



The Hellgate Static

March 2024



Hellgate Amateur Radio Club

P.O. Box 3811, Missoula, MT 59806-3811

Web: www.w7px.org

Inside this issue:

Feb Testing Results
Feb Meeting Minutes
HARC Inventory: Items for Sale
Radio Help Wanted
The Triode turned 117 Years Old Last Year
Mar Meeting Agenda
Mar HARC calendar
HARC Events

Officers:

President: NZ7S
Vice-President: W7RPG
Treasurer: KJ7YHG
Secretary: K7MSO

Positions:

Emergency Coordinator: contact_us@w7px.org

QSLs, Awards: contact_us@w7px.org

Webmaster: contact_us@w7px.org

Asst Webmaster: editor@w7px.org

License Exams Contact VE:

harc.ve.testing@gmail.com

Static Editor: editor@w7px.org

Repeater Committee:

W7RPG (Chair)

K7QA --- Dec 2022 for (23/24)

KG7WYO – Dec 2022 for (23/24)

N7PAS -- Dec 2023 for (24/25)

KI7PCR -- Dec 2023 for (24/25)

C&BL – Board + N7PAS and K7MTD

Buy-Sell Operations hfc@w7px.org

W7XT, K0SN, K7QA

Coming Events 2024

Mar 10 Dalight Savings Start 2:00AM

Mar 11 **HARC Testing, Meeting**

Mar 17 St. Patrick's Day

Mar 19 First Day of Spring

Mar 24 Palm Sunday

Mar 31 EASTER

Apr 1 April Fool's Day

Apr 8 **HARC Testing, Meeting**

HARC March Meeting

Program: FT8/4 by Dick Walton

RADIO LICENSE AND EXAMS

We are having in-person monthly meetings and live in person online testing. The testing and meeting are on the 2nd Monday of each Month.

The Radio license Exams are from 5:30-6:30PM Meetings which start at 7:00PM will be held at The Church of Jesus Christ of Latter Day Saints, 3026 South Avenue West, across the street from Big Sky High School. Use the North entrance as all others will be locked.

Meeting will begin at 7:00PM (Program & Business).

12 Feb 2024 Exam Testing Results

Congratulations to:

- * 1. Jeff Gardanier of Missoula passed his Technician exam. His new call sign is KK7RIO.
- * 2. Ted Fiaser of Missoula passed his Technician exam. His current call sign is KK7RIN.
- * 3. Doug Drader of Missoula passed his Tech and received credit for his General exam.
His current call sign is KK7RKD.

12 Feb 2024 HARC Meeting Minutes Meeting called to order @ 7:03 PM

1. **Attendance:** N7BIO, N7PAS , NZ7S, K7MTD, K7MSO, K0SN, AG7SW,
N7NHS, K7QA, W7XT, KJ7PCR, KK7NOM

Visitors: Seth McClain, Doug Drader, Keaton Surratt W7KJA

NOTE: 12 Members present. Thank you to all that attended.

2. **Last meeting minutes, Jan:** Motion to approve minutes: 1st NZ7S 2nd W7XT
Discussion __None_____ Vote: Passed
3. **Treasurer's report KJ7HYG/W7XT:** Discussion on Finances for club, Annual budget is awaiting
input from Repeater Committee, HF Committee, etc._____ Vote: Passed
4. **Repeater Committee W7RPG:** Discussion _Nothing to Report _____ Vote: Tabled
5. **HF Committee Report K0SN:** __Bought a bunch of used amateur radio gear to the meeting.
It all needs to go to a good home._____ Vote: _____
6. **Discussion List:**
- a. MARS Interoperability Excercise scheduled for 22 - 24 Feb. Eric NZ7S will probably be asking for help with this on either our Wednesday night or Saturday moning nets.
 - b. Discussion on Events list. President wants to do more this year.
 - c.

7. New Business:

- a. None

8. Net Control Operators

Mar	06	N7PAS	Apr	03	N7PAS
Mar	13	K7MSO	Apr	10	_____
Mar	20	K7MSO	Apr	17	_____
Mar	27	N7JGS	Apr	24	_____
_____	_____	_____	_____	_____	_____

9. Good & Welfare:

Meeting adjourned at 8:03 PM.

