County Hunter News

April 1, 2008
Volume 4, Issue 4

Welcome to the On-Line County Hunter News, a monthly publication for those interested in county hunting, with an orientation toward CW operation.

Contributions of articles, stories, letters, and pictures to the editor are welcomed, and may be included in future issues at the editor's discretion.

The County Hunter News will attempt to provide you with interesting, thought provoking articles, articles of county hunting history, or about county hunters or events, ham radio or electronics history, general ham radio interest, and provide news of upcoming operating events.

We hope you will enjoy the County Hunter News. Feel free to forward, or provide links. Permission is given for copying or quoting in part or all provided credit is given to the CHNews and to the author of article.

County Hunter Nets run on 14.0565, 10.122.5, and **7056.5**, with activity nights on 3556.5 on Tuesday evenings around 8-9pm Eastern Time. Also, with low sunspot activity, most of the SSB activity now is on 'friendly net' 7188/7185 KHz. The cw folks are now pioneering 17M operation on 18.0915. (21.0565, 24.915.5, and 28.0565 when sunspots better). Look around 18135 or 18.132.5 for occasional 17M SSB runs.

You can see live spots of county hunter activity at ch.w6rk.com

For information on county hunting, check out the following resources.

The USACA award is sponsored by CQ Magazine. Rules and information are here: http://countyhunter.com/cq.htm

For general information FAQ on County Hunting, check out: http://countyhunter.com/whatis.htm

MARAC sponsors an award program for many other county hunting awards. You can find information on these awards and the rules at: http://countyhunter.com/marac_information_package.htm

The CW net procedure is written up at: http://www.wd3p.net/ch/netproc/netproc.htm

There is a lot more information at www.countyhunter.com . Back issues of the County Hunter News are available at www.CHNewsonline.com

The County Hunter News publishes some April Fool's articles in the April 1st issue each year. Readers beware!

De N4CD (email: telegraphy@verizon.net)

Notes from the Editor

1) OKLA QSO Party – March 8,9, 2008. Wow! There must have been at a half dozen mobiles running all over the state with great sigs on 40M. Maybe 100 spots for OK counties as the mobiles went through them. Despite having 9-12 inches of snow just two days before, that didn't seem to slow down the mobiles one bit! I heard dozens of county hunters chasing them on 40M and 20CW, with a few spots on SSB. . In OKLA, there was NO5W, W3DYA, AA5JG, K5YAA, NY4N, W5TM, W0BH, plus fixed stations on cw, and a few counties run on SSB as well. Spots on 20M as well, and later in the evening, a few on 80M CW.

Most of the OKLA counties were spotted, but not all. I managed to snag 2 of the 5 I needed, didn't see the other 3 spotted on cw (they were run on SSB), and worked over 50 contacts. Saturday was great. On Sunday, the propagation was not too good, but folks were still snagging counties. I caught several new band counties (40M CW) as well.

The ID QSO party was also in progress with a few spots from fixed stations over the weekend. About 6 counties were spotted, mostly on 20M.

2) WI QSO Party – March 9 – Sunday saw the WI QSO Party. Conditions were flakey. I heard nothing on 20M from TX, and worked a dozen counties on 40 CW from TX. W9MSE, W9KB, NN9K, and many fixed stations out. Caught one new 'band county' on 40cw.

3) VA QSO Party - 3/15-16 another good one! Lots of fixed station activity and mobiles to chase. Propagation didn't cooperate as much as it could, but there were dozens and dozens of spots, and I snagged some on 40M and 20M. Later in the evening, there were dozens and dozens of spots for 80M operation. WA4PGM was one of the mobiles out running counties.

4) 80M night – The first 80M mobile activity night in a while was held the first week of March to encourage mobiles to go out and put out a nearby county. W0QE reported that mobiles KB6TAL, KE3VV, W9MSE, NU0Q, K8ZZ, KN4Y, AA8R, N9JF, AND especially to W0GXQ who did about 2/3 of the NCS work while mobile. I think about 25 counties were activated which was great. Larry is trying to drum up interest in trying to get all of them on 80M. (note de N4CD – I think at least one person has worked all counties on 75M SSB – it used to be a main county hunting band with nets that ran all night long way back when).

5) 30M – Where has it gone? W0QE wrote on the K3IMC forum:

"I really don't have much interest in many of the MARAC awards. I have no intention of applying for MG, prefixes, Indians, Dead Presidents, Bingo 2,3,4,5 even though I have qualified for several of these awards. My real interest is in working the counties on individual bands and maybe doing them on CW once more. I understand many do not feel this way.

I remember in 2004 when N4CD (thanks Bob) suggested we start county hunting on 30m. There were several of us who changed our antennas put out virtually all the counties on 30m in about 2 years. The result was that several mobiles were sharing the load. For myself, this was my most enjoyable time in county hunting. We had a lot of NCS help and 30m became the main CW county hunting band thanks to these folks. W0GXQ, N4CD, K8CW, and myself finished all the counties on 30m in July and August 2006. Since then no one has finished even though I go to 30m in every county I run when 30m is open. Often I get no NCS help at all there. For those who do not help

it may be hard to understand what affect the hard work of a few can have but there doesn't seem to be a lot of new people willing to help either as a mobile or NCS."

Maybe as the higher bands open up again, we'll have lots of enthusiasm for working them all on 17M – that should be a challenge, but hundreds have done it all on 20M, so it shouldn't be impossible to do it – just takes activity by mobiles when conditions improve! During this cycle, I've been concentrating on 40M, filling in the hundreds of band counties needed. It seems most of the CW activity is on 40M – that is where most mobiles start their runs, then QSY to 30/20. Some go to 80M, then 30/20 and if equipped, to 17/15 meters.

6) Mobile Activity

With winter weather, and higher gas prices, mobile activity was down a bit for the month. Ed, K8ZZ, made a nice trip to FL and back, running some rare counties in KY, and then running most of FL before returning home. Sterling, WA7JHQ, made a trip to ID from NM and back, putting out the counties on multiple bands. Both had 80M and were spotted often in the evening/morning hours. Jerry, W0GXQ headed down to IA and back. Gene, WB4KZW, made a trip down south, and many other mobiles made short trips. There were hundreds of spots on 40M SSB and CW, with activity spotted frequently on 30M, and less often on 20M. Don, AE3Z, headed down to VA/NC area for some vacation time, and Bill, KM1C ran around in VA and up into NJ. Jeff, W9MSE, headed to OH and back on a trip. K3EXT was out mobile.

Unfortunately, lots of folks are not making much progress toward new awards as the bands and weather are not cooperating in many sections of the country. Hopefully things will turn around with spring/summer weather and normal driving season, more hamfests to go do, and more vacation trips.

7) Peak Oil News

Gasoline hit $5 in Gordo, CA
http://www.sanluisobispo.com/news/local/story/304197.html

"James Willman seems to be a nice enough guy: polite, good-humored and hard-working, pumping gas seven days a week at the Amerigo Gas Station in the tiny Big Sur town of Gorda, about 35 miles north of Cambria.

This week, as crude oil flirted with $110 a barrel and gasoline prices surged nationwide, a gallon of regular at Amerigo was going for $5.20.

The CHNew also had reports of diesel over $4/gal in ME and SC.

The main arguing points among the 'experts' is whether this is based upon 'fundamentals' or is a market creating due to people fleeing the financial sector and stocks, and buying commodities for inflation protection. In any event, oil futures out for 8 years are all over $100/bbl, so don't expect prices to drop any time soon. We may see $4/gas everywhere by summer. It is already near $4/gal in CA.

8) Channelizing the HF Bands

The FCC is giving serious attention to a recently filed Petition for Rule Making requesting channelization of the HF 'voice bands' bands from 160 through 10 meters. Noting that hams already operate on channels on 6M FM, 2M FM, and 432 FM, through voluntary frequency coordinators, and on the 60M band, the Commission noted that many regulatory problems and interference issues could be resolved by extending the channelization down to frequencies under 30 MHz. The Chairman also noted that the success of channels on the 60M amateur band is a good precedent on how this can be extended. Here, the amateur users operate in between other authorized users with little problems. FCC action is being coordinated worldwide by the ITU which is looking at doing this worldwide.

Part of the drive for doing this is coming from third world countries, which control about half the votes in the ITU and the upcoming WARC meetings that will consider amateur allocations. This will also allow the ITU to 'harmonize' the frequencies of international broadcast stations which are planning on additional channels for digital shortwave broadcasting in the 41M band which overlaps the Region II 40M band (7100-7300).

The FCC has received other petitions urging the use of digital modulation on the amateur bands. Nothing that nearly all other commercial services have gone digital (cellular, PCS, police and fire systems, business radios such as

Nextel), the Petition requests that the FCC provide incentive for amateur operators to adapt the latest state of the art technologies. Having specific channels set aside for digital only operation, not allowing analog, and increasing the number of digital channels over time would force a slow transition of the amateur community to digital modulation. The FCC noted the success of the D-Star radios on VHF, which provide both digital voice and high speed data – both needed abilities for emergency communications in the 21st century.

Part of the reasoning contained in the Petition for Rule Making noted that many new hams have trouble understanding the Amateur Rules. Many are converts from the Citizens Band, where everything is contained on 40 channels. (it was also noted that the current CB band was once an amateur band back in the 1950s). The CB radios allow for easy selection of any given channel. It was also noted that the FCC receives many complaints from amateur operators about people operating 'too close' to communications already in progress. If specific channels were assigned, this would free up Commission resources for more valuable spectrum policing work. With the end of the testing requirement for Morse Code Proficiency, many new people are receiving ham radio licenses and operating only on voice modes.

