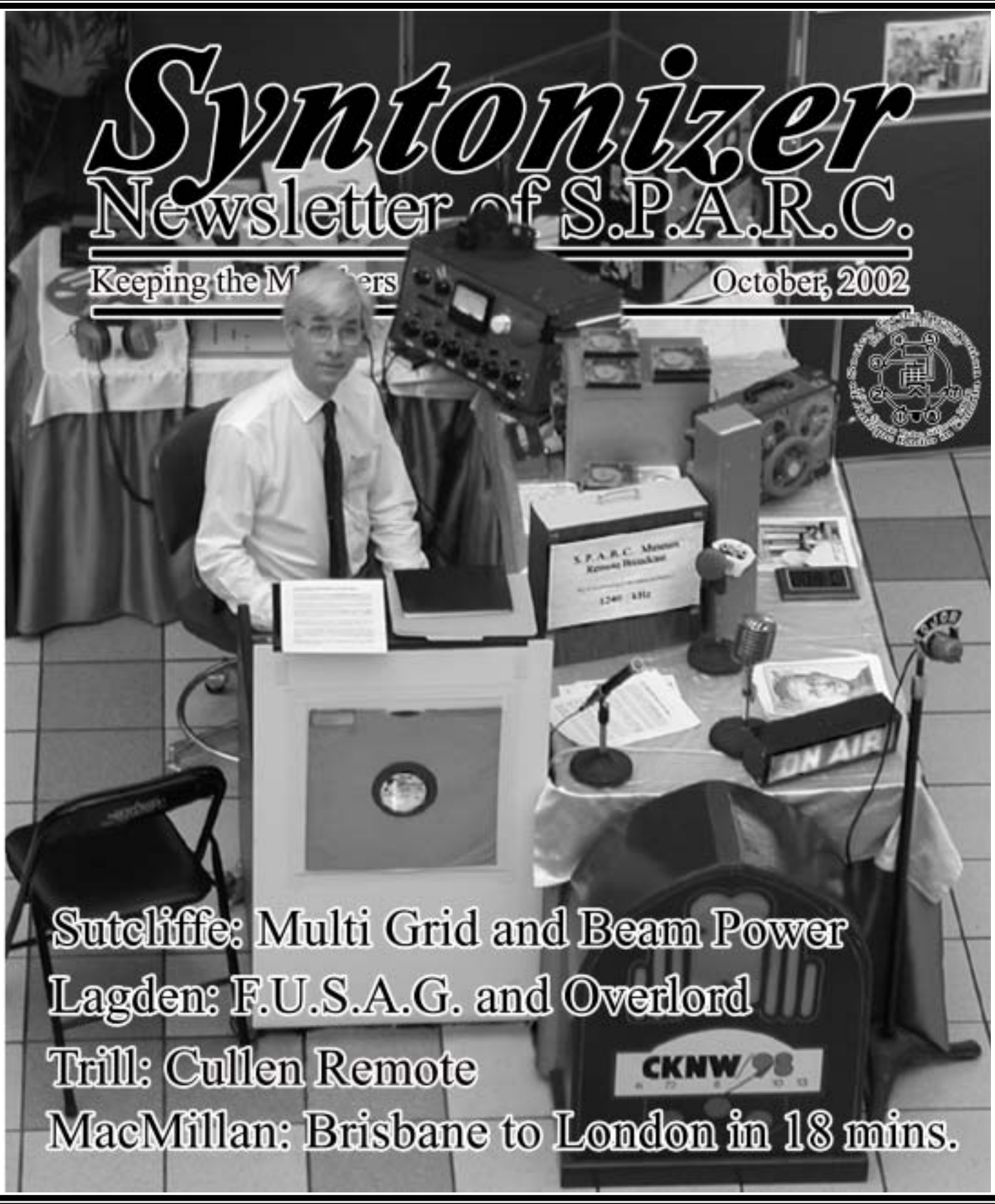

Syntonizer
Newsletter of S.P.A.R.C.
Keeping the M ers
October, 2002
S.P.A.R.C. Museum
Remote Broadcaster
ON AIR
CKNW/98
Sutcliffe: Multi Grid and Beam Power
Lagden: F.U.S.A.G. and Overlord
Trill: Cullen Remote
MacMillan: Brisbane to London in 18 mins.

