AWA Newsletter

#65

May 2011

A Member of the SARL

Antique Wireless Association of Southern Africa

Inside this issue:

AWA Committee:

* President—Don ZS5DR
* Technical Advisor—Rad ZS6RAD
* Net Controller—Willem ZS6ALL
* Secretary/PRO—Andy ZS6ADY

*Western Cape—John ZS1WJ

Reflections:

April has not been a good month for me. I had a few attempted burglaries in to my shack by some who were convinced there was something of great value in there. Each time the burglar alarm kept them at bay until they found a way in under the passive detectors and my 2100Z and shack PC were donated to the cause of the disadvantaged in SA.

A week later my Collins 32S-3 decided it was time to throw some sparks and totally destroy the 6146 finals. This of course is the rig I use for the 80m relay and so until I can get it back in commission, there will be no 80m relay on the SSB net.

The thing that concerns me more than anything else is that we seem to have got to the stage where we just accept this as a part of life these days. Not just here in sunny SA, but all over the world.

We need to look and see this is not just a part of life here, but everywhere, and we are helpless to do anything about it.

I have certainly entertained myself with thoughts of what I would like to do to the perpetrators of this heinous crime, because the fact of it all is that the linear will probably find itself being stripped down and sold as scrap metal for about R20 because it has no value on the local market. The PC is at least 10 years old and very outdated, but none the less will be sold to some unsuspecting soul or a paltry amount who will think he has just made a good investment.

I was fortunate in that I did not suffer great loss. I heard of one of the hams in Western Cape who came home to find his whole shack had been stripped out. Now that is devastating.

Will I now pack my bags for Australia ? No ! I will try to improve the security around my home to prevent these petty burglars from getting to the things I value, but most of all from getting to the ones I love and cherish. My family.

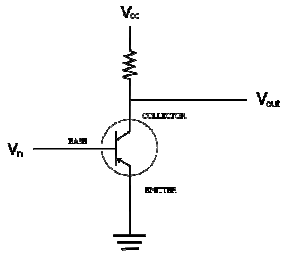
Who knows, maybe one day they will be back and hopefully I will be better prepared.

Best 73

De Andy ZS6ADY

Wikipedia—The Transistor

The essential usefulness of a transistor comes from its ability to use a small signal applied between one pair of its terminals to control a much larger signal at another pair of terminals. This property is called gain. A transistor can control its output in proportion to the input signal; that is, it can act as an amplifier. Alternatively, the transistor can be used to turn current on or off in a circuit as an electrically controlled switch, where the amount of current is determined by other circuit elements.



The two types of transistors have slight differences in how they are used in a circuit. A *bipolar transistor* has terminals labeled **base**, **collector**, and **emitter**. A small current at the base terminal (that is, flowing from the base to the emitter) can control or switch a much larger current between the collector and emitter terminals. For a *field-effect transistor*, the terminals are labeled **gate**, **source**, and **drain**, and a voltage at the gate can control a current between source and drain.

The image to the right represents a typical bipolar transistor in a circuit. Charge will flow between emitter and collector terminals depending on the current in the base. Since internally the base and emitter connections behave like a semiconductor diode, a voltage drop develops between base and emitter while the base current exists. The amount of this voltage depends on the material the transistor is made from, and is referred to as V_{BE}

CW Activity:

Although the home grown CW net has not been so active this last month, the Dx bands have been very active.

Many stations have been heard on the 10m openings and the 20 and 15 meter bands have also been quite active.

On Marconi day, which was held on the 30th April due to it falling during the Easter weekend, I heard many stations calling and answering. ZS1BAK did a sterling job of promoting CW locally and were heard on many of the bands.

