the radio which was the standard four pin UX4 base. The four pins were arranged in the B4 configuration, with one pin offset from a rectangle. These bases are not easy to find, but eventually a five pin B5 base was found, which is identical to the B4 except having an additional central pin. B4 valves fit smoothly into the B5 base (Figure 3). The filaments of the other two triode amplifying valves, *Philips* B605 and A609, were intact, so it was hoped that they might still perform.

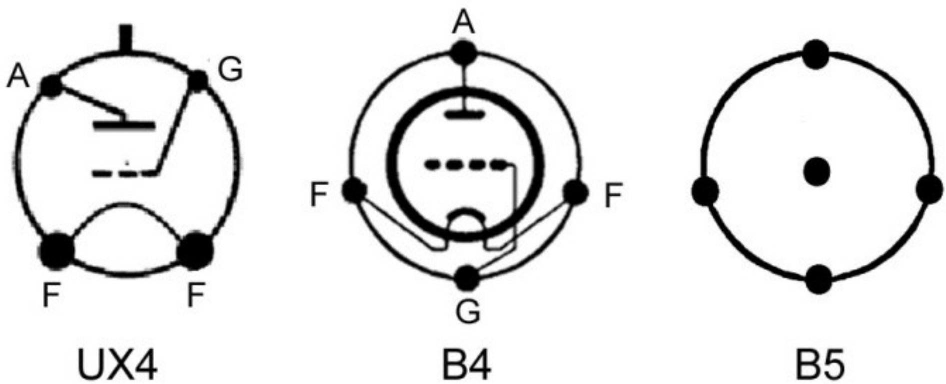
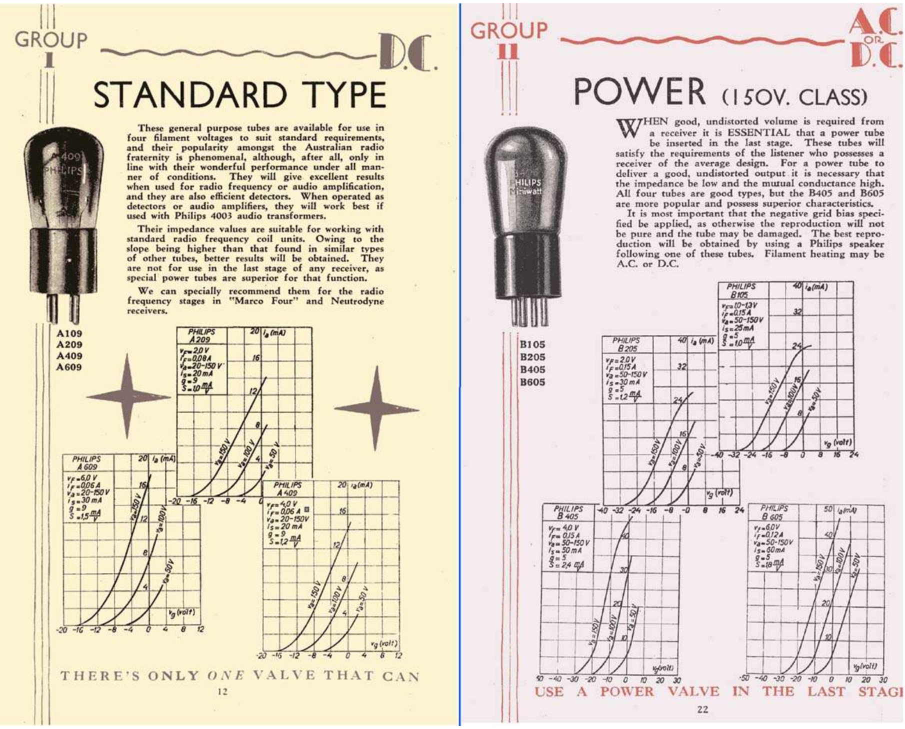


Figure 3: The valve pin configurations

The B405 valve is also a triode, used as a detector, and was first manufactured in 1927, (according to https://www.radiomuseum.org/tubes/tube_b405.html). The filament is 4v, and draws up to 0.15A. The emission characteristics are given in Figure 4.

The B605 valve in this radio is a triode, used as an amplifying tube, and was first manufactured in 1926, (according to https://www.radiomuseum.org/tubes/tube_b605.html). The filament is 6v, and draws up to 0.12A. The emission characteristics are given in Figure 4.
The A609 valve is also a triode, and used as a second stage amplifier in the radio, and was first manufactured in 1926, (according to https://www.radiomuseum.org/tubes/tube_a609.html). The filament is 6v, and draws up to 0.06A. The emission characteristics are given in Figure 4.



GROUP I — D.C.

STANDARD TYPE

These general purpose tubes are available for use in four filament voltages to suit standard requirements, and their popularity amongst the Australian radio fraternity is phenomenal, although, after all, only in line with their wonderful performance under all manner of conditions. They will give excellent results when used for radio frequency or audio amplification, and they are also efficient detectors. When operated as detectors or audio amplifiers, they will work best if used with Philips 4003 audio transformers.

Their impedance values are suitable for working with standard radio frequency coil units. Owing to the slope being higher than that found in similar types of other tubes, better results will be obtained. They are not for use in the last stage of any receiver, as special power tubes are superior for that function.

We can specially recommend them for the radio frequency stages in "Marco Four" and Neutrodyne receivers.

A109
A209
A409
A609

THERE'S ONLY *ONE* VALVE THAT CAN

12

GROUP II — A.C. OR D.C.

POWER (150V. CLASS)

WHEN good, undistorted volume is required from a receiver it is ESSENTIAL that a power tube be inserted in the last stage. These tubes will satisfy the requirements of the listener who possesses a receiver of the average design. For a power tube to deliver a good, undistorted output it is necessary that the impedance be low and the mutual conductance high. All four tubes are good types, but the B405 and B605 are more popular and possess superior characteristics.

It is most important that the negative grid bias specified be applied, as otherwise the reproduction will not be pure and the tube may be damaged. The best reproduction will be obtained by using a Philips speaker following one of these tubes. Filament heating may be A.C. or D.C.

B105
B205
B405
B605

USE A POWER VALVE IN THE LAST STAGI

22

Figure 4: Emission characteristics of the three valves. Left: A609, Right: B405 and B605

The two transformers (*Telsen* 3:1 intermediate, and *Ferranti* output) were not open circuited, so we hoped these would still be serviceable. However, the filament rheostat made by *Fada* was quite another story. It presented zero Ω from one end of the track to another. When taken apart the rear side of the wires were caked with a hard white deposit, presumably a conducting oxide of one of the metals making up the alloy of the wire. The deposits were mechanically removed with a dental tool, and acetone used to clean all components. This brought back 8Ω resistance This rheostat is designed to lower the filament voltage from the 6v battery supply used for two of the valves (B605 and A609) down to the 4v required for the B405 valve. It also acts as a sensitivity control. However, unless modified, the rheostat could be rotated to supply 0Ω which would produce 6v to the B405 valve, which would certainly blow the filament. Such a simple error may have been the cause of the original failure of the radio, which was then discarded. An additional 1 watt 6.8 Ω resistor was added in series with the rheostat as a safety measure. After cleaning, the two variable capacitors measured 40 to 300 pF, and 50 to 360 pF respectively.

The grid-leak resistor was clearly marked *Pilotohm* 10 meg-ohm, and although physically this appeared in good condition, when tested with a regular multimeter and mega showed to be at least 50 MΩ. In spite of much searching, a replacement could not be found, so a modern equivalent was used in its place. The accompanying fixed capacitor was labelled *Pilot*, 0.0002 MFD*, Isograd* , and tested within range on a multimeter.

The original 4-pin sockets for tubes B605 and A609 are made of porcelain and the top surfaces were originally baked with a black glaze at high temperature. However, over the years the glaze on the upper surfaces had degraded, which was unsightly, so the two bases were replaced with Bakelite versions from the same period as a cosmetic measure (Figure 5);

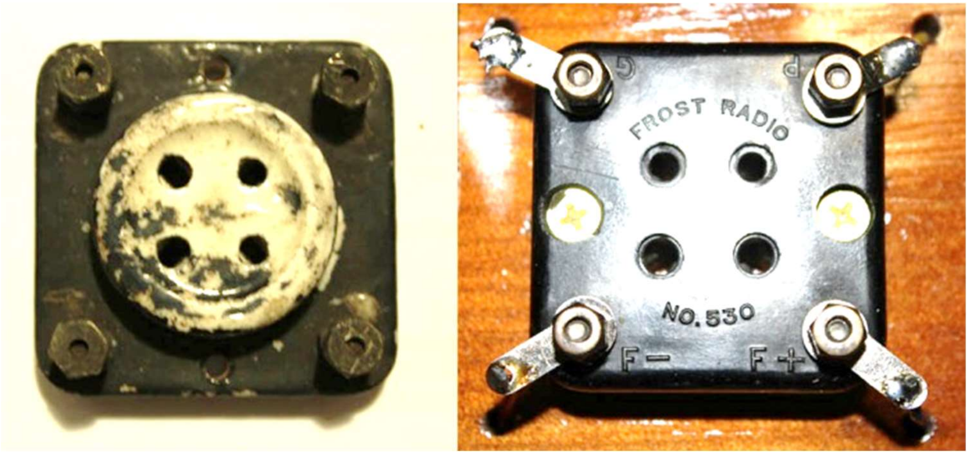


Figure 5: Valve bases before and after.

Reassembling the Radio
Although a quantity of 1.6 mm OD enamelled copper wire, similar to the original, was available, it was decided to use modern plastic coated multi-strand hook-up wire instead in re-wiring the radio components. This seemed a reasonable sacrifice from authenticity, especially as it was a kitset, and possibly homebrew (Figure 6).

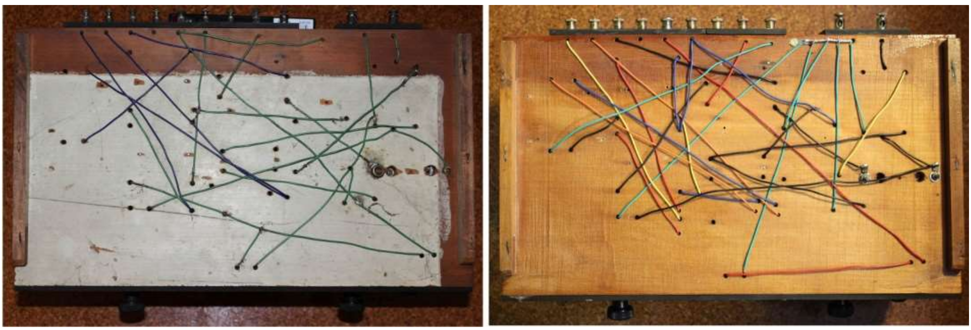


Figure 6: Under the breadboard, before and after

The circuit
Many radio enthusiasts will have already recognised this 1920s radio as belonging to a type known as a *regenerative radio*. Manly described this as follows: "Regenerative is the action by which part of the energy from the plate circuit of a tube is fed back into the grid circuit of the

same tube. The plate circuit energy is added to the energy already in the grid circuit" (Manly, 1934).

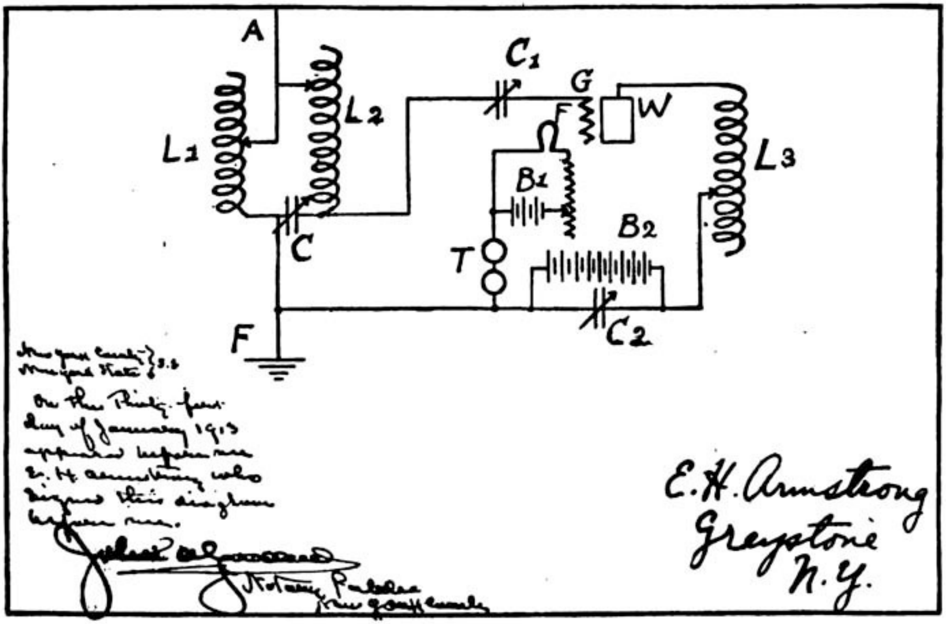


Figure 7: The original regenerative circuit by Armstrong

This type of radio receiver was invented in 1912 by Edward Howard Armstrong, an American electrical engineer while he was still an undergraduate at Columbia University. The form was commonly used in radios between 1915 and the 1930s The positive feedback (which is also known as regeneration), adds to the signal from the antenna, thereby raising the gain of this stage. Armstrong struggled for years to have his patent awarded, and was finally accepted and published (Armstrong, 1922). A copy of his original circuit appears in Figure 7. During his lifetime, he was awarded 42 patents. His fascinating life is reviewed in Wikipedia (https://en.wikipedia.org/wiki/Edwin_Howard_Armstrong).