The Petition suggested 3 KHz channels, starting at the bottom of each phone segment. For example, on the 14 MHz amateur band (called 20 meters), channels would start at 14.150 and be assigned every 3 KHz up to the top of the phone segment, i.e., 14.150, 14.153, 14.156, 14.159, etc. This might cause some long time operations to have to shift frequency slightly. In the future, new ham equipment would come with channel assignments internally programmed so that operators simply switch between the various channels, and automatically avoid operating on frequencies in between the channels. The FCC noted there likely would be no additional cost since radio equipment is already totally digital in frequency generation.

Older radio equipment manufactured without this capability would be grandfathered in. The Petition does not address the band segments containing CW, data, and other modes of authorized transmission.

The FCC is likely to issue a Notice of Proposed Rule Making (RM –04-01-2008) shortly. One area where comments are requested is the number of digital only channels to be assigned after April 1, 2009, and the number of

channels per year that should be transitioned to digital only modulation each year, and which channels in the band segments should be digital only on initial assignment. Look for the Notice of Proposed Rule Making on line. (www.fcc.gov/April1NPRM) Comments are due by April 1, 2008.

Note de N4CD – If channels start at 14.150, then 14.336 would be Channel 62 on 20M. The CW bands would currently be unaffected.

9) Cycle 24 Sunspots

After months of relative quietude, a trio of new sunspot groups appeared this week and they are all growing rapidly. Adding to the tangle of understanding, the new sunspots have a magnetic polarity consistent with Solar Cycle 23 rather than the new cycle, proving yet again that much remains to be learned about the sun. Cycle 24 only starts officially when the number of new sunspots exceeds the number of old ones. Things are progressing very slowly toward the new cycle.

N5UZW Joe & AD4IA Randy

Many days Joe, N5UZW, runs the 40M SSB on 7188 (or 7185) day after day. He received the 'Net Control of the Year Award' last year from MARAC. Scottie, N4AAT, dropped by and visited Joe. Here's a picture of them together.

Scottie, N4AAT Joe, N5UZW

Randy, AD4IA, has been one of the regular net control operators on 40 SSB for many years. Here's his pic from Dayton 2007

Randy, AD4IA

The "Continuous Wave"

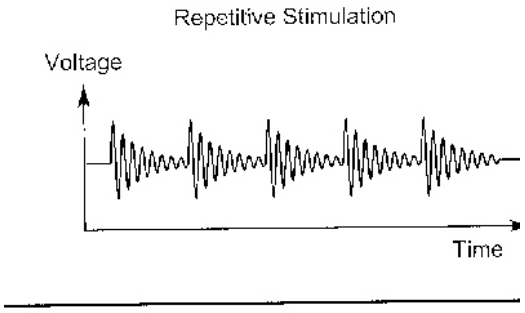
In previous issues, the CHNews covered the development of the spark transmitter and the first basic receivers (coherers, magnetic detectors, galena or carborundum crystals, diode detectors) for receivers. Never seen a carborundum detector before? Me either, until this showed up on Ebay. You never know what will show up there! Did I buy it? No, went for too much money with the rest of the stuff in the lot.

Carborundum Detector – Early Spark Era

Shipboard operators favored carborundum detectors (they often had several hooked up to use) as they did not overload and could not be burned out like pre-packaged galena crystals from being right next to a high power transmitting station, like in a harbor situation. .

As noted previous, the era of spark transmission started at the end of the 19th century with Marconi, and went up to the 1920s. However, starting in the mid 1910s, there was an effort to develop 'continuous wave' transmission.

Spark transmissions consisted of 'damped waves'. This was an r.f. signal that was caused by an electrical spark jumping a gap, with a resonant circuit that determined the frequency attached. Think of the r.f. equivalent of hitting a bell. The circuit 'rang' but the waves died out quickly. By sending multiple sparks quickly (by having an interrupter in the primary circuit) or by having a rotary spark gap, you could generate a series of decaying waves.



Spark Gap Waveform

One of the many problems of spark transmission was the total system inefficiency. First, most of the power was wasted in heat and in putting r.f. on harmonics and wide noise signals. Scaling up systems to generate thousands or hundreds of kilowatts was difficult. A 250,000 KW spark transmitter took a separate room for the equipment, in which no one could be in during transmission as the noise was incredibly loud (deafening) – like lighting/thunder continuously. With the associated power plant capable of generating a half megawatt, facilities were located way out in the boondocks. People wanted ever increasing system performance, and systems got up to the half megawatt level for certain military installations. Most of the energy in a spark gap transmitter was dissipated in the spark gap itself! Very little got radiated on the desired frequency.

Spark used high voltages at fairly low current. You probably know what a spark transmitter sounds like. Just turn off the noise blanker in your mobile rig, rev up the engine to several thousand RPM, and the 'ignition noise' you hear is just like a slow speed rotary spark gap transmitter. Needless to say, it wasn't the most effective way to get messages across, but millions and millions of messages went by spark transmission. The Titantic rescue used Marconi spark equipment.

Early coherer receivers may have required as much as a volt to conduct! That is quite a signal to have at your antenna terminals! "Tuning" was difficult as there was no one frequency containing most of the energy. Thus, the search was on for a system that did not work by requiring a spark gap in order to create RF signals. "Tuning systems" helped, but overall the system was terribly inefficient.

Marconi generated about 8 sparks/second in his system. This provided a train of damped waves as shown in the figure above. The search was on for a system that could provide the equivalent of 1000 sparks per second – or continuous generation of RF. With 5000 sparks per second, it might even be possible to send voice! The rotary spark gap provided faster sparks – but the same problems of massive amounts of energy being wasted persisted, and things flying apart at higher speeds.

There were at least two competing technologies during the early 20th century to provide continuous wave transmission – the Poulson Arc and the RF Alternator.

Fessenden and the RF Alternator

In 1900, alternators provided AC current for limited applications – things like generation of household power (50-60HZ) and for arc lighting where the frequency used might actually be above the audible range (15 KHz) to avoid having a 'singing arc'. (there was gigantic battle between Thomas Edison, who favored DC electrical systems, and Westinghouse/Telsa who wanted A/C transmission and systems. A/C won out eventually.)

Fessenden has worked for many large companies during his first 20 years. He was fascinated by wireless technology and determined to find a better way for wireless other than the simple spark gaps and coherers of the Marconi Company, which dominated the wireless industry. Soon, he invented the liquid barreter, which was 100 times more sensitive than the coherer. It was the 'electrolytic detector'. Unlike the coherer which had to be 'tapped back' after each received spark, the electrolytic detector was 'continuous'. It was the most sensitive detector until the introduction of the triode vacuum tube more than a decade later.

However, like the coherer, all that was heard was a 'click' from the spark. There remained another serious problem to be solved to receive continuous waves. Fessenden solved this by inventing 'heterodyning' – a part of every hams vocabulary. He noted that by mixing another signal close in frequency, say 160,000 with 161,000 Hz, you would then hear a 1000 Hz difference signal – and thus could decode Morse code with a simple earphone connected to a liquid barrater detector. He patented this, and it would turn out to be a critical and much disputed invention of his career.

However, 1900-1915 was the era of the spark, and after 1906 with the invention of the carborundum and galena crystal detectors, there was no need for Fessenden's heterodyne receiver – there were no continuous waves to listen to! His invention was 10 years ahead of the times. The other problem was there was no good device to generate the continuous wave signal for the local oscillator which operated at radio frequencies!

Fessenden had worked for Thomas Edison for years. He learned Edison's exhaustive search technique – try something, optimize it as far as it will go, then move on to something else until you find something that works. Hundreds or thousands of attempts to solve a problem different ways. At first, Fessenden tried to stabilize the electric arc. By using nitrogen to blow out the arc as soon as it formed, he found he could get the arc up to 3 Mhz, but it was not stable and could not provide decent voice transmission – his goal. After months of effort, he rejected it. The search went on for a continuous wave transmission system.

Several electric companies (GE and Westinghouse) were looking to get into the lucrative wireless market. Fessenden selected GE with its chief engineer Charles Steinmetz to build a prototype RF alternator. He hoped to be able to hook the alternator up to an antenna and ground system, and radiate signals directly. He was to be disappointed, as the first GE alternator could only generate RF up to 10 KHz. No one used wavelengths than long (miles). Marconi primarily used 250 and 500 KHz areas of the spectrum.

The main problem was the wound wire armatures, which go only go so fast before they would tear themselves apart from the speed involved. He made the best he could from it, and used it to trigger a spark gap transmitter with quenching added, thus being able to generate 20,000 sparks per second – much better than any other technology. Still, it wasn't where he wanted to be.

He tried again with GE, placing an order for a 25 Kw alternator that would work up to 150 KHz. The task at GE was assigned to a new, Swedish engineer – Ernst Alexanderson. He used a stationary armature winding on a iron core, located between two rotating steel disks, with projecting pole teeth cut into the circumference. This formed an induction type alternator – previously used only at normal power frequencies (60Hz). This prototype alternator put out only 50w instead of the desired 250w at 100 KHz, and

would only operate up to 76 KHz, but Fessenden put in on the air at his Brant Lake station.

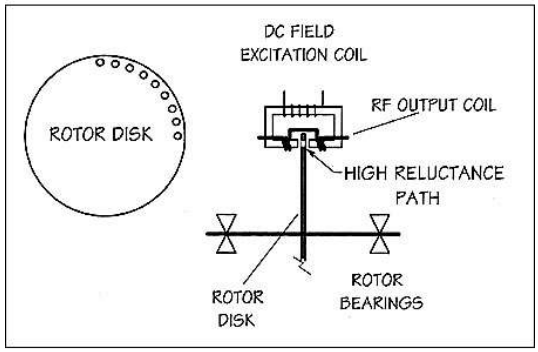


Figure 2. Basic Alexanderson h.f. alternator.

Alexanderson Alternator

With previous patents, Fessenden and some business partners set up the National Electric Signaling Company – NESCO. This was to commercialize continuous wave transmission using Fessenden's patents. At this time in radio history, Marconi owned nearly all the patents for spark technology, making it impossible for competitors to arise. Fessenden was out to show he could do anything Marconi could do, but better. That was to be a tough challenge.