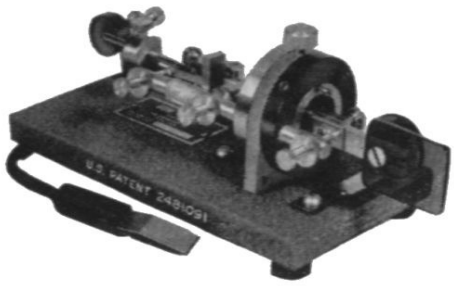
Further afield, the UK stations were vary active with quite a few registered Marconi stations on the air with an International Marconi day Special awards certificate for logging the registered stations over the 24 hour period they were on the air.

I wonder if any local CW enthusiasts managed to log any DX contacts with some of the registered stations ?

I still find it amazing at the interest in CW that still exists in the UK, and US. I don't know if there are many European stations that take great interest in CW except for the odd Russian station heard every now and again.

Would be nice if someone could let me have more on CW activity on the Dx side of things as I must admit, I do not get that much time to spend in the shack as some of our more privileged stay at homers. (No insult intended just in case any is taken). I look forward to the day when I will be able to devote more time to my favourite hobby and spend more time in the shack.

Remember the CW net on Saturday afternoons at 14:00 and come along and join



us, a bunch of guys just interested in using an outdated mode of communication because we can.

The QRP group also meet every morning at 07:30 on 3579, give them a try too.

DE ZS0AWA/CW …-.-

SSB Activity:

40m has been very active over the last month especially with all the public holidays. I have heard most of the 40m segment being occupied at various times of the day and it is quite encouraging to hear.

Dx stations seemed to have waned on 40m, but there is certainly no shortage of operators on 20, 15 and 10 meters.

Maybe this is not the forum to say this, but please guys. Watch out for over driving your rigs. The 40m band has been extended, but there are times when it has become too small due to some people over driving their rigs and spreading themselves across a wide spectrum of the band.

If you need to use a linear amplifier, make sure you are using your ALC connected to the linear.

You don't need to have the mic gain turned up so far we can hear the neighbour mowing the lawn.

We conducted a test this last weekend (Don ZS5DR and myself) with a Racal rig putting out 10w using a battery for power, connected to a tuned antenna. From Div5 it was still being received here in Benoni 5/8 peaking S9.

Maybe I am preaching to the converted, but maybe there is someone out there who will read this and understand too. The bands are there for all of us to enjoy, not just for a select few of power hungry hams.

Enjoy the hobby.

Drake 2B

AM:

AM has been pretty good this last month. In general, 80m has not been too bad compared to the storm active summer months which are quickly dissipating.

The Saturday morning nets have been well attended and some pretty good AM stations are coming to the fore.

MF's are of a good quality and none of the stations are using high power. The average station is running around 25 to 30 watts with only some of the old valve sets putting out a bit more than that.

My Collins 32V-3 runs around 60w carrier, peaking a bit higher on voice activation.

What is great is that many of the guys joining us in the morning are not using dedicated AM rigs, but some of the newer transistorised rigs also putting out good AM signals.

Just a word of warning to those using these rigs, do be very careful about turning the wick up too high as you will fry the finals.

Wednesday evenings are also starting to improve greatly and the last Wednesday evening in April we spent nearly 3 hours playing AM on 80m. Conditions are certainly getting good enough for AM in the evenings, so listen out and see if you can join us during the week for a mid-week session.

I'm sure there will be evenings when the band will be noisy, but in the same breath, there will be evenings when the band will be super. So if you have an interest in AM, then come along and join us. Remember, you don't have to Tx music, but it would be great to hear more stations on AM.

Keep those filaments warm and the glow gentle.