Syntonizer

The ***Syntonizer*** is published quarterly at Vancouver, Canada, by The Society for the Preservation of Antique Radio in Canada, a charity registered under the laws of the Province of British Columbia, Canada.

Editor and Publisher
John Nightingale
Box 4695,
Vancouver, B.C.
Canada, V6B 4A1.
syntonizer_editor@myrealbox.com

Contributing Editors
Peter Trill, Neil Sutcliffe

Web Research
Mel Porritt

Mailing Department
Lisa Churchill and Paul Johnson

Back Issues
http://www3.telus.net/radiomuseum/news.html

Society President
Peter Trill
ptrill@telus.net
www3.telus.net/burnabeans/studio_news
www3.telus.net/radiomuseum/news.html

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

An FB QSO but Much Too Short

The Lower Mainland lost one of its most energetic, most technically able and most respected citizens with the untimely passing of Greg Soderling in September. As in so many other areas of technical and community endeavour in Vancouver, Greg's influence extended to the museum of which you are a member. Greg's absence leaves a void in the lives of all of us.

Embarras de Richesse

Last quarter's *Syntonizer* showed on the cover Bruce Russell restoring a cabinet. On an inside page was a photograph of a restored table top receiver in the form of a three masted, ship rigged, sailing vessel. It turns out that the museum has *two* such restorations. As Murphy would have it, neither Bruce nor Phil had performed the work on *that* receiver. The restoration illustrated was that performed by Gary Jones. Gary is another one of the engines of the museum. The January edition you received, for instance, was sealed into its envelope by Gary. While the rest of us worked away at folding, inserting, applying postage, applying labels and rubber stamping; Gary toiled away at the task of sealing every single one of the envelopes of the January edition and did that for hundreds of copies without relief.

Lagden

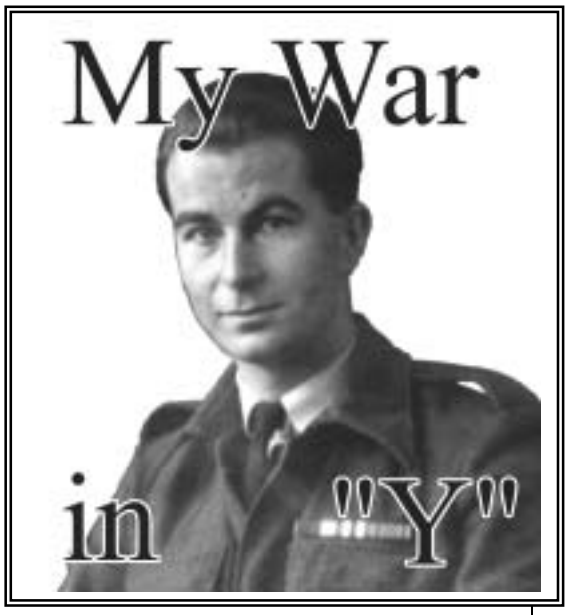
Last issue, Brian had come back to Britain just ahead of the world's first *Blitzkrieg*. In this issue, Brian Lagden's first hand account of Second World War elint continues with participation in the F.U.S.A.G. deception and then with preparations for a return to the Continent to resume unfinished business there.

This Month's Cover

In the days of tubes, the "radio remote" was an *event*. As pimply faced youths, many of you readers and your editor made a pilgrimage by bicycle to see the technical doings when a local station put on a remote broadcast at the local store opening. Those of us who were greatly daring chatted up the engineer and asked of him what we thought were penetrating technical questions that showed off our knowledge. If he turned to us slowly in silence with that expression annoyance and curiosity on his face that said: "I hadn't thought of that. Who is this kid?" then great joy! Peter Trill, our radio engineer and disc jockey, demonstrates his expertise at the now lost art of the old time, tube, "radio remote". Peter, Jack Watson and Paul Johnson scored a triumph at Brentwood Mall on the 22nd and 23rd of August. These gentlemen have put your museum on the map for the burghers of Burnaby.