His chain of radio stations used 100 KW synchronous rotary gap transmitters. However, weather often destroyed the large antenna systems of the era, and he wound up with little success. He then turned to radiotelephony, something that Marconi could not do with his spark equipment. Unlike Fessenden, who hoped to sell wireless equipment, Marconi only sold services. You could not buy Marconi equipment. Fessenden's business model changed many times. He succeeded in 1906 with his new high powered alternators. In that year, using 50 and 60 KHz, he demonstrated duplex wireless telephony over a distance of 11 miles.

One problem yet to be solved was the way the signal was modulated. At this time, carbon microphones were placed in the antenna circuits. There was a limit as to how much power a carbon microphone could carry! And how close someone wanted to get to those microphones carrying RF (and not getting an RF burn).

That led to one of the most fabled stories of transmission. On Christmas Day and New Year's Eve, 1906, Fessenden sent greetings to shipboard operators off the Atlantic coast on navy and ships of the United Fruit Company (those using liquid barreters capable of receiving modulated AM signals). This was the first time any of them had heard a human voice through their headphones over the wireless. The alternator was a success.

Fessenden attempted to sell his invention to the telephone companies. Back then, there was very primitive 'long distance' (no electronic amplifiers existed). Radio could provide that service with radio telephony. Unfortunately, internal bungling at Western Electric over the next five years, the procurement arm of AT&T, and the invention of the audion capable of providing repeaters for telephone long distance amplification, led to the near business failure of NESCO.

By the close of 1907, GE had produced a 100 kHz 2 KW alternator. Put on the air in 1909, it provided excellent service and Fessenden was recognizes as one of the most influential and important radio engineers of the era.

GE did put some creative energy into the alternator project – and the Alexanderson Alternator system – consisting of the high power RF alternator, magnetic modulator, multiple tuned antenna, and barrage receiver led to further advancements. By 1917, RF alternators of 200 KW could be produced.

One of the things used by some of the early folks was the passive magnetic frequency doubler. Using saturating inductors, it could take a low frequency alternator and move it up to the RF frequencies above 100 KHz.

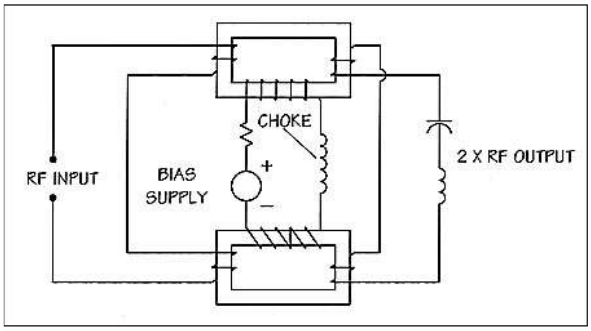


Figure 4. Times two frequency multiplier.

NESCO went into receivership, and Marconi wound up with the rights to use many of the alternator patents. After 1911, Fessenden had little role other than litigant in battles over the remains of NESCO, from suits against him by business partners, and others. He disappeared from the radio scene.

GE wound up with the design and rights to build the alternator, but who would the customers be? They turned out to be few and far between. As noted previously, Marconi would use low frequency alternators for transatlantic service (37 and 55 KHz) but there was little other market for them. Other system technologies were passing them by.

The irony is that Fessenden's most successful transmitter was the rotary spark gap transmitter at Arlington (using his alternator to excite the spark gap). If GE had another 5 years to develop the RF alternator, things might have been different, but a competing technology intervened.

The Poulson Arc

In the Arlington transmitter building housing the 100KW rotary spark of Fessenden's NESCO was a second transmitter. It would prove with 1/3rd the power to be a superior performing unit. It was virtually noiseless in operation, and had only one tiny moving part. Unless you were using one of Fessenden's heterodyne receivers, you could not even tell it was 'on the air'. What did we have here? From this point on, the military would look toward 'continuous waves' as a better system.

So it is off on the trail of history for the electric arc. We start about 1800. Unlike the spark transmitter, which used high voltage fairly low current, the arc used low voltage high current operation. Starting in the early 1800s, people had used carbon arcs for lighting. The brilliance of the arc was impressive although the light was harsh. At first, batteries were the only source of electricity, but after 1875, one could use the dynamo to get the power. The first installations were for commercial buildings, auditoriums, and very large rooms. Trying to scale it down to home lighting didn't work.

Experimenters began to tinker with it. If you fed it a/c, it would radiate sound waves through the air. Some connected a microphone in series or inductively coupled and formed a poor public address system. However, the arc itself was noisy, required high quality electrodes and had to be run at low powers. Physicists were dumfounded by the arc – it apparently violated

Ohm's Law. Every ham knows that the electrical current passing through a device is proportional to the voltage across it and inversely proportional to the inverse of the resistance. In the arc, over part of its range, as voltage across it increased, current through the arc decreased! The arc demonstrated negative resistance!

Experimenters tinkered with the arc, and discovered that if you could make the arc intermittent, so that it would extinguish and then relight itself very rapidly, you could get alternating current out of the arc. Some tried using a blast of air to blow out the arc, others tried a transverse magnetic field.

Duddell discovered that if you put a capacitor across the arc, it would oscillate. He didn't realize his interconnecting leads provided inductance as well, but he was the first to capitalize on having a 'tuned circuit' across the arc gap. Duddell had stumbled upon the arc cw generator – generating an a/c signal from a dc input. This was the" musical arc", and Duddell never got it to work above 10,000 Hz. There wasn't any application to wireless at those frequencies! It was a 'scientific curiosity' that demanded further study.

This led to fascination by others about the 'singing arc'. Unfortunately, as you tried to scale it up, it took larger and larger capacitors to get it to oscillate.

Vladimar Poulson took this a bit further. He accidentally discovered that if you put the arc in the fumes of a spirit lamp, one noted a very significant increase in power. If you added a magnetic field, he could get the arc to operate up to 150,000 Hz (150 KHz). Any hydrocarbon atmosphere would work – ether, alcohol, coal gas, water vapor, or pure hydrogen.

It took scientists quite a while to explain why arcs actually did what they did. Tinkering had exceeded the explanations of science of the day. One problem arose – it was great for telephony (continuous signal) but keying the arc on and off for Morse code was difficult. This was solved later by using frequency shift keying – switching in inductance to move the frequency during 'unkey' periods but leaving the arc running!

The arc generated lots of heat. The arc chamber had to be cooled, either by cooling fins or ventilation of sorts. It was quiet – you could stand next to it.

Next we have the problem of reception. If you try to copy cw on an AM receiver, you hear clicks which are hard to decipher. How was one to copy CW? There were two methods. Fessenden had shown that if you take an oscillator and use it to heterodyne against an incoming signal you could decode the cw as an audio note. (A 'homodyne' receiver as it was called – we'd call it a direct conversion receiver today).

Unfortunately, only a low power arc with all its associated noise was available in the early days of 'continuous wave' as the 'local oscillator'.

One of Poulson's co-workers, Pedersen, came up with the 'tikker'. By 1903, they had designed a working 'cw system'.

A tikker went between the detector and the earphone. It consisted of two small gold wires, one of which was attached to a magnetic device like a old fashioned electric doorbell. This vibrated one small wire against the other, breaking the circuit at an audible rate. For higher speed versions (up to several hundred words per minute) this was magnified by optical means and recorded on photographic film. Later it could be played back for retransmission. Poulson locked up the patents on his arc technology(hydrocarbon atmosphere) and the tikker receiver.

Now it is time for the story of one Cyril Elwell. He graduated from Stanford in California in the early years of the 20th century and worked in metallurgy. On one assignment, he was designing a high power transformer, and while he was waiting for the prototype to be manufactured, he had some time on his hands.

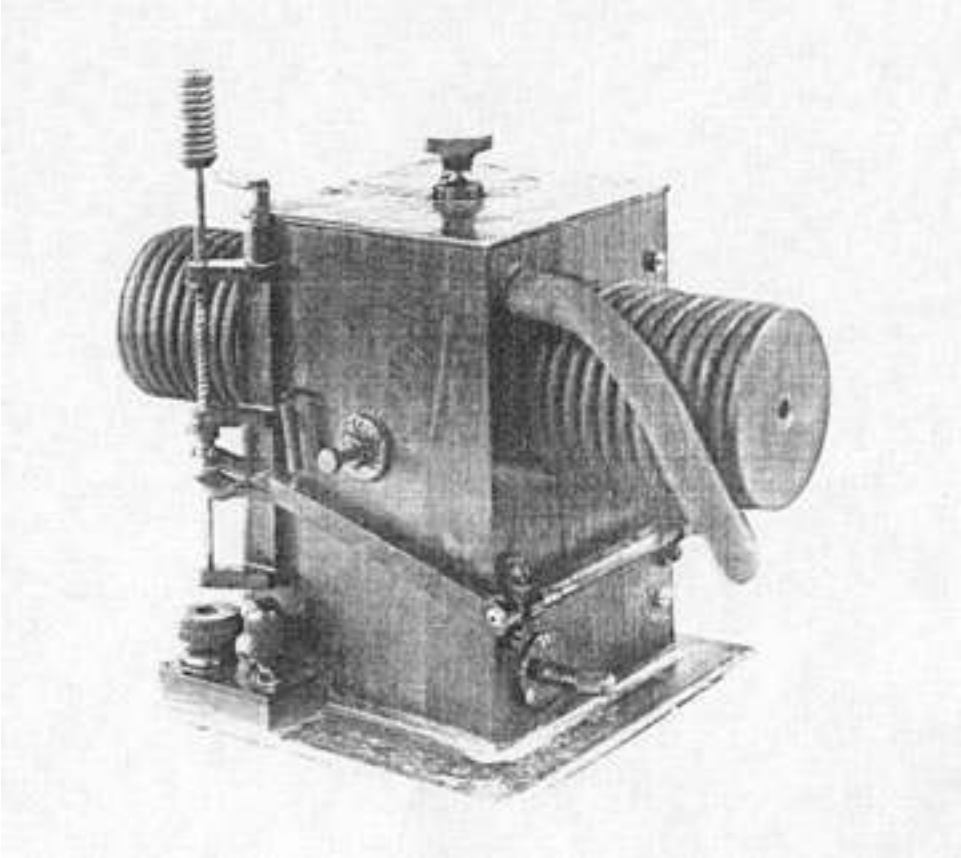
One group of investors in California had sunk money into trying to come up with a local radiotelephone system using spark technology by inventor McCarty. Elwell quickly confirmed what others had found – that using voice over undamped spark transmission just wasn't going to happen over any significant distance. McCarty had died in a car accident. The investors decided to bail out, and offered to sell him the prototype equipment, and all the test equipment they had acquired for the project. Elwell took them up on the offer. Wireless intrigued him. All he needed was a generator of continuous high frequency oscillators that could deliver appreciable current to an antenna to make the system work.