Collins 32V3

Building a 1929 Style Hartley Transmitter

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General Background


AT&T Engineer Ralph Hartley

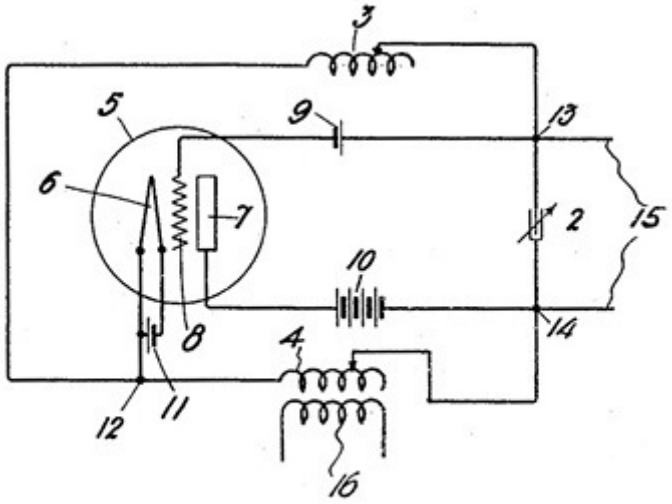
In the 1920s hams were embracing the latest technologies as they migrated from rotary and mechanical spark transmitters to the new electron tube based oscillators and transmitters. To the modern eye, that '20s technology may seem crude and unusable but there are a group of AWA hams today that are still building those transmitters and using them on the air to contact other hams around the country.

In the December 2008 AWA Bruce Kelley Memorial 1929 QSO Party, there were approximately 58 stations on the air using 1929 style transmitters on 3.5 MHz and 7.0 MHz. If you've thought about building and operating your own 1929 transmitter, here is your chance. This article will discuss how to build an 80 meter 1929 style transmitter that can be used in the 1929 QSO Party or any other time for that matter.

This oscillator configuration was invented by Ralph Hartley, an engineer from AT&T, in 1915. The “Hartley Oscillator," as it was usually called, was a popular transmitter during the 1920s. It is a simple circuit consisting of two coils, a variable capacitor, the tube, and a handful of small parts. Don't be fooled though. This simple circuit is easily capable of working coast to coast and around the world.

The circuit that I used was published in QST August, 1928 and is typical of the configuration used in the 20s and 30s. I've taken some liberty with the component values to reflect what I had in my junkbox. The transmitter is capable of producing a pleasant and fairly stable CW tone. While working this year's AWA 1929 QSO Party, I heard several absolutely beautiful Hartley oscillators, so there's no reason for you to have anything less than a gorgeous signal.

I've never built a single-tube Hartley transmitter before so I thought that putting one together while writing this article would be a good experience for both you and me. And it was. I started building it Saturday morning and finished the testing by early Sunday afternoon.