Muy Bueno y Multi Bene

Member Bob Eldridge, as many reading these pages will be aware, is a gentleman of eminence on the Canadian radio scene. Fewer will know that he further distinguishes himself by an appreciation of the power and flexibility of this jumble of a language, this English. Within a correspondence with your editor on topics divers, he notes that though the fine old expression "syntonizer", found satisfactory by such notables as Oliver Lodge a hundred years ago, has withered in English, it is still going strong as *sintonizador* and *sintonizzatore*. *Gracias y gratzi*, Roberto!



By

Brian Lagden

After the relatively pampered existence in comfortable civilian billets in Gorleston, the transfer to 382 Wireless Unit, 2nd Tactical Air Force was an abrupt "reality check"; paillasses, rather then real mattresses, were the order of the day! True that, after forming up at Newbold Revel, we were dispatched to Folkestone where we were accommodated in two commandeered houses over the following winter.

Break The Ice First, Men

In early March of 1944, we moved into tents in fields adjacent to the houses. This, it was explained, was to "toughen us up for the invasion". Minimal demands of personal cleanliness in the early morning involved rolling, bleary eyed, out of the tent and washing to the waist and shaving in a half "Jerry can" of cold water placed conveniently the night before, often breaking the ice to get at it! An effective "waker-upper"!

Castra Romanorum

Our technical site was located on the high ground behind the town adjacent to an area known as "Caesar's Camp"; when we were "in residence" we doubled with the H.D.U. at Capelle-Ferne, monitoring Luftwaffe fighter R/T traffic. Our pre-invasion training, however, throughout the period from our arrival to departure from the area, consisted of a number of exercises, in which the object seemed to be getting used to moving, from point A to point B as frequently and as uncomfortably as possible!

Castra Impeti

Coping with rain and mud became second nature! I recall feeling at the Waterlooville transit camp, (my fairly recent Boy Scout memories coming to the fore) scorn at the fact that the "professionals" didn't know how to keep the inside of a tent dry in bad weather! Conditions were truly awful, with 4 or 5 inches of liquid mud over the entire floor of each of the army bell-tents provided. We slept, against the rules, in the cabs of our vehicles.

F.U.S.A.G.

In the period leading up to the Normandy invasion, our small W/T section helped, by passing reams of dummy traffic, in the subterfuge by which General Patton's fictitious First United States Army Group posed a serious "threat" to the enemy in the Pas de Calais area. Patton was, in truth, eventually to head the U.S. 3rd Army then arriving in England. [The deceptions with radio traffic, false intelligence reports and with bogus installations, vehicles, armour and aircraft (Fortitude, Quicksilver, Cockade) were such a success that 18 German divisions were still detained in the Pas de Calais awaiting the 30 divisions of F.U.S.A.G. nearly two months after the Neptune (Overlord's assault phase) landings. This relief together with the relentless British pressure on Caen bought the Americans time to break out, clear their right flank and to move south (Cobra). *Ed.*]

Preparation for The Innings

In early May, however, we were off to Funtington Down, behind Gosport, on a jaunt that had all the earmarks of yet another hated exercise! On arrival I, (by now Acting W/O, having overcome the C/O's misgivings at promoting one so youthful!) was quietly advised to "strip the decks for action" as it was fairly certain that the show was soon to kick off.

Brilliant Idea

Charged with the responsibility of cleaning up his workshop vehicle (we had two, with 9kva generators mounted transversely behind the cab) my WEM Sergeant had an experience that was illuminating in more than one sense!

We had often wondered how the Germans were able to cast aluminium three–dimensionally in constructing their excellent cube-shaped radios, which we put to use, operationally, whenever we could lay our hands on them. The equipment from downed aircraft, even if somewhat damaged was usually turned over to us as a source of spare parts. On the occasion of this pre-invasion clean-up, junk of various kinds was being incinerated in a bonfire; and, having stripped several chassis of their small components, the Sergeant tossed them on to the blaze. Nothing happened for a few seconds until with an awe-inspiring "Whoosh!" an intense blue/white flame shot about 15.0 feet into the air! The secret ingredient in the alloy was obviously magnesium, which made the whole mass of metal burn like a roman candle!