McCarty's spark system actually did transmit voice. If you had the two spark gap electrodes very, very close, so that the spark discharge was practically continuous, the quality of the transmitted speech was reasonably good. The trouble began when you tried to get greater distance by making the spark gap wider, and the sparks became more intermittent and irregular. Then it was useless.

Elwell also knew that GE was working on an alternator that might be the solution to his problem. However, he didn't want to be a footnote in the GE history, and didn't see the rapid advance in alternator technology happening very fast. He elected to try another path and be his own boss. (and find something to patent and make a lot of money).

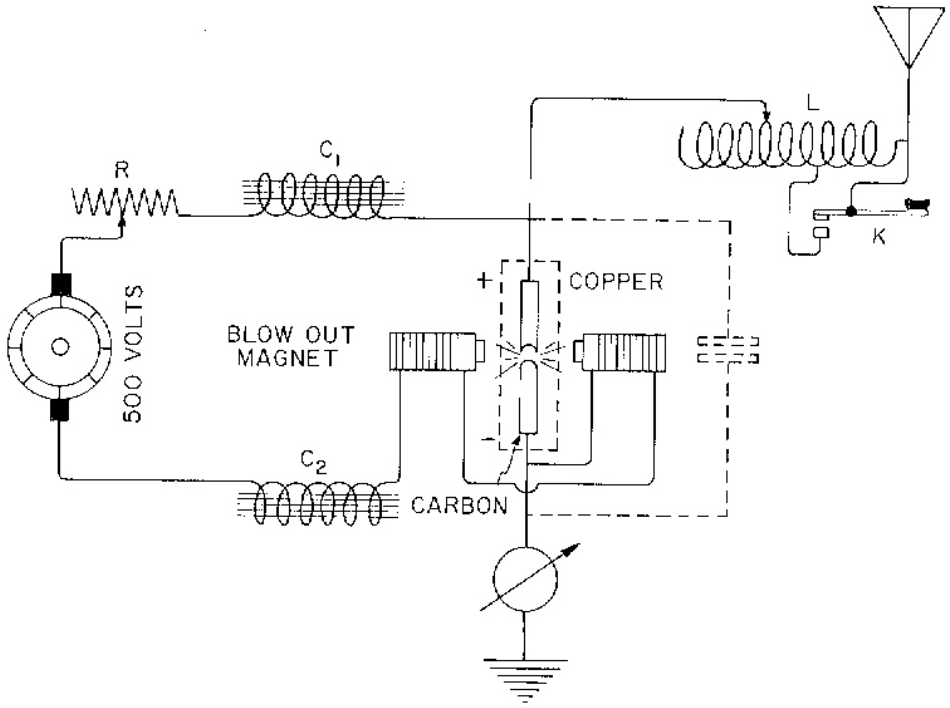
There was one other known way at the time to generate contiuous waves – the oscillating arc by Vladimar Poulson of Denmark. Limited experimental use had been made of it. Fessenden had used arcs in his radiotelephony experiments and Lee de Forest had tried it in his ill-fated radiotelegraph tests in 1907. Poulson had used it for a short range system which did not progress. No one had tried to use the device for really high power long distance transmission.

Elwell had heard of Poulson. He had received won the Grand Prize for Science at the Paris Universal Exhibition in 1900 for his Terragram – the ancestor of the modern tape recorder. Elwell contacted Poulson in 1908 asking what he might sell the USA wireless rights for his arc, offering him $250,000. After negotiations, Elwell had to buy a package of rights for $450,000, payable over multiple years. He returned from Denmark with a prototype 100 watt arc which he paid another $1,000, and placed an order for two larger models. No other party had shown interest in Poulson's patents and there were no commercial deployments. It was a win/win situation for him.



Poulson 10 KW arc converter

Elwell succeeded in attracting investors, and soon had set up a series of stations up and down the California coast. He started to make his own arc transmitters. They consisted of an arc chamber, a motor generator at about 500 w fed through large iron-cored chokes to the arc which burned in an atmosphere of coal gas or alcohol and in a strong magnetic flux. Simplicity was the key initially - low cost. Keying was done by shorting out turns of the antenna inductance – which moved the transmitter frequency (FSK).



Poulson Arc Transmitter

In those days, business was cutthroat. Fraud was rampant in the investment community. Stock schemes defrauded many of hard earned cash. Elwell managed to lose control over most of his patents via schemes by others to buy out the original investors, set up other companies to buy out this and that. Before long, Elwell had very little stake left in his original California company and his patents. The original company turned into the Federal Telegraph Company. From then on, commercial operators knew the transmitters as "The Federal Arcs". From 1911 on, Elwell came up with bigger and bigger arc transmitters – 30KW for long distance communications – CA to HI, and further. Federal began to give Marconi competition for long haul traffic. The demonstration at Arlington in 1911 convinced many that spark's days were numbered. Elwell left Federal in 1913 and went on as a freelance engineer.

Federal lacked a sense of direction. It had two groups working, including Lee de Forest working on audions. A new engineer, Fuller, succeeded in building 60KW and then 100KW arc transmitters. The annoying Marconi 'four 7s' patent became a big issue – 'tuning'. Marconi would not license it

to others. By 1917, the Navy was running a 500KW arc transmitter at Pearl Harbor. By 1919, it had a megawatt arc transmitter ready for operating in France. That was as high as arc transmitters got. The 500KW and megawatt versions weighed 60 tons and 85 tons each! This was not something you could build in your garage!

The Europeans were not far behind in arc development. Major companies like Telefunken and Lorenz provided systems where patents were not a problem.

The one organization you might expect to have rapidly adopted the arc or continuous waves was Marconi. Instead, they usually did everything they could to stymie the advancement of non-Marconi technology. Marconi had long had a reputation for refusing to interconnect with companies using non-Marconi equipment. He would not license his patents – wanting only to sell services using his equipment. That would come back to haunt them big time with the outbreak of WW1. The USA simply confiscated and used all wireless patents during WW1 from Federal and the Marconi USA subsidiary. The Navy did return the patents to Federal after the war, but not to Marconi! More arc stations were set up for five more years, but vaccum tube technology had advanced tremendously. The US assigned Marconi's patents to GE, which formed RCA – the Radio Corporation of America.

After WW1, the entire radio scene changed. Broadcast radio started, and vacuum tubes were now ready for prime time. The invention of the regenerative receiver, super regen receiver, vacuum tube oscillator, and super heterodyne receiver in the 1910s, but waiting for decent vacuum tubes, would lead quickly to the obsolescence of spark, alternator, and arc technologies within a decade. The 'broadcast' industry after WW1 had to have continuous wave AM transmitters and receivers.

For the first 20 years of the 20th century, the spark and arc ruled supreme. By 1930, they were footnotes in history. The perfection of the audion, from lab curiosity to common household use, led to availability of devices at reasonable prices to build 'continuous wave' systems effectively. Spark and arc were outlawed in mid-20s.

Note: Early hams used primarily spark – arc transmitters were difficult to build at home (requiring castings). Up to the mid-20s, hams relied upon

various forms of spark gap transmitters. As vacuum tubes (audions) became available, hams moved quickly to 'continuous wave'.

References

Aitkin – The Continuous Wave

http://hjem.get2net.dk/helthansen/poulsenarc.htm

BBC Ends Shortwave English Broadcasting

The BBC World Service, which started its shortwave transmissions to listeners 75 years ago, ended its last English-language shortwave services in Europe on Monday. The British public broadcaster has been reducing its shortwave transmissions over the past seven years, eliminating services to North America and Australia in 2001 and South America in 2005. Last March, the BBC started reducing European transmissions, finally cutting off a transmitter that reached parts of southern Europe on Monday.

"There comes a point where the shortwave audience in a given region becomes so small that spending money on it can no longer be justified," the BCC spokesman said in a statement.

Modern modes of communication have been squeezing out shortwave services in Western countries, where programming is available on FM radio, on the Internet and on iPods with wireless connections.

"Europe is very developed and so is America," said Michael Gardner, a spokesman for BBC World Services. "Shortwave is not the best way of reaching those audiences there. They all have FM, AM stations close by. Some of them have satellites or they can pull it down on their TV screens and there are alternatives on line. There are lots of ways of interacting with the BBC."

Simon Spanswick, chief executive of the Association of International Broadcasters in London, said that the move by the BBC "probably sounds the death knell for traditional analogue shortwave broadcasting in the developed world."

Shortwave transmissions remain an important media outlet in Africa and Asia, he noted. Since 2006, the BBC World Service shortwave audience has grown by 7 million people, or 7 percent, to 107 million - about 58 percent of the BBC's total radio audience.

But in developed countries, Spanswick added, "nobody really uses shortwave radio any more to listen to content produced on a big scale."

