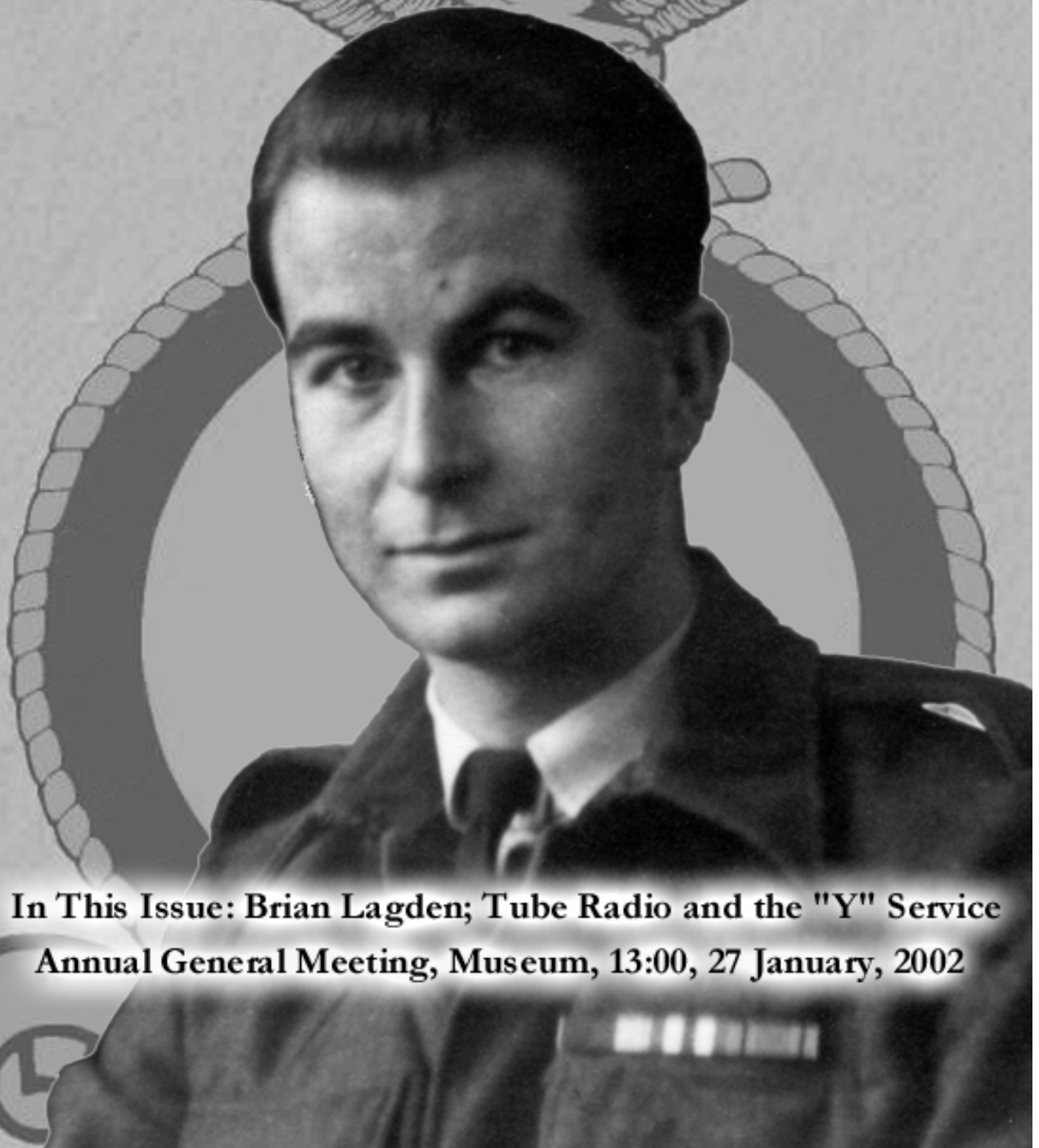


Syntonizer

Newsletter of S.P.A.R.C.

