The Jersey Broadcaster

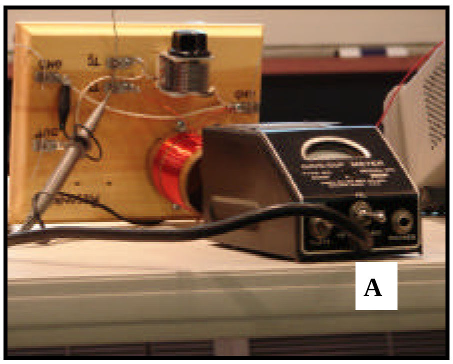
NEWSLETTER OF THE NEW JERSEY ANTIQUE RADIO CLUB

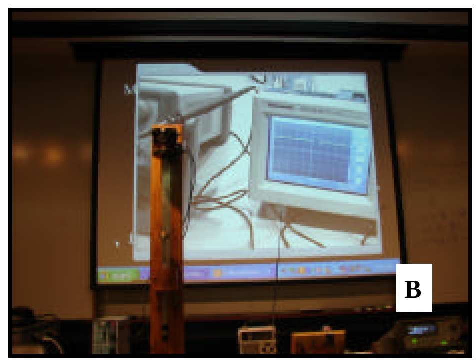
August 2009 **Volume 15 Issue 8**

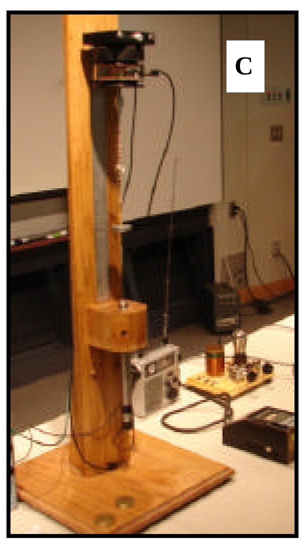
MEETING NOTICE

NEW MEETING LOCATION!

The August meeting will take place at Princeton's Bowen Hall (70 Prospect Avenue) on Friday, August 14th, at 7:30 PM. Directions to Bowen Hall are included in the June *Broadcaster* or may be found at the club's website (http://www.njarc.org). Dust off some of those old (or new) radio relics that have been gathering dust in your collection and show them the light of day at our "Show & Tell" scheduled for this month. A little story, a few laughs and you and your fellow NJARC members will be glad you did.







A) A grid dip meter was inserted directly in the inductor coil to determine electrical resonance. B) Resonator output was monitored by a scope with the image projected on a large screen to enhance the demonstration. C) Demonstrating mechanical resonance. A "forcer" at the top of the device adds energy to the spring so it may oscillate. Notice the weight below the spring, analogous to the inductor in an LC circuit.

MEETING/ ACTIVITY NOTES

Reported by Marv Beeferman

THE ON-LINE BROADCASTER

The New Jersey Broadcaster is now on-line. To date, 97 of your fellow NJARC members have subscribed, saving the club over $1900 a year. Interested? Send your e-mail address to:
mbeeferman@cs.com
Be sure to include your full name.

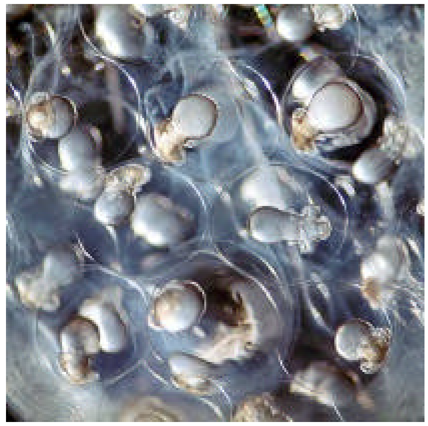
At the July meeting, the full potential of Princeton's Bowen Hall was realized via Dr. Michael Littman's demonstration of the concept of resonance. Must members are familiar with the resonance associated with LC tuning circuits found in radio receivers, but the subject took on more clarity and familiarity when the circuit was compared to its mechanical equivalent.

Dr. Littman explained that a mechanical resonator works by exchanging the kinetic energy of motion with the potential energy stored in the compression or extension of a spring. This is analogous to an electrical resonator that works by exchanging the magnetic energy stored in an inductor with the electrical energy stored in a capacitor. Dr. Littman also demonstrated how a mechanical resonator could be "tuned" and how its sensitivity could be improved by adjusting its forcing frequency, forcer position (see photo "C") and mass position.

Prior to Dr. Littman's demonstration, we moved the meeting to the Friends Center (a short walk from Bowen Hall) to view an "Art of Science" exhibition where a panel of judges had selected the best pieces of art to come out of the University's research labs. The theme of the competition was "found art," that is, images created during the course of an actual research project rather than art inspired by science. The show supported the idea that images produced in the pursuit of science can have an aesthetic value on par with art created for art's sake. Included in the exhibition was a display of cathedral radios and speakers from Dr. Littman's collection.

We had a great "rainless" (of course) swapmeet at InfoAge and thanks go out again to all those who pitched in to allow it to run smoothly. Special thanks to members like Ray Chase who, after a long drive, arrived in the early morning hours to arrange the important logistics that no one gets to see later in the meet. This month's *Broadcaster* captured some of the day