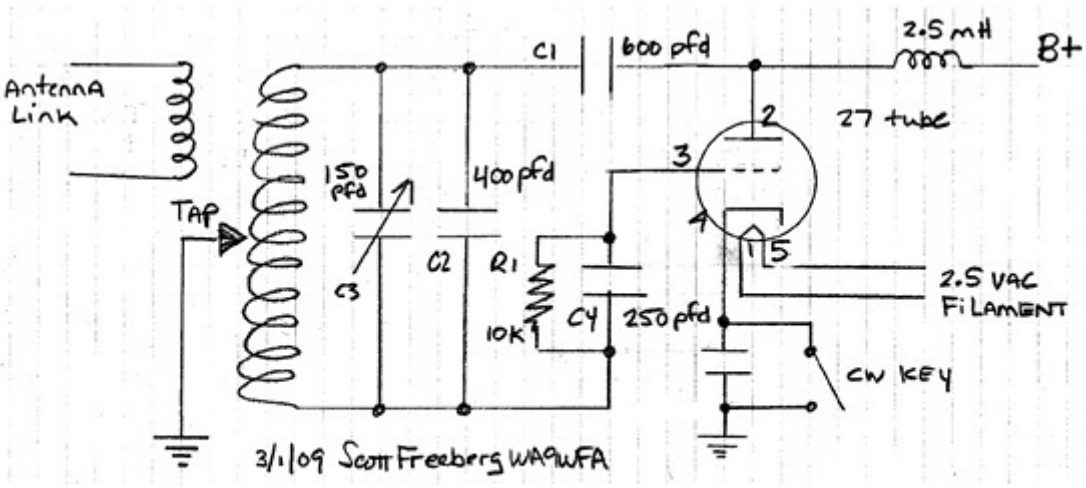
The Original Hartley Patent: #1,356,763

1920s era tubes can range in price from a few dollars to hundreds of dollars. For this project I selected the type 27, which is very inexpensive. The 27 (this type number might be preceded by UX2 or UX3 in older versions) was a very popular audio tube in the 1920s and can be purchased at hamfests in the range of $3-$5.
It is a 5-pin glass envelope triode with an indirectly heated cathode. Lighting the heater requires 2.5 volts AC @ 1.75 amperes. The type 27 is capable of generating 2 to 4 watts of output power depending on the plate voltage and plate current.

Construction

I've included the schematic diagram of my transmitter with the actual values of the parts that I used. For the PA tuning capacitor, I used a parallel combination of 400 pF fixed and 150 pF variable. The fixed capacitor places the transmitter in the band; the variable capacitor gives us some bandspread tuning around the band. This circuit also has a 600 pF capacitor in series between the high voltage and the PA coil. This keeps the high voltage off of the coil and reduces the risk of shock.

The transmitter was built on a piece of wood and almost all the components were attached with wood-screws. Just two machine screws were used. This genuine 1920's construction technique is a real treat to work with because it's not only easy to place parts, but you can also change your mind and move them in a matter of seconds. With a cordless drill and a box of wood screws, you can complete the job in short order.



Schematic of my Hartley, showing values of the parts I used.

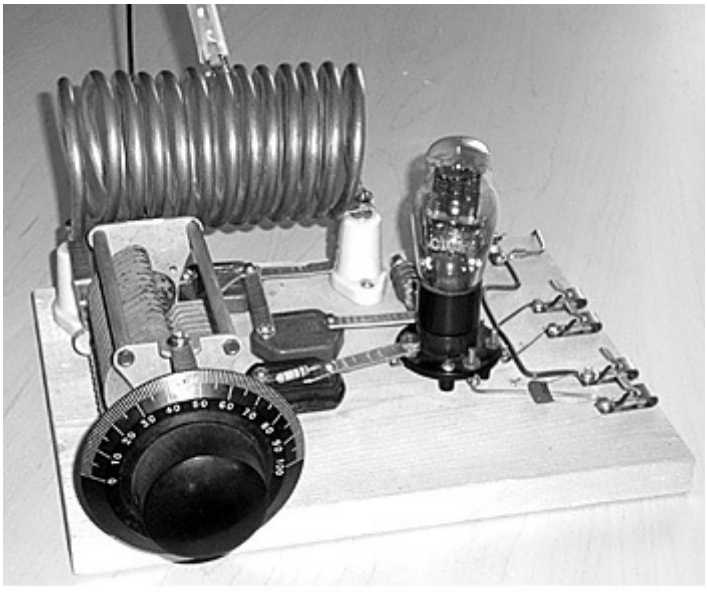
The parts were assembled on an 8” x 10” piece of 3/4” thick pine board. The dimensions are not critical but if this is your first transmitter project, it might be prudent to leave yourself some extra space to work with. Parts placement is not critical in general but keeping the parts close together and connections as short as possible are important for the stability of this transmitter.

I set the major parts on the board and moved them around until I came up with a placement that looked like it would have short connections and a good circuit flow. The PA coil and standoffs were mounted first. The coil consists of 13 turns of 1/4" copper tubing 3” in diameter. I wound the copper tubing on a 2.5” piece of PVC tubing and then slid the tubing off the form. The coil is suspended between two ceramic standoffs.

I love the look of a copper tubing coil because it is so typical of the real 1929 transmitters. I did have to experiment with the number of turns on the coil versus the tuning capacitance in order to get the transmitter into the 80 meter band.