All of the world's largest international broadcasters, based in the United States, France, Germany, England and the Netherlands, are cutting back on shortwave or reviewing the deployment of their resources.

Andy Sennit, a media specialist with the Dutch public broadcaster, Radio Netherlands Worldwide, said that he got his start 30 years ago working on BBC shortwave broadcasts and had mixed feelings about the end of the transmissions.

"For die-hard shortwave listeners, this is negative," he said. "What they don't understand is the huge cost of powering transmitters. The cost of diesel fuel has doubled."

Radio Netherlands has also cut back its shortwave services in English and has considered shutting down some transmitter stations, he said.

Jonathan Marks, a former radio executive and consultant for international broadcasting, said the decision by the BBC was simply another sign of shortwave radio's "long, slow fade."

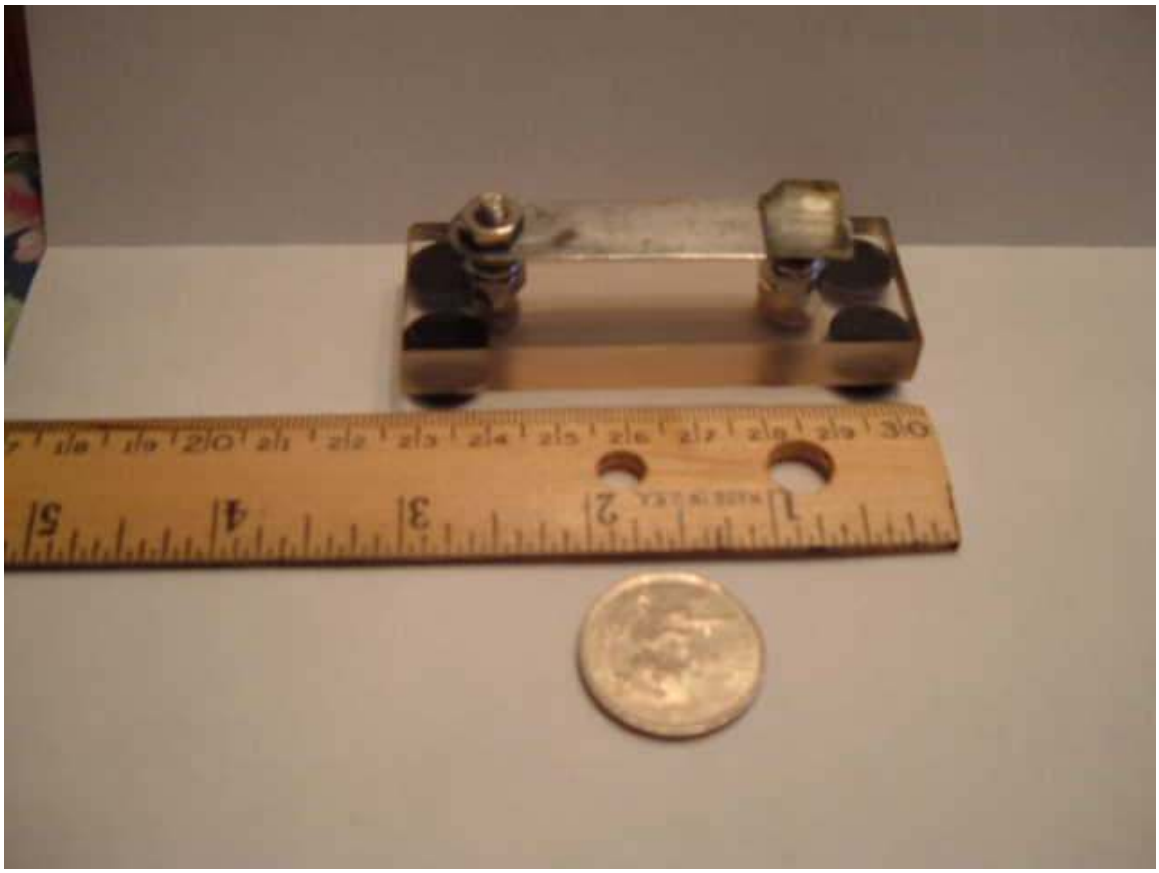
"A major broadcaster has pulled the plug on a major continent," he said. "It indicates that the BBC no longer sees it as a viable medium."

Homebrew Mobile Key – AE3Z

This is what happens when we get bored on these long winter months and more importantly, you just can't find what you need... hi..

I have a "small" S-10 Chevy Pickup, regular cab and it's a challenge to get a radio mounted in one of them things along with the tuner, external speaker and find room for a CW key. There is no room under the seats, and very limited room behind the seats... I tried various things and nothing worked out because of the space. I just couldn't deal with a full size key of any sort. I looked everywhere for a miniature CW key and couldn't find anything that suited me for the price I wanted to pay. So, I built my own..!!

It's mounted on a piece of 3/8" thick Lexan (not plexiglas) with all stainless steel hardware. The "swiper" is a blade from old set of spark plug/points gauges which I've had since back in the 50's (when we had points and plugs...). This blade is stainless "spring" steel and literally impossible to bend.. (I've tried it..!!) and the spacing is adjusted with two locknuts where it's mounted... So, if you hear me on the CW bands from my little Red Truck, this is what I'll be using...



AE3Z's Homemade CW key – Winter Project

Hillsboro, NH?

Jeff, N1ESE, the contest manager for the TARA Skirmish (digital contest) posed the following question. Curious minds want to know -

"My main issue is with Hillsborough County, NH and why powers that be chose to rename it on all the CH lists to HILLSBORO. Since inception back in the late 1700's, it has never been "Hillsboro" and there never will be. No other radio organization or club, even the ARRL, has ever felt the need to rename my county and wondering why CQ Magazine or whomever chose to do this.

Honestly, I didn't notice it until a new version of the logging

software I was releasing yesterday and one of the changes was to "fix" Hillsborough County, NH to match the county hunters ADIF standard of Hillsboro. As someone born and raised here in Hillsborough County, with a long family history as residents and employees of the county, I was a bit taken back and very curious as to why this is.

I know that this is a minor issue to get worked up about and I'm not really that worked up about it but I would like to better understand the history behind this. If folks in charge to see a way to correct this, that'd be an added bonus but I know how some of us can be resistant to change.

Thanks again.

- JT"

I did some research to dig into this situation. It seems the very first County Book by CQ Magazine, and the very first Counties list by the Certificate Hunters Club, called it 'Hillsboro, NH". There is a town of Hillsboro Junction. There is one ancient map on line that calls it Hillsboro, but all the other maps you find on line and in person call it Hillsborough. Of course, the CW ops always tend to shorten things. This seems to be the only county in the country where county hunters spell it different that what the official designation is. Of course, you'll search all over Hawaii to find a map that lists Kalawao County – the locals call that area Kaluappa. As far as I can tell, every version of the Coloring Books, no matter the source (B&B, N4UJK, others) and every version of a County Hunting Record Book list it as Hillsboro, NH.

Peak Oil News

1) Gulf of Mexico - from Financial Times

"Disappointing oil exploration results in the Gulf of Mexico are upsetting the hopes of US oil majors for big new findings in an area free from interference by foreign, state-owned oil companies. Wood MacKenzie, the energy consultancy, said in a new report that findings in the Gulf in 2007

were the lowest of the past decade. With a total of 553m barrels of oil equivalent, these new reserves were less than half of what was found in 2006.

The deep-water Gulf of Mexico is one of the few areas to which the majors have access without the fear of intervention by state-owned oil companies. National oil companies now control more than 80 per cent of the world's oil.

"The Gulf of Mexico represents what many companies believed was the safest, most prospective area open to them in the world,'' said Robin West, chairman of PFC Energy, the consultancy. According to the report, exploration in the Gulf deep-water region is becoming more costly. The average quantity discovered per exploration well decreased in 2007 to 16m barrels of oil equivalent – well below the 10-year average for the region of 26m barrels of oil equivalent per exploration well.

Rex Tillerson, chairman and chief executive of Exxon Mobil, the world's biggest private oil company, said: "When you are dealing in that kind of water depth, you need to try to get about a billion or so (barrels) under a facility to make it work." With a couple of notable exceptions, he said, most of the industry's discoveries had been 100m barrels – some less, some slightly more. BP projects its Thunder Horse project in the Gulf of Mexico will yield 1bn barrels, but it has been beset with a host of problems delaying production."

2) Alberta Oil Sands – from Financial Times

"Canada has warned the US government that a narrow interpretation of new energy legislation would prohibit its neighbor buying fuel from Alberta's vast oil sands, with "unintended consequences for both countries".

In a letter to Robert Gates, US defense secretary, Canada said that it "would not want to see an expansive interpretation" of the Energy Independence and Security Act 2007. A copy of the letter, from Michael Wilson, Canadian ambassador, and copied to Condoleezza Rice, US secretary of state, and Samuel Bodman, US energy secretary, has been obtained by the Financial Times"

It seems that the 'greenies' in the USA are attempting to force the USA to buy 'alternative fuels' only from sources that produce less CO2 per gallon made than getting 'conventional oil'.

3) World Oil Production – Matt Simmons

The most troubling piece of historic oil supply data available in the public domain comes from the US Department of Energy's Energy Information Administration (EIA). Every month, the EIA publishes its best estimate, on a country-by-country basis, of the world's crude oil and condensate supply. This supply ignores natural gas liquids, biofuels and refinery processing gains, even though all three now plug a critical gap between crude oil supply and how the world satisfies total petroleum demand.

This seldom-scrutinized set of EIA crude oil production data is not perfect, but it is as accurate as any other estimate in the world. What the EIA data interestingly shows is a steady growth in crude oil output until world crude output finally blew through 70 million barrels a day, setting a new annual record of 72.5 million barrels a day in 2004. Soon this all-time high crude output sputtered. For 9 out of 12 months of 2005, it remained in the 73 million-per-day range, only exceeding 74 million barrels a day in April, May and finally December. The all-time crude oil output record, as best we now know, was realized in May 2005, when the world produced an average of 74.3 million bpd of crude. This peak quickly slipped under the 74 million-bpd level. Ironically, this record was set in the same month that Cantarell, Mexico's giant oil field, peaked and then went into decline.