The birds-nest of wiring which was traced on the radio before disassembly (Figure 1) was unscrambled into a recognizable circuit and is shown in Figure 8. One point of interest is that on the breadboard the electronic train of components is from right to left (Figure 1), whereas it is more customary when drawing circuits to proceed from left to right (Figure 8). Figure 1 was therefore initially somewhat confusing. The only change we made to the circuit (not shown in Figure 8), was the addition of a 6.8Ω resistor in series with the rheostat (discussed above).

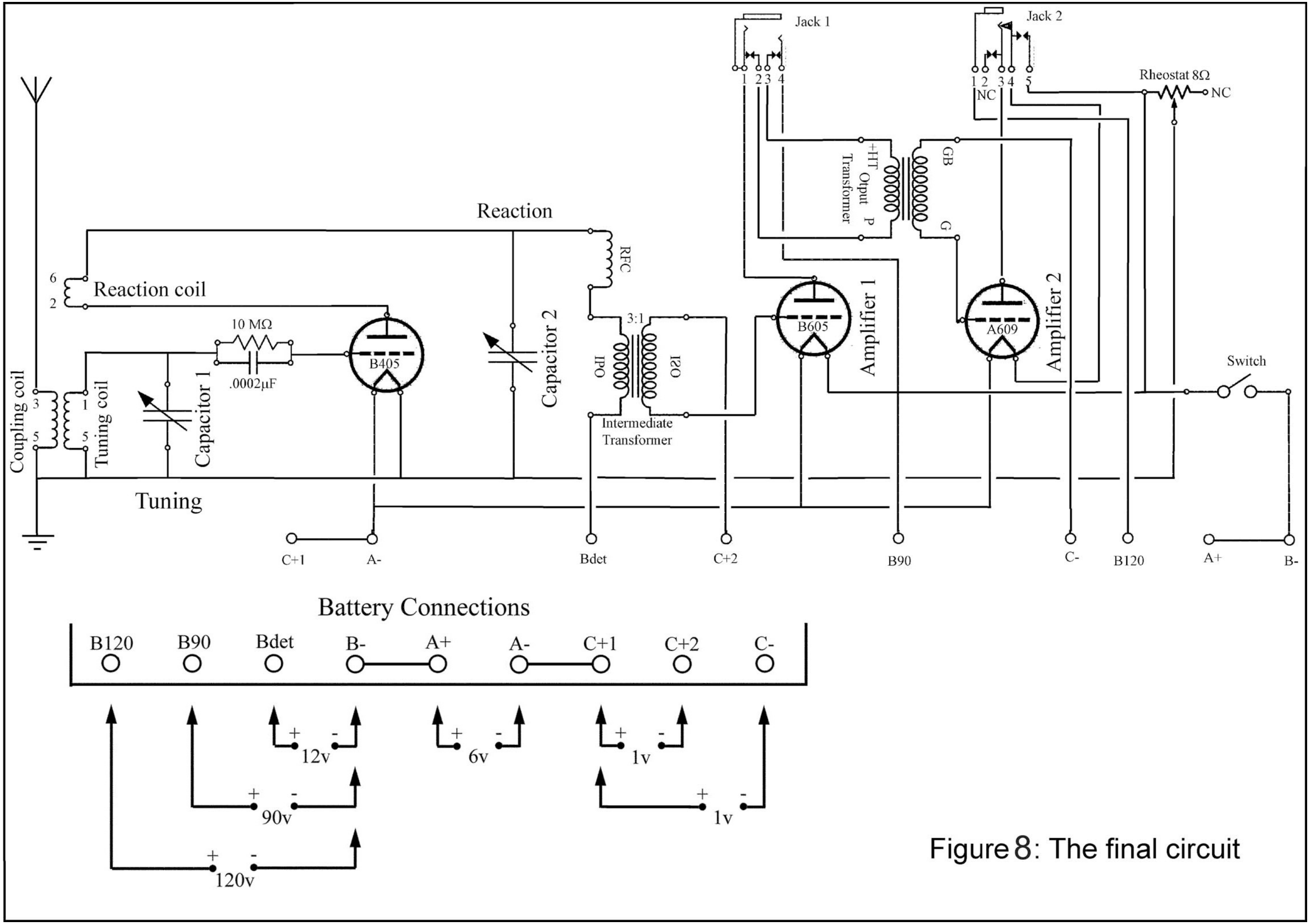


Figure 8: The final circuit

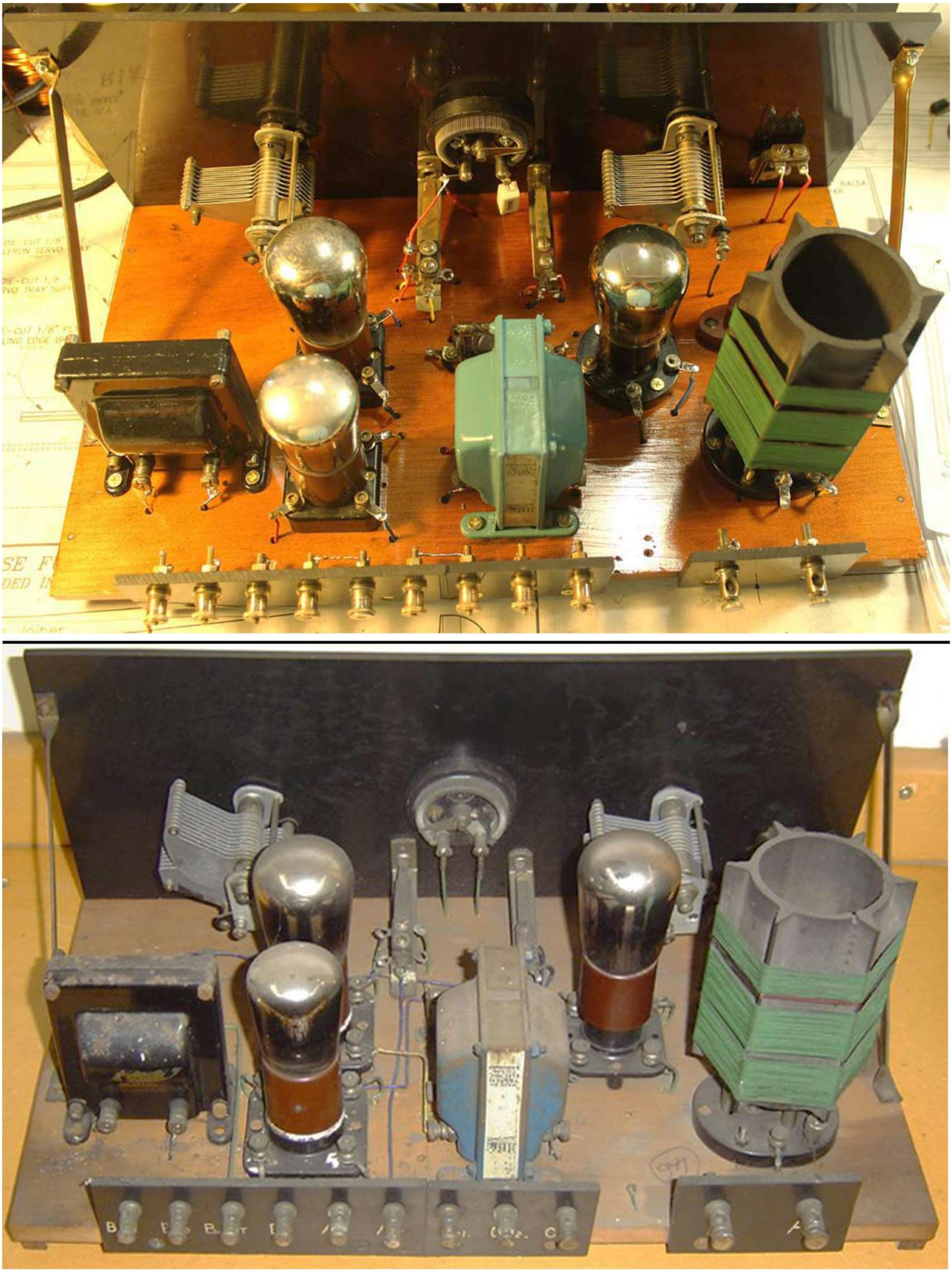


Figure 9: The 1924 radio after and before restoration

There were two main errors in the original wiring: The base plates of capacitor 1 (the tuning capacitor) had no connection, so this was earthed. Secondly, at some stage during the life of the radio wiring on the antenna coil had broken in two places and repaired (not very effectively). In the process, connections to two of the wires were reversed (points 1 and 5 on the antenna tuning coil in Figure 8). This had the effect of connecting the earth point to the bottom of the antenna tuning coil instead of the top where it should be; that is, adjacent to the bottom earth point of the antenna coupling coil. Rather than attempting to un-solder the delicate green silk insulated coil wires from the holder and reverse them, the external wires leading away from the coil former were reversed (Figure 9).

It is difficult to understand how this radio could have worked with this incorrect coupling in the coil. The coupling could only provide positive feedback when the fed-back signal is in-phase with the existing input signal, thereby adding to the signal. With negative feedback the fed-back signal is out-of-phase and would therefore subtract from the input signal. Perhaps the original radio worked with very strong radio signals. In any event, reversing these coil connections had a dramatic effect on reception, and gives due credit to Armstrong's ingenious invention.

The three coils were wound with the following number of turns:

Antenna Coupling coil	60 turns
Antenna Tuning coil	60 turns
Reaction coil	38 turns

The tuning range of the radio seemed to vary depending on the aerial used, but essentially it appeared to be approximately 600 to 1480 kHz.

It was somewhat puzzling why there were two phone jacks on the radio. One of these jacks was between the two amplification stages, and one after both. It was concluded that The first jack is for high impedance headphones (for example, 2000Ω) when receiving strong local signals. The second jack would function with a speaker but really will only provide enough volume on stronger signals, particularly if the speaker was only 8Ω impedance. A high impedance speaker, for example 600Ω, would be much better. The second jack could, of course, also be used with headphones, providing adequate volume from weaker signals. If the signal was too loud, such as from a strong local station, the reaction control could reduce the feedback (and gain) to give a more comfortable volume.

The RF choke in the circuit is present to block or filter out radio frequencies from passing to the second stage, It's inductance is probably about 2.5 mH. The "pi" construction helps to minimise self-capacitance, thus raising the self-resonant frequency. It's value is not critical and it is not necessary to tune it with a slug. It's reactance will not be high enough to affect the detected audio frequencies, consequently these are passed on to the second stage via the intermediate transformer.

The Batteries

No less than six batteries are, in theory, required for this radio: Three "B" batteries (120v, 90v and 12v), One "A" battery (6v), and two "C" batteries (both 1v). In practice, these can be reduced in number. The 120v and 90v could be the same battery, and we found (discussed below) that anything from 40v upwards was satisfactory, with 60-80v optimal. The two 1v batteries were replaced with small partly used torch cells.

Figure 10: The radio in it’s mahogany cabinet, before and after

The Identity of the Radio

The radio in its cabinet before and after restoration is shown in Figure 10. If the information in the *Radio Museum* web page is correct, the *terminus post quem* of this radio is 1927, which is the latest date of the three valves when first manufactured. However, identifying exactly what the identity is of the radio is not simple. A thorough search through the three volumes of Douglas's famous work *Radio Manufacturers of the 1920's* [sic] failed to find an exact match of the cabinet. However, there are a few that are similar. For example small sloping panel radios made by Freed-Eismann (Douglas, 1943: II, 11), a popular kitset made by Pilot in USA called the Pilot Wasp (ibid.: 242, and illustrated in Figure 11, and Western Coil and Electrical Company Cabinet Deluxe, also manufactured in the USA (ibid.: III, 221). Another possibility is a kitset from the New Zealand company called Selectra, or perhaps a homebrew based upon a Selectra radio (Figure 11).

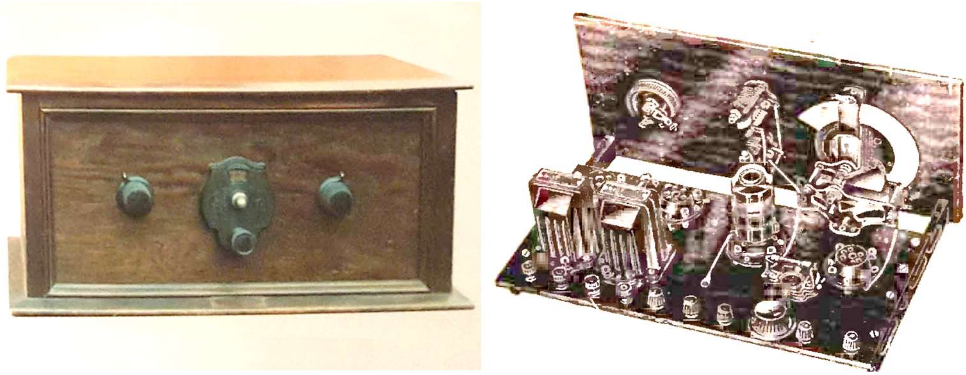


Figure 11: Left a Selectra three-valve AC regenerative radio made in New Zealand 1929. Right, a Pilot Wasp short wave kitset, made in USA.