January, 2002



**In This Issue: Brian Lagden; Tube Radio and the "Y" Service
Annual General Meeting, Museum, 13:00, 27 January, 2002**

Syntonizer

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Editor and Publisher

John M. Nightingale
Box 4695,
Vancouver, B.C.
Canada, V6B 4A1.

Contributing Editors

Neil Sutcliffe, Peter Trill

Web Research

Mel Porritt

Mailing Department

Mike Hardy, Paul Johnson
Mel Porritt

Society President

Bruce MacMillan
radio@telus.net

Membership

Paul Johnson
7720 Cheviot Place,
Richmond, B.C.,
Canada, V7C 3S6.
604-277-4489

The Society exists for the purpose of preserving for future generations the electrical and radio-electronic communications artefacts that defined the 20th Century and to pass on the now rapidly diminishing expertise in their maintenance. Membership is open to all those interested in furthering those aims.

The Society operates a museum located on the campus of Riverview Hospital, Coquitlam, B.C. Call 604-777-1885 for up to date information on opening hours. Children are especially welcome. Special openings and extra display interpreters can be provided for large groups by prearrangement.

Tour and technical enquiries may be directed to the President. Enquiries regarding tax exempt financial donations and bequests should be directed to the Society's solicitors, Russell and Company, Suite 220, 4411 East Hastings Street, Vancouver, B.C., V5C 2K1.



Editorial Comment

“Y” Service

The fabric of radio history consists of more than simply wiring, tubes and chassis. The hard spun threads of its warp are technical inventions, hardware and engineering design but interwoven back and forth across this structure is an equally important weft, the lives of people.

One of those lives we encountered in the last issue of the *Syntonizer*, we met Bill Rieverley, a ham for 69 years. In this issue, we examine another thread of that woof, a life that was part of the greatest intelligence triumph of all time. We begin a series that is a firsthand account of a gleaming facet of radio history that is little known.

Brian Lagden, our cover subject, was one of a different “few”. Brian was a part of what started out as a rag tag collection of radio operators drawn from all sources and which ended up a part of the sophisticated technical and human mechanism which, among its early achievements, deflated the German opportunity of a 1940 invasion of Britain.

A Change of Course

An earlier editorial in these pages set out the course ahead for the *Syntonizer*. As some readers will have noted, it has been possible to vary that course. Since experience subsequent to the first edition has shown that we *can* provide readers with original material, we *shall* provide readers with original material while it is available.

Annual General Meeting

The annual general meeting of your museum will be held on the 27th of January at 13:00 in the museum. On this most important occasion of the year, administratively, come on out and assist in directing the affairs of the museum.

The meeting is a chance for everybody to meet the executive and to chat with the newsletter editor and the columnists; we will look forward, in turn, to meeting our readers.

Since we keep'em short, you can wander around after the meeting and admire the displays. The new spray booth will be in commission by a.g.m. time and that will make the museum smell less, ahhh, intoxicating!

Be sure to see our “basement”, too. You may *think* that you have a volume of junk in your basement but that's because you haven't seen the museum's storage room yet! If you are a ham, take your wife in there and show her the sort of basement junk collection to which *you* aspire!

This month's Mini Poster

Meccano is a magic name to those of us who were nerdy little boys around the middle of the last century. There were two schools of Meccano. Some were doctrinaire assemblers who looked at models in the manual and simply reproduced them. Others of us eschewed the beaten path and always brewed our own designs; we wanted to make a gadget that actually did something. In that regard, the Meccano set filled the same office in making concrete one's concepts that brewing one's own

Page7, Editorial Comment, concluded

My War in “Y”

Brian Lagden

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Introduction

In composing an introduction to this series of articles, a few words of clarification seem desirable. It will appear, at first, that the RAF and Y in particular started WW 2 in a state of disarray; although in some respects this is true, that crisis-activated energy and enthusiasm for which we British are so well-known, came to the fore and we started to “pull ourselves up by the bootstraps”. Before long we had an efficient and effective service in which I am proud, and greatly honoured, to have played a small part.