Average world crude production in 2005 was 73.8 million bpd. In 2006, it fell to 73.5. Preliminary data through August 2007 indicates the seven-month average was 73.1 million barrels per day. Reported 2007 crude production slid to 72.8 million in June 2007, and then 72.5 million in August 2007. Is this slide over? If it is not, it becomes hard to envision getting back to the May 2005 record, let alone sustaining the production growth needed for global petroleum use to cross 90, let alone 100 million barrels per day.

Could this May 2005 record be the point at which global crude oil production peaked? The answer to this should become obvious within a year or two at the most. Oil supply analysts at the EIA shrug off this peaking as simply being typical of how crude oil output climbs in spurts, only to retreat and then be followed by yet another spurt.

4) Natural Gas – from Houston Chronicle

Russia is forcing Exxon Mobil to abandon plans to export natural gas to China. Nigeria is requiring explorers to share output with its citizens. Indonesia will cut sales to Japan. Countries holding almost half the world's gas are curbing shipments to meet growing domestic use, hurting importers from the U.S. to Japan. Prices for the heating fuel may rise 50 percent within five years on the New York Mercantile Exchange as a result. Natural-gas use is rising 2.5 percent a year, three times the rate for oil, according to BP Plc statistics.

In Russia, the energy ministry told Exxon Mobil in August that gas from the $17 billion Sakhalin-1 project off the nation's eastern coast should be sold into the domestic market, not exported. Russian President Vladimir Putin wants the gas to feed an economy that's growing 7.6 percent annually.

Demand for LNG, or gas chilled for shipment in tankers, is the industry's fastest-growing business, with growth of about 10 percent a year, Shell and Total estimate. Compared with fuel oil, natural gas costs 18 percent less, based on the amount of energy in each fuel.. Natural gas in New York may rise to $15 per million British thermal units by 2013.

Indonesia lost its top ranking as an LNG exporter to Qatar in 2006 as Southeast Asia's most populous nation diverted exports to meet soaring domestic needs. The economy grew 6.2 percent in the three months ended Dec. 31, near the fastest pace in 10 years

Increasing demand and a lack of supplies meant that Japan and South Korea this winter paid more than double the U.S. benchmark gas price to attain cargoes from as far away as Trinidad, the biggest LNG supplier to the U.S. U.S. natural gas futures for delivery at the Henry Hub in Louisiana have risen 29 percent so far this year on the New York Mercantile Exchange, outpacing a 9 percent gain in benchmark U.S. crude prices.

5) Skrewbowski on Oil

A gloomy forecast about the future of the oil industry — looking forward to a possible Doomsday within a very few years — was given to the Sub-Saharan oil, gas and petrochemical conference in Cape Town on Tuesday.

Chris Skrebowski, a researcher for the Energy Institute in Britain, told delegates that the oil supply will peak in 2011 or 2012 at around 93 million barrels a day, that oil supply in international trade will peak earlier than the oil production peak, and he forecast: "There will be supply shortfalls in winter before peak."

Skrebowski said that latest BP statistics showed that peak is already happening in some regions. "OECD production peaked in 1997 and has now declined by 2.2 million barrels a day (10.4 percent)," he said. "Non-OPEC, non-former Soviet Union production peaked in 2002, and has now declined by 771 000 barrels a day (2.15 percent). North America/Mexico peaked in 1997. North Sea — UK/Norway/Denmark peaked in 2000 and has now declined by 1.6 million barrels a day (25.4 percent)."

Producers are in decline

The figures show, he said, that around 28 significant producers are in decline, and that about 35 percent of global production comes from the decliners. Once that figure reaches 51 percent "we reach global peak oil", he said.

Peak oil will be earlier than most expect, Skrebowski told delegates. And he explained that global production falls when loss of output from countries in decline exceeds gains in output from those that are expanding. And he cited eight key pieces of evidence that we are close to peak: a falling discovery rate; few large discoveries; ever more countries in sustained depletion; companies struggling to hold production; non-geologic threats to future oil supply; the current lack of incremental flows; few countries with real growth potential; the age of the largest fields; and sustained high oil prices

"The oil companies are already struggling to hold production," he said. "In the third quarter of 2007, only Total recorded oil production gains. **For the last 12 quarters oil production has drifted down for the five super-majors; has flat-lined for the 10 largest quoted companies and has flat-lined for the 24 largest quoted companies. Quoted companies' share of production is now declining, notably for the super-majors."**

Non-geologic threats to oil supply

The non-geologic threats to future oil supply flows include resource nationalism in Russia, Venezuela, Bolivia and Ecuador, with perhaps more to follow; civil insurrection in Nigeria and Sudan; and cost inflation, ageing infrastructure, lack of skilled people, refinery constraints.

"How likely is improvement in any of these?" he asked. And he wondered: "Who will cap or ration production first?" The world's biggest oilfields are old, tired and fading, he said. Of the 120 largest fields, 50 are in decline, 44 not in decline, 12 unclear and seven are undeveloped. The average age of the giants is 42 years, but the 120 largest fields give 50 percent of total production and contain two-thirds of resources.

Source: http://business.iafrica.com/news/306952.htm

6) Airlines

Did you notice that Delta airlines failed in its merger with Northwest, and now is planning on offering early retirement to HALF of its workers? High jet fuel prices are about to wipe out much of the domestic airline industry. Nearly all the carriers are planning 10% cutbacks (or more) in service, and mothballing older, inefficient planes. Airline fares have gone up $10 a month for the past six months, and likely will continue to rise.

From CNN:

“Delta Air Lines said Tuesday it will offer voluntary severance payouts to roughly 30,000 employees - more than half its work force - and cut domestic capacity by an extra 5 percent this year as part of an overhaul of its business plan to deal with soaring fuel prices.

Executives at Atlanta-based Delta said in a memo to employees that the airline's goal is to cut 2,000 frontline, administrative and management jobs through the voluntary program, attrition and other initiatives.

A spokeswoman says that if more than that amount agree to take the voluntary severance, it will be allowed. The severance program primarily affects mainline Delta employees.”

Aloha Airlines has filed for bankruptcy protection (again). Hawaiian Airlines was in bankruptcy 3 years ago.

7) Pemex – Just when you keep reading that Mexico has lots of potential undeveloped oil in the Gulf of Mexico:

"**Mexico will divert a portion of state-run Pemex's exploration budget to cover other financial needs, according to Mexican media.**

The Mexican newspaper El Universal reported that the Finance Ministry would "reassign" funds the company was planning to use to explore for oil and gas for other programmes.

The newspaper's website said that the government reduced the exploration budget to cover administrative spending, among other things.

Pemex is Mexico's cash cow, providing nearly 40% of the federal government's budget. What's not clear is if the lower budget will complicate the state-owned company's ability to find new reserves at a time of sky-rocketing oilfield services costs. "

Pemex has been looted by the government to pay for all sorts of social programs and is in terrible financial shape (horrible debt loads). Don't count on any new oil from Mexico soon.

Source: http://www.upstreamonline.com/live/article151046.ece

8) Gulf of Mexico - Why is oil getting more expensive?

"**Australian producer BHP-Billiton has removed all personnel from its Neptune tension leg platform (TLP) in the deep-water US Gulf after inspections discovered 'anomalies' in the facility's hull.**

According to BHP spokesperson Teresa Wong, visual inspections being conducted in advance of planned start of production from the Green Canyon block 613 platform found the 'anomalies', which she added have not been fully defined.

The facility is located in about 4250 feet of water.

As a safety measure, BHP pulled the project personnel working on commissioning of the SBM-Atlantia-designed mono-column TLP while additional surveys are being undertaken to discover the source and nature of the 'anomalies'.

According to Wong, a number of teams are working at the facility to determine the next course of action. She added that BHP hopes to know more about the situation early next week.

The 5900-ton hull of the Neptune TLP was built at the Port Arthur, Texas, facility of Signal International. The project was the first of its kind for the fabrication yard.

The $1.1 billion Neptune project has been a source of cost overruns and delays, and was most recently due to come on stream during the first quarter."

Many of the major new production platforms in the Gulf are running into multiple billions, and delays of years and years, running costs up right through the roof. The Thunder Horse Platform is over 5 billion and counting now. The "Jack" field may never be developed – too much cost for not enough oil.

Source: http://www.upstreamonline.com/live/article151049.ece

Power Tunnel Diodes

If you look at a modern solid state CW transmitter, it takes hundreds of parts to get any appreciable power. Back 4 or 5 decades, you could build a 50w transmitter with maybe 12 parts – one tube, one quartz crystal, one tuned circuit consisting of an inductor and variable capacitor, one RF choke, and a

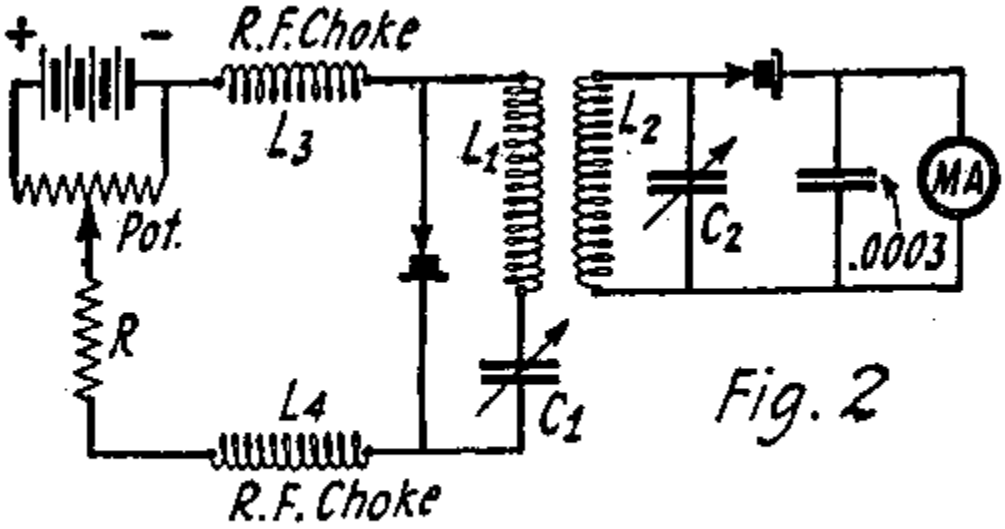
handful of resistors and capacitors. It was simple to homebrew a transmitter or to build a simple kit. The development of power tunnel diodes might makes this possible once again with solid state devices.