Minutes by K7MSO

Program: None

HARC INVENTORY -- FOR SALE

Line	ITEM	MAKE	MODEL	CONDITION	VALUE	STORED	Remarks
1	Computer	Dell	Latitude	Fair	100	?	
2	Pow Supp. 220-225mhz	Mirage	C106G	Good	25	?	
3	Handie-talkie	Realistic	HTX 202	Good	50	?	
4	Portable Repeater		TM-241X2	?		?	
5	Triband Beam	Hy-Gain		Few Missing parts	200	K0SN	
6	Tuner	Signal Corps	BC939B	Parts only	25	K0SN	parts only, no cabinet
7	Speaker + Power Supp.	Drake	MS-4 + AC4	Not tested	75	K7QA	needs upgrade
8	Reflected Pwr Mtr	Heathkit	HM-15	Works	10	K7QA	
9	Mobile Tuning Mtr	Heathkit	PM-2	Untested	10	K7QA	
10	Trap Vertical	Hygain	14AVQ	Clean, untested	150	K7QA	
11	2 Mtr HH Transceiver	Realistic	HTX-202	Error Code	25	K7QA	
12	Spkr. w/vol. control	Yaesu		Untested	50	K7QA	
13	1993 ARRL Handbook			like new	free	K7QA	
14	Handbooks	ARRL	1950-1980	OK	Free	KGVO	
15	Vintage Mic	Astatic	JT-30	worn, untested	50	KGVO	Ebay sales \$50-300
16	13.8V, 20A power supp.	Astron	RS20A	No output	15	KGVO	
17	RC checker	CDE		untested	30	KGVO	
18	Rotor	CDE?		untested	50	KGVO	w/ control head
19	Transceiver	Collins	RT-91ARC-2	untested	100	KGVO	Aircraft Military
20	Transverter Interface	Down E. Micro		untested	offer	KGVO	
21	Low pass Filter	Drake	TV-3300	untested	20	KGVO	
22	Receiver	Hallicraft.	SX-100	fair	150	KGVO	
23	Receiver	Hallicraft.	SX-62B	untested, rough	75	KGVO	no cabinet top
24	Vintage Speaker	Hallicraft.	PM 23	Nice, untested	150	KGVO	
25	Vintage Speaker	Hammar.	S-100	Nice, untested	60	KGVO	
26	AC Power Supply	Heath Kit	HP-23-A	works		KGVO	for the HW-101
27	SSB Transceiver	Heath Kit	HW-101	needs repair		KGVO	Ebay \$90-300
28	HF Xcvr + Power Supp.	Heathkit		untested	150	KGVO	
29	Oscilloscope	Heathkit	IO-4105	untested	30	KGVO	
30	Power/SWR Meter	Heathkit	HM15	untested		KGVO	
31	Vertical antenna		Dipole 80	?		NOAA	
32	Receiver	Heathkit	HR-10	untested, rough	offer	KGVO	Ebay sales \$100-300
33	SSB Adapter	Heathkit		untested	40	KGVO	
34	Test Oscillator	HP	650A	untested	offer	KGVO	
36	VHF Mobile Xceiver	Icom	IC-25A	fair, untested	30	KGVO	
37	2M FM Transceiver	Kenwood	TR7400A	no output	10	KGVO	
38	HF Transceiver +Man	Kenwood	TS-520	non-working	100	KGVO	
39	Transceiver	Kenwood	TS-940	Needs Repair	250	KGVO	No output on CW, others
40	Transmitter	Meissner	9-1160 (tube)	good		KGVO	was in use
41	Voice Keyer	MFJ	MFJ-432	untested	30	KGVO	
42	Fwd/Ref. pwr meter	Midland	23-126	untested	10	KGVO	
43	2 mtr, 30 Watt amp	Mirage	B23	untested	25	KGVO	
44	2 mtr mobile Xcvr	RadShack	HTX-242	untested	40	KGVO	
45	Field str/SWR meter	RadShack		untested	10	KGVO	
46	VHF/UHF/FM amp	RadShack		untested	20	KGVO	
47	Gen. Coverage Rvr.	Realistic	DX302	untested	125	KGVO	Ebay sales \$80-350
48	Receiver	Signal Corp	R-392/URR	fair	300	KGVO	Stromberg Carlson
49	VTVM	Simpson	311	untested	25	KGVO	
50	Oscilloscope	Telequip.		untested	20	KGVO	
51	Var. power resistors	Various		untested	10	KGVO	box of ~20
52	Scanner	Uniden	BC9000	works	50	KGVO	
53	BUG KEY	unknown		fair		KGVO	