In places the writing represents a conscious attempt at humour; no disrespect is intended; our efforts were crowned with success in the end but *-really, some of the situations were so darn' funny!*

Efficient Distribution

One of my most lasting impressions of Y, 1939/1945 is the change in the way information was disseminated and treated by the recipients of the product.

Many are aware of the efficient and careful handling of Ultra by S.L.U.s (Special Liaison Units) and the way “the brass”, including Winston Churchill, came to rely on it.

'Twas not always so!!!

Order, Counter Order, Disorder

A group of we newly enlisted RAFVR types (hastily transferred from the RAF Civilian Wireless Reserve in July 1939) reported for duty

to Eton Square August 26th 1939. Upon being told we were bound for Cheadle, one of our number, a commercial traveller who knew the country pretty well, asked to which of the three Cheadles were we to travel? The reply was swift, “Oh! Cheadle, Cheshire of course!” (This after a ‘phone call to the fount of all knowledge, The Air Ministry!) - Well, that’s where the 43 of us were sent! After an uncomfortable night, sleeping all over the ground floor of the “Hesketh Arms” in Cheadle, Cheshire, we made our way, the mistake having by now been discovered, to Cheadle, Staffordshire, arriving the next afternoon!

To greet us, Squadron Leader W.G.Swanborough turned out, resplendent in his (rarely worn) uniform, which he had donned especially for the occasion, because he thought we would have been kitted out, and was quite disappointed at the civvy-clad group confronting him! He gave us an impressive lecture about secrecy, which was well reinforced by our own prior knowledge that the place was *so damn' secret that even the Air Ministry itself hadn't known where it was!!*

Sitzkrieg

A few days later, on watch, on the first day of the war, while training on our Marconi DFG-10 Direction Finding Receivers*, we tracked a *Luftwaffe* bomber formation over the North Sea, making a beeline for the Firth of Forth bridge. They were from a unit quite familiar to the fellows at 61 WU; who had been monitoring their training exercises for months. Now, hard to believe though this is, it would appear that, at that time, there was no set method for passing such information on for action! Someone at the Air Ministry was ‘phoned and, ten minutes later the query came back, “Are you sure they’re German Aircraft?” Happily, although the formation reached the vicinity of the bridge their bombs missed the target and no damage was done.

Most of us can recall, and be amused by, such “teething troubles”

early in the war but the level of efficiency in the prudent and secure handling of Signals Intelligence, which was attained over the next few years, is a fact of which we “ex-Y types” can all be proud. The comparison between 1939 and 1945 was staggering!

Equipment

* The DFG-10 used a B/T loop antenna and was a “straight” receiver having 2 RF stages, detector and audio, with separate tuning controls for the RF and (regenerative) detector; a sloping panel, convenient to the operator’s left hand, held the goniometer. A fairly simple circuit, using battery-operated tubes but the size of its console, since each stage was in a separate RF-tight enclosure, led us to nickname it “The Mighty Wurlitzer”, after the large and elaborate movie-theatre organs of those days!

[In the next issue of the Syntonizer, Brian will tell us about the tangled up first days of his field service in “Y” during the Sitzkrieg in France]

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Peter Trill demonstrates an antique broadcast recorder to an Audio Engineering Society member.

In response to an invitation from the Audio Engineering Society, Vancouver Section, Peter Trill brought a display of antique broadcast audio equipment to the Society’s last meeting.

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with
Neil Sutcliffe,
Tube Troll

The Humble Rectifier Tube

The simple vacuum rectifier tube (as used in receivers) has an interesting, if humble, history. As mentioned in the last issue, the high vacuum rectifier tube, while imperfect, has some advantages compared to solid state rectifiers and gas rectifiers.