Hams have used 'negative resistance' devices for many decades. Many do not think of this as they look at various circuits, but the use of 'negative resistance' has been an extremely valuable tool for radio engineers for over a century starting with the Poulson arc – and it got up to power at a megawatt with only a handful of components! Then various forms of tube oscillators were designed, then into solid state. Look inside a modern SS transceiver, and there are thousands of components. Even a simple QRP rig is likely to have a hundred components.

If you go back in history to 1924, you will see Russians experimenting with the predecessor of the tunnel diode back in the 1920s.

http://earlyradiohistory.us/1924cry.htm

"Oscillating crystals are not new since they were investigated as far back as 1906 by well known engineers, but it was not until lately that a Russian engineer, Mr. O. V. Lossev, succeeded in finding some interesting uses for oscillating crystals. The construction of the apparatus by means of which oscillations may be produced with crystal as a generator seems quite simple"



The amount of energy produced by the oscillating crystal may be measured with a microammeter connected as shown in this diagram.

Amazingly, experimenters in the USA also made up a regenerative receiver using this, but the primitive crystals used (very poor quality) made it difficult to 'adjust' the set. See the link for details on the crystalodyne receiver! What people had found was 'point contact' diodes, but they didn't realize it at the time, or what the impact would be later. Add a second wire to the crystal surface, and you have the basics of a transistor! This was back in the early 1920s! Some did that, but didn't realize what they had, and with two very fine wires trying to find 'hot spots' on a crystal, and keep them there, things were extremely difficult to keep in operation. One bump and things didn't work any longer.

In another article at:

http://earlyradiohistory.us/1924sens.htm

"A curious fact about the new Crystodyne Principle is that it operates exactly as an arc transmitter. While at present only the crystal zincite in connection with a steel point gives the real results, there is no question but that other combinations will be found that will work even better….. It will take many years for the Crystodyne Principle to be adopted in our radio sets. Three to five years may be necessary before that is brought about.

Right here we must sound a note of caution. It must be understood that, for the present, the invention is practically confined to the laboratory and the up-to-date experimenter. It has not become perfected sufficiently to enter into the commercial stage. This lies in the future. As wonderful as the invention is, it still has all the troubles and weaknesses of the crystal. There is the usual cat-whisker contact and the usual elusive sensitive spot. Once the contact is adjusted the Crystodyn*e* works well, but a knock or jar may put the circuit out of commission."

That problem with adjustment, plus never finding the 'right material' within the next few years, sidelined the crystodyne invention for the next 30 years.

One statement at the end of the article was right on:

"Future improvements of the Crystodyn*e* will probably be along the following lines: perhaps in some form of a synthetic crystal or perhaps some crystal arrangement in a vacuum that is just as fixed as is the present day

vacuum tube. There will then of course be no necessity for cat-whiskers and adjusting means."

Would you believe you can still get copies of the original articles on Ebay?

http://cgi.ebay.com/1924-The-Crystodyne-Principle_W0QQitemZ330215022651QQcmdZViewItem?IMSfp=TL0802260952a16652

Amazing! If you know what to look for!

More links on the crystadyne (or crystodyne or crystaldyne) applications, including basic heterodyne (direct conversion) receivers in the 1920s!

http://www.a-reny.com/iexplorer/cristadyne.html

To have a circuit oscillate, you must excite a tuned circuit. A typical tuned circuit has some finite losses. If you put an impulse of energy into a tuned circuit, it will ring – just like striking a bell – and the output signal will quickly decay. In order to get continual signal out, you must overcome the losses in the tuned circuit. The primitive arc converter did that by converting some of the DC energy into RF by exploiting the negative resistance characteristics of the arc itself. The arc was allowed to start, then quickly extinguished, started again, and that excited the tuned circuit. It was self limiting as at some point as the current would again start to rise.

There is a good description on Wikipedia of this at:

http://en.wikipedia.org/wiki/Negative_resistance

Now keep in mind there are no resistors you can buy with minus 10K ohms value. You are operating on a device curve that has a negative resistance region – it still takes an active device to do this. Various forms of tube oscillators did this – canceling out the small but finite resistive losses in the tuned circuit so that oscillations could build up, and be maintained at the desired level.

For hairy math explanation of negative resistance oscillators, see

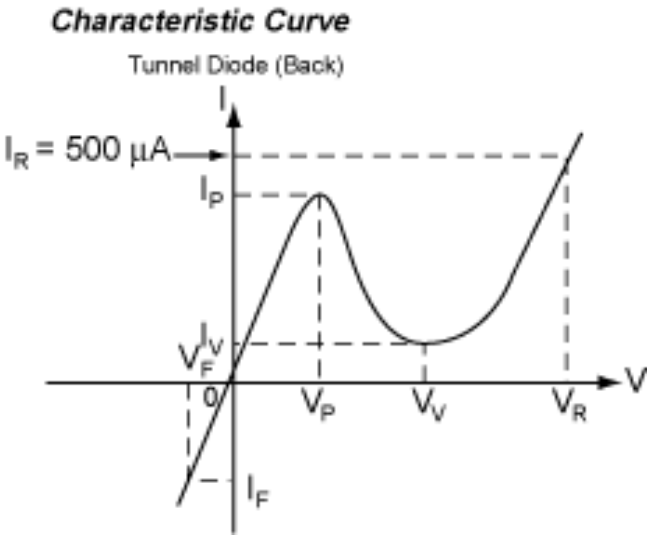
http://www.st-andrews.ac.uk/~www_pa/Scots_Guide/RadCom/part5/page1.html

Just to go off on a tangent, did you also know that Oleg Losev (**Oleg Vladimirovich Losev** (Олег Владимирович Лосев) (10 May 1903 - 22 January 1942) also wrote a two page paper on the Light Emitting Diode in 1927?

http://en.wikipedia.org/wiki/Oleg_Losev

"In course of his work as a radio technician, he noticed that diodes used in radio receivers emitted light when current was passed through them. In 1927, Losev published details in a Russian journal of the first-ever light-emitting diode." Wow…that was 4 decades before LEDs were 'rediscovered' and commercialized! In the 1990s, he was finally recognized for his pioneering work in LEDs.

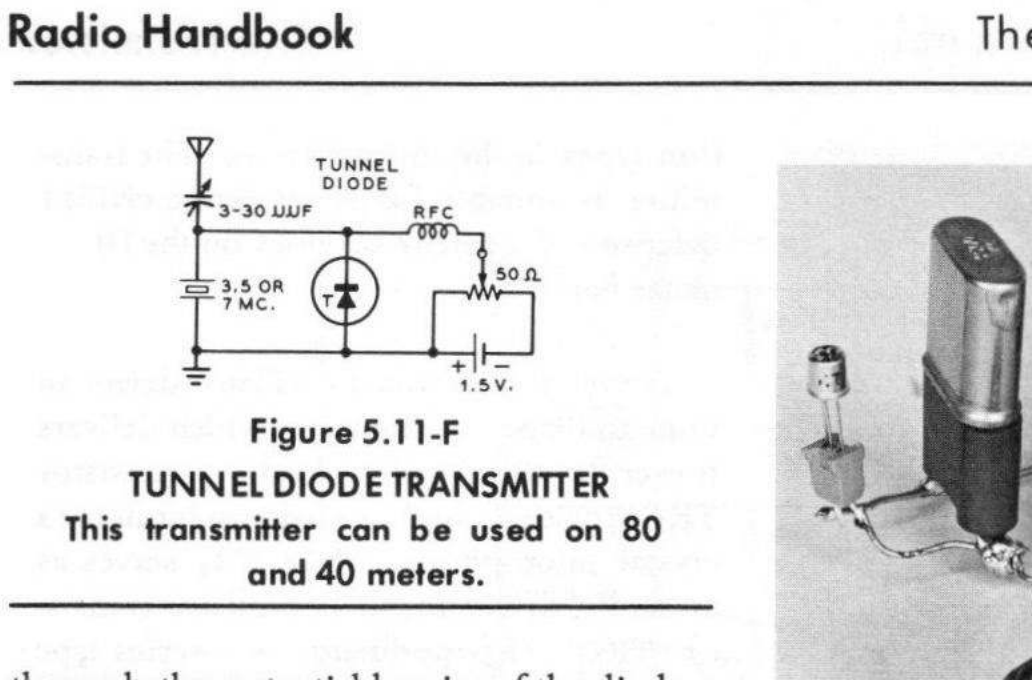
With the introduction of solid state in the 50s and 60s, a new type of device came out – the tunnel diode – invented by Esaki at Bell Labs. (Well, actually let's call it what it was – the **rediscovery** of negative resistance diodes!) This device also had a negative resistance characteristic – here is a typical curve for one:



Tunnel Diode Negative Resistance Curve

You will not that as voltage increases, at Vp the current begins to decrease! Between Vp and Vv, the diode exhibits negative resistance. Esaki later won a Nobel Prize for his work in researching and explaining the phenomena of 'tunneling' in solid state devices.