Kitset radios were very popular in the 1920s and 1930s, and many commercial companies in the USA sold their radios in kitset form. Descriptions of some of these kitsets in Douglas's book show that many did not include valves or cabinets in what was supplied in the kit. However, some certainly included both in their kits. None of the ones we found specified the three valves B405, B605, and A609 in the radio we restored. Moreover, none of the numerous circuits examined matched Figure 8, although many were similar.

The final possibility is homebrew. Home production of radios was made possible by merchants having large stocks of radio components. A magazine called *Radio Merchandising* published an astonishing large range of recommended stock for new radio dealers in 1922 (cited by Douglas 1943, I, vii). There were also radio dealers in New Zealand well stocked with components. One company, John's Limited, based in Auckland, put out an annual catalogue well into the 1930s which was brimming with radio and other components. They also marketed their own manufactured radios, named: Ace, Kiwi, Tui, Rangatira, and Ariki. The first named was a three-valve table cabinet model (Johns Catalogue, 1938-9, page 60).

> "for the entire decade [1920s], 'homebrew'… radios made up a large percentage of the total in use [in USA]. Statistics compiled by *Radio Retailing* (pp xx & xxi) show roughly

a million homebrew sets built each year, outnumbering factory production by ten to one in 1922 and not surpassed until 1925” (Douglas, 1943, I, xi).

In view of the fact that the breadboard is made of Kauri and not well drilled suggests that at least this part was home-made. There are also some incorrectly drilled holes in the face-plate, suggesting that this too was home drilled.

Getting the radio to work

Initially, the radio appeared not to work. However, this was due to the feedback in the detector stage being negative instead of positive and therefore the stage gain was minimal. Reversing the connections to the tuning coil fixed this, as well as bringing the earthy ends of the tuned and aerial windings together. Once this was done, the radio burst into life and a number of stations were heard. Performance was also improved when the grid leak resistor was replaced with one of correct value.

The next step was to ascertain whether the proliferation of supply voltages suggested by the terminal strip was really necessary. The filament supply is 6V, with the rheostat being adjusted to provide 4V on the B405 heater. The 120V and 90V anode supplies were functional but it was found that about 75V for both was sufficient. The “Bdet” voltage value for the detector was not stated but a value of around 10 to 20V gave manageable reaction, and in fact the detector functioned quite well down to 2V ! Finally, a value of 12V for this supply was chosen as convenient. The labelling for the grid bias (C) supplies was somewhat confusing, particularly the “C+2” label. Grid voltages are usually negative relative to the cathode and consequently -1.0 to 1.5V was suitable for both grid bias supplies. Experimentation with small variations either side of this value made little difference.

Regenerative receivers are at their most sensitive just on the point of oscillation, and the reaction control needs to be adjusted to that point for each station, as that point will vary with the position of the tuning control. When just tuning generally, looking for stations, it was found best to adjust the reaction control to just past the point of oscillation (not shrieking, but still giving whistles and beat notes on stations as they are tuned in), and then backing off the reaction slightly once a station is detected to get rid of the beat note but still give maximum sensitivity (or suitable volume on the stronger stations). The reception should then be clean and quite readable, similar to what is expected of AM reception today.

If the reaction is backed off too far, then volume/sensitivity diminishes rapidly. This gives control over the volume of strong signals, but weak signals may be lost altogether.

Most of the Wellington AM stations could be heard at good volume in Blenheim, even with a modest wire antenna. Anything too ambitious, antenna-wise, can be counter-productive, as the selectivity suffers and stations merge with one another.

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No. 2481

23rd June, 1958

TO: ALL CENTRE MANAGERS. SERVICE CHARGES.

There appears to be an appalling lack of any realistic idea of what charges and costs are involved in servicing and what we should legitimately pass on to our clients.

Some time ago I indicated that our service charges should be based on a rate of £1 per hour for actual servicing and that in addition a charge of approximately 5/- per set should be made for picking up and delivering. These figures were based on known costs and the assumption that our Service Departments were reasonably efficient. At that time it was taken for granted that Managers would know that apart from the fact that their serviceman is on the payroll for 40 hours of the week, there were the attendant costs of running, operational costs of the department, parts, general overhead and motor vehicles.

The only way a Service Department can pay is to run it along the lines of our competitors and other servicing organisations such as the motor industry, whereby the aim is to secure 40 hours of effective effort per man which can be charged from servicemen who are solely employed in servicing work.

As a result of investigations in certain Service Departments, I am quite confident that an honest day's effort is being made by the servicemen concerned, but I am equally certain there is no proper understanding of the costs involved. I would be the last one to suggest that if service work is not forthcoming any department should endeavour to send out accounts which show 40 hours of labour. On the other hand there are claims that the Service Department cannot cope with the work; nevertheless recovered hours are extremely low. Even with one serviceman the minimum number of hours which should be shown is 40 because it must be borne in mind that apart from the service time at the bench there is additional chargeable time involved in collecting and delivery.

The simple fact is that our Company is not recovering a just amount of money for work which is done. An examination of the service books of several Centres where full time servicemen are employed and where in addition, the services of other staff are used for collection and delivery, shows that the number of hours being recovered do not approach 40 when in fact, the number of hours actually used and chargeable could with a serviceman and pick-up and delivery man come very close to 60.

Where there is more than one serviceman obviously additional accountable hours should exist. Where there is an apprentice it is fair to say that he should be able to account for 20 hours out of the 40 as being chargeable i.e., a man and an apprentice between them should have approximately 60 hours which are chargeable as far as bench and actual service work is concerned. There is of course, the additional time taken up in the matter of delivery which will now be taken as 7/6 minimum. Where special calls are made for service or long distances are involved, we must be recompensed. Customers should be encouraged to bring in small sets and should be told it saves them money. Public transport can also be used as this is obviously less costly than special trips.

While it may be considered elementary to raise the matter of how much can be charged for a job, I feel it necessary to do so because, obviously there is a lack of elementary knowledge in our approach to this subject. I refer to the long and difficult job and the quick job. Everyone in the industry who has any appreciation of technical problems knows that there are jobs which do take a considerable amount of time particularly in the matter of location of say, an intermittent fault, and full time cannot always be recovered on such a job. Conversely however, there is what is known as a quick job where the fault is elementary and can be speedily remedied and it is the accepted practice that a little time is put on to such a job to offset time lost on the job which does not justify time taken.

It is a grave mistake in management if a serviceman is allowed to wander away from the bench and carry out tasks which should be carried out by other members of the staff when service work is not right up to date. The serviceman is a technical specialist and to be of greatest use to the firm he should be constantly at the bench. Where a Centre has to admit that a serviceman has idle time on his hands, obviously 40 hours cannot be charged for, but this is an opportunity for ascertaining that all stock at centres is performing properly.

The obvious approach where there is a full time serviceman is that there is an 8 hour day and at the end of each day these 8 hours should be accounted for in chargeable time, particularly where there is an abundance of work. If 8 jobs are done in the day this means that an extra two hours of time should also be accounted for, or approximately quarter of an hour per job for collection and delivery.

I know that some Centres will bring up the bogey of 'no charge' after-sale service but it is a peculiar thing that our most successful Centres seem to make the least clamour about after-sale service work.

The question that must be shaped up to on the matter of guarantee work is 'Is all work done and claimed for as no charge under guarantee justifiable on such a basis?' If the trouble arises from abuse, misuse, or from fire, flood or some other act of God it is not covered by guarantee. The guarantee does not envisage numerous calls to adjust record changers, particularly where the adjustment has been brought about by misuse. In this regard Managers woul9 do well to know off by heart the terms of the Dominion-wide guarantee. Customers under the terms of our guarantee are supposed to bring sets back into the shop and while in many instances it is impracticable to insist on this as far as console sets are concerned, the procedure for mantel sets should be quite simple.

We now reach the point where we must consider how we are to operate in the future if we are to run a Service Department which will play its part not merely as a builder of good will but as a profit-earning unit in the Company.

First of all, the serviceman must have a knowledge of what his duties are - which are first and foremost, at the bench repairing radios; secondly, a value of time and its effective use in the Company's interest; thirdly in charging out it must be done on a basis which will cover all our costs and in particular, account as near as possible for full labour hours spent at the bench.

On the matter of charges, while judgement is necessary in certain cases, attached hereto is a minimum scale of charges which is approved by the various Radio Traders Associations throughout New Zealand. These minimum charges do not cover transport. As you will see, the question of service calls is covered on a minimum charge of 7/6 plus additional mileage and travelling time. Centres would do well to model their charges on these.

Now that charges have been placed on a proper basis, the whole economics of our Service Departments in our Centres can be watched. We will be watching very closely firstly, the basis of charges and secondly the chargeable hours which every Centre can attain. It is not a question of making unduly heavy charges, it is a question of making realistic charges in keeping with today's costs. Apart from benefit to the centre and the company an adequate return on our Service Department means a better service bonus and thus beneficially affects the pockets of those involved.

It is extremely important in detailing work done that the following explanatory story should be given on the charge docket:- Collecting, (where applicable) checking for faults, dismantling, locating faults, replacing parts as above, re-aligning, testing, re-assembling and final check.

The effective use of all labour, whether in the field of sales or service, _ brings about a successful Company. Equally important is that the labour should be paid for and in addition to seeing that adequate charges are made it is of paramount importance that the customer actually pays us. Repairs should be for cash only and credit should be given only under exceptional circumstances. Where credit is given the matter of payment should be energetically pursued.

I would like every Manager to carefully peruse this letter and pass it on to his serviceman where there is one, and then to write back acknowledging the letter and also making specific comments.

Yours truly,

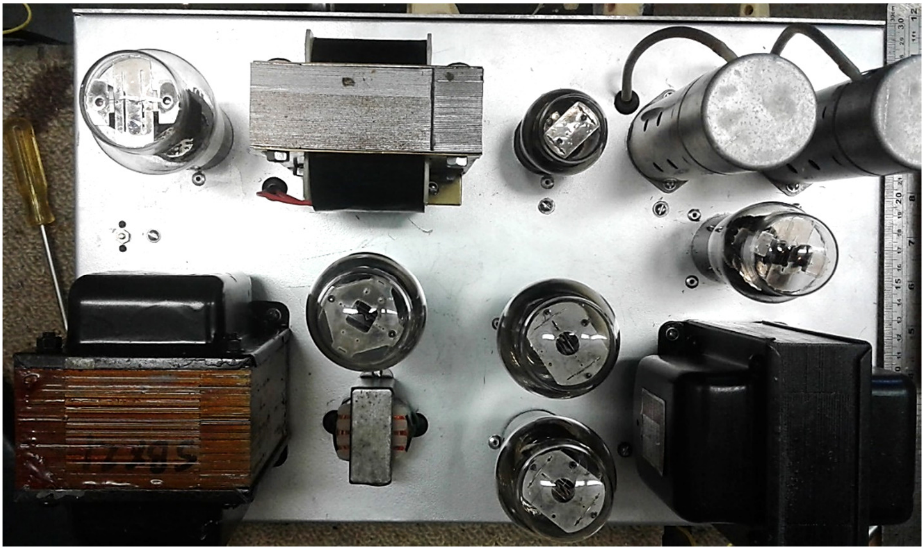
An Audio Project – Just for Fun from John Dodgshun