First Tube

Oddly, the rectifier was the first thermionic device discovered. Although Edison did not appreciate the potential of the "Edison effect" when it was first observed, it was duly noted in his journals for future reference. At the turn of the 19th century, the X-Ray machine was making rapid strides in medical and physical research, but the X-Ray tube had to be powered either from a large bank of batteries or a rotating generator. Both of these were, due to the high voltages involved, large and troublesome. Arthur Wehnelt, in Germany in 1903, described a rectifier tube using an oxide coated platinum filament that provided a strong emission of "negative ions". In January 1904 he obtained a patent on such a rectifier tube for providing the necessary high DC voltages for X-Ray from transformed single or poly-phase commercial AC power. No mention

S.P.A.R.C. Syntonizer, January, 2002.

was made of use in rectifying high frequencies.

Fleming Valve

In October 1904, John Fleming conducted experiments with some Edison Effect lamps he had to see if they would work with some sensitivity in the detection of HF oscillations. He had considerable success with these and proceeded to develop the "Fleming Valve" in his quest to convert HF signals into DC which he could feed into d'Arsonval type galvanometers. This would allow direct visual indications of the information impressed on the carrier so that he, with his failing hearing, could make visual observations.

By 1908, Lee DeForest had developed the "Audion" (a triode) into the basic form that can be recognized as a 'control grid' tube.

"War Time Development"

The need for rapid deployment communications as well as ship and aircraft communications in WW I demanded the immediate development of rugged, sensitive and compact equipment that the vacuum tube formed a key part of. By 1920, the rise of amateurs using this war surplus equipment spawned trials by Westinghouse Electric of 'Broadcast' entertainment. This was so well received (pun intended) by the public that commercial broadcasting began. With the tubes of the day, battery power was essential for the filaments since they were direct heated and, in the low signal stages, any AC on the filament would appear as hum in the amplified signal. If a method could be found to efficiently rectify the AC mains, the modest current requirements of the plate circuits could be met and, at least, the large (and costly) "B" battery could be eliminated.

Rectifiers Emerge

Various tubes were pressed into service for this, usually power triodes, with some success. Raytheon, developed a cold cathode gas rectifier (the BH and BR) and, while these worked, they did generate considerable RF noise. Meanwhile, in 1925, Kellogg Switchboard was manufacturing the new "indirectly heated" cathode tube developed by Fred McCullough who had worked at Westinghouse on indirectly heated cathodes. This design was picked up by Ed Rogers in 1924, improved to practical operation, and introduced the 'Roger's Batteryless' in

1925. This set used the BH as a B+ rectifier.

The RCA group was not idle and they introduced the AC triode, the UY227, in 1927 and the UX222 tetrode came out about a year later due to technical difficulties. With these it was possible to make a fully AC operated set, and the RCA group needed a substantial rectifier to provide the B supply to such sets. The early UX213 full wave rectifier simply could not supply the necessary voltage and current needed, so the newly developed UX280 was introduced in 1927.



They did well on the basic design of the UX280, since the type was used both unchanged as the 80, 5Y3 and 5Y4, (and others) and also in an upgraded form as the 82, 5U4 and their ilk. The basic design appears to be the longest running design of any American type, remaining in production from introduction in 1927 until the end of tube manufacture in the early 1980s, some 53 years.

Indeed, there were other common rectifiers developed for applications

where the 80 would not do the job. Since the 80 is directly heated, any application where an isolated filament supply was unavailable required an indirectly heated type. One of the first applications was in automobile radios where the 6V (nominal) starting battery would supply the filaments. The initial type used for this was the 1-v, a single diode (half wave) rectifier with a well insulated cathode capable of 500V standoff from the filament. While this was used successfully with what now is known as a 'fly-back' converter, a more efficient push-pull vibrator/full-wave rectifier was more desirable to reduce battery current. Since it would take two 1-v tubes for full wave, significant space could be saved if a full-wave version was developed. This came about the 84 (6Z4) which also saved 100mA of filament current over two 1-v's. Since the 1-v and the 84 were both "large pin" types (4 pin for the 1-v, 5 pin for the 84), an improved version was introduced with the advent of the octal base. This is the very popular 6X5 which has a slightly better

current rating of 70-80mA compared to the 60mA of the 84, but at the cost of an extra 100mA of filament current. The internal structure was successfully shrunk in size to fit a 7 pin miniature bottle and became the 6X4 with identical ratings to its larger octal ancestor.