54	12V DC Backup Power	West Mtn	PG40S	good, untested	25	K7MTD	
55	Speaker	Yaesu	SP-8	Good, untested	125	KGVO	
56	VHF FM Transceiver	Yaesu	FT720RU	untested	25	KGVO	
57	VHF Transceiver	Yaesu	1500M	untested	75	KGVO	
58	Many electronic parts too numerous to list.				offer	KGVO	some free, door prizes
59	Misc. meters			untested,	40	KGVO	2 boxes full
60	RCA male Patch cords			good	10	KGVO	box of ~20
61	Peter Dahl 10 HY @ 1 A		new	new		KGVO	
62	Peter Dahl 40 HY @ .6 A		new	new		KGVO	
63	Peter Dahl 9 HY @ 1.5A		NEW	NEW	200	KGVO	66 pounds - pick up only
64	Peter Dahl Sw. Choke		new	new		KGVO	
65	Antenna Tuner	Icom	AH-4			NZ7S	
66	Voice Synthesizer	Icom	UT-102			NZ7S	
67	Transceivers, qty.2	Kenwood	220-225 mhz.	?		NZ7S	
68	Antenna Tuner + man	MFJ	MFJ-934			NZ7S	
69	RTTY CW	MFJ		?		NZ7S	
70	Telescoping Mast	MFJ	MFJ-1910	new		NZ7S	
71	Audio Filter	Heathkit	HD-1418	works	15	K0SN	
72	Audio Filter	AFTronics	Super SCAF	works	15	K0SN	
73	TRIPLEXER	Comet	CFX-324			K7MTD	
74	WATTMETER/SWR	MFJ	864	works	10	K7MTD	
75	2 mtr, 30 Watt amp	Mirage	B23	works	25	K7MTD	
76	Microphone	Astatic	D104, SE	needs work	offer	K7QA	
77	Vintage Mic	Astatic	JT-30	worn, untested	50	KGVO	Ebay sales \$50-300
78	Rotor Control	Hygain	DCU-1	untested	100	KGVO	
79	VHF FM Transceiver	Yaesu	FT720RU	untested	25	W7KJA	

For information email to hfc@w7px.org

Radio Help Wanted: Must Like Geysers, Bison, and Helicopter Rides

Occasionally, *The ARRL Letter* shares job postings that may be of interest to radio amateurs, and this one may be the most scenic job yet -- Yellowstone National Park is looking for three radio technicians, according to posts on the park's social media and a [listing on the USAJobs website](#).