A grid dip meter was used to help determine the right amount of inductance (turns of copper tubing) and the fixed/variable capacitor to put the transmitter on 3550 kHz. It turns out the grid dip oscillator readings were right on the mark because the transmitter did indeed tune to 3550 kHz with no problems.

The variable tuning capacitor and tube socket were placed in front of the PA coil. As mentioned virtually all the parts were fastened with wood screws. The two machine screws were used to mount the variable capacitor.
The LC tank circuit connections should be made with a beefy wire or tubing connection in order to offer the lowest possible resistance to the high circulating currents that occur here. All PA tank circuit connections were made with 1/4" copper tubing that was squeezed flat with holes drilled at the ends for making connections. I chose the flattened copper tubing just because I wanted to try it, I liked its looks, and I knew it would have excellent current carrying capabilities.



Here's the completed Hartley; it was an easy weekend project.

The other connections can be made using #12 or #14 copper house wiring with the vinyl insulation removed. I like the current carrying ability of the wire and the fact that it can be bent to create right angle wire routing similar to the look of the real 1920s transmitters. Key and power supply connections are brought onto the board using brass Fahnestock clips that I purchased at the AWA Convention.

For safety reasons, I placed the high voltage Fahnestock clips at the rear of the board. The 2.5 volt filament clips were placed near the tube, on the left side, center. The clips for the key are on the left side of the chassis, clos-

est to the operator.

Tuning
The only two "tune up" adjustments on the Hartley oscillator are the placement of the PA coil ground tap and the position of the antenna link on the PA coil. You will have to experiment with the ground tap location to discover the spot that provides just the right amount of grid drive and yields the best sounding tone. When I first powered up the transmitter it had a nasty buzzy tone, but I was able to move the clip lead to a tap position that yielded both safe plate current and good tone.

My transmitter worked great with the tap position shown in the picture, which is the sixth turn from the grid side (left side). The second adjust is the physical placement of the antenna link coil near the PA coil. For the antenna link, I simply coiled up two turns of #14 AWG house wire, leaving the insulation on, and inserted it in between the first and second turn of the PA coil at the grid end. I ran this connection right to the coax antenna cable.

Between the tap setting and the antenna link coupling, I was able to get two to four watts output depending on how hard I drove the tube. The goal is to adjust the antenna link coil to give you a decent power output and yet maintain a decent tone. Generally the harder the tube is driven, the worse the tone becomes, so it is a balancing act between power output, frequency stability, and tone.

For the filament voltage I used a 2.5 vac transformer. For the high voltage power supply, I used a Heathkit TBD HV regulated power supply. With the tap and antenna link position that I discussed, this transmitter was drawing approximately 35 millamperes at 200 volts. I measured 2 watts output into a Bird wattmeter and 50 ohm dummy load. The input power was 7 watts, output power 2 watts, yielding an efficiency of 28%. That's pretty darn good for an audio tube. Out of curiosity, I cranked up the high voltage to 250 volts and set the PA coil tap to yield 50 mA plate current. This resulted in 4 watts output with a good sounding tone.

AWA WESTERN CAPE

A successful meeting to form the AWA Western Cape was held at the home of John ZS1WJ and Mouse (his spouse), during April. The meeting was attended by a group quite willing to get the Western Cape on the map and some interesting items exchanged hands, I believe.

Since then, the SSB net has been extended on a Saturday morning with the Western Cape AWA net taking place from 08:00 on 7070 before the now National SSB net at 08:30.

Anyone wanting further information regarding the W/Cape net or the group itself can contact John ZS1WJ at 0826735337.

It’s not fully known who this bunch of Mafiosi are, but I’m sure we’ll get to know them as time goes by.

Herbert Metcalf and the Magnavox Type A Tube

by P. A. Kinzie
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*I*n the early 1920s it became evident that radio broadcasting was becoming an important feature of American life, and companies large and small began producing radios to meet the growing demand. In some cases the companies became major manufacturers with familiar brand names. At the other extreme, there were firms that eventually filed for bankruptcy or simply closed their doors. But The Magnavox Company followed a unique path.