AC Sets Take Off

During the '30s there was a push to make affordable radios with adequate performance to be saleable in volume. This effort resulted in the 'transformerless' chassis which, initially, ran the basic tube set (6.3V-300mA) in series and added a 300mA filament rectifier (25Z5) and a low plate voltage 300mA filament output tube (43). The 25Z5 has two independent rectifier sections which could be paralleled or connected as a voltage doubler for higher B+. This scheme still required a significant filament voltage drop (30V @ 300mA) and this wattage was typically dumped outside the compact housing by using a 'resistor line cord' (a.k.a. "curtain burner"). Along with the advent of the octal metal types in the mid '30s, a family of direct to line filaments was

developed by upping the filament voltage of the 6.3V tubes to 12.6V (at 150mA), the 25V 43 to 50V as a 50L6 (and making it a 'beam' tetrode), and creating a new low loss rectifier. Since the 'doubling' capability of the 25Z5 required AC, these sets were not 'universal' (AC/DC) and this feature was, therefore, not used anywhere near as often as the parallel mode, this new rectifier, the 35Z4 was a half wave configuration. A tapped filament version of this was soon introduced to allow easy implementation of a pilot lamp, and this became the ubiquitous 35Z5. This type was also, with great difficulty, compressed into the 7 pin miniature 34W4 but caused RCA considerable grief in field failures until the heat stress problems of the envelope were properly understood. This stood them in good stead with the development of the many high dissipation tubes to follow in the next few years.

See Page 7, **Television's Demands**

Notice

of

Annual General Meeting

The Society for the Preservation of Antique Radio in Canada

will conduct its annual general meeting on the **27th day of January, 2002**, in the Society's premises within the Old Pharmacy Warehouse, next to the Sheriffs' headquarters, on the grounds of Riverview Hospital, 500 Lougheed Highway, Port Coquitlam, B.C., at the hour of 1:00 in the afternoon.

The past year's operations will be reviewed, the financial position of the society will be presented, election of officers for the coming year will take place and the meeting will consider such other matters as may properly be brought before it.

Both members in good standing and lapsed members are urged to attend. In order to vote, lapsed members must renew their memberships *before* the meeting. Mr. Paul Johnson, Membership Secretary, will be in attendance well before the meeting to renew memberships. Mr. Johnson will be delighted to enrol new members at the same time.

Further information may be obtained by contacting Mr. Bruce MacMillan, Society President, at radio@telus.net or Mr. Paul Johnson, Membership Secretary, 7720 Cheviot Place, Richmond, B.C., Canada, V7C 3S6, 604-277-4489, or at the museum in person on the Sundays before the meeting.



Station Break

with

Peter Trill

Over the last several years, computer technology has spun over into broadcast operations. Audio sources have moved from magnetic tape and vinyl disc to CD-ROM and computer hard-drive files. Audio operations are now sequenced and completed by computers. These changes have displaced some of the equipment and methods that are the very basis of our studio demonstration area in the S.P.A.R.C. museum (my last column introduced traditional broadcast operations). In this issue, we will look into magnetic tape recording – its history and place in broadcasting.

Magnetic Tape – Some Post-war History

Although magnetic recording milestones were achieved from the turn of the century onward, modern, high-quality recording awaited the German advances during World War Two, and subsequent American advances by companies that based their research on captured German AEG magnetophons (tape recorders) brought back at the conclusion of the war. What made the German machines' fidelity so good was the use of "AC bias" – the mixing of a large supersonic signal with the audio being recorded. The net effect was that a much louder signal could be impressed on the tape with low distortion and a flatter frequency response. Many researchers worldwide were aware of AC bias, but the Germans were the first to apply it on machines intended for high-quality reproduction.