The Balloon Goes Up

At Funtington, close to the port, we were considered to be in the "Concentration Area"; following this we would, in due course, move into and stay in the "embarkation area" for about a week, surrounded by barbed wire and the strictest possible security, completely cut off from the outside world. That secrecy was tightly maintained in the days leading up to the launch of 'Operation Overlord", is well illustrated by my own experience: I left Funtington to travel to London on a 36-hour pass; the following morning around 9 a.m., as I was leaving my parents' house, a telegram arrived, ordering me back to camp immediately! Instead of going to see the recently released "For Whom the Bell Tolls" my folks accompanied me to the train station and wished me "*Bon voyage*."

I arrived back at Funtington to be informed by the C/O that our orders were to leave for the embarkation area at 2 a.m. Walking over to the technical site to check on activities there, I was just in time to witness the intriguing magnesium./aluminium alloy "flare"!

The Airborne

Few made any attempt to sleep in the hours before our departure; for we were gazing in fascination, almost awe, at the veritable armada of glider-towing aircraft passing overhead in an

unbroken stream. We felt uplifted, optimistic and excited, all at the same time!

After leaving at 2 a.m., in high spirits, things became a little anti-climactic; we spent all day parked along a leafy avenue at the edge of town listening to the rain and waiting for the order to move on! This was, after all, the kind of thing we had done in training, so we were inured to it! In late afternoon we moved on into the Embarkation Area where the barbed wire closed in on us and we were reminded that we were now *incommunicado* for several days until moving to the "hard" for embarkation. Those few days were, unquestionably, the most boring of my life to date; no mail; no telephone calls, not a step outside the barbed wire. just *waiting!*

Bravado

It was sometimes amusing to eavesdrop on little conversational groups; I recall hearing some RAF Regiment types, discussing coming events in "fierce" terms (no doubt to bolster each other's courage), all the while honing their bayonets and cleaning their already spotless weapons!

Wash and a Brush Up

Boring as it was (and, to be fair, we *were* shown a few recent-release movies), our time in "concentration camp" finally ended and we were off to the "hard" at Gosport to board our LCTs (Landing Craft – Tanks). At the end of another day of waiting we were lined up along a street a few yards from the cobble-stoned hard. At this stage I was grumbling to the driver about my dire need of a "clean up" and he suggested that he could draw me a mug of hot water from the radiator (no anti-freeze, as it was June!) so that I could at least shave. I jumped at the opportunity and, by planning and executing my procedures with care and precision, managed to have a body-wash and shave in one enamel mug full of hot radiator water!

Hurry Up and Wait

Feeling much refreshed, I helped the driver back the vehicle on to the LCT *(backing to enable a rapid disembarkation on the French beach),* using the efficient hand signals in which we had been trained. Again an anti-climax, for now we pulled out from the "hard" and then promptly anchored in Southampton Roads for 24 hours due to an unfavourable weather change!

+++++

Brian's story continues in a future issue with a voyage to the Continent and an encounter with beetle bombs.

Above. Red Robinson was master of ceremonies for the unveiling of the plaque which now commemorates the presence of Jack Cullen's store and studio in Brentwood Mall. In the tradition of his profession, the energetic emcee arrived well before the proceedings got under way on the 22nd of August. Above we see Red chatting with Peter Trill on the left and Jack Watson on the right. Brentwood's Publicity Director and a security guard are participating. In a later conversation with your editor, the matter of preserving British Columbia's broadcasting history was explored. Red Robinson proved to be an ardent proponent of the sort of work your museum is doing.

Below. Though long and securely installed in the acme of broadcast talent, far from lowly board operators and booth announcers, an obliging Red Robinson nonetheless dons Peter Trill's headphones and grabs an unconnected mike to ham it up in front of the McCurdy remote board for the Syntonizer's *photographer!*

The Miracle of the Age

A businessman in London, England wishes to place an order for goods with a company in Brisbane, Australia. A message is composed and dispatched. 18 minutes later it arrives in Australia. Was the E-mail server slow that day? Definitely not, it won't be invented for another 90 years! This communication transpired in ***1902***.