Magnavox was established as a manufacturer of loudspeakers, public address systems, and other electrical products before the advent of broadcasting. As such, it had some of the necessary facilities for radio manufacturing, engineers familiar with radio-related products, and the expectation of being able to produce innovative designs using major components of their own invention. However, after producing radios for a short period in the mid 1920s, the firm left that field entirely for several years. Yet it remained a major corporation until becoming a part of North American Philips in 1981.

When originally entering the radio field, Magnavox had a special interest in producing a new type of vacuum tube. This was at a time when the Radio Corporation of America controlled the deForest triode patent, which had not yet expired. The all-important feature of deForest's "Audion" was the placement of the control grid between the filament and the plate.

In efforts to circumvent the deForest patent, several inventors had demonstrated tubes with a controlling element at other locations, but none of these had been successfully produced and marketed. Nevertheless, an inventive Magnavox engineer named Herbert E. Metcalf had come up with an alternative that looked promising. When Magnavox decided to produce radios, it also committed to the development and manufacture of Metcalf's invention.

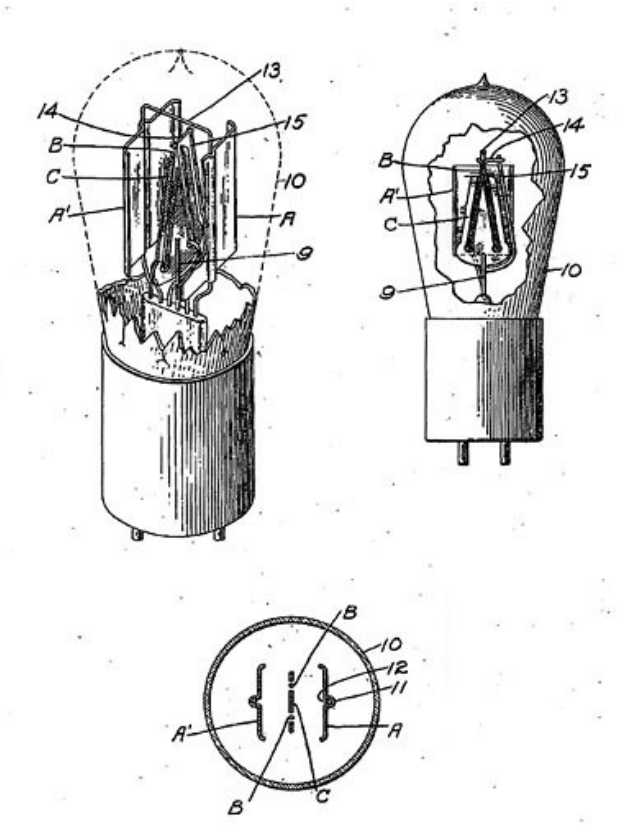

Fig. 1. Illustrations from Metcalf patent of July 23, 1924. See text for details.

Originally, Metcalf avoided positioning the controlling element between the filament and the plate. In fact, his first vacuum tube patent (in the order of the filing date) disclosed several configurations featuring the control element close to the filament, but not in a direct path of the electron flow to the plate [1]. Important objectives were high sensitivity and low control element-to-plate capacitance, the latter being a desirable feature for radio frequency amplification.

The patent, filed on February 28, 1924, may have been primarily intended for broad coverage protection against competition, because his next filing, just a few months later in July, was much more specific. The control element (Figure 1) was a metal sheet ("C" in all views) located in the same plane as a hairpin-style filament ("B" in all views) and slotted to accommodate it.
With this arrangement, the electrostatic field produced by a negative charge on the electrode strongly affects the paths of electrons leaving the filament, providing the necessary control of their flow to the plate. Figure 1 also shows the structure that positions the control electrode and the filament. The latter, lying within the slotted control electrode, is held at the top by arm 14 projecting from supporting member 15. The plate ("A") is in two physically separate pieces, one on each side of the filament-control-electrode assembly.