Enter Jack Mullin and Richard Ranger

Both of these men were in the

U.S. military, and combing Europe at the conclusion of the war, to assess German technology. Mullin himself, while stationed earlier in England, had been listening to German radio stations. He was certain that the quality of reproduction of the large orchestras was too good to be coming from discs, yet the performances could not be live broadcasts, as the programs continued all through the night. He was to discover the answer in a mountain-top studio in Germany, where the AC-bias magnetophon was demonstrated for him. Procuring two machines, he mailed them in pieces to himself in California. On his return home, Mullin reassembled the two machines, built new electronics, then demonstrated them in May 1946 for a meeting of the Institute of Radio Engineers (IRE). The reaction to the high quality reproduction was a little short of a sensation!

Bing Crosby Gets Involved

Around the same time, Bing Crosby was desperately looking for a way to pre-record his Philco Radio Time radio show on ABC. He had earlier left NBC because of the network's insistence that all programs originate live. It was a fact that the quality of recordings made on lacquer disc-cutters of the day was noticeably inferior, causing Bing's ratings to drop when disc production was tried out at ABC. The editing process to create the finished show meant that the final disc was perhaps a third- to fifth-generation re-recording. As it happened, a member of Bing's staff was at Mullin's IRE demonstration. This led to an invitation for Mullin to produce a show, using his two magnetophons. Since tape editing, using splicing techniques, results in a finished product that is entirely first-generation (the original taping), quality is not compromised through copying. As well, tape inherently was better than first-generation disc recordings of the day. The first taped show aired in October, 1947. Bing was sufficiently impressed by the quality that he directed Crosby Enterprises to finance the development of an American version of the German

machine (with a no-interest cheque for \$50,000!). The model 200 was produced by the Ampex company and put into operation in 1948.

Although Mullin is credited with bringing tape recording to America, mention should be made that Richard Ranger followed a similar path, bringing out his "Rangertone" professional machine at the same time. He as well made demonstrations to the IRE, as well as to NBC and RCA. Les Paul (the guitarist) had met Ranger, and remembers telling Bing that Ranger should demonstrate his machine. When Crosby asked for 50 machines, Ranger informed him that the factory could only supply one machine a year. This may be why companies such as Ampex began to squeeze the Rangertone out of the market.

Tape Catches On

As confidence grew that tape was a reliable and superior program source, Networks began to use it for time-shifting (to meet the needs of time-zones and daylight savings time), and then program production. A company called Magnecord had been developing wire recorders, then switched to tape machines. The result was the durable and famous PT-6 machine that many local stations adopted heartily.

In the "Flesh"

In the museum's broadcast alcove you can see a working Ampex 300, the direct descendant of the Model 200. Also, don't miss one of our Magnecord PT-6 machines, with CKNW's "Top-Dog" logo. It's old enough to have the 1320 frequency on the dog's collar! I really wish we could find a "Rangertone" for the display!

A Last Sneer...

Mullin was reluctantly part of an innovation... when some of the comedians on Philco Radio Time were met with a luke-warm response, the producers had Mullin splice in laughter sections from other better moments, and the "laugh-track" was born!

"This is Heritage Radio!"

routines on the desktop computer does today.

Mr. Alan Ellis, a gentleman of energy and diverse accomplishment, numbers among his distinctions that of having become a world authority on Frank Hornby's company, it's derivative companies and the products of all of them. He has a Hornby collection to match. Within his vast collection of Hornby material is a library which includes editions of *The Meccano Magazine* going back into the 'twenties. Alan gives us a glimpse of radio in the England of September, 1922.

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Tube Talk, concluded

Television's Demands

With the appearance of television and the effort to reduce costs, a variant of the 35Z5 construction was used to create a rectifier with a high voltage rating between filament and cathode (6W4) to be used as damper in the horizontal fly-back converter circuit.