Completed on October 30, 1902 and open for business in November of that year, the globe-girdling cable united the far reaches of the British Empire. Cutting communication times of weeks or months down to minutes gave the governments and businesses of the Empire a distinct advantage. This was quite a technological feat. Marconi had crossed the Atlantic only a year earlier and the Wright Brothers had yet to have powered flight. The following are news clips of the day:

MESSAGE FROM FIJI

(By Cable Message)

SUVA, October 31

The Pacific cable was completed at 5:15pm today

The steamer Britannic laid the sections between Fanning Island, Norfolk Island and Queensland and between Norfolk Island and New Zealand. The Colonia recently arrived at Fanning Island from Vancouver and the Anglia undertook the laying of the section between Fanning Island and Fiji.

OTTAWA, December 7

In order to test the speed of the telegraph transmission around the world, Sir Sandford Fleming two days back sent a message to Mayor Cook, of Ottawa, in the province of Ontario, Canada, and at the same time invited all connected with the cable and telegraph lines to co-operate in the experiment, and make it as successful as possible. The message went around the world eastward via Canso, London, Ascension, Capetown, Durban, Cocos, Perth, Brisbane, Fanning Island, Bamfield (Vancouver Island), and reached the starting point in 6 hours 3 min. But the most surprising results of the trial are brought out by returns furnished by Sir Sandford Fleming. It appears that the message passed from Ottawa to London in 3 min., via the Commercial Company's cable. In London it was taken charge of by the Eastern Extension Telegraph Company, and transmitted to Brisbane, Queensland, in 3min. After it reached Brisbane, it was forwarded across the Pacific cable to Canada, and along the Canadian Pacific telegraph line to Ottawa. The time occupied between Brisbane and Ottawa was 11min. The facts go to establish the effectiveness of the Canadian route. The actual time of transmission between London and Brisbane by the Eastern Extension Telegraph Company's system was about 5 3/4 hours, while between Brisbane and London by the Canadian route the time of transmission did not exceed 18min.

There is a celebration planned for this October. People from Australia, Canada, England and the South Pacific community are organizing events to mark this centenary. Please check the following website for more information: http://www.pacific-cable.org/

SPARC has a page on our website: http://www3.telus.net/radiomuseum/ and check out the most comprehensive museum at : http://www.porthcurno.org.uk/index.html

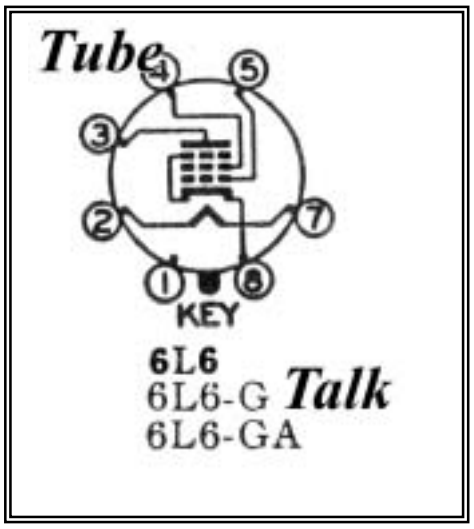
The following picture is an actual piece of paper tape with signals put on it by a device called a syphon recorder. This device allowed hard copies to be retained.

[This is rarely heard about and nearly never seen today. It is a genuine undulator tape, an oscillogram of voltage excursions above and below 0Volts on the cable. "Dits" are excursions one way; "dahs", excursions the other way. Ed.*]*

Note the common base line in the middle. The letters were formed by reversing the polarity of the voltage. A good telegraphist could look at this and simply read the message.

The museum ham radio station (VE7CHR) is planning to operate a special event the week of October 27 to October 31. A special certificate will be issued to all stations worked. Details on the website soon.

-Bruce MacMillan



The Multi-grid Tubes, Part II

by
Neil Sutcliffe, **Tube Troll**

In the late '30s a further development of the pentagrid converter removed the requirement for the second grid to function as the oscillator plate so it could be RF grounded and much better shield the RF input grid (3) from the oscillator. This required a novel design change to the oscillator circuit (using cathode feedback) but also eliminated the need for one pin and allowed the type to be 'single ended' (no top cap connection) as the 6SA7 and, later, with oscillator transconductance improvements, as the miniature 6BE6.