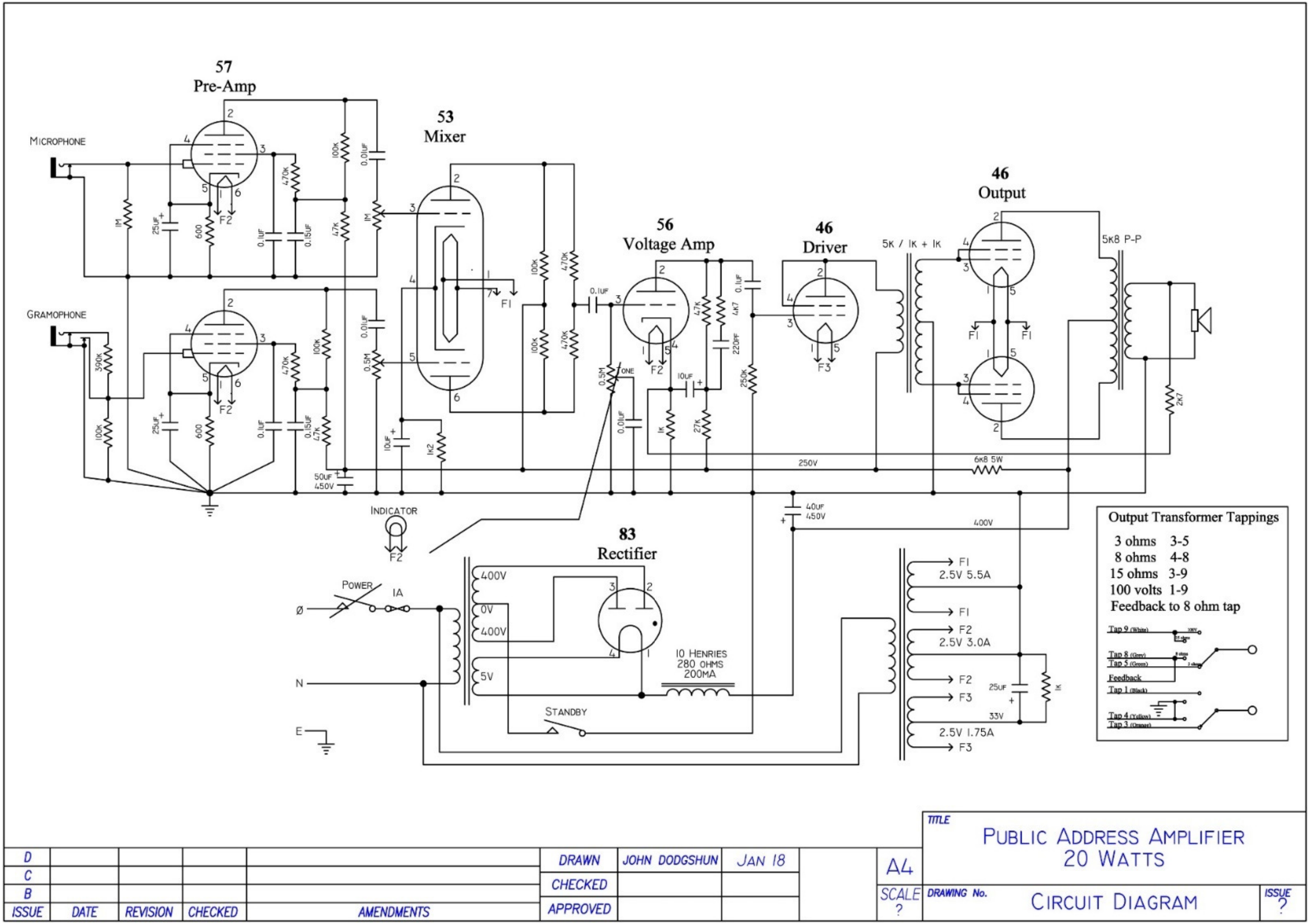
A while ago I bought a collection of valves from TradeMe. In amongst the ones I wanted was a type 46. Now we all know about 45s & 47s but I had never come across a 46. I dived into the RC19 edition of the RCA Valve Manual that resides on my bench but I didn't learn much except that it was described as a *Dual Grid Power Amplifier* tube. – not a Tetrode. I had to go back to the RC12 edition to find out some more. Some of these details didn't appear after RC12. As well, Radio Museum.org shed some light. It first appeared in April 1932 – after the 47, but was only ever used in a very few radios. The interesting use of it is in the push-pull output stage of an amplifier under Class B zero bias conditions. The two grids are connected together and the transconductance of the tube rises such that with 400 volts on the plates, the idling current is 12mA for the pair of tubes. This is a very similar to the way a 53/6A6/6N7 dual, high mu power triode operates when connected in the same configuration, except that a pair of 46s has twice the power output. The other use is as a class A driver for the push-pull output stage, with grid 2 connected to the plate thus producing a much more conventional triode. Interestingly, the 46 never featured in any of the circuits at the back of the valve manuals. Well, by now I was hooked! How best to try this out? It soon became apparent that for me, the only way was to incorporate the circuit into an amplifier that could be suitable for small-scale public address work. Because the 46 heater is 2.5V, I elected to use 2.5V tubes for the rest of the amplifier as well. Murray Clark kindly donated a pair of N.O.S. 46s for the output section. For the remaining circuitry I consulted the circuits section of the RC15 edition of the valve manual and cobbled together three different bits to produce what I wanted. I had previously used some of these circuits with excellent results. The front-end pre-amps (2) are type 57s. These are the equivalent of the 6J7 shown in the circuit. As I had to have a Gramophone input as well as the microphone, the two-channel mixer is a type 53 and the voltage amplifier a type 56. I had a fish around in my box of transformers and found a suitable power transformer with 400 volts a side at 150mA, a 5V, 3A heater winding for the rectifier and a 6.3V heater winding which was of little use. Never mind, it was very cheap! There were two options for biasing the class A 46 driver tube. – cathode or fixed bias. I opted for cathode bias, because that removed the necessity for a bias supply which would have required yet another heater winding and rectifier tube – I daren't use silicon diodes here! But it did necessitate a separate 2.5V heater winding for the 46 driver tube.

Now to the power supply proper. As Class B current requirements vary widely, the DC rail needs to be very stable. I opted for a choke input filter and a mercury vapour rectifier type 83 because it has a lower forward voltage drop. In order to further increase the stability of the HT voltage, I decided on a 10 Henry choke of low DC resistance at 280 ohms. There is just one 40uf filter capacitor on the load side of the choke. Sorted!

Conveniently, the output tube driver transformer ratio was given in the valve manual data so that was a great help as I am yet to work out how these transformers are specified. Another fish in my transformer collection produced a good old Beacon 35 Watt universal output transformer - these were a high-quality unit. Not so lucky with the filament transformer which I had to wind. (Don't ask why there is a third 2.5V winding on this.) What to build it on/in? I looked around but found nothing suitable. On occasions I have used a local sheet metal firm, so once again I went to them with my design. They produced a good quality chassis and removable base for $45. A spray paint later and it looked A1. In the meantime, I had a front panel and replica dial plates made. Some assembly time later and I had an amplifier ready to test. The output stages worked exactly as the design described and produced 20 Watts, again as specified, on full cry. There was

however a persistent hum problem with the 57 pre-amp stages. The circuit I had selected from RC15 connected the pair of 6J7s/57s element to element with a single set of components around them. I had selected this circuit because it solved the problem of a mixer rather tidily. However, for some reason which never became quite clear, there was a hum introduced into the plate circuit which I couldn't eliminate. Following a re-design of the pre-amp circuit using individual components for each 57 (as shown in the circuit) and the installation of the 53 mixer stage, it is all sorted and the amplifier indeed works very well. It doesn't look to shabby either!
A date? Let's say early 1933.




57
Pre-Amp
53
Mixer
56
Voltage Amp
46
Driver
46
Output
83
Rectifier
MICROPHONE
GRAMOPHONE
INDICATOR
POWER
IA
STANDBY
10 HENRIES
280 OHMS
200MA
5K / 1K + 1K
5K8 P-P
250V
400V
6K8 5W
40UF
450V
50UF
450V
2.5V 5.5A
2.5V 3.0A
2.5V 1.75A
33V
Output Transformer Tappings
3 ohms 3-5
8 ohms 4-8
15 ohms 3-9
100 volts 1-9
Feedback to 8 ohm tap
TITLE
PUBLIC ADDRESS AMPLIFIER
20 WATTS
DRAWING No.
CIRCUIT DIAGRAM
ISSUE
?
A4
SCALE
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DRAWN
JOHN DODGSHUN
JAN 18
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APPROVED
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ISSUE
DATE
REVISION
CHECKED
AMENDMENTS

Improving Modulation Acceptance

From Brian Beezley, *Electric Radio*, August 2003. ham-radio.com/k6sti

Modulation acceptance is the maximum modulation level an AM receiver's detector can handle without distortion. An ordinary diode detector can accommodate upward modulation well beyond 100%. But capacitive loading can prevent a detector from faithfully reproducing downward modulation. At some point it stops and clips the waveform instead of continuing toward zero.

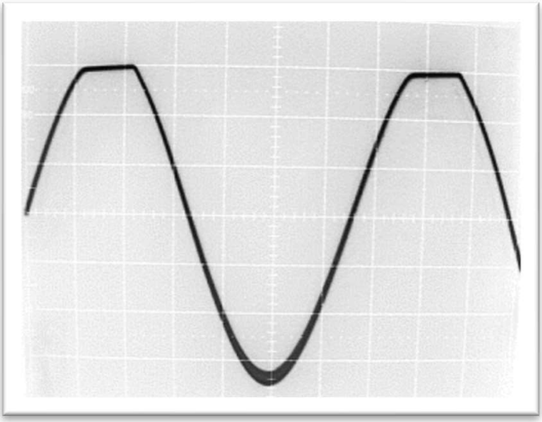


Fig. 1 Detected sine wave - clipped

Fig. 1 shows the output of a diode detector for a 100% amplitude-modulated sine wave. The trace appears inverted because the detector circuit is arranged to generate a negative output voltage for AVC. 0 Volts, corresponding to no carrier, is at the top of the screen. The modulation acceptance of this detector is 88%.

Clipping distortion on sine waves is easily audible. In fact, you can hear it before you can see it on a scope. But casual tests suggest that clipping on speech and music isn't objectionable as long as the modulation acceptance is greater than about 80%.

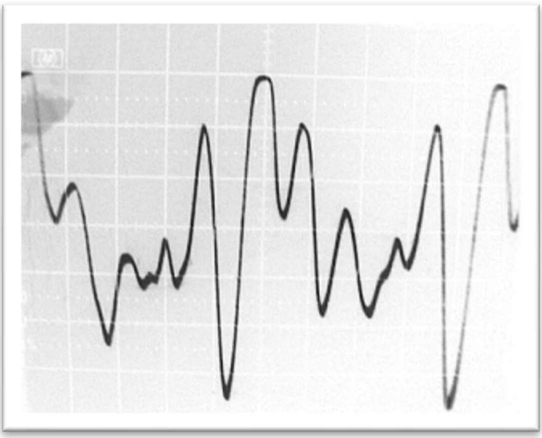


Fig. 2 Detected broadcast signal

Fig. 2 shows an AM broadcast signal demodulated and clipped by the diode detector. While the sine wave distortion was obvious (as in fig 1), it's not so clear from this audio modulated trace alone whether the broadcast waveform is distorted. In this case the ear agreed with the eye - I was listening to the receiver when I took the photo and I heard nothing seriously amiss.

Modulation acceptance somewhere in the low-80% range is typical of consumer radios from the 1930s and 1940s. But the communications receivers I've tested have been much worse, typically distorting at 60% downward modulation or less. Distortion at such shallow modulation depths is nearly always audible. The audio tends to lose its crispness and clarity, and in severe cases sounds downright grungy. I always modify any receiver I restore for a modulation acceptance of at least 90%; most approach 100%.

Measuring Modulation Acceptance

To test your receiver's modulation acceptance, you need a signal generator with variable amplitude modulation. If the modulation percentage isn't calibrated, you can measure it by observing the waveform on a scope. Modulate the signal with a 400-Hz tone and increase the modulation percentage until you can just hear distortion in your receiver (the character of the tone will change). You can also use a scope to look for distortion at the detector load (R2 below). The percentage AM at the onset of distortion is your receiver's modulation acceptance.

Causes of Low Modulation Acceptance

Fig. 3 shows a typical AM detector circuit in a communications receiver. Diode D1 conducts whenever the voltage across it is positive. When the top terminal of IF transformer T1 goes positive with respect to the lower terminal, D1 clamps the terminal near ground. The lower terminal then charges C1 negatively to the waveform peak. C1 partially discharges while the IF waveform reverses sign. R1 and C2 filter out the IF component, leaving a DC level corresponding to the carrier and audio corresponding to the envelope modulation across detector load R2.

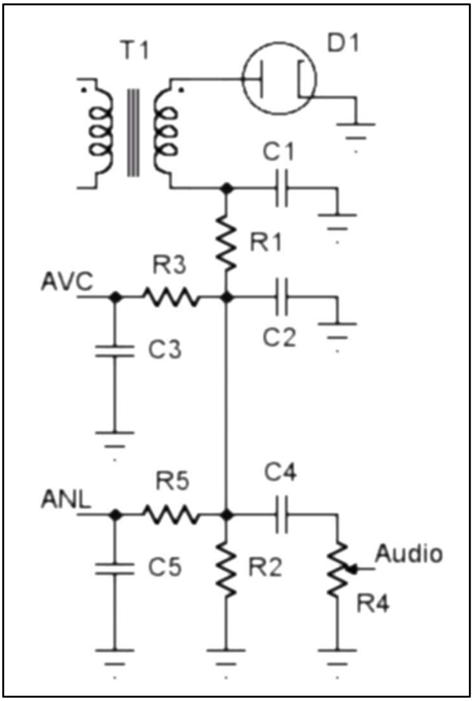


Fig. 3 Typical detector

The primary cause of low modulation acceptance is back-biasing of D1 due to capacitive loading. The AVC capacitor, the volume control coupling capacitor, and any ANL capacitor are the culprits. Focus on the AVC capacitor alone to see how the damage is done.