Post WW II, another old friend from the mid '20s, the BH/BR cold cathode gas rectifier, reappeared in automobile radios as the 0Z4. Since the power saving synchronous rectifying vibrator that had supplanted the 84 in many sets had proved relatively short lived and fairly troublesome to keep in adequate timing accuracy, the full-wave 0Z4 was expected to fill the application with almost as good efficiency. Unfortunately, the 0Z4 came with the same baggage as all gas rectifiers: noise. At least in an automobile radio substantial shielding was already needed to suppress the vibrator and ignition noise, so only minor changes were needed to suppress the noise from the 0Z4. The 0Z4 also proved troublesome in starting, especially with low battery voltage (winter night driving) and low temperatures. The usual fix was to wire filament voltage to the socket and substitute a 6X5 (which had the same basic pin-out) which did not suffer the problems of the 0Z4.

Reference material:

Gerald F. J. Tyne "Saga of the Vacuum Tube"
R.C.A./Cunningham Tube Manual RC-17

Mailing Label

Bruce Winter, our indefatigable keeper of the mailing list, has introduced with this edition a detail that resolves an old issue on which many have been confused. It has to do with the length of a year. A year is a long time and it is difficult to keep track of one's membership status in the Museum Society. Memberships are for calendar years.

The museum should keep members up to date on their status with a reminder mailing. Postage is so costly that we simply can't afford to send out reminders to those whose membership is expiring as do big, wealthy, organizations. From now on, when the *Syntonizer* arrives, take a peek at what's inside the square brackets on the address label. The year in there is the calendar

year for which you are paid up.

[2001] your membership was paid up for calendar 2001 but has not yet been paid for 2002.

[2002] your membership is paid up for calendar 2002 and *thank you!*

[**]** not only have you not paid for 2002, you didn't pay for 2001, either, and here you have been getting free *Syntonizers* all this time while the rest of us have carried your Museum along on our backs for two years. You are BAD. Come on out to the a.g.m. and make amends by renewing for 2002!

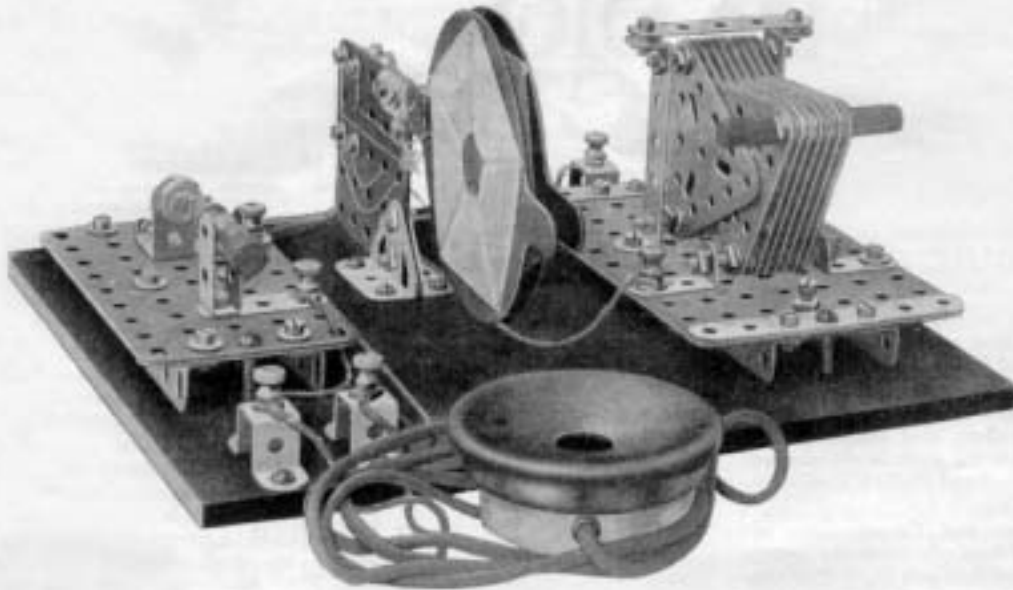
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Look what Paul Wende is doing here in the museum's ham station. Only real radio operators know how to do this or even what it is. He is practicing a part of the ancient and honourable art of the ham.

Real radio operators are thin on the ground these days. Let's see how many of them are readers of these pages. Those of you who know what is going on here and who have done the same thing yourselves, let the editor know your identity. We will put your names in the next *Syntonizer* !