This new configuration was also used in 1939 in the 1R5 miniature battery tube, but the lack of an isolated cathode on the type required either some specialized oscillator coils or a configuration of oscillator somewhat akin to the autodyne circuits, but the type performed very well up to at least 22MHz. Because some designers wanted a miniature replacement for the 1A6/1A7/1LA6 (battery equivalent to the 6A7/6A8), this design was repackaged as the 1L6 shortly after WWII.

Power Tube Developments

Stepping back a bit, we also need to look at the 'Power' types designed, primarily, for the audio output stages of the receiver.

Initially, the only available tube type, the triode, was used as a relatively low power amplifier to drive headphones. This arrangement would also operate the early horn speakers whose drivers were little more than headphones anyway. As seen in early advertising, everyone was gathered around the speaker horn to actually hear, since the sound level was feeble, at best.

Louder, Please!

The demand for 'more volume' required the development of better, more efficient speakers, as well as more powerful audio amplifiers. Apart from using early transmitting tubes, better techniques were needed to improve the power output without causing intolerable dissipation in the tubes themselves, and, since most early sets were supplied power from batteries, to moderate the power into the stage.

For reasonable levels of distortion, a single tube output had to be run in 'class-A', a none too efficient mode. With a large voltage swing on the plate of the triode, the operating point moves quite significantly, leading to substantial second harmonic distortion.

Push Pull

It was found that operating two triodes in push-pull and biasing to almost class-B mode, the B+ current draw was proportional to the output 'volume' used, and there was a significant improvement in the second harmonic distortion produced.

Through the '20s this sufficed and, if more power was needed, the triodes could be run with several in parallel. Also, with the advent of AC power for the sets, the use of push-pull had the added advantage that the hum of the none-to well filtered B+ (large value filter capacitors were difficult and expensive to make) was inherently neutralized and did not appear in the speakers. At the end of the '20s the UX245 was the workhorse of audio output stages.

Hard Times, Lean Circuits

By 1930, however, it was desired to cut costs to maintain sales in the depression market, and replacing the two output tubes and somewhat complex transformers and drivers with a single tube and simple output transformer was essential. The tetrode had the potential of solving the second harmonic distortion problem of the triode, but the secondary emission problem inherent in the tetrode still existed. Since the current through the tetrode is strongly affected by the screen voltage and much less by the plate voltage, good filtering of the low current screen supply meant that the B+ ripple on the high current plate supply was not so critical. For these applications the '47, '48 and '49 were introduced.

Since the secondary emission problem limited the plate swing, the further step of adding the suppressor grid and creating a power pentode was taken. The resulting tubes ('41, '42 and '43) were commonly used singly or in push-pull, but the screen dissipation was still substantial. In about 1936, RCA developed a design where the screen grid wires were carefully arranged to be in the electron stream shadow of the control grid wires, while still exerting their electrostatic effects. To further enhance this effect, shield plates were fitted each side of the grid structure to prevent the plate field spreading the electron 'beam' outside the desired path. This design resulted in a substantial reduction in screen current and thus dissipation, as well as utilizing space charge to suppress secondary emission effects.

6L6, Loyal Maid of All Work

This first appeared as the 6L6, rated at up to 17 watts output for a push pull pair and was soon followed by a lower powered version, the 6V6 rated at 10 W per pair or 5.5 Watts single ended. This type, the '*beam power amplifier*' with various enhancements and improvements filled most power amplifier applications to well above 100MHz to the end of tube use in consumer equipment, and was seen as the 6DQ6 horizontal amplifier, the 6AQ5 miniature, the 807 and many others.

The Specialized Tubes Next Time

Other than the very specialized types designed for television and industrial applications, this, more or less, covers the amplifier types used in consumer radio equipment. Next time we shall look at some of the specialized tubes that were developed in and for the heyday of radio development in the 1930s.