AVC capacitor C3 charges to the level of the carrier, and the voltage on it divides back through R3 to R2. R1 and C2 are absent in some receivers, and it simplifies analysis to assume that R1, typically 47kΩ, is zero. In this case the DC voltage on R2 appears at the lower terminal of T1. Now assume that R3 is 2.2MΩ, R2 is 470kΩ, and the detected carrier level is −6 V. Under these conditions a DC bias of about −1 V appears at the lower terminal of T1 due to C3, since R2 ⁄ (R2 + R3) is about 1 ⁄ 6. When the signal drops to about one-sixth of its unmodulated level at 83% downward modulation, it generates +1 V across T1. Added to the −1 V at the lower terminal, this yields 0 V at D1. D1 stops conducting. It becomes back-biased and remains nonconducting for deeper downward modulation. R2 just sits at the −1 -V bias level. This creates a flat spot in the detected waveform. The detector has clipped and distorted the demodulated audio.

If you swap R4 and C4, which leaves their current unchanged, you can see that the volume control and its coupling capacitor develop back-bias in the same way. An ANL circuit typically connects an additional filter, represented here by R5 and C5, to the detector load. This is yet another source of back-bias for D1. In each case the value of the offending capacitor matters little. These RC circuits are designed to pass or filter most of the audio spectrum, so the capacitors develop little AC voltage across them. You can think of them as little batteries. What matters is the ratio of the detector load R2 to the parallel combination of resistors that connect to these capacitors. Voltage division by this resistive divider is what causes the back-bias on D1. You can increase modulation acceptance by reducing the resistor ratio.

This analysis ignores the IF passband shape, IF source impedance, and the rectification efficiency of real diodes. These factors actually may increase modulation acceptance by lowering the effective modulation depth at the detector. However, detector back-bias usually swamps these factors in practical circuits. See the detection section of Frederick Terman's *Radio Engineers' Handbook* for more.

Improving Modulation Acceptance

The easiest way I've found to improve modulation acceptance is to reduce the detector load resistance R2. Surprisingly, dropping the value by as much as a factor of four causes few problems. It does lower the load impedance presented to the last IF stage, and this may alter its passband shape. But I've never found this to be a problem. Often the audio level will drop by a dB or two, but I find this a small price to pay for cleaner audio. Usually I wind up cutting the detector load roughly in half. (Lower audio may be caused by excessive IF ripple on C1. Check the waveform with a low-capacitance ×10 scope probe. If you increase C1 until the peak-to-peak IF ripple is less than 20%, the audio level should be within 1 dB of the maximum possible. Making C1 too large will reduce the treble response.)

AVC resistor R3 typically is 2.2MΩ. I've increased its value to 4.7MΩ without problem. If you try this, it's a good idea to check for leakage current in the AVC circuit, particularly when several tubes are controlled. Any leakage current develops an offset voltage across R3; doubling R3 doubles the offset. Increasing R3 will lengthen the AVC time constant, but I've found that the AM time constant is way too short in most receivers, so this normally is not a problem. You can decrease C3 to compensate if you want.

Some communications receivers (and most consumer radios) replace R2 with the volume control R4, typically 500kΩ. C4 then connects the wiper to a grid resistor, typically 10MΩ. Because this AC-coupled load has much higher resistance than the volume control, this circuit configuration can greatly improve modulation acceptance. This technique applies DC from the detected carrier to the volume control. If the wiper contact is worn or dirty, rotation can generate interrupted DC, causing scratchy audio noise. Make sure the volume control is in good condition if you use this circuit.

R5 typically is 1MΩ. This resistor, along with another 1MΩ resistor often used in series-ANL circuits and not shown, can be major contributors to poor modulation acceptance. There is a way to eliminate the R5-C5 network and any additional resistor, and use the AVC capacitor for the ANL function. Not only does this modification improve modulation acceptance, it makes ANL so transparent that you can leave it permanently engaged. It also automatically implements fast-attack AVC, which helps if you modify your AVC system to minimize selective-fading distortion.

An alternative way to improve modulation acceptance is to use a separate diode for detecting AVC and ANL, leaving the existing diode for audio detection only. The second diode in a 6SQ7, for example, is often unused (or tied in parallel with the first diode). If you couple the anode of D1 to the anode of a second diode through 100 pF or so, you can connect the AVC and ANL resistors to the new diode, along with a second load resistor. D1 is then DC-isolated from the AVC and ANL capacitors, and only the volume control coupling capacitor can degrade modulation acceptance. Better still is to connect the 100 pF directly to the plate of the last IF amp. This feeds a wider passband to the AVC detector and keeps it from boosting the gain as you tune away from a station, eliminating raucous noises. The coupling capacitor must have low leakage if tied to the IF-amp plate. Because of the high-level IF signal at D1, you must take care any time you modify its wiring. Unwanted coupling can result in IF feedback that may alter the gain and frequency response of the IF strip, or even cause it to oscillate.

Rejuvenation of a 6V6 – from the Serviceman who Tells.

Noted from a pile of "might be interesting items" I came across this cutting from the 1990's;

" From time to time there are jobs which a serviceman tackles for no remuneration; sometimes voluntarily, and sometimes unwittingly. The former are usually done out of curiosity, amusement or necessity. The story that follows involved all three. It started when a friend of mine, an auto electrician by trade, arrived at my home one wet Saturday afternoon with an old 6V6-G valve in his hand. I winced inwardly at the sight, but actually I should not have done so. He had helped me with a favour - weeks previously, with overnight repairs to the service van, so I was in his debt. As a hobby, my friend had been restoring a vintage console radio. It transpired that the task had been completed recently, and although the set operated quite well initially, the volume slowly decreased over time until it became barely audible. He had suspected the cause to be low emission of the old output pentode, now cradled carefully in his hand. His hope was that I might have "an old one in the junk box?" that he could try. He might well have been right, but an extensive search failed to unearth one. However, what I did find while rummaging around, was a piece of homemade equipment that I had used back in the black and white days for rejuvenating weak picture tubes. I had never before used it on normal valves, but curiosity overcame me. We discussed the possibilities over a cup of coffee. It was a rainy day, my friend felt he had nothing to lose, and I felt like `having a go' -- so that settled it.

These 'CRT rejuvenator' devices were at one time quite common about the trade and generally consisted of a filament transformer tapped at 6.3, 7.5 and 9 Volts, together with some form of HT supply around the 200V mark.

Mine was constructed in an old wooden meter case, with a set of fly leads emanating from one side, terminated in an eight pin CRT socket.

When fitted to the picture tube, all the elements were tied to the positive side of the HT supply through a 15 Watt 240 Volt lamp. The cathode of the tube was returned to the negative terminal. The front panel was simple consisting of a filament voltage selector switch, an AC on/off switch for the filament transformer, and the lamp. There were probably as many versions of this device as there were methods of using them. In operation, the HT supply remained on for the duration of the rejuvenation and the filament voltage was turned on at the lowest setting and slowly advanced, all the while watching the lamp for any sign of redness. Usually nothing happened at the lowest setting so one then tried the 7 5 V tap, or if necessary the 9 V tap. At the first sign of a glow, the AC supply to the filament was cut until everything cooled down, then the whole process started over again. The object was to have the lamp glow on the 6.3 V setting. At this point the low emission is considered "cured", and the tube should perform like new.

On this particular occasion we set up the rejuvenator on the workbench and connected the 6V6-G to the unit with a socket and the jumper leads. The valve responded quickly to the treatment, for in only a few minutes I felt confident in pronouncing the job a success. But proof of the pudding came some time later, when a phone call confirmed that the old radio had "never sounded better!"

So, for those enthusiasts finding themselves stuck in this manner, I can only suggest they also 'give it a go!' However, for lower power valves, and mini-series types, it would be wise to use a higher ohmage load than the one I have described. The characteristics of an incandescent lamp are ideal for this application, since the resistance will increase with temperature (brightness) — thereby offering some degree of protection over that of pure resistance and of course have the visual feedback. " *[One wonders... Ed]*

New Zealand Broadcasting Stations

CALL SIGN	DIAL NO.	W'Length Power, &c.	LOCATION AND SCHEDULE
1YA		902 k'c. 332 m. 500 w.	AUCKLAND—3 p.m. to 10 p.m., and Sat.), and 2 to 10 p.m., week days (3 to 11 p.m., Tues. Sun. Silent day, Mon.
2YA		720 k'c. 416.4 m. 5 k.w.	WELLINGTON.—Mon., 10 a.m. to noon, 2 p.m. to 11 p.m.; Tues., Wed., Thurs., Fri., 10 a.m. to noon, 2 p.m. to 10 p.m.; Sat., 3 p.m. to 11 p.m.; Sun., 2 to 4.30 p.m., 6 p.m. to 10 p.m.
3YA		980 k'c. 305.9 m. 500 w.	CHRISTCHURCH—3 to 10 p.m. week days (3 to 11 p.m. Thur. & Sat.); and 2 to 10 p.m. Sun. Silent day, Tues.
4YA		650 k'c. 461.3 m. 500 w.	DUNEDIN—3 to 10 p.m. week days (3 to 11 p.m. Wed. and Sat.); and 2 to 10 p.m. Sun. Silent day, Thur.
1ZB		1090 k'c. 275.2 m. 18 w.	AUCKLAND—Mon. 7.30 to 10 p.m.; Wed., 8 to 10 p.m.
1ZH		630 k'c. 479.5 m. 45 w.	HAMILTON—Mon. to Fri., noon to 1 p.m.; Tues., Fri., 7.30 p.m. to 10 p.m.
1ZJ		1320 k'c. 227.3 m. 26 w.	AUCKLAND—Tues. and Thurs., noon to 2 p.m.; Wed., 7.30 to 9.30 p.m.
1ZM		1210 k'c. 247.9 m. 17 w.	MANUREWA—Mon., 9 to 11.30 a.m., 2 to 5 p.m. 7.30 to 10 p.m.; Tues. to Sat., 9 to 11.30 a.m.; Sun. and hols., 10 a.m. to noon, 1 to 3, 4.30 to 6, 8.30 to 11.30 p.m.
1ZQ		1190 k'c. 252 m. 25 w.	AUCKLAND—Mon., Tues., Wed., Thurs. and Sat., 8 to 10.30 p.m.; Sun., 4 to 6, 7.30 to 10 p.m.
1ZR		1090 k'c. 275.2 m. 70 w.	AUCKLAND—Mon., 10.30 a.m. to 2 p.m., 5 to 7.30 p.m.; Tues., Thur., Fri., 10.30 a.m. to 2 p.m., 5 to 10 p.m.; Wed., 10.30 a.m. to 2 p.m., 5 to 8 p.m.; Sat., 10.30 a.m. to 1.30 p.m., 5 to 11 p.m.; Sun., 9 to 10.30 a.m., 2.30 to 4 p.m., 6.30 to 9.30 p.m.
1ZS		1420 k'c. 211.3 m. 5 w.	AUCKLAND—Mon. to Fri., 7.30 to a.m., 2 to 3 p.m.; Sat. 7.30 to 9 a.m.
2YB		1230 k'c. 243.9 m. 100 w.	NEW PLYMOUTH—Mon. and Wed., 6.30 p.m.; Sat., 2.30 to 5.15, 8 to 10 p.m.; Sun., 8.15 to 10 p.m.
2ZB		1260 k'c. 238.1 m. 7.5 w.	NAPIER—Mon and Thurs., 6 to 7 p.m.; Sat., 6 to 7, 7.30 to 10.30 p.m.; Sun., 10.30 a.m. to 12.30 p.m.
2ZD		1180 m. 254.2 m. 2.5 w.	MASTERTON—7.30 a.m. to 9 a.m. daily; 8 p.m. to 9.30 p.m. Sun.; 7 p.m. to 10 p.m. Wed.
2ZE		1210 k'c. 247.9 m. 10 w.	EKETAHUNA—4.30 to 6 p.m. Sun.
2ZF		1050 k'c. 285.7 m. 150 w.	PALMERSTON NORTH—Wed., 6.30 to 9.30 p.m.; Fri., 7 to 9.30 p.m.; Sun., 3 to 4.30 p.m., 7 to 9.30 p.m.
2ZH W I B	12 14	1260 k'c. 238.1 m. 65 w.	NAPIER—Mon. to Sat., inclusive, 10 a.m. to 1 p.m.; Wed., 6.30 to 10.30 p.m.; Sun., 2.30 to 4.30 p.m., 6.30 to 9.30 p.m.
2ZI		1330 k'c. 266 m. 15 w.	HASTINGS—Mon. and Thurs., 7 to 10 p.m.
2ZJ		1150 k'c. 260.9 m. 20 w.	GISBORNE—Tues., noon to 1.30 p.m.; Wed., noon to 1.30 p.m., 7.30 to 10.30 p.m.; Fri., 4 p.m. to 5.15 p.m., 7.30 p.m. to 10.30 p.m.; Mon. and Sat., 2.30 p.m. to 4.30 p.m.
2ZK		600 k'c. 500 m. 120 w.	WANGANUI—Mon. to Fri., 7 to 8 p.m.; Sat., 11 a.m. to 1 p.m.
2ZL		1330 k'c. 225.6 m. 20 w.	HASTINGS—Tues. and Fri., 7 to 10.30 p.m.
2ZM		1150 k'c. 260.9 m. 110 w.	GISBORNE—Mon., Fri., Sat., noon to 1.30 p.m.; Tues., 2.30 to 4.30 p.m.; Thur, noon to 1.30 p.m., 7 to 10 p.m.; Sun., noon to 1.30, 7 to 10 p.m.
2ZO		1050 k'c. 285.7 m. 10 w.	PALMERSTON NORTH—Tues., 7 to 9 p.m. Sat., 1 to 2.30 p.m.; Sun., 10.30 to 12.30 p.m.
2ZP		820 k'c. 366 m. 45 w.	WAIROA—Daily (except Sun.), 7 to 9 a.m., and Tues., 6.30 to 10.30 p.m.
2ZW		1120 k'c. 267.9 m. 400 w.	WELLINGTON—Mon. and Tues., 10 a.m. to 2 p.m., 7 p.m. to 11 p.m.; Wed., 10 a.m. to 2 p.m., 5 to 11 p.m.; Thur., 10 to 2 p.m., 3 to 4 p.m. 7 to 11 p.m.; Fri., 10 a.m. to 2 p.m.; Sat., noon to 2 p.m., 7 to midnight; Sun, 10 a.m. to 12.30 p.m., 7 to 10 p.m.
3ZE		820 k'c. 366 m. 45 w.	GREYMOUTH—8 to 10 p.m. Mon. and Wed.; noon to 2 p.m. Fri.; 9.15 to 11 p.m. Sat.
3ZR		820 k'c. 366 m. 80 w.	GREYMOUTH—Tues. and Thurs., 6 to to 6.30 p.m., 7 to 10 p.m.; Fri., 6 to 10 p.m.; Sat., 3 to 5 p.m.; 6 to 6.30, 7 to 9 p.m.; Sun., 3 to 9 p.m.
3ZC		1200 k'c. 250 m. 250 w.	CHRISTCHURCH—Mon., 12 noon to 2 p.m., 8 to 10 p.m.; Tues., 10 to 11.30 a.m., 12 noon to 2, 2.30 to 4, 5.30 to 10.30 p.m.; Wed., 10 a.m. to 10 p.m.; Thur., 10 to 11.30 a.m., 12 noon to 2, 6.15 to 10 p.m.; Fri., 12 noon to 2 p.m.; Sat., 5.30 to 11 p.m.
4ZB		1080 k'c. 277.8 m. 20 w.	DUNEDIN—Wed., 6.30 to 11 p.m.; Thur., 6 to 11 p.m.; Sun., 10 a.m. to noon.
4ZF		1080 k'c. 277.8 m. 7 w.	DUNEDIN—Mon., Sat., 9 to 9.55 a.m. Mon. to Fri., 1 to 2 p.m.; Mon., 3 to 5 p.m.; Tues., 6 to 7.30 p.m.; Wed., 3 to 5 p.m., 11 to midnight; Sun., 5 to 6 p.m.
4ZI		1160 k'c. 258.6 m. 8 w.	INVERCARGILL—Daily (except Sat. and Sun.), noon to 1 p.m.; Wed. and Sat., 8 to 10 p.m.
4ZL		1220 k'c. 245.9 m. 100 w.	DUNEDIN—Daily (except Sun.), 7 to 9 a.m., 1 to 2 p.m.; Mon., 7.30 to 11 p.m.; Thur. and Sat., 3 to 5 p.m.; Sun., 8 to 10 p.m.
4ZM		1080 k'c. 277.8 m. 45 w.	DUNEDIN—Daily (except Sun.), 10 to 11.45 a.m.; Tues., Thur., Sun., 3 p.m. to 5 p.m. Tues., 8 to 11 p.m. Sun., 8 to 10 p.m.
4ZO		1080 k'c. 277.8 m. 40 w.	DUNEDIN—Mon., Tues., Wed., Thur., noon to 1 p.m., 5 to 6 p.m.; Fri., noon to 1 p.m., 5 to 6 p.m., 7 to 8 p.m., 10 to midnight; Sat., noon to 1 p.m., 5 to 6 p.m.
4ZP		1160 k'c. 258.6 m. 500 w.	INVERCARGILL—Mon., Tues., Thurs., 5 to 10 p.m.; Wed., 5 to 8 p.m.; Fri., 5 to 11 p.m.; Sat., 5 to 8 p.m., 10.15 p.m. to midnight; Sun., 6.30 to 10 p.m.
4ZR	WTB 6 11	1340 k'c. 223 m. 4 w.	INCHCLUTHA—Thurs., 8 to 10 p.m.; Sun., 10 a.m. to noon.
4ZW		1080 k'c. 277.8 m. 50 w.	DUNEDIN—Mon. to Fri., 2 to 3 p.m.; Sat., 2 to 3 p.m., 8 p.m. to midnight; Sun, noon to 2 p.m.

