Southern African ZSOAWA Antique Wireless Association

AWA Newsletter

#67 July 2011

A Member of the SARL

Antique Wireless Association of Southern Africa

Inside this issue:

AWA Committee:

Reflections:

How the months are flying by. It seems like it was only yesterday we were at the start the New Year and here we are already half way through the year.

So far the bands have not been too bad, but seem to be waning fast. I heard on the local news the other day about high sunspot activity going to cause cell phone, television and all sorts of communication problems and wondered which sun they were looking at.

This winter has been one of the colder ones here in Gauteng, and I am sure elsewhere. I have been keeping temperature recordings of my area since we moved there almost 7 years ago, and this has certainly been the lowest recorded in that time. But I do remember some harsh winters in the past, but not lasting as long as this one has.

My annual pilgrimage to the Kzn Coast is coming up shortly, and with the reports of the weather down there filtering back, I am starting to wonder if it's such a good idea.

Yet it will be shorts and T short time again while the rest of Gauteng sits caught in this wintry weather, and hopefully one or two of the famed Kzn green shad to drag across the coals. (sorry Willem).

My intentions to try and visit a few people while down there will hopefully work out and we can come back home armed with some photos of shacks and people to publish in forthcoming editions of the news letter. The mobile HF has been sorted out, after I lost the bottom section of the antenna due to not checking mounting fixtures, so to all you out there running mobile stations, check the mountings on your antennas regularly. I know I am not the first to lose a piece of an antenna and probably won't be the last, but I do hope this is my last time.

Lastly, my apologies for the late posting of this edition, but I am afraid salt mine activities are really interfering with my free time these days and I will try to get the next edition out on time.

Look forward to meeting some of the Div 5 stations either on 2m or in person

Best 73

Andy ZS6ADY

Wikipedia—A Point-Contact Transistor

A **point-contact transistor** was the first type of solid-state electronic transistor ever constructed. It was made by researchers John Bardeen and Walter Houser Brattain at Bell Laboratories in December 1947. They worked in a group led by physicist William Bradford Shockley. The group had been working together on experiments and theories of electric field effects in solid state materials, with the aim of replacing vacuum tubes with a smaller, less power-consuming device.

The critical experiment, carried out on December 16, 1947, consisted of a block of germanium, a semiconductor, with two very closely spaced gold contacts held against it by a spring. Brattain attached a small strip of gold foil over the point of a plastic triangle — a configuration which is essentially a point-contact diode. He then carefully sliced through the gold at the tip of the triangle. This produced two electrically isolated gold contacts very close to each other.

An early model of a transistor

The piece of germanium used had a surface layer with an excess of electrons. When an electric signal traveled in through the gold foil, it injected holes (points which lack electrons). This created a thin layer which had a scarcity of electrons.

A small positive current applied to one of the two contacts had an influence on the current which flowed between the other contact and the base upon which the block of germanium was mounted. In fact, a small change in the first contact current, caused a greater change in the second contact current, thus it was an amplifier. The first contact is the "emitter" and the second contact is the "collector". Today the terminology for the three terminals of a bipolar transistor are base, emitter and collector. The low-current input terminal into the Point Contact Transistor is the Emitter, while the output high current terminals are the Base and Collector. This differs from the later type of junction transistor invented in 1951 that operates as modern transistors do, with the low current input terminal as the Base and the two high current output terminals are the Emitter and Collector.

The point-contact transistor was commercialized and sold by Western Electric and others but was rather quickly superseded by the junction transistor because this later type was easier to manufacture and more rugged. Germanium was employed extensively for two decades in the manufacture of transistors. It has been almost totally replaced by silicon and other alloyed materials today, but remains in use in diodes such as those used for high-precision sensors including radiation counters.

(See Layout picture Page 8)

CW Activity:

Locally the bands have been fairly quiet as far as CW is concerned. As far as I am aware the only recent activity has been the QRP net every morning on 80m and the AWA CW net on Saturday afternoons.

I haven't had much time to tune around on the DX bands, but I am sure there is still quite a bit of activity there.

Reading the articles out of CQ magazine, which Om Dave ZS6AAW sends me every month, activity in the UK and US is still pretty good.

Due to changes in my itinerary, it has become impossible for me to run the AWA CW net on a Saturday afternoon, but the net is still well attended and kept going by the likes of Barrie ZS6AJY, Clive ZS6AVP, Evert ZS6AQW and John ZS6JBJ. My thanks to these gents who put a lot of effort in to CW in general.