Reference Material:
Gerald F. J. Tyne "Saga of the Vacuum Tube"
R.C.A./ Cunningham Tube Manuals
General Electric Tube Manuals
F. Langford-Smith "Radio Designers Handbook, 4th Edition"

with
Peter Trill

Remotes and Reminders

Partially, this newsletter's column was inspired by SPARC's August weekend in Brentwood Mall, done in the style of a remote broadcast. The event was focussed on Jack Cullen's time when he had a combined record store and CKNW studio there in the 70s. It was a golden time for Jack when his studio was often filled with guests who supported his kind of music and shared and revelled in his knowledge of the show business they enjoyed.

Remotes

Surprisingly little of Jack Cullen's air-time originated from CKNW's New Westminster studio location. The station management, and Jack himself, preferred that he originate from a "remote" location, sending his program over an "audio pair", or "wire-line" connection to the studio location, and from there to the transmitter. This was a well-established tradition in broadcasting, and here's how it worked.

Usage of the pair of wires carrying the program was actually rented from the telephone company, simply because they owned an extensive network of cables throughout our cities. With advance notice, they would arrange interconnection of a wire circuit which would be routed between any two desired locations, whether the origin was in a church, city hall, or sports arena, and terminating at the radio station's studio. It was a simple matter for a crew (or even one person) to arrive at the remote location, connect a portable remote amplifier to the pair of wires, set up mikes, perhaps with one mike for a host announcer, establish communication with the studio, and be ready for going to air live with the remote feed. At air-time, precisely at the appointed hour, listeners would hear "Live, from high atop the Hotel (name), we present (name)!" For local stations, the city's listeners would then sit back and hear the music of local bandleaders and personalities in their homes. In a similar way, these remotes were also the source for nation-wide network broadcasts of top-name bands of the 30s and 40s.

The early popularity with the public of remote broadcasts arose perhaps because listeners felt it was a great substitute to being present in person, plus the band's performances were warm and unconstricted by the cold atmosphere of the recording studio. A part of the ambience might be the clinking of glasses, laughter, and warm applause for the performers. I can remember CBC remotes of fine Canadian musical groups that I enjoyed into the mid-60s on Friday and Saturday nights. In network's hey-day, the very best bands would be sure to suppliment their record sales with weekly or even daily exposure on remotes from top club locations in New York, Los Angeles, and other major centers. In latter days, remotes came from shopping malls and car dealers, more as extended commercials.

How Did They Do It?

Technically, remotes were handled in an interesting way. The pair of wires that carried the audio to the studio was also used in advance of the broadcast to allow communication between the remote personnel and the studio engineers. Before air-time, the engineer would leave the remote line on "over-ride listen", awaiting check-in of the remote operator, once his amplifier and microphones had been set up. In return, the remote operator could hear the engineer's voice over his "talkback" microphone, thus allowing one-direction-at-a-time conversation. Finally, leading into the start of the remote broadcast, the engineer would send a feed of the program down the remote pair. When the remote operator heard the on-air "cue" ("This is the XXX network"), he knew to begin the show, and gave the appropriate cue to the host or bandleader. In remotes of latter years, music was on disc, often being played back at the studio, although remote set-ups were used in which turntables had been integrated (See our Gates catalog).