NZ and Australian Stations 1932 - from Bill Marsh

W/d.—Week days.

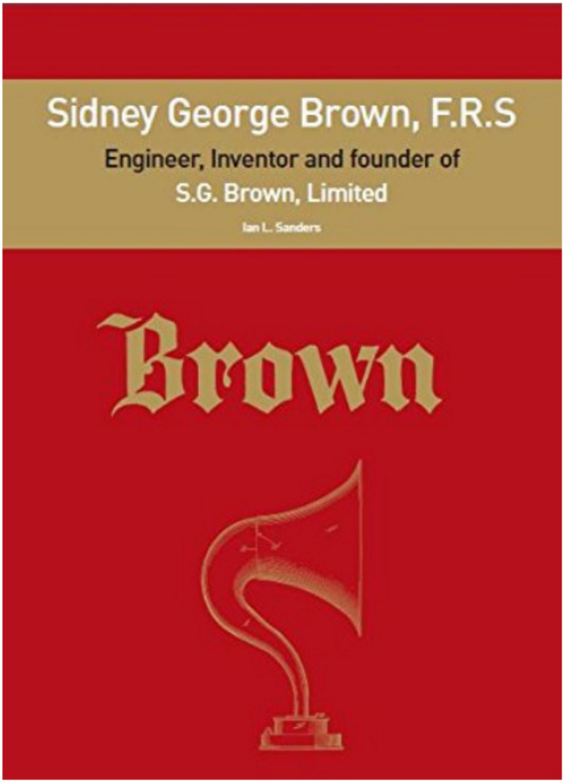
Australian Broadcasting Stations.

All schedules given in Australian time.

CALL SIGN	DIAL NO.	W'Length Power, &c.	NAME AND LOCATION
3AK		200 m. 1500 k'c. 50 w.	MELBOURNE—W/d. 12.30—2 a.m.; 5—7 a.m.; 11.30—12.30 a.m.; Sat. 1—2 p.m. Sun. 12.30—2.30 p.m.; 10—12 p.m.
2AY		203 m. 1480 k'c. 50 w.	ALBURY—W/d. 6.30—10.30 p.m.; Sat. 7—10.30 p.m.; Sun. 7.30—10 p.m.
2WL		209.06 m. 1435 k'c. 50 w.	WOLLONGONG—W/d. 6.30—10 p.m.; Sun. 7—9 p.m.
3AW		210.5 m. 1425 k'c. 300 w.	MELBOURNE—W/d. 7—8.30 a.m.; 11.30—2 p.m.; 2.30—5.15 p.m.; 5.30—6 p.m.; 6.15—11 p.m. Sat. w/d sched. to 11.30 except 1—5.30 p.m. Sun. 4.30—10.30 p.m.
2KO		212 m. 1415 k'c. 200 w.	NEWCASTLE—6.30—10 p.m. Sat. 10—12 noon; 6.20—10 p.m. Sun. 9—10 a.m. and 7—9 p.m.
3GL		214 m. 1400 k'c. 50 w.	GEELONG—W/d. 9.30—11 a.m.; 2—3 p.m.; 7—10.30 p.m.; Sat 7.30—10.30 a.m. 10.30—11.45 a.m.; 7—10.30 a.m. Sun. 7 10 p.m
2GN		216 m. 1390 k'c. 50 w.	GOULBURN—Tu., Th. 12.15—1.45 p.m. 6.30—7 p.m.; 8—10 p.m. Sat. 6.30—7 p.m.; 7.30—10.30 p.m. Sun. 8—9.30 p.m.
4BH		217.3 m. 1380 k'c. 600 w.	BRISBANE—W/d. 7—8.30 a.m.; 11—12.30 p.m.; 1—2 p.m.; 6—6.30 p.m.; 7—7.30 p.m.; 8—10.30 p.m.; Sat. as w/d. to 11.30 p.m. Sun. 12—2 p.m. 7—10 p.m.
3KZ		222 m. 1350 k'c. 200 w.	MELBOURNE—W/d. 8.30—9 a.m.; 11—1.15 p.m.; 6—11 p.m. Sat. as w/d. Sun. 2.30—4.30 p.m.; 6—10 p.m.
2XN		224 m. 1340 k'c. 50 w.	LISMORE—W/d. 6.30—8.30 p.m. Relays of 4BK are featured occasionally. Sun. Church services.
2MO		226 m. 1330 k'c. 50 w.	GUNNEDAH—W/d. 7.45—8.30 a.m.; 1—2 p.m.; 6—9 p.m. Sun. 8—10 p.m.
5AD		229 m. 1310 k'c. 300 w.	ADELAIDE—W/d. 7—11 a.m.; 6—11 p.m. Sat. as w/d. Sun. 5.30—10 p.m.
3BA		230.8 m. 1300 k'c. 50 w.	BALLARAT—W/d. 11—12 noon; 1—2 p.m.; 7—10.30 p.m. Sat. 7—11 p.m. Sun. 1—3 p.m.; 6.30—10 p.m.
4BK		233 m. 1290 k'c. 200 w.	BRISBANE—W/d. 8.30—1 p.m.; 4.30—7 p.m.; 7.15—11 p.m. Sat. 8.30—12 noon. 5.45—11 p.m. Sun. 7—10 p.m.
3TR		234 m. 1280 k'c. 50 w.	TRAFALGAR—W/d. 12 noon—1 p.m.; 7—10 p.m. Sun 7—9 p.m.
2SM		236.1 m. 1270 k'c. 1000 w.	SYDNEY—W/d. 7.30—8.30 a.m.; 10—noon; 5.45—10.30 p.m. Sun. 11—1 p.m.; 6—10.15 p.m.
3WR		238 m. 1260 k'c. 50 w.	WANGARATTA—W/d. 7.45 p.m. to 10 p.m. Sun. 8—9.30 p.m.
2NC		241 m. 1245 k'c. 2000 w.	NEWCASTLE—2FC relay station.
6KG		246 m. 1220 k'c. 100 w.	KALGOORLIE—W/d. 11.30 a.m. to 1 p.m.; 6.30—10 p.m. Sat 12—6 p.m.; 7.30—10 p.m.
2CH		248 m. 1210 k'c. 1000 w.	SYDNEY—W/d. 7—8.30 a.m.; 10—12.30 p.m.; 2—4.30 p.m. 5.15—10 p.m. Sun. 10—12.30 p.m.; 3—4.30 p.m. 5.30—10.30 p.m.
5KA		250 m. 1200 k'c. 300 w.	ADELAIDE—W/d. 6.30—8 a.m.; 2.45—4 p.m.; 5.45—10 p.m. Sat. as w/d. except afternoon. Sun: 10—11 a.m.; 3—4 p.m. 7—9 p.m.
4MK		252 m. 1190 k'c. 100 w.	MACKAY—W/d. 7—10 p.m.; Th. silent night. Sun 7—9.30 p.m.
3DB		254 m. 1180 k'c. 500 w.	MELBOURNE—W/d. 7—12.30 p.m.; 1—5 p.m.; 5.30—10.45 p.m. Sat. as w/d. Sun. 6—9.45 p.m.
4TO		256.4 m. 1170 k'c. 100 w.	TOWNSVILLE—W/d. 6.30—7 p.m.; 8—10.15 p.m.
3YB		262 m. 1145 k'c. 25 w.	MELBOURNE—W/d. 6—7 p.m.; 8—10 p.m.
4BC W T B	26 24	262 m. 1145 k'c. 600 w.	BRISBANE—W/d. 7—9 a.m.; 10—3.30 p.m.; 5.45—11 p.m. Sat. as w/d. Sun. 10—11 a.m.; 5.45 p.m.—10 p.m.
6ML		264 m. 1135 k'c. 300 w.	PERTH—W/d. 11—noon; 12.30—2 p.m.; 3—4 p.m.; 5.45—10 p.m. Sat. as w/d. Sun. 7—10 p.m.
3SH		277.8 m. 1080 k'c. 50 w.	SWAN HILL—W/d. 7.30—10 p.m. Sun. 12.15—2.15 p.m.; 4—6 p.m.; 7.30—10 p.m.
2UE	35 34	293 m. 1025 k'c. 1000 w.	SYDNEY—W/d. 7—noon; (Wed. & Sat. noon—5 p.m.); 5.45—10.30 p.m. Sun. 10—noon; 8—10.15 p.m.
7LA		273 m. 1100 k'c. 200 w.	LAUNCESTON—W/d. 3—4.30 p.m.; 6—10.30 p.m. Sat. 1.30—5 p.m.; 6—10.30 p.m. Sun. 6 p.m.—10 p.m.
2UW		267 m. 1125 k'c. 1500 w.	SYDNEY—W/d. 7.30—9 a.m.; 10.30—noon; Noon—2 p.m.; 2.30—5.30 p.m.; 6—10.30 p.m. Sun. 10.30—1 p.m.; 5.15—10.30 p.m.
2KY		280 m. 1070 k'c. 1500 w.	SYDNEY—W/d. 10—noon; 6—10 p.m. Sun. 7.30—10.30 a.m.; 6—10 p.m.
2CA		286 m. 1050 k'c. 50 w.	CANBERRA—W/d. 7.30—10 p.m. Fri. & Sat. mornings 10—11 a.m. Sun 8—10 p.m.
5PI		288 m. 1041 k'c. 50 w.	PORT PIRIE—W/d. 6.30—10 p.m. Sun. 7—10 p.m.
2HD		270 m. 1110 k'c. 200 w.	NEWCASTLE—W/d. 8.15—10 a.m.; 12.30—1.30 p.m.; 6—10 p.m.; 8.15—10.15 a.m.; 2 p.m. to 5.30 p.m. Sun. 10—11 a.m.; 7—9 p.m.
3HA		297 m. 1010 k'c. 200 w.	HAMILTON—W/d. 5.30—6.30 p.m.; 7—10 p.m. Sun. 7—10 p.m.
4GR		300 m. 1000 k'c. 50 w.	TOOWOOMBA—W/d. 9—9.40 a.m.; 12—noon—1.20 p.m.; 7.20—10 p.m. Sat. 9—12.45 p.m. Sun. 10—12.30 p.m.; 7.30—10 p.m.
3BO		309 m. 970 k'c. 200 w.	BENDIGO—W/d. 3—5 p.m.; 6.30—10.30 p.m.
5DN		312 m. 960 k'c. 500 w.	ADELAIDE—W/d. 3—11.20 p.m. Sat. 5.30—11 p.m. Sun. 8—9.30 p.m.
2GB		316 m. 950 k'c. 3000 w.	SYDNEY—W/d. 7—11.30 p.m. Sat. 7—11.30 p.m. Sun. 9 a.m.—10.30 p.m.
3UZ		326 m. 930 k'c. 500 w.	MELBOURNE—W/d. 7.30—12.30 p.m. 1—2.30 p.m.; 4.30—11 p.m. Sun. 5.45—9.45 p.m.
4RK		330 m. 910 k'c. 2000 w.	ROCKHAMPTON—W/d. 4QG relay station. Same schedule as 4QG.
7HO		337 m. 890 k'c. 50 w.	HOBART—W/d. 8—9 a.m.; 11 a.m.—2 p.m.; 6.30—10.30 p.m. Sun. 8—9.30 p.m.
6PR		341 m. 880 k'c. 200 w.	PERTH—W/d. 10.30—11.30 a.m.; 12.30 1.30 p.m.—4.30—5.30 p.m.; 6.30—10.30 p.m. Sun. 10—11 a.m.; 12.30—1.45 p.m.; 6.30—10 p.m.
2BL		351 m. 855 k'c. 5000 w.	SYDNEY—W/d. 8.15—11 a.m.; noon—10.30 p.m. Sun. 10.55 a.m.—3 p.m.; 4.30 5 p.m.; 6—10 p.m.
3LO		375 m. 800 k'c. 5000 w.	MELBOURNE—W/d. 7—8.15 a.m.; 10.30—12.30 p.m.; 1—11.30 p.m. Sun. 10—12.30 p.m.; 3—10.30 p.m.
4QG		395 m. 760 k'c. 5000 w.	BRISBANE—W/d. 7.30—8.30 a.m.; 11—2 p.m.; 3—4.30 p.m.; 6—11 p.m. Sat. 7.30 a.m.—5 p.m.; 6—11 p.m. Sun. 10.30—12.15 p.m.; 3—4.30 p.m.; 6—10 p.m.
5CL		411 m. 730 k'c. 5000 w.	ADELAIDE—W/d. 7.30—8.30 a.m.; 11—2 p.m.; 3—4.30 p.m.; 5.50—11 p.m. Sat. as usual. Sun. 10.30 a.m.—12.30 p.m.; 3—4.30 p.m.; 6—10 p.m.
6WF	70 68	435 m. 690 k'c. 5000 w.	PERTH—W/d. 7.30—8.30 a.m.; 11 a.m.—2 p.m.; 3—4.30 p.m.; 6—11 p.m. Sun. 10.30—12.30 p.m.; 3—4.30 p.m.; 6—10.30 p.m.
2FC	74 68	451 m. 665 k'c. 5000 w.	SYDNEY—W/d. 7—8.15 a.m.; 10.30—12.30 p.m.; 1 p.m.—4.30 p.m.; 5.45—11 p.m. Sat. continuous. Sun. 10.30—12.30 p.m.; 3—4.30 p.m.; 6—10.30 p.m.
5CK	77 72	472 m. 635 k'c. 7500 w.	CRYSTAL BROOK—Relay station for 5CL.
3AR	81 75	492 m. 610 k'c. 5000 w.	MELBOURNE—W/d. 8.15—11 a.m.; 12 12.15 p.m.; 2—5.45 p.m.; 6.15—11.30 p.m. Sun. 10—12.30 p.m.; 3—6.53 p.m.; 7.10—7.40 p.m.; 8—10.30 p.m.
7ZL	84½ 78½	517 m. 580 k'c. 3000 w.	HOBART—W/d. 7.30—8.30 a.m.; 11—2 p.m.; 3—4.30 p.m.; 6—11 p.m. Sun. 10.30—10.59 a.m.; 11—12.30 p.m.; 3—4.30 p.m.; 8—10 p.m.
2CO	89 80½	535.7 m. 560 k'c. 7500 w.	COROWA—Relay station for 3LO and 3AR.