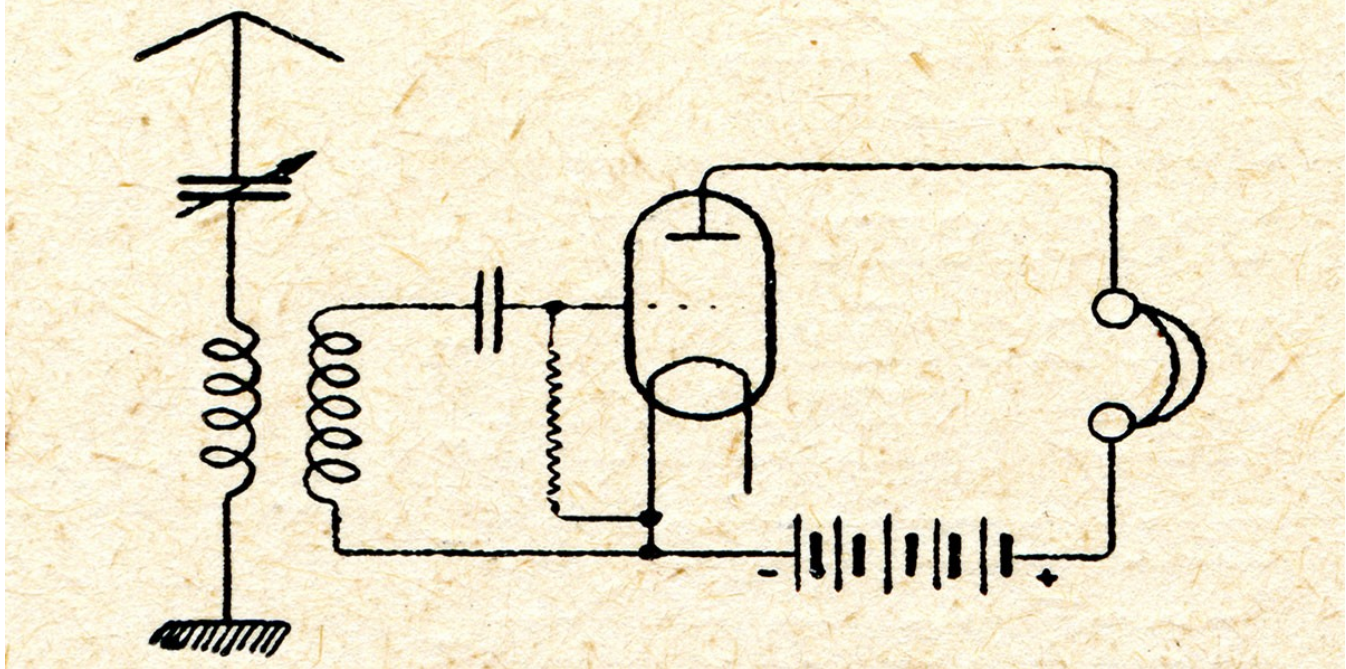
The job listing says that the electronics technician (radio) positions are "located in Yellowstone National Park, in the Technology Services Radio Shop within the Administrative Division." There's even a provision for hazard-duty pay for mountaintop repeater helicopter flights and tower climbing.

On Facebook, the park [has some fun with their post](#): "Does your idea of taking your career to new heights involve flying in a helicopter to 10,000 foot peaks? How about hiking, snowmobiling, and even skiing your way to telecom sites? Well... do we have the job for you! We are hiring not one, but 3... yes THREE, Electronic Radio Technicians," it says.

The lucky three who are hired for these positions will have their work cut out for them; the system has eight repeaters, more than 20 base stations, and 500 mobile and 1,000 portable radios -- all in a national park with 500 geysers and 5,900 American bison.

Mike Leary
mleary2001@icloud.com

The Triode turned 117 Years Old Last Year



By [Vaughn D. Martin](#)

Last year (2023) marked the 117th anniversary of Lee de Forest's Audion or first vacuum tube triode (**Figure 1**). This was the most famous of de Forest's 180 patented inventions. This vast improvement upon John Ambrose Fleming's valve changed the world like few other events since.



FIGURE 1. A photo of de Forest's Audion, the first vacuum tube triode.

The "valve" was a vacuum tube diode that Fleming invented as a modification to an Edison light bulb by adding a second element to it. Lee de Forest's triode or "Audion" as he called it ushered in the age of radio and electronic communications. The Audion detected radio signals, and then it could amplify them to produce audio. Finally, it served as the basis of an oscillator for the final transmission of signals.

This era of early radio was one in which only a few visionaries and promoters realized its great potential, and this fostered ferocious competition and frequent legal battles.

de Forest's Impact

The significance of de Forest's invention was at least two-fold. First, it allowed control over the stream of electrons between the tube's cathode and anode, which is the basis of electronic communications, as just explained. Secondly though, this invention inspired and planted the seed for further improvements to a whole bevy of vacuum tubes and related devices, including the cathode ray tube, X-ray tube, photomultiplier tube, and klystron. The following site shows a chronological timeline of inventions relating to vacuum tubes, and later television http://inventors.about.com/library/inventors/bl_television_timeline.htm.