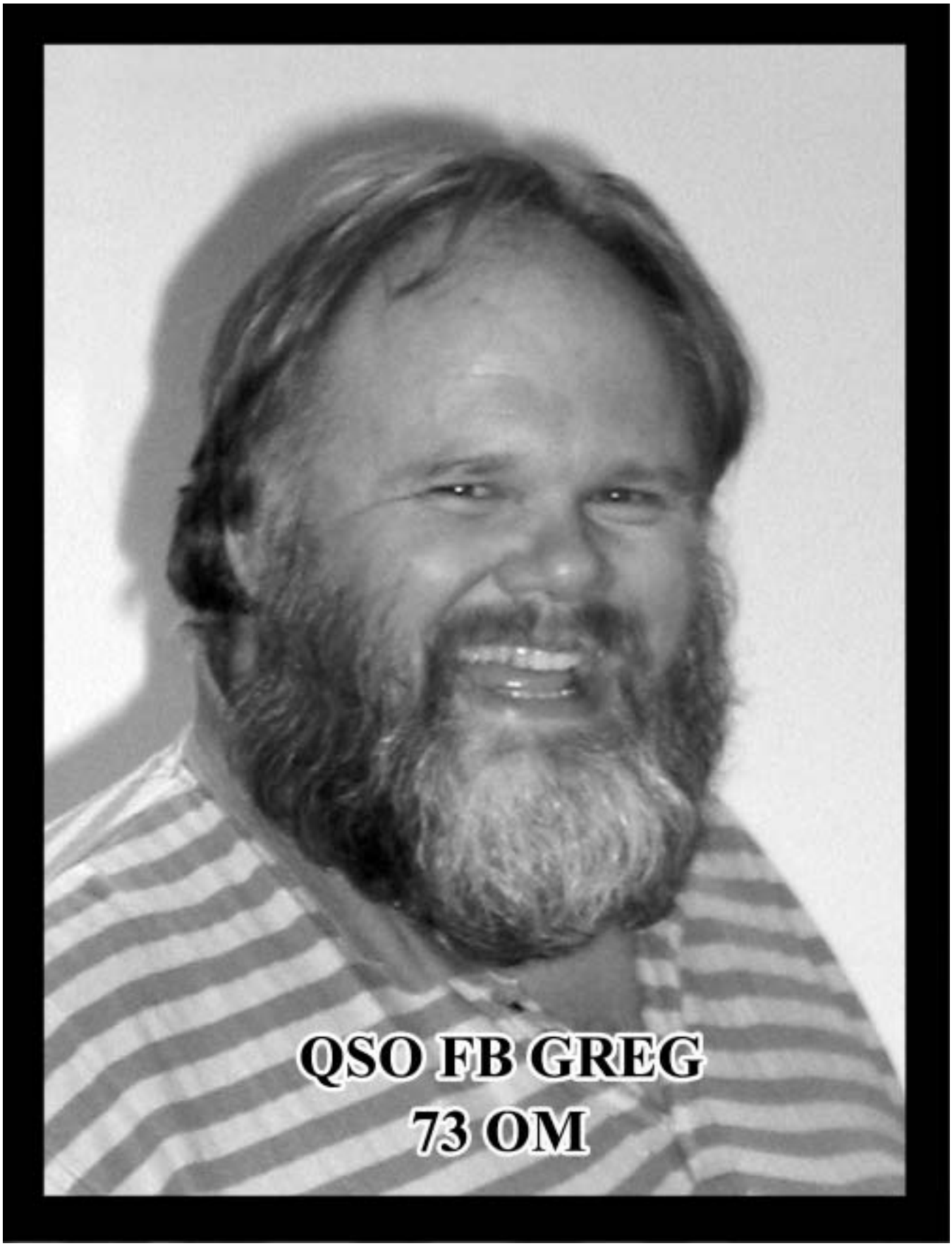
For local broadcasters, there would only be the one pair of wires. For the large networks, there was the luxury of an extra pair of wires, called the "order-wire". This extra circuit provided full-time intercommunication during the broadcast, and constituted an "emergency" pair in case the main pair failed. Switches on the remote equipment could quickly resort to the order-wire as the prime broadcast circuit. With the cost of dedicated pair rentals, local broadcasters did not commonly use a separate order-wire.

The SPARC studio has a pristine McCurdy remote amplifier from the mid-50s, set up as a remote. Come for a visit, and ask for a demonstration!

Reminders

Here's the reader's "jolt", where I remove my broadcast hat, and put on my president's hat to pass along a reminder -- for our dear readers to ensure that they keep their membership fees up to date. It's more than monetary (paying the rent and supporting our other minimal expenses). It's also your commitment to the continuing existence of the SPARC Museum… playing a role in preserving our radio heritage, whether you are using your member benefit of access to SPARC's document archives, having our experts revive your old Philco, or even contributing your time to museum restoration work and conducting visitor tours. Let us know what your passion is – there's room for new volunteers, because there's always a backlog of effort needed to improve our displays and presentation! Now -- scrutinize your address label on this newsletter. If 2002 appears, then thanks for your support. If 2001 appears, then oops… you missed out sometime after January – catch up now! If **** appears, then we've been especially kind! Currently, the fee is $15 (or $20 family), which can be submitted to the address elsewhere in this newsletter, or in person (better -- you get to visit).

Stay tuned to Heritage Radio!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