Yes, yes, it's true, S.P.A.R.C. doesn't have one of these.



The Meccano Crystal Radio Receiving Set.

Our illustration shows the Meccano Crystal Receiving Set and we wish to draw our readers' special attention to its great simplicity in design and manner of construction. Any intelligent boy can assemble it in one evening. It has been tested thoroughly in London, Paris and New York and in each of these cities clear telephonic and telegraphic messages have been received. In London we have listened to broadcasted concerts from Marconi House. In New York, where the opportunities for testing are much greater than in this country, it has proved to be as efficient as the more costly and elaborate instruments in use there. In Paris we have listened to concerts broadcasted from the Eiffel Tower and have heard them with great clarity.

No scientific instrument ever introduced has been subjected to more thorough tests than the Meccano Radio Receiving Set and if properly adjusted, according to the

simple instructions, it will be found to be highly efficient. It is suitable for receiving telephonic or telegraphic messages on a wave length of 360 metres. Provided that the instrument is installed within a distance of about 25 miles from any of the broadcasting stations, it will be suitable for "listening in" to the concerts, etc., that will be broadcasted in accordance with the arrangements made by the Postmaster-General with the Broadcasting Company of which Meccano Limited is a member.

Tests and experiments are being made continuously by trained Radio experts in the Meccano factories. Already several valuable discoveries have led to improved results in Radio receiving with the aid of Meccano parts. These will be fully described in future numbers of the Meccano Magazine.

We are very desirous that all Meccano boys shall be kept in close touch with the Radio movement and that they shall

participate fully in the pleasures that this great invention will bring. If you live within 25 miles of a broadcasting station the Meccano Crystal Set is the simplest and most effective apparatus with which to commence to enjoy this wonderful new science. Your first step should be to send for the Meccano Radio Instruction Leaflet. This will be forwarded post free on receipt of 3d. in stamps. If you reside more than 25 miles from a broadcasting station you will require a more powerful receiving set, and in this connection our Radio Department is now at work on a Meccano Valve Set, and full particulars will be announced in the "M.M." as soon as it is ready.

If you are in any difficulty in regard either to your apparatus or to the erection of your aerial, do not hesitate to write to the Editor, Radio Department, Meccano Magazine, Old Swan, Liverpool, who will be glad to help you.

Prices of Meccano Radio Receiving Set and Special Radio Parts.

- RS1. Meccano Crystal Receiving Set, complete. Efficiency tested. Packed in strong carton. price 55/-
- RS2. Outfit containing parts to make Meccano Crystal Receiving Set, in strong carton...price 43/-

| No. | Meccano Radio Parts. | s. d. |
|------|---|----------|
| 401. | Specially Prepared Fibre Flat Plates, 4 1/2" x 2 1/2" ... | each 0 3 |
| 402. | Specially Prepared Fibre Flat Plates, 2 1/2" x 2 1/2" ... | 0 2 |

| No. | | s. d. |
|------|--|----------|
| 403. | Specially Prepared Fibre Triangular Plates, 2 1/2" ... | each 0 1 |



| | | |
|------|--|--------------|
| 404. | Insulating Handles ... | each 0 3 |
| 405. | Brass Washers, 1/22" | doz. 0 4 |
| 406. | 9" Lengths 25s Bell-wire with Tags ... | each 0 2 |
| 407. | Inductance Discs (wound to 250 metres) ... | per pair 6 0 |



No. 408. Single Telephone Receivers each 18 6

| | | |
|------|---|----------|
| 409. | Detector Arm, Complete | each 1 0 |
| 410. | Meccolite Crystals Mounted (Complete with Clips, No. 411) | each 2 6 |
| 411. | Clips for Crystals | 0 3 |
| 412. | Mounting Boards | 5 0 |
| | Instruction Leaflets | 0 2 |

Courtesy of the Alan Ellis Hornby Collection. The Meccano Magazine, September, 1922.

Look in your basement, we could use one! Museum of Antique Radio at Riverview Hospital, 604-777-1885