I have asked a few of the regulars about moving the net, for my sake that is, but they seem to be quite set on the Saturday afternoon.

A few have indicated their willingness to come up on 80m to play some CW and perhaps an early evening net on Sundays would be possible too.

I put this forward as a suggestion and would love to hear from any of the CW activists who may like getting together on a Sunday evening. How about some suggestions of times which may be suitable ?

I know there are many who cannot get on to the Saturday afternoon net and may just be the Sunday evening may be more suitable. The Saturday net will keep running under the auspices of the gents mentioned earlier.

Begali Stradivarius

I may not be the best CW operator around, far from it, but I do enjoy it and would love to hear more stations up on the bands tapping out their merry tunes on a regular basis.

Best 73

DE ZS0AWA/CW …-.-

SSB Activity:

It seems propagation on 40m was very short lived and as we have entered in to the colder months, the bands have turned to favour 80m once again.

Conditions on the Saturday morning SSB net have certainly gone down quite a bit and whereas Willem used to peak through at 5/9 at my QTH, these days I am fortunate to hear him pushing an S5.

Locally 40m is proving to be very unreliable, but the relay going out on 80m is picked up as far as Durban with a good Q5 readability, and for the short skip stations on 40m, 80m is once again proving to be the band to be on.

Of course Div 1 remains a challenge, no matter what band we use and only seems to open up much later on 40m. I have yet to copy a Div 1 station well on 80m.

The Western Cape Net now also use 80m for their Saturday morning net as 40m is just not working for them locally. It just means us Div 6 guys can longer interfere in their net.

I think we are going to be in for some challenging times and the good propagation we all long for is still some way off. Listening to the sunspot Guru's, it certainly does not seem that bands will improve for some time again.

But let us make the most of what we have and utilise the bands to the best of our ability.

AM:

Propagation on 80m has certainly improved and on Wednesday evenings we experienced some good signals for the AM net.

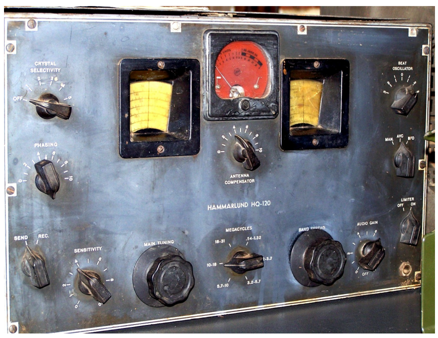
Don ZS5DR, Munro ZS5IN and myself have had some good fun on a Wednesday evening with the band starting out well from around 19:00, then fading out to almost nothing and then coming back around 20:00 in full force with 5/9 signals both ways.

Saturday mornings is still a bit of a challenge as the band only seems to open from around 06:30—06:40, not leaving us with too much time to play around with.

One thing for sure, the Saturday morning AM net is still well attended though. Regular call in from at least 7—8 stations certainly keeps us busy and makes for some interesting MF's being played on frequency.

For some who may be interested, Om Munro ZS5IN has some interesting AM equipment for disposal. Have a look at the last page on items there. You never know, it may be just what you are looking for to get your AM station up and running.

Munro is well known for his AM transmissions over the years and his fantastic selection of MF's he has collected have certainly played a big role in keeping 80m MF's going.

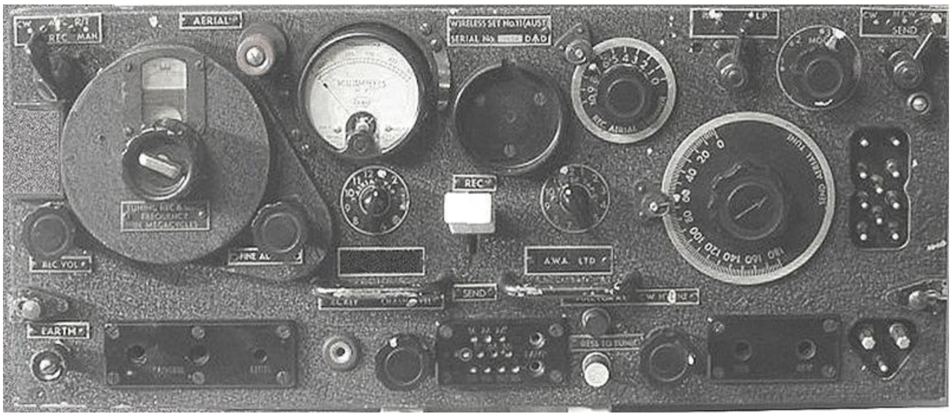


Hammurland HQ100

Wireless Set No 11 and the West Africa Command

(by Richard ZS6TF)