How it All Began

The earliest crude forms of the vacuum tubes appeared in the late 17th century. However insufficient technology, including efficient vacuum pumps, advanced glassblowing techniques, and the Ruhmkorff induction coil prevented them from being more than a "laboratory curiosity." Incidentally, this coil standing alone could produce sparks more than one foot in length. The first radio transmitters used such a coil (see **Figure 2**).



FIGURE 2. The Ruhmkorff induction coil, an integral part of early attempts to make a vacuum tube.

One Inventor Inspired by the Audion

Lee de Forest inspired inventors, like Irving Langmuir, to produce spin-offs of the triode vacuum tube. Langmuir was a physicist and chemist who promoted a better understanding of plasmas, heat transfer, and thermionic phenomena. This allowed Langmuir to invent a high-vacuum electron tube and gas-filled incandescent lamps. Langmuir invented the first high performance practical gas-filled bulbs.

A common myth is that Edison invented the light bulb. Edison just improved upon a 50-year-old idea. In 1879, Edison used a small carbonized filament in a vacuum inside a glass enclosure or envelope to produce a more reliable light source. But Langmuir, a name most people have never heard of, really invented a far more useful, optically-efficient device.

One account of the significance of this discovery attributed to it was a savings in America's lighting bill of \$1,000,000 a night. This was especially welcome since it occurred in the middle of the Great Depression.

Lee de Forest's Illustrious Life

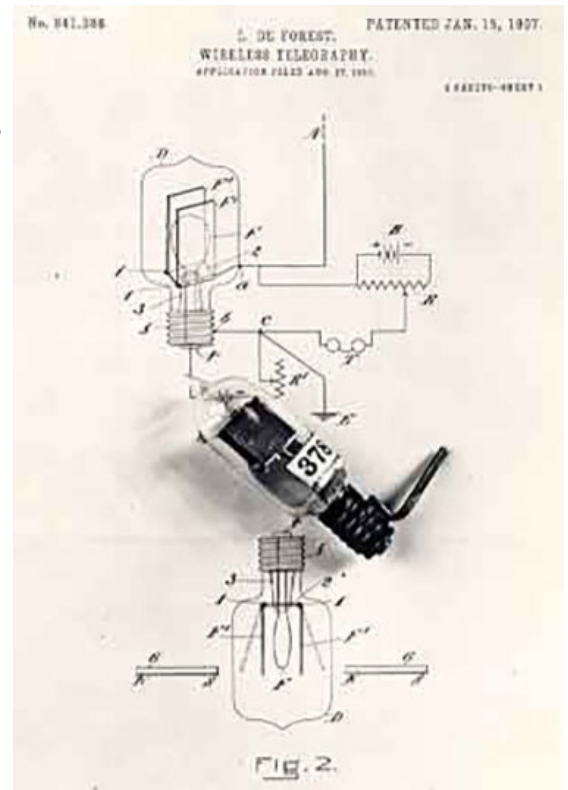
After graduating with a Ph.D. from Yale, de Forest had numerous jobs related to his education and interest in electronics. He preferred to be his own man, however, and never worked with any one company very long before striking out on his own. His interest in yet-to-be-invented scientific devices was a tough sell in the business world, though, since his "products" did not yet exist.

Lee was a personable man who appreciated the performing arts, especially opera. In fact, newspaper accounts tell of him sending the voices of opera singers to members of the press stationed at receiving sets as a way to promote the medium of radio, which was still in its infancy.

de Forest also fostered amateur radio by making broadcasts that many hams would receive. One broadcast of historical merit was his coverage of the Hughes-Wilson Presidential election returns in 1916. This actually preceded what many believe was the first radio broadcast in 1920 by KDKA in Pittsburgh. Interestingly, de Forest became very vocal in the 1950s, over his remorse over what radio had become since he referred to himself as the father of radio. He felt radio was only comprised of second rate jazz, sickening crooners, and constant interruptions for “sales talk” — as he called commercials.

de Forest briefly worked for the Federal Telegraph Company in Palo Alto, CA while he was perfecting and promoting his Audion vacuum tube as an amplifier (**Figure 3**).

FIGURE 3. The actual sketch submitted by de Forest (patent application) for his Audion.



The telephone company used it in transcontinental phone calls, but it was cost-prohibitive for the average person. It would cost over a week’s pay (at the time) for just a few minutes. de Forest received \$50,000 for this invention.

de Forest’s Love of the Performing Arts

By his own admission, de Forest spent the happiest 30 years of his life in Hollywood, where he died at the age of 88. Appropriately so, because de Forest’s second most notable invention was adding sound to motion pictures. He called this invention the “Phonofilm.” It added a synchronized sound overlay to film. This significant feat earned him an Oscar from the Motion Picture Arts and Sciences foundation in 1959 for this 1920 invention. However, the Phonofilm was not the system used in the famous talkie movie *The Jazz Singer*.

The de Forest process used a device called a light valve to expose a series of dark and light patches right on the film’s sprocket edge. A photocell read these areas and converted them to sound with a great success of being in synch with the picture, see **Figure 4**, Lee de Forest in his mid-age admiring his audion.

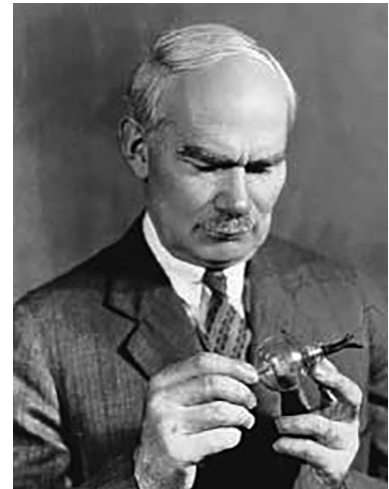


FIGURE 4. A middle aged Lee de Forest admiring his audion.

Dispelling Another Common Myth

By 1916, the Audion was the basis of an oscillator for the radiotelephone transmitter for experimental broadcasts in New York City. By now, de Forest's Audion vacuum tubes had emerged into two large Oscillation vacuum tubes that he used as generators of RF (radio frequency) current. **Figure 5** shows one of de Forest's earliest radio transmitters made with Oscillation vacuum tubes.

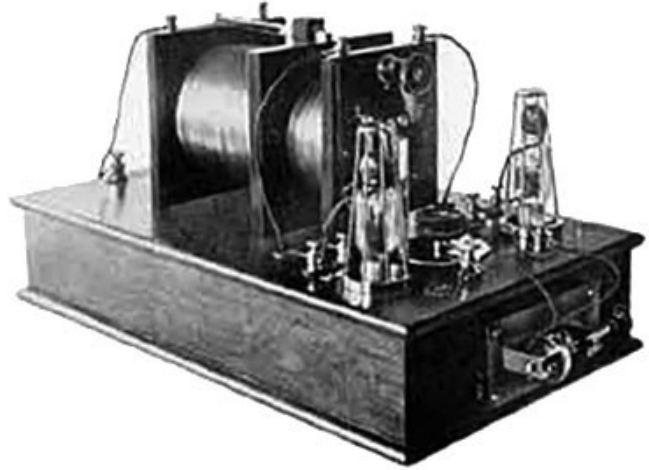


FIGURE 5. An early Lee de Forest transmitter using his Oscillation vacuum tubes.

The early radiotelephone transmitters before 1916 were not based on de Forest's Audion vacuum tubes. Virtually all early broadcasters of voice and music used some version of the Poulsen DC arc. Generating high frequency signals in radio's infancy assumed a number of innovative forms.

Heinrich Hertz is generally accepted and credited with being the first to accomplish this, but in a crude form. He used a spark-excited resonant circuit. This might have been useful in telegraphy, but since it only generated damped waves that would quickly dissipate, it was not useful in any sort of applications related to modulation schemes. In 1900, William Duddell succeeded in creating high frequency undamped signals that he called the "singing arcs."

Duddell accomplished this with an arc light as the power source to continuously excite and, in turn, cause oscillations in a tank or parallel-tuned resonant circuit. But it was Valdemar Poulsen in 1906 who invented the first practical arc transmitter for transmission work. Poulsen may be best known for inventing the first magnetic recording that he demonstrated in principle around 1898 in what he called his "telegraphone," which was actually a magnetic wire recording. This was the precursor of tape recording.

Strife and Toil

de Forest's life was not without controversy, as four wives and expensive litigation attests to that. His first marriage lasted less than a year, then a year later he married a liberated electrical engineer who was not at all content living in his shadow. His third wife was a singer, Mary Mayo, and 18 years later he married his last wife, Maria Mosquini, an actress. She was his favorite by his own account, and they spent his last and happiest years in Hollywood.

de Forest was frequently accused of unethical business practices. In 1903, when visiting fellow inventor Reginald Fessenden's lab, he observed Fessenden's Liquid Barretter detector and purportedly stole the idea. After three bruising trials, Fessenden finally prevailed and received an injunction against de Forest for patent infringement.

In 1902, de Forest aligned himself with Abraham White (a Wall Street promoter) and they formed De Forest Wireless Telegraph Company. They approached the War Department and the US Navy, and had a public stock offering. Unfortunately, the actual value of the radio equipment sold did not match the hype of the promoter. Discredited, de Forest went on trial with two other promoters who were found guilty of misleading the public in the stock offering. However, de Forest was acquitted.

de Forest did realize one early victory in 1904 by successfully demonstrating a wireless telegraph station to the US Navy in San Juan, Puerto Rico. This was with a valve (diode vacuum tube), since he had not yet invented his triode.

The Navy Success Story

In 1909, de Forest eventually sold his arc radiotelephone systems to the Navy. To test them, he played a record on a wind-up phonograph. Much to his pleasure and surprise, wireless ham radio operators intercepted his test signals. After successfully completing the test phase, de Forest equipped the Navy fleet's lead ship, the U.S.S. Ohio, with one of his arc transmitters and a wind-up phonograph. During an around-the-world duty cruise between 1907 and 1908, de Forest accompanied his equipment aboard the U.S.S. Ohio and successfully communicated with Mare Island on the other coast during June of 1908.

A Bitter-Sweet Ending

There were many ups and downs for de Forest, but his most famous legal battle was when he and Edwin Armstrong both simultaneously claimed they invented the regenerative or negative feedback principle of the Audion. This allowed feeding back weak signals at the tube's output to its input to strengthen the signals.



FIGURE 6. Lee de Forest's palatial estate on the Hudson River that he lost due to numerous lengthy litigations.

This litigation lasted 20 years from 1914 to 1934, and through it all, Armstrong won the hearts of the technical community. Somewhat disgraced, de Forest's peers no longer took him seriously as an inventor. de Forest had to sell his prized palatial estate on the Hudson River that he called Riverlure, see **Figure 6**, to pay for legal expenses during his long battle with Armstrong and others. It was at this stage of his life that he decided to live out his days in Hollywood. **NV**

How Triodes Work

Vacuum tubes began with the invention of the light bulb: a glowing filament in a vacuum. This was followed by the observation that a bulb's heated filament gives off electrons. If the filament is connected to the negative terminal of a battery (in addition to the voltage that lights it up) and a second electrode is introduced and connected to the battery's positive terminal, electrons flow from the filament through the vacuum to that second terminal. This is called the Edison Effect, and the resulting structure is a diode.

In a diode, the heated filament is the cathode and the positively charged electrode is the anode or plate. The introduction of a third electrode — a grid — between the cathode and the anode yields a triode. The grid is wound of wire, so electrons can pass through it to the anode. The voltage on the grid controls the flow of electrons from the cathode to the anode. A small change in that voltage produces a larger change in the electron flow. Thus, a triode can amplify a signal.

In recent tubes, the filament and the cathode are separated. The filament heats the cathode which emits electrons. Figure A shows the usual schematic symbol for a triode.

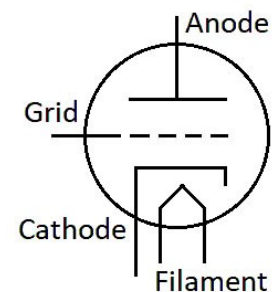


FIGURE A. Schematic of a triode.

The voltage required to light a tube's filament is generally modest — a common value is 6.3V — but the voltage applied to the anode is usually above +100V, and for a receiving tube may be as high as +250V. For high-power transmitting tubes, the voltage applied to the anode can be much higher still.

Schematics represent a triode's cathode and anode with straight lines and grids with dotted lines. In physical tubes, however, the electrodes are generally concentric circles from the filament out.

More grids can be added to refine a tube's performance. A screen grid between the original grid — now the control grid — and the anode receives a positive charge and draws electrons through the control grid. A suppressor grid following the screen grid is often connected to the cathode and, with its relative negative charge, prevents electrons from bouncing off the anode.

The name of a receiving tube is generally a number that indicates its filament voltage (one or two letters) and another number that indicates the number of elements in the envelope. A 6C4 triode, for example, requires 6.3V on its filament and consists of four electrodes: filament, cathode, control grid, and anode.

HELLGATE AMATEUR RADIO CLUB

AGENDA – 11 Mar 2024 meeting

Program: FT8-DX by W7XT

Meeting called to order at 7:___ PM

(8 needed for business)

Introductions. Please make sure you signed the attendance sheet **Quorum Y/N** _____

Last meeting minutes, Jan: Motion to approve minutes: 1st _____ 2nd _____
Discussion _____ Vote: P/F/T

Treasurer's report: KJ7HYG, Discussion _____
_____ Motion to approve report: 1st _____ 2nd _____ Vote: P/F/T

Repeater Committee Report: W7RPG, Discussion _____
_____ Motion to approve report: 1st _____ 2nd _____ Vote: P/F/T

HF Committee Report: K0SN, Discussion _____
_____ Motion to approve report: 1st _____ 2nd _____ Vote: P/F/T

Events for 2024:

- Mar 10 Daylight Savings Starts 2:00AM
- Mar 11 HARC Testing and Meeting
- Mar 19 First Day of Spring
- Mar 31 Easter
- Apr 01 April Fool's Day
- Apr 08 HARC Testing and Meeting

HARC Fun Net every Saturday morning @ 9:00 AM on 147.040 Repeater – Buy/Sell - During.

HARC Discussion List

1. April 27th – River Bank Run _____
2. CERT Training _____
3. Red Cross Training _____

VHF Net Control Station assignments:

- | | |
|--------------|--------------|
| Mar 06 N7PAS | Apr 03 N7PAS |
| Mar 13 K7MSO | Apr 10 _____ |
| Mar 20 K7MSO | Apr 17 _____ |
| Mar 27 N7JGS | Apr 24 _____ |

Reminder: Backup is always the next person in line as the net control.

Good and Welfare. _____

*** Next Club meeting: **Apr 08** ***

Is there any other business? _____
_____ Meeting is Adjourned at __:__ PM.

Hellgate Amateur Radio Club

Calendar of Events

Board: NZ7S, W7RPG, KJ7THG, K7MSO



Editor - N7PAS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	4	5	6 HARC Saturday Net 9:00AM on 147.040 Repeater.
7	8 HARC Testing 5:30 & Meeting 7:00PM	9	10 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	11	12	13 HARC Saturday Net 9:00AM on 147.040 Repeater.
14	15 TAX DAY	16	17 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	18	19	20 HARC Saturday Net 9:00AM on 147.040 Repeater.
21	22	23	24 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	25	26	27 HARC Saturday Net 9:00AM on 147.040 Repeater. River Bank Run
28	29	30				

HARC Events: (Actual Dates Unknown)

#	Month	Activity
1.	Monthly	MARS Interoperability Exercises – Eric NZ7S will keep us advised. 1 st week of each month for 2024. Check in on 60 meters. Noon and 8 pm Channel
2.	April	Grizzly Triathlon
3.	April	Riverbank Run
4.	June	Trail Rail Run
5.	June	Field Day – What are we doing? -
6.	June	Missoula Marathon - was same day as field day in 2022
7.	July	W7PX Special 4 th of July Event – Cabin needs to be reserved.
8.	July	Glacier Waterton Hamfest
9.	Aug	Fox Hunts 1 per year on Saturday from 10:00AM to 4:00PM
10.	October	JOTA/JOTI
11.	October	Great Montana Shakeout Drill
12.	October	Bitterroot Musers Dirt Dash
13.	November	Election Day
14.	December	Sky Warn Recognition Day (0000Z-2400Z)
15.	December	HARC Dinner Meeting