Sidney George Brown, FRS - Engineer, Inventor and founder of S.G. Brown Ltd, a new book by Ian Sanders.

The name or brand “SG Brown” is relatively well known in vintage radio as the make of somewhat excellent high impedance headphones, so I was interested in this book about Brown as I thought it would highlight the headphone developments. I was well short of the mark. The book starts with the influences and development of the SG Brown company. Part two works through a selection of his inventions in pictorial detail.
This advert generally sums up the book;
“Sidney George Brown or S.G. Brown as he preferred to be known (he never used his first names) was a prolific inventor. Some sources have credited him with "over a thousand" patents, but that is an exaggeration. Nonetheless, the actual number was impressive - he was awarded some 170 British patents and a sizeable number in the United States, Canada and Europe. His talent was in the design of precision electro-mechanical apparatus for a wide range of applications. Brown's technical interests spanned cable and wireless telegraphy and telephony, medical apparatus, gyro-compasses, industrial public-address systems, military, commercial and domestic radio equipment and accessories. Among his many contributions, he is credited with introducing the first loudspeaker, not only the instrument, but the moniker itself. A reserved, perhaps even an aloof individual, it is both his prolificacy and a preference for solitary pursuits which make him a difficult subject for the historian. Brown's retiring nature has meant that the written record left behind - other than his patents - is surprisingly sparse. Possibly these factors at least partly explain why so little has been printed about the man or the respected company that bore his name. While it is true that he received credit during his lifetime - he was elected a Fellow of the Royal Society at the age of forty, and he mixed with the most eminent scientists of his day - few testimonials to his career can be found. This volume is an attempt to rekindle interest in his work.”

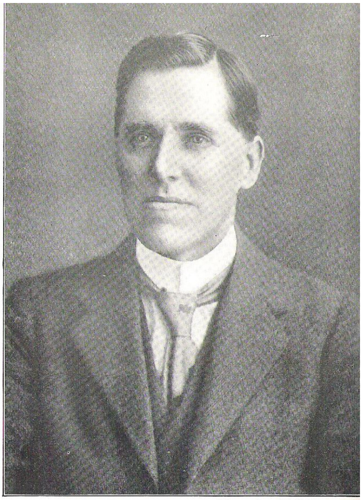


The hardback book with dust jacket has lots of pictures, sketches etc of excellent quality on a good matt stock. It is about $25 from on-line book sellers. Of course you can always petition your local library to get a copy in!

Brief biography of Sidney George Brown (1873-1948)
electrical engineer and inventor.

1873 Born in Chicago, USA, on 6 July. He was the eldest son of English parents.

1879 The family returned to England and Brown was privately educated at a school in Parkstone, near Bournemouth, and subsequently educated at Harrogate College, Yorkshire, followed by University College, London.



[By courtesy of S. G. Brown, Ltd.

S. G. BROWN, F.R.S., M.I.E.E.
A Pioneer in Radio Acoustics

1892-1897 He was a paying pupil at Crompton's electrical engineering works in Chelmsford. After completion, he was employed for a further six months by Cromptons. His father became ill so he had to return to the family business in Bournemouth.

1899 He continued to work at his electrical interests and patented the first of many inventions for improving telegraph cables. At about the same time he was assisting Sir Henry Hozier, secretary of Lloyds, to develop a radio telegraph system.

1906 He formed the Telegraph Condenser Co to manufacture and market his inventions.

1908 Brown married and his wife, Alice Mary Herbert Russell, took a keen interest in his work. In later years she was largely responsible for the administration and financial control of his companies.

1910/11 He formed a new company, S. G. Brown Ltd, to manufacture telephone equipment. With his wife's assistance, he designed a telephone relay, an improved receiver, and an effective loudspeaker (the **Browns** being first to use this name for the device). He had a small workshop in Houndsditch for the manufacture of the type 'A' reed headphone which became famous throughout the world.

1914 His businesses had expanded to employ over a thousand people. At the outbreak of war, there was no British manufacturer of gyro compasses, which had been imported from Germany. Brown set out to remedy the deficiency. During this work also devised a new method of damping the oscillation set up in a compass by a change in course called ‘liquid ballistic control’.

1916 Brown served as a member of the Admiralty's inventions board during the First World War. Already a member of the Institution of Electrical Engineers and a fellow of the Institute of Physics, he was elected a fellow of the Royal Society.

1943 Brown retired and sold his interest in the Telegraph Condenser Co to a syndicate, and S. G. Brown Ltd to the Admiralty. In retirement, he devoted time mainly to cultivating orchids.

1948 He died at his home in Sidmouth, Devon on 7 August, survived by his wife.

End of year auction item available for all financial NZVRS members.

An Edison E cylinder phonograph player has been donated to the NZVRS and will be available to members via auction process to bid on via our new forum and in person at the end of year auction night (in Auckland). The idea is to get more members registered on the forum and using the site. This is a new process and experiment in our auction process that we hope will work well for selected items. See the following forum link for the best pictures and any updates to the process;

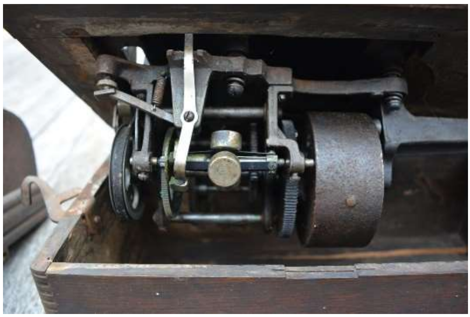
http://nzvrs.freeforums.net/thread/139/edison-cylinder-player-upcoming-auction

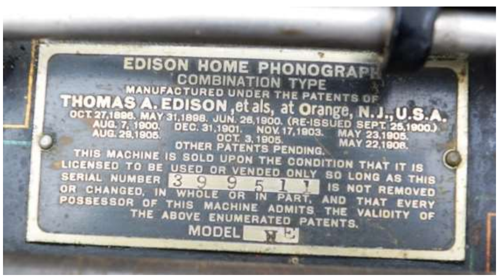
Details:
Edison model "E" player with 2 and 4 minute playing times. Serial number 399511, made approx. 1910 without horn or earphones, with some borer holes in the cover.
The player is missing the winder, the internal mechanism turns freely, the belt is worn and will probably require replacing, The wax cylinder holder appears seized – in that it does not rotate.

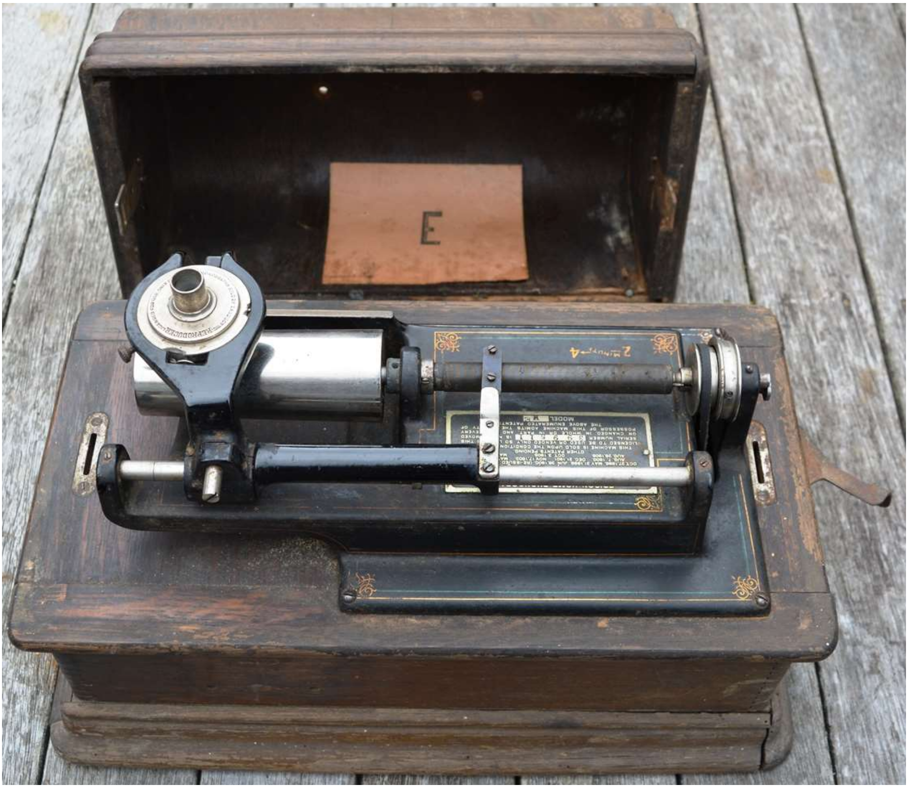
Auction and bidding Conditions:

* For sale "as is where is (Auckland)", no warranty is expresses or implied.
* All proceeds to the NZVRS
* Bids will be taken only from financial NZVRS members, in person, on behalf, on-site and via the for-sale thread on the forum.