The Wireless Set No. 11 is a combined transmitter and receiver with a frequency range of 4.2 Mhz to 7.5 Mhz. it operates on CW, MCW and R/T. The set has nine valves three of which are common to transmitting and receiving. The receiver is a superheterodyne circuit with AGC. The transmitter is grid modulated for MCW and R/T. The main tuning control for the receiver is also the master control for the transmitter, so the transmit frequency is automatically adjusted to the same frequency as the signals being received simplifying netting. It was also capable of remote-control from up to 400m and a remote aerial at up to 10m, making it a harder target and more convenient to use.



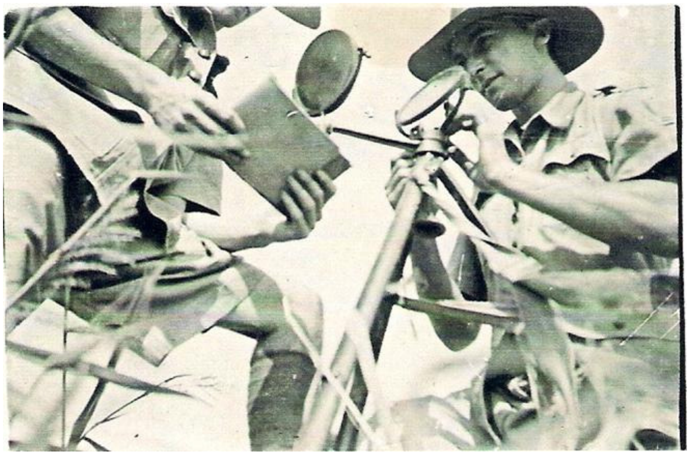
First ordered in 1935, it went into production in 1938 by the E.K.Cole “Ekco” company. The No 11 Set was originally intended for tanks but was mainly used on the ground, and together with the No9 set, forerunner of the 19 set widely used as mobile radios, were the main communications of the British Army for the early part of WWII. It was used by the Long Range Desert Group in north Africa. It was also used by the Germans, who captured several sets in France. Over 5000 sets of this design with some improvements were also manufactured by Amalgamated Wireless Australia Limited in Sydney.

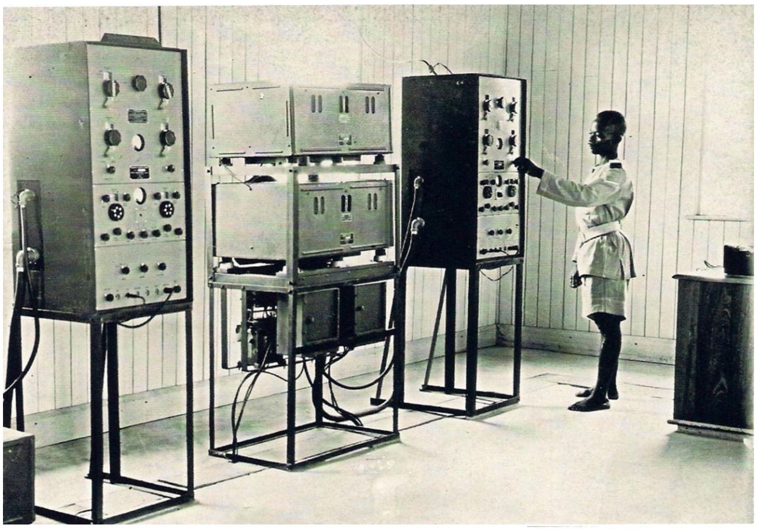
Power from batteries or low or high power (6V or 12V) supply units gave outputs of 0.6W to 4.5W and ranges between 3 and 20 miles with the use of 6ft or 9ft aerials. The set itself, 8.5 x 19.5 x 12 inches, weighs 43 lb; the complete Low and High Power stations weigh 180 and 216 lb. respectively.
Amazingly these very crude and low powered sets by today’s standards, enabled contact to be maintained with base over distances exceeding its design range reliably for 50 miles and in the desert of Tunisia the LRDG consisting of no more than a couple dozen men in a handful of re-fitted civilian trucks, consistently operated WS11’s up to 1000 miles range from base.

The picture left is of field training of the West Africa Command men, (previously the West African Frontier Force), in the Gold Coast, to operate the WS 11 in 1943 under the supervision of the Royal Corps of signals.

The West African Frontier Force operated in the four British territories of Nigeria, Gold coast(now Ghana), Sierra Leone and Bathurst(The Gambia).

Morse by heliograph





Communication from the WAC HQ in Lagos Nigeria in 1944 was with the more powerful type 43 sets. The wireless set no 43 was a Canadian designed 400watt transmitter developed in 1943.It was used as a general purpose high power transmitter for mobile or static operation. Frequency range coverage was 2 to 12MHz with master oscillator or crystal control.

When all else failed a dispatch rider could be sent. Here is a picture of a fine display team on Matchless motorcycles taken in 1945. All pictures previously unpublished and provided by Gordon McGee, G3MDM who was seconded to the WAC from the Royal Corps of Signals at the time.

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)

THE RECEIVING TUBE STORY

By Marc F. Ellis, N9EWJ

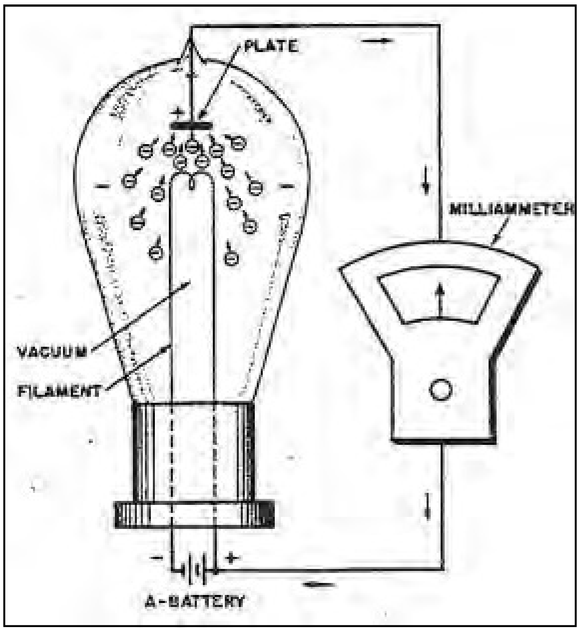
THE EDISON EFFECT

Historians generally agree that the vacuum tube era dawned in the 1880s when Thomas Edison went to work on some annoying phenomena he had encountered during his early development of the electric lamp. The primitive carbon filaments of his lamps were burning out too soon. At the same time, the interiors of the glass bulbs darkened rapidly with use, becoming coated with a deposit of carbon from the filament.

Seeing that the filaments were being weakened by the carbon "evaporating" from them onto the glass, Edison sealed a metal plate into a bulb, between the filament and the glass, to see if he could intercept and study the flow of carbon.

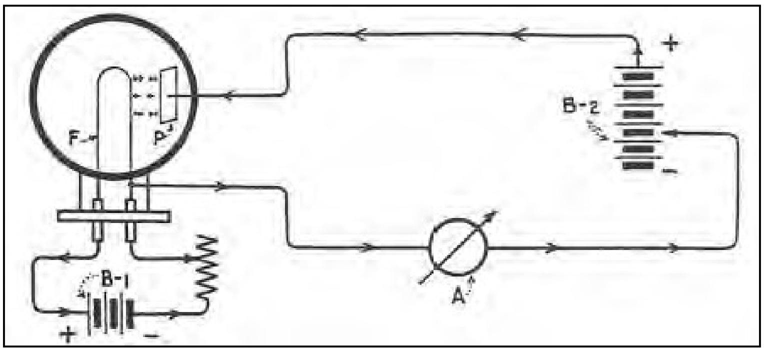
During his work with such experimental bulbs, Edison tried connecting a milliammeter between the positive side of the power source feeding the filament and the metal plate inside. He got a reading on the meter, which meant that an electric current was somehow flowing between the filament and the plate through the vacuum separating them. When the meter was switched to the negative filament connection, no current flowed.

Edison never got around to investigating the meaning of the odd phenomenon he had discovered, but in 1899 the eminent British Scientist J.J. Thompson theorized that the current was, in fact, the flow of infinitesimal negative "particles of electricity" which he termed electrons.



The "Edison Effect" test circuit. Milliammeter indicates current flow through bulb when connected to positive filament lead.

Emitted by the heated filament of the bulb, the negative particles were attracted to the plate when it was connected to the positive side of the filament through the meter. Hence an electron current flowed from the filament to the plate, through the meter and into the positive filament connection. When connected to the negative side of the filament, the plate became negatively charged, which meant that it repulsed the electrons emitted by the filament and no current could flow.



A Fleming Valve demonstration circuit. When an AC source is connected in place of battery B-2, rectification will take place—converting AC to pulsating DC.

THE FLEMING VALVE

But it remained for John Ambrose Fleming, working for British Marconi, to put the Edison effect to practical use. After duplicating Edison's original experiment he connected a source of alternating current between the filament and plate of the test lamp. Current then flowed through the bulb only during the portion of the AC cycle when the plate was positive with respect to the filament. When the cycle reversed, and the plate was negative with respect to the filament, no current flowed. This, of course, is the principle of rectification; the alternating current was changed to a pulsating direct current.

It was already well understood that the crude mineral radio detectors of the era operated by rectifying the received signal. Fleming found (1904) that his device would work in place of a mineral detector, receiving signals more reliably at some sacrifice in sensitivity. He had, in effect, developed the first radio diode (two element tube). It was known as the Fleming valve because of its ability to control the direction of the current flowing through it.

THE AUDION

The epochmaking innovation in vacuum tube technology was patented by Lee de Forest in 1906-07. Physically, it was nothing more than a few turns of fine wire surrounding the filament and positioned between the filament and the plate. This new element was dubbed the grid, and de Forest had created the first three-element tube, or triode.

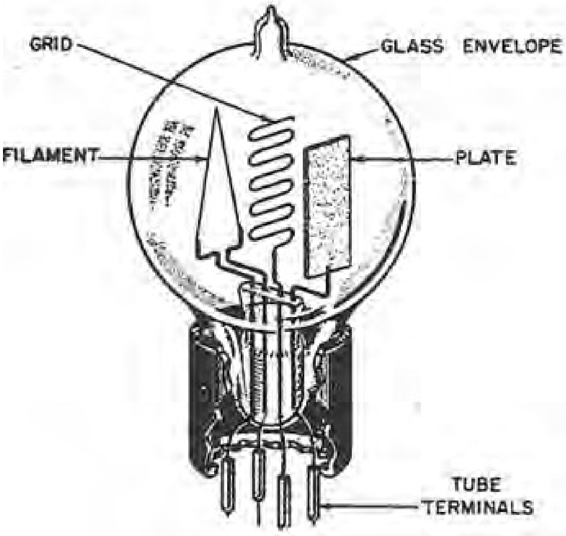
With nothing connected to the grid, the new tube behaved like a Fleming valve: making the plate positive caused a current of electrons to flow from filament to plate. However, connecting a small positive voltage to the grid would attract and accelerate the electron stream flowing to the plate. As a result the plate current would increase.

Conversely, making the grid negative would have the opposite result. But the significant thing was this: very tiny variations in the voltages on the grid would cause similar, but much larger, variations in plate current.

The implication of this is that, properly connected, de Forest's triode (or Audion as he called it) would act not only as a detector of radio signals but as a very sensitive amplifier. It could accept the minute radio frequency voltages present at the antenna and strengthen them to the point where they would provide comfortable volume in the headphones.

The fact that the tube could amplify, as it was very soon discovered, also made it very adaptable for use as an oscillator, or generator of a radio signal. Though in this series we are concentrating on the receiving tube applications, it's important to say that this was a major breakthrough.

Radio signals could now be generated in a more controlled manner and tuned more easily; the equipment to generate them could be relatively lightweight and easily constructed; no longer would radio signals have to be generated by ferocious arcs or heavy rotating machinery. Further, the way was paved for the development of effective and reliable methods for the trans-



Simplified drawing of de Forest's 3-element "Audion." The original tube had no base.

The 6-volt storage batteries used to light early tubes were similar to automotive units.

mission of voice and music. Though the Audion was a watershed development in the evolution of radio and from the beginning de Forest gave many flashy demonstrations of his invention in that application, the first practical, large scale use of the device was in telephony. De Forest had sold telephonic rights to AT&T, whose engineers quickly improved the Audion, notably by evacuating the bulb to a higher vacuum. De Forest's brainchild was then quickly put to work as a voice amplifier on long distance phone lines, including the first U.S. transcontinental line (1915.)

Large-scale commercial development of the vacuum tube for other applications was hindered for some time because of divided ownership of the patents.

Marconi held the patents on the basic two-element tube (Fleming having been a Marconi employee,) but de Forest held the patent on the grid. The stalemate was broken during World War I, when vacuum tube development was considered critical and the U.S. Navy offered to indemnify tube manufacturers against patent infringement.

RCA's tube types '200 and '201 (released in 1920), which were the first radio receiving tubes produced for the mass market, were products of the technological advances made in tube design during World War I. They were produced under a key cross-licensing agreement that enabled the major patent holders to pool expertise.

Now that we've touched on the historical beginnings of vacuum tube technology, we will be concentrating on American tube types, beginning with the ones first mass-produced during the early 1920s for use in home broadcast sets.

By the end of this series of articles, we'll take the discussion up through a few years after the resumption of civilian radio production at the end of World War II. These are the tube types you'll be most likely to encounter in the sets that you'll be collecting.

Though there's no way that every tube type designed during this period can be covered, we will discuss the development of all major families of vacuum tubes (diodes, triodes, tetrodes and pentodes) as well as the innovations in tube "packaging" (physical design of bases, tube elements and envelopes) that took place during these years. And since the development of the radio receiver depended on, and paralleled, the development of the vacuum tube, the information you'll pick up in this series will assist you in understanding the sets you find and placing them in the proper historical perspective.

EARLIEST COMMON RECEIVING TUBES

Let's go back to a point just before the excitement of the "broadcast boom" began, the year 1920 to be exact. In that year, the fledgling RCA company placed its first two receiving tubes, the types '200 and '201, on the market.

Products of technological advances made during World War I, these tubes were manufactured under the cross-licensing agreement.

Both tubes were triodes, like de Forest's Audion. They contained three basic elements: a filament, grid and plate. When such a tube is connected to appropriate external circuitry, the filament generates a stream of electrons (or electric current) which flows, via the plate, through anexternal load.

The grid (a spiral of wire surrounding the filament and placed between it and the plate) controls the flow of electrons. As described in the discussion of the Audion, small voltage changes on the grid can cause large changes in the tube's plate current, which makes it possible for the tube to amplify radio or audio signals.

One of the first receiving tubes to reach consumers in quantity

The type '200 was primarily a detector, designed for the job of separating the audio information in a signal from the radio frequency carrier wave; the type '201 was primarily an amplifier. Construction of the two was virtually identical, except that the glass envelope of the '201 contained only a vacuum, while that of the '200 contained a small amount of argon gas introduced after the air was pumped out.

A source of direct current (typically an automobile-type storage battery) was required to light the tungsten filaments of these tubes. Alternating current, supplied from the power lines via a small transformer, would have been much more convenient and economical—but would have introduced an unacceptable hum into the signal. The filaments of both types operated on five volts at one ampere.

The operating voltage was selected to work with the six-volt storage batteries of the era. When a battery was freshly charged, its voltage was reduced appropriately by a heavy-duty rheostat (adjustable resistor) wired in series with the filament. As the battery became depleted, the resistance of the rheostat could be decreased to keep the filament voltage reasonably constant.

BIRTH OF THE 'OLA

The one-ampere current draw of the '200 and '201 filaments was a bit of a problem. Frequent battery recharges were required, particularly if the set contained several tubes.

In 1923, however, General Electric released the '201A which was equivalent to the '201 but required only 25 percent of its filament current (.25 ampere). This was accomplished by introducing a small amount of the element thorium into the tungsten filament. The '200A (thoriated tungsten filament version of the '200) was not released until a few years later, and never saw wide distribution.

The '201A (or 01A, as we usually refer to it) became very widely used both as an amplifier and a detector. In fact it was probably one of the most manufactured tubes of all time, having been sold under at least 500 different brand names.

TYPE NUMBERS AND BASE STYLES

You've probably wondered at the apostrophe we've been using as a prefix to the tube type numbers mentioned so far. That convention is also employed in a lot of early radio literature, with the apostrophe substituting for omitted parts of the nomenclature. Such shortcuts were often taken with the elaborate nomenclature system originally used for tube types. The system was eventually scrapped by the radio industry, and isn't even much used in discussions among collectors, but you should have a working knowledge of it.

In its complete form, a tube type designation included one or two letters followed by a three-digit number. One of the letters and the first digit of the number were arbitrarily assigned by the manufacturer and had nothing to do with the characteristics of the tube. The other letter (or in some cases, the absence of same) served to indicate the base style. The final two digits of the number always identified the tube type.

As cases in point, the RCA UX201A and Cunningham CX301A were identical as were the RCA UV201A and Cunningham C301A (NOTE: absence of the "V" in the Cunningham number is not accidental). Eventually, however, RCA's prefix letters came to be used generically to represent a tube's base style.

As originally manufactured, the '200, '201 and '201A had a standard base with four stubby contact pins at the bottom and a horizontal locating/locking pin sticking out of the side. The latter slipped into a bayonet-style guide in the socket, ensuring correct orientation of the base. It also served to lock the base in place when the tube was pushed down against the socket contacts and twisted to the right (in the manner of the older auto taillight bulbs). This base style was identified by the prefix "UV" in the tube type designation.

But in 1925 the standard "twist lock" base style was changed to a "push-in" design, the pins being made longer so that they could slip into friction-type spring contacts via mating holes in the bottom of the socket. Two of the four pins were made fatter than the other two to make sure that the tube could be inserted only one way. These new sockets were much more compact, provided more positive electrical contact and were probably cheaper to manufacture. The revised base design bore the designation "UX." For a time, the new "UX" bases retained the locating/locking pin, which was moved to a higher position so that the bases could still be "bayoneted" into "UV"style sockets even with their longer pins. That meant that a person who had to replace a UV- 201A in an older set could substitute a UX201A with no problem.

THE DRYCELL TUBES

When General Electric released the UV-201A in 1923, another type was released along with it. It was the UV199, a brand new design. Like the '201A the new tube had a thoriated tungsten filament. But this filament drew only .06 amperes at its rated battery voltage of 3.3. It was designed to be on operated from three l.5-volt dry cells connected in series, with a series rheostat to reduce the 4.5 volts to the value required by the tube.

The dry cells could not be recharged, of course, and had to be discarded when exhausted. But they were much easier to handle than the clumsy storage batteries, being less bulky, less heavy and containing no easily-spilled corrosive acids. Sets using these tubes were much easier to move around than those employing '01-A's, and could even be built (as either "living room" or portable models) with internal storage compartments for all batteries.

It should be noted that the "UV" designation on the '199 is a bit misleading. The UV199 base is similar in design to the standard "UV" base as used on the '201A, but is scaled down in size to match the '199's much smaller bulb size.

Interestingly enough, when the UX199 came out, it was equipped with the large, standard size "UX" base. The UX120 was released in 1925 as a companion to the UX199. It looked similar to the '199 and operated from the same filament voltage. Maximum plate voltage was higher, however, and the filament drew more current. The '120 was intended for use as an audio output tube, and could deliver more "punch" to the speaker than a '199.

Many '120's have a factory-applied sticker reading "USE IN FINAL AUDIO SOCKET ONLY."

Another variety of dry-cell tube was marketed by Westinghouse beginning in 1922. Designated the WDll, this tube had a filament designed to be operated from a single dry cell drawing .25 amperes at 1.1 volts.

The WDll filament was not thoriated as in the General Electric designs; its enhanced electron emitting performance came, instead,

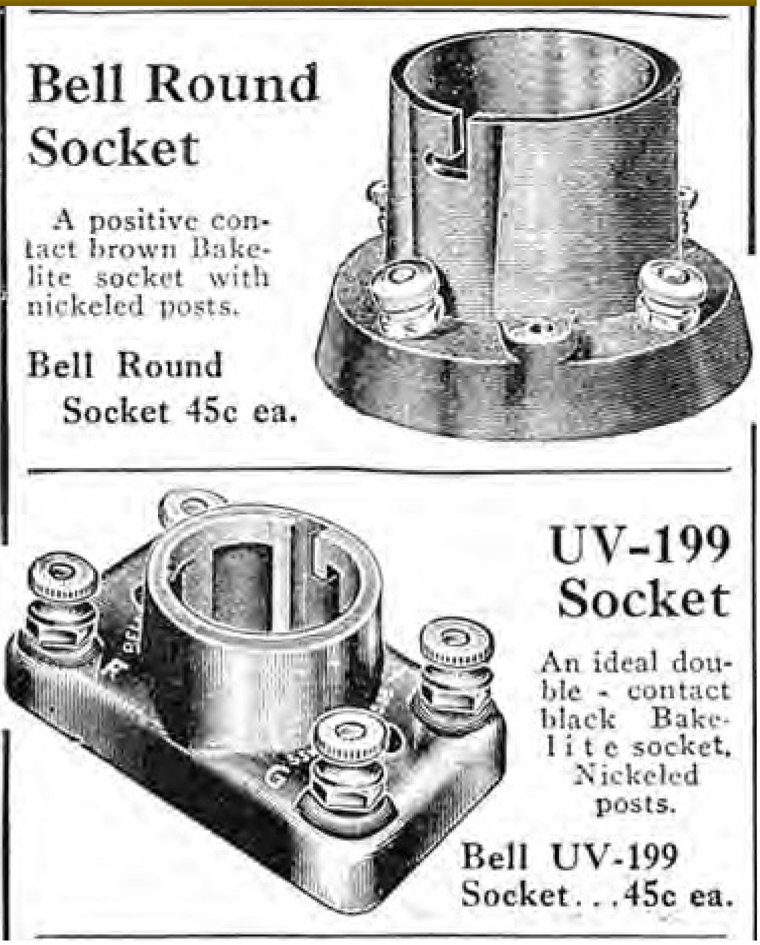
from an oxide coating.

The base of the WD11 was a bit unusual. First of all, it had long pins designed for friction contact at a time when most tube bases were of the stubby-pin, bayonet mount variety. Secondly, it had only one "fat" pin, instead of the usual two, to ensure proper orientation in the socket.

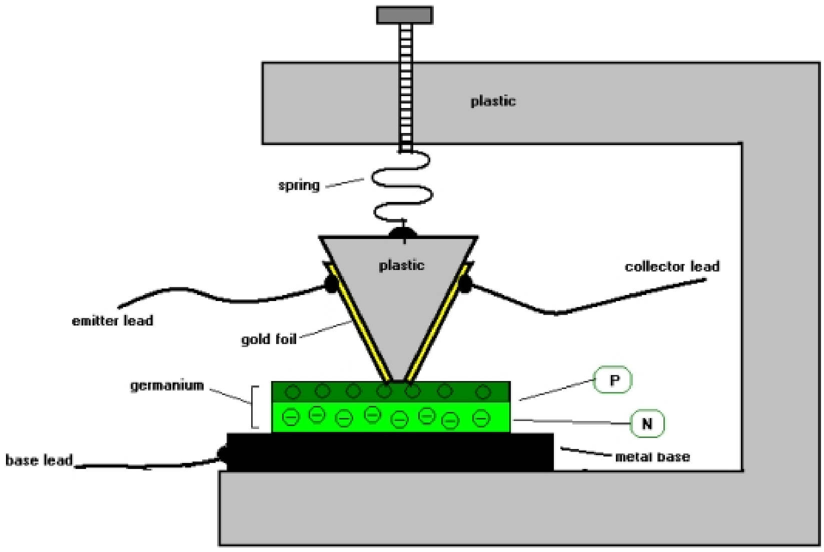
The following year, a version of the WD-11 having a standard "UV" base was introduced. It was designated the WD12. Eventually a version having the "UX" base (the WX12) was introduced. If the logic of these designations escapes you, you're not alone!

The "W" obviously stands for Westinghouse and the "D" for the unique base of the type 11. But it seems that the WD12 and WX12 would have been better designated the WV11 and WX11, respectively. I also have no idea why Westinghouse chose not to prefix the type number with the usual proprietary extra numeral (making the '11' s full designation "WD411," or something like that).

We hope you've found this overview of the earliest vacuum tubes interesting and useful! The Receiving Tube Story continues in the next issue with "The First AC Tubes."



Detail from 1920s ad shows standard UV base (top) and a smaller version for the UV-199.



An Early Model of a Transistor

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http://harc.org.za/newsletters/AWA/

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:

PLEASE NOTE CHANGE IN MY EMAIL ADDRESS— andyzs6ady@vodamail.co.za

For Disposal:

1. Homebuilt 200 Watt output only for 80m. operation in Viking Valiant cabinet.
   Consisting of 3 x 6146's in Final RF amp. 2 x 6146's in modulator.
2. Homebuilt 200 Watt output in Rack and panel mount only for 80m operation..
   Consist of 3 chasis slide-in units Top RF Stages, Centre Modulator
   Bottom Power supplies Total cabinet height is 800 mm. Mounted on Base
   with castors, with total height 900mm.
   Consits of RF Amp. With 4-250 valve. Modulator consist 4x 6146's.
3. Leader Signal generator 120k/c to 325 mHz.
4. 2 x Jennings vacuum tuning capacitors 5-500 mmfd at 5 kV.
5. 5 Pin Jumbo ceramic valve bases for 4-400 series.
6. Elctrolytic capacitors 680 mfd at 350 volt.
7. Various Doorknob ceramic capacitors at 5kV from 50pfd- 1000pfd.
8. Plate RF Chokes for Linear Amplifier application.
9. Relays 2 and 3 pole types for antenna c/o application
10. Resistors 50 watt ww. Various.
11. Inductors for RF final tank cct. Roler and fixed types.

For further information contact Munro ZS5IN Landline 039-6950997