All of this resulted in an arrangement that the Magnavox Company believed would free it from the problems and costs of negotiating an RCA license to manufacture a de Forest type triode. The claims outlined in the patent stressed high sensitivity, a high amplification factor, the elimination of microphonics, and other advantages. (Microphonic response to shock or vibration was often present with triodes of that period.)

Metcalf commented that the construction was easy to manufacture, and mentioned that the spacing between the edges of the control electrode and the filament be "as close as consistent with commercial production." But from a following patent filed Jan. 21, 1925 [3] it is evident that he had encountered some problems.

The straight-edged control electrode was now modified because, with the earlier planar configuration, the narrow but intense electrostatic field between the control electrode and the filament "acted to choke off the flow of electrons from the filament to the anode." Difficulty in aligning the control electrode and the filament wire was also mentioned, which is understandable considering the close tolerances required by the small separation between the two elements.

Metcalf addressed these problems by serrating the edges of the control electrode, with the resulting teeth projecting alternately on

each side of the filament wire. He described how to form electrodes of this type by stamping them out in a single operation, stating that the process was considerably less expensive than constructing a conventional grid.

Further production problems were revealed in the disclosures of still another patent filed by Metcalf and an associate in March of 1925 [4]. Regardless of earlier claims about low microphonic noise characteristics, they had found that "while noises appearing in the output circuit of the device are small, nevertheless when the device is used as a detector of electric waves and the output amplified, the noises are objectionable." This condition was said to have been eliminated by making certain structural changes that also provided a rigid alignment of the control electrode and filament during assembly and thereafter.

Another patent filed on the same date [5] provided details of the redesigned tube structure. Figure 2, showing illustrations from the latter patent, shows a view of the assembled tube and some of its components, including alternatives for plate structure. In particular, the control electrode teeth, 8, are still supported by sheet metal, 5, but now they are partially in the path of electron flow from the filament, 6, to the plate, 4.

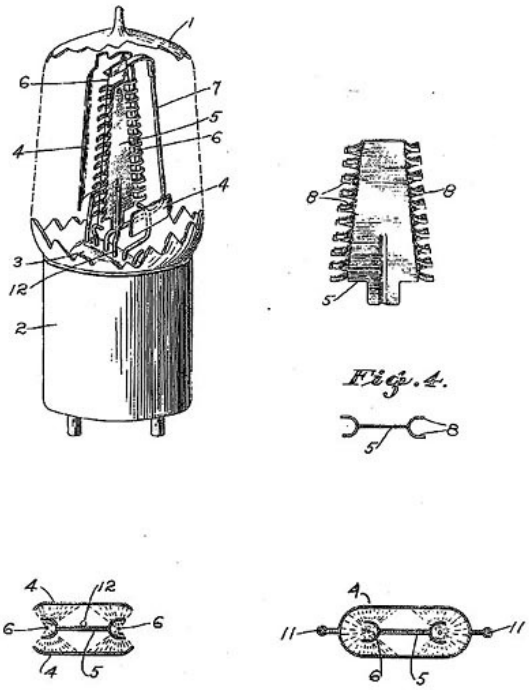

Fig 2. Illustrations from Metcalf's second patent of March, 1925 show control element partially in path of electron flow.

It could be argued that there was now at least some conventional grid effect present, but fortunately for Metcalf and for Magnavox the deForest Patent had expired in February of that year, so infringement was no longer a consideration. Note the distinctive shape of the glass envelope (identified as "1" in Fig. 2). This appeared in the production version, making the Type A tube identifiable on sight.

Metcalf was probably confident about the performance of the new tube at this point, because an article by him appeared in the March 1925 issue of *QST* [6]. According to an accompanying Editor's note, Metcalf was by then in charge of research and development in the Vacuum Tube Division. The article gave details of the tube structure, with photographs of components before and after partial assembly.

Average data for the Magnavox tube were compared with an average for other storage battery tubes, and showed a control-to-plate capacitance of less than 50% of the grid-to-plate capacitance of the latter type. (This very likely was the much-used '201A of the period.) The Type A was recommended for RF and AF amplifiers, detector, and oscillator applications. Metcalf wrote that it gave "a beautiful clarity of reproduction" for audio frequency circuits.

A partial assembly photograph, including the control electrode, that appeared in the QST article, matches the electrode in the patent application of January, 1925. However, it does not match the improved control in the March application of Fig. 2. Of course, the improvements could have been made at any time during the production run.

According to Stokes [7] advertising first appeared as early as October of 1924 and continued until the end of 1926--beginning prior to the article and patent applications of March 1925 and continuing well afterwards. There are questions about how many improved tubes may have actually reached the marketplace, and if they did, whether some later complaints about the tube were based solely upon the earliest version. Advertisements for Magnavox radios appeared in various publications and some of these included the Type A tube.

Historian Alan Douglas reproduced examples in his three-volume work covering radio manufacturers of the 1920's [8]. The first tube advertisement may have been the one that appeared in the September 1924 issue of QST [9] with some technical details and enthusiastic claims. The photography with flattering commentary in Magnavox ads was no different from that in the ads of most other companies during that intensely competitive period.

Of course there was no hint of the problems that the company was experiencing at the same time. According to Douglas [8] the unconventional design of the Type A tube "was prone to shorts and misalignment," and production and distribution to retailers of Magnavox products led to large and unexpected expenses. Some of these problems were recalled years later by Edwin S. Pridham, one of the founders of the Magnavox Company.

Regarding the tube situation, Douglas quoted him as saying that the tube factory was found to be unable to produce tubes that lasted for more than five hours of continuous operation before failure. At some point after the expiration of the de Forest patent, tube production was shifted to conventional types. Also, great efforts were made to solve the problems associated with manufacturing and distributing receivers.

Nevertheless, in mid 1927 Magnavox stopped production and abandoned its line of radios and tubes altogether, concentrating on its more successful products. It was not until the mid 1930's that the company returned to the broadcast radio market with a selection of high quality radio-phonographs [7, 10].

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4. Metcalf, Herbert E., and Valentine Ford Graves, Vacuum Tube. Patent 1,657,221, filed Mar. 23, 1925; issued Jan. 24, 1928.5. Metcalf, Herbert E., Vacuum Tube. Patent 1,558,111, filed Mar. 23, 1925; issued Oct.20, 1925.
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10. Eckland, John, "The Magnavox Company," *Antique Radio Classified*, Vol. 24, Sept., 2007, p.l0.

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Antique Wireless Association of Southern Africa

Mission Statement

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yester-days radio transmitters and receivers. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association.

Notices:

AWA AM and SSB QSO Party:

This weekend, 07 and 08 May is the AWA QSO party on AM and SSB. Come and join us on Saturday 07 May from 15:00 to 19:00 on AM on the 40 and 80m bands and see how many stations you can log working AM.
Then on Sunday 08 May from 15:00 to 19:00 is the SSB section and once again you can come and join us.
Obviously if you are wanting to score points, then your best bet is to be using an all valve radio to get the highest score.

Certificates will be issued to those scoring the most points in 1st, 2nd and 3rd place.

All conditions in the SARL contest Manual.

NET TIMES AND FREQUENCIES:
The following are times and frequencies for the AWA nets:

AM Net—Wednesday evenings from around 18:30 (depending on band cond and QRN): Saturday mornings from around 06:00 or when band conditions allow. Frequency—3615.

SSB Net—Saturday mornings from 08:30. Frequencies—7070 with a relay on 3615.

CW Net—Saturday afternoon from 14:00. Frequency—7020.
(Times given are CAT or SAST)