NZVRS Online Auction date = 17 December 2018, general auction starting 7.30pm.
Online bidders will be against on-site members.






E

MARKETPLACE

Advertisements should be neatly hand printed, typed or printed onto a separate page, posted to the NZVRS or emailed to *nzvrs@pl.net*

Often a picture will help members understand your item. No verbal or telephoned adverts thank you, and don't forget to include some contact details; eg postal, telephone & email. There is no charge for members' adverts but the NZVRS is not responsible for the outcome of any transactions between members.

AVAILABLE

Valve Cartons Final Run on these - no more to be made by Paul: – plain white flat packs

- Small size $15 per 100
- GT size $15 per 100
- Medium size $18 per 100
- Large size $25 per 100

NZ & OZ supplied, contact Paul for post and package charges per order.

Contact: Paul Burt, 44 Hastings St West, Christchurch 8023.
Tel: 03 - 960 7158, Mob: 021 0236 1748
Email: **paulburt444@gmail.com**

Society Sales:

NZVRS supplied CAPACITORS for sale to NZVRS NZ members only please. Order via Bryan Powell, 279 Spur Road, RD3, Silverdale 0993. Tel: 09 - 44 22 514 or mob: 029 415 5119
Email: **bapowell@xtra.co.nz**

Metal polyester film, axial leads, (µF):

0.001	630 Volts	**60** cents each
0.002	630 volts	**60** cents each
0.005	630 volts	**60** cents each
0.01	630 Volts	**60** cents each
0.022	630 Volts	**60** cents each
0.033	630 Volts	**60** cents each
0.05	630 Volts	**60** cents each
0.068	630 volts	**60** cents each
0.1	630 Volts	**60** cents each
0.22	630 Volts	**60** cents each
0.33	630 Volts	60 cents each
1 µF	400 Volts	$1.00 each

Might pay to get these now as we will be reviewing prices in the next consignment!

Electrolytic capacitors, polarized, axial

10 µF	450 Volts	$1.50 each
10 µF	**600 Volts**	**$3.00 each**
20 µF	450 Volts	$2.00 each
40 µF	450 Volts	$3.00 each
47 µF	450 Volts	$3.50 each
100 µF	450 Volts	$5.00 each

Lamps 6.3 volts 150 mA (low wattage)
MES & Bayonet 50c each

Extra specials while stocks last:
Box of 10, globular 12volt, 250mA MES lamps at $2 per box. Limited supply – only one box per order please.

For all orders please add $5.50 for P&P.

Power plugs (Tilley white plastic type with unprotected brass pins as pictured above) available at 50 cents each plus $4 post and package per set of 4 (ie $6 for set of 4, posted to an NZ address).

KTW62 valves (actually VR100 10E/278 or 6U7 GT, CV1100) NOS $1 each collected club nights or $15 for packs of 5 P&P inclusive. Quantity limited and may be rationed per member.
Contact the NZVRS Secretary Paul Woodcock, 2 Levy Road, Glen Eden, Auckland 0602.
Email: **paul.woodcock@opus.co.nz**

All Society Sales cheques to be made out to the "NZVRS" and crossed "Not Transferable" please.
Direct banking options are available to the NZVRS ASB bank account – see bottom of page 2.

Society Sales – continued;

NZVRS circuit e-library on a chip

Over 1300 circuit diagrams of NZ-made radios in PDF form are now available to NZVRS members at a cost of $20. James Davidson coordinates this work - email your details to **james.justjazz@gmail.com**

If you wish to have all the past collection of bulletins added to the chip, please add $5, ie for $25 you can have the circuit and bulletin collection supplied on the one chip!

The $20 or $25, should be paid to the NZVRS account (NZVRS ASB account number on page 2 of the bulletin.). Overseas members can be supplied for an additional $5, and payment can be made via PayPal.

Please note that we hope to have the library scanned circuits available via the website in the near future. Individual queries will still be answered via the library team who will continue to provide their excellent service.

Dial Glass: The NZVRS now has a collection of dial glass - if you are looking for something in particular email a picture of your set / broken dial to James Davidson and he will check the collection. There is a minimal fee of $10 per glass supplied, postage included to NZ members. Payment to the NZVRS cheque account - details bottom of page 2.

Also you might like to check the digital scans of dials on the website.

AVAILABLE:

Spare components for BC-348Q receiver: IF's, BFO, coil units, and crystal filter unit. I have bound copies of the full U.S. service manuals and spare valves for all models.

I also have spares for the BC-348N: Tuning condenser, tuning unit and knobs, and all odd coils pots etc.

7 of ARC 5 receivers fully restored to factory specs and most with 24 volt dynamotors and one plug in ac power supply. A full range of spare valves, mostly NOS in packets. All US service manuals and other info is available.

Hallicrafters Model S 38C receiver, fully restored but modified with power transformer fitted for 230v operation.

P.S. Some years back there was a guy in the Auckland area who was after all the ARC-5's he could get. Let's hope he may be still be interested. Unfortunately, I do not have his name or address.

Contact: Stu Stidolph
Email: stustid@exta.co.nz
Tel: 06-844-5591 (Napier)

For Sale

Approximately 70 radios including Pye 25w Amplifier and Pye black box record player.

Courtenay console and mantle radios model 75 (as new).

Windup gramophone.

Many boxes of valves and spares

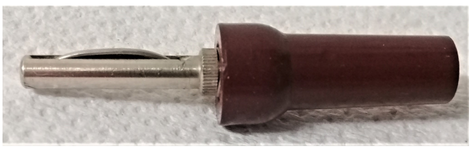
All offers consider

All queries to John Cooper (Whitianga)
john@locksmithsecurity.co.nz

WANTED:

Banana plug, Bakelite, body slightly flared at pin end. Require one black or a pair red and black. About 50 mm overall length. Terminal diameter just over 3mm, but with the spring designed to go into a 4mm hole.

Contact Bruce Churcher at
library@nzvrs.pl.net

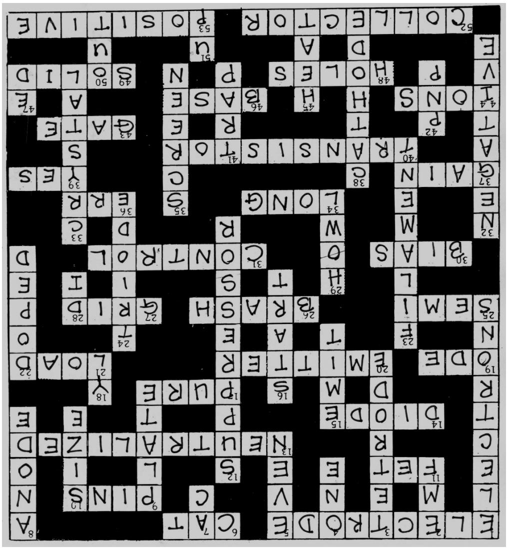


WANTED:

Valve sockets for a Pilot AC Midget radio. One 4 pin & four 5 pin. see sample pic –

Also either a 150mm length of 25mm diameter Paxolin tubing or three old coils on the same.
John Dodgshun 021 139 6155
jandjdodgshun@gmail.com

Crossword answers



Choose your own slum by Whim Wham
{NZ Herald 11-5-1985 - 33 years ago}
A rebut to the comments; "NZ Children will live in a slum with scenery unless the nation joins the second industrial revolution of computers and communications. The Government could adjust the social and fiscal environment. … And by helping educators to produce technologically literate men and women" so says Mr Charles Martin, a Christchurch chemical engineer, to the science summit at Parliament Buildings in 1985.

The technological Snob
Despises You and Me
How backward We are! Does it hurt
Us much to agree?

There's no computer in the house
And I don't own
A word processor, nor even
A digital telephone

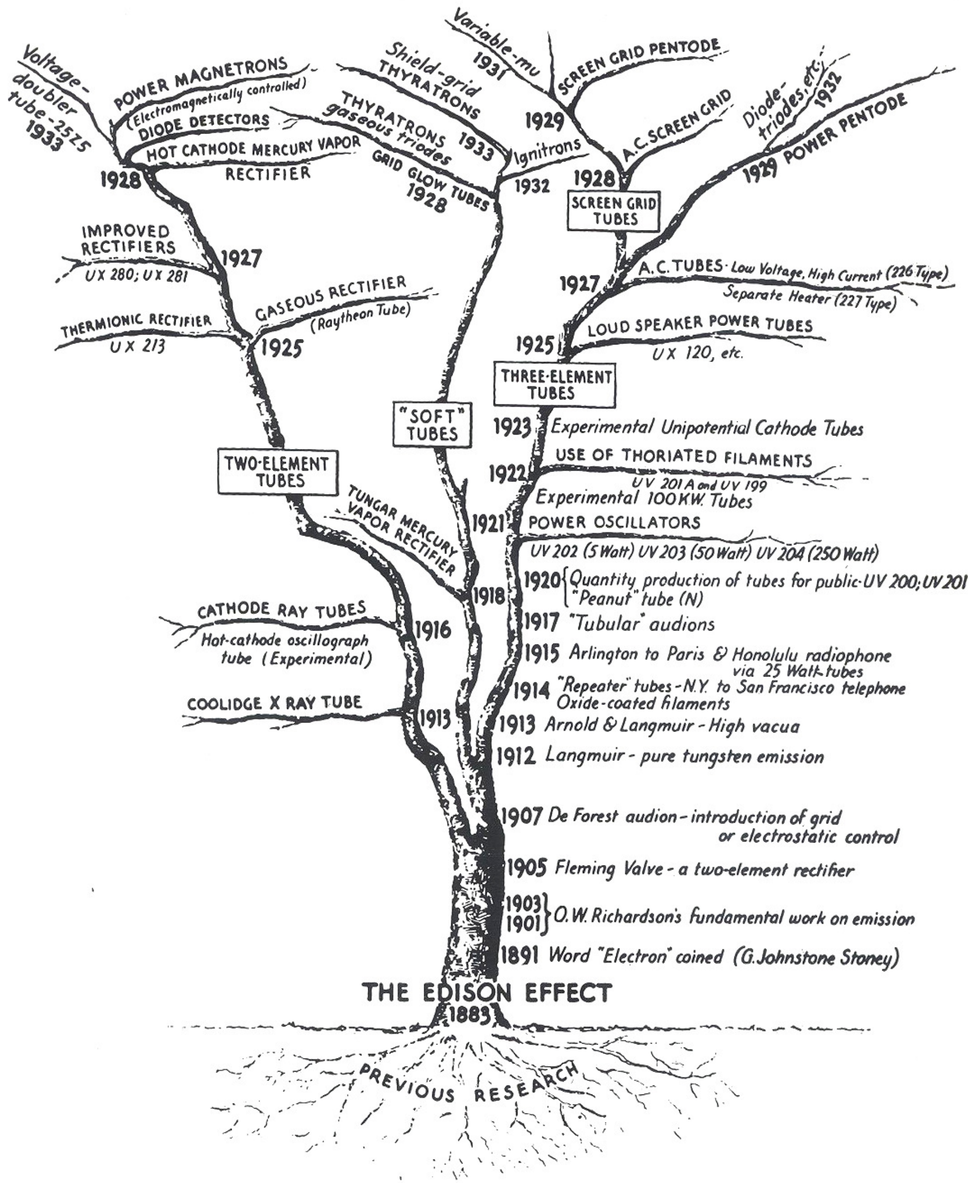
A couple of typewriters, both
More or less obsolescent
The old TV's black and white,
The stereo senescent –
No video, nasty or nice
To amuse myself with
And where would I keep it? I've got books
To fill every shelf with.

I suppose this is what he means
By a slum, with scenery –
Or without? – my collection of pre-
Revolutionary machinery?
Doing sums in my head, on my fingers
Counting twice five,
In a world of software and microchips
How can I survive?

Am I "technologically literate"?
How arrogant he seems!
Won't the future catch up with him, too,
Faster than he dreams?
I give him ten years to keep talking
In his technocrat tone –
Before he wakes up – without scenery!
In some slum of his own.

[Oh, who was right after 30 years? Ed.]

The "Family Tree" of thermionic valves; a 1930's perspective.



AGM Sale Day pictures