One can use this to make simple transmitters. Here is a VERY SIMPLE tunnel diode transmitter from a 1950s Manual:



There are only a handful of parts required. This unit just puts out microwatts – as the state of the art in the 1950/60 era wasn't advanced. Heathkit offered a 'Tunnel Dipper' – a solid state replacement for the Grid Dip Oscillator.

The tunnel diode would work up to the tens of Gigahertz and saw service in microwave systems, garage door openers, and other low power applications. IMPATT diodes were similar using this principle that allowed microwave multiplication up to 60-80 GHz. Tunnel diodes were superb and quick switches for computer type applications. With the high quality material available to the industry, it was much easier to make thousands of thousands of working diodes, although yields were often disappointing, sometimes only 10% of the entire batch worked as desired.

The development of GaAs transistors and high speed conventional transistors sidelined further development of the tunnel diode in the USA. One could easily build increasing numbers of transistors on an integrated chip, but this proved elusive with tunnel diodes due to manufacturing technology at the time. So again, tunnel diodes got to be 'forgotten'.

FAST FORWARD TO 2008 – Time for our yearly April technology update.

Super tunneling in tunnel diodes - new discovery!

Lately, new articles have revealed major advances produced by the Russians during the Cold War. While the USA moved rapidly toward miniaturization and integrated electronics, the Soviets retained tube technology in vehicles and airplanes, and used only early solid state devices. The vacuum tube actually survives better in a nuclear war as it has high EMP immunity. (Electro Magnetic Pulse). At the same time, they improved upon tunnel diodes creating the 'power tunnel diode' capable of tens or hundreds of watts of power.

An article by the Russian ПУСТАЯ БОЛТОВНЯ* written April of 1980 was recently translated by several German ham radio operators. While the USA abandoned further research, the Russian scientists perfected the ability to put many tunnel diodes on a single chip. They then took the normal low power of each, and combined them on the chip in combinations that stacked over 1000 tunnel diode units. While each tunnel diode can only put out milliwatts, by paralleling/stacking thousands of them on a chip, you create useful devices for RF power. You'll note in the 60s article above, the UD made unit ran on several hundred millivolts. The Russian integrated power tunnel diodes run on 10V as they were designed for mobile military applications running off regulated 10V power supplies. That makes it perfect for ham use. While the original Russian tunnel diodes cost hundreds each to make (MIL SPEC) , today there is no military application for them, and they are 'cold war surplus' at bargain prices.

Now, Esaki had discovered the principle of 'tunneling' in semiconductors. This meant that when electrons and holes tried to cross boundaries between layers, they encounter a 'wall' and have to have enough potential to get over that wall. That is why on your silicon diode you have a 0.7v drop. It takes that much voltage to get the diode to conduct (current to flow). With tunnel diodes, the electrons 'tunnel' through the wall, resulting in conduction at

much lower potential levels, and other interesting characteristics such as a negative resistance area. That is well established.

One Russian scientist discovered that if insert a third element at the boundary level (make a 3 dimensional corner), you will get what he called super tunneling. By controlling the voltage at the third part of the corner (where two other sections come together at a right angle, you find that it 'modulates' or controls the level at which the tunneling occurs. You get the equivalent of a transistor which has 0.7v drop and no negative resistance region but using diode construction and having a negative resistance region.

That allows for making very high power tunnel diodes with a control element with very low voltage drop across them – which means they dissipate very little power per diode. In addition, just a tiny voltage on the control element will control amps of current through the power diode.

While this isn't anywhere near a linear process, it does allow for interesting possibilities. By using a very small signal, you can frequency lock the high power tunnel diode oscillator to a stable crystal oscillator or VFO. I tried a smiple xtal osc driving the power tunnel diode RF section. That works amazingly well.

Getting some of the Russian tunnel diodes wasn't too much of a problem as they are now readily available in Europe at hamfests (along with all their old military tubes and newly made replacements for just about every old American tube! They never shut down their tube factories from 40-50-60 years ago!). Once you figure out that Без перевода means tunnel diode, you are home free.

The circuit I used is similar to that above – a tunnel diode on a heatsink, with power lead RF chokes on ferrite rods, and link coupling to the output circuit to drive a 300 ohm feedline. The circuit in the recently translated article was amazingly simple to that used in the 1920s. Of course, 60 years later, the technology to build the power tunnel diodes has leaped ahead.

I tried the circuit that showed a simple 50w output transmitter using about the same number of parts as a Heathkit DX-20 – but limited to one band so that I didn't have to get involved in bandswitching right off the bat. I used plug in coils from the 1950s era – made it easy. For the main readers of the CHNews who are CW ops, they will appreciate that the power tunnel diode

operates in Class C mode – and is difficult to linearize, so it won't be popular with the SSB crowd, or with most manufacturers of ham gear who cater to the majority of operators.

However, power tunnel diodes should be very popular with homebrewers and experimenters! It can do AM for those of the boatanchor interests. Just be sure not to drive it too hard or all those electrons and holes will tunnel right through the wall and the wall will collapse and the device will destroy itself.

I used a simple one transistor xtal oscillator hooked to the control element of the power tunnel diode with a capacitor, and had a trim pot to set the bias voltage at the optimum point to get 'super tunneling'. A key in the power lead was used (it sparked a bit, but was OK).

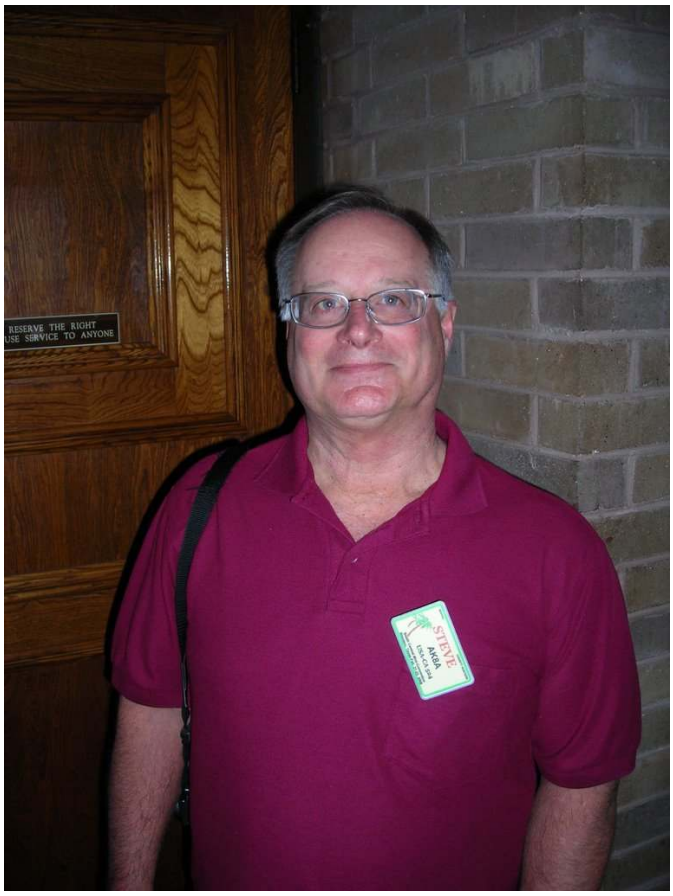
Build it carefully after you get your power tunnel diode from Russia, don't overdrive it, and hook it up to your nanotube short mobile antenna for some real fun. Just be sure not to drive it too hard or all those electrons and holes will super tunnel right through the wall forever (like a flood) and the wall will collapse and the device will destroy itself. That occurs usually about 10 microseconds after you turn it on. That's why it is so hard to find working power tunnel diodes. It can be very touchy.

References:

http://www.ioffe.ru/journals/ftt/2004/01/p5-9.pdf

http://youtube.com/watch?v=cDBpBYkRw0Q

Pictures from the Mini in Weslaco



AK8A, Steve – on CW

WG9A, Bill – mainly on SSB

N5OHQ, John, with Mobile – on SSB

Awards

Wow. It's been slim pickings this month! No awards issued.

Operating Events for County Hunters

April Mini in MI – April 17, 18, and 19. Listen for the mobiles, or head there yourself for a nice get together.

County Hunter Contest - MAY

May is the month for the MARAC CW County Hunter Contest. All the rules at WWW.AA8R.NET , So plan your activities in April for the County Hunter contest happening in early May!

The contest runs from 0000Z May 3 to 2400Z May 4, all bands – mobile/combo/fixed. Nice plaques for high scorers in each category plus certificates for runner ups.

April State QSO Parties – a good month coming up. Should be good mobile activity in most of these!

4-6 1 **Montana QSO Party** 0000Z Apr 4 to 0000Z Apr 6, RS(T), S/P/C or MT county - info at: www.fvarc.org 31-May

5-6 MO QSO Party 1800Z Apr 5 to 0500Z Apr 6 and 1800Z Apr 6 to 2400Z Apr 6 , RS(T), serial or MO county. Info at www.w0ma.org/mo_qso_party.htm 30 days

12-14 **GA QSO Party** 1800Z Saturday until 0359Z Sunday and 1400Z to 2359Z on Sunday. info at: http://gqp.contesting.com/

19-20 Michigan QSO Party 1200 EDST to 2400 EDST (16Z Saturday until 04Z Sunday UTC). http://www.miqp.org/

26-27 Florida QSO Party 1600Z April 26 - 0159Z April 27 and 1200Z - 2159Z April 27. info at : http://www.floridaqsoparty.org/

26-27 Nebraska QSO Party 1700 UTC - April 26 to 1700 UTC - April 27. info at: http://www.hdxa.net/neqso/index.htm

Postscript

If anyone finds any **working** power tunnel diodes let me know. They seem to be as rare as nanotube antennas described last April. Tunnel diodes are real but still operate at the microwatt level. That hasn't changed. Pwer tunnel diodes are wishful thinking, but then again this is the April issue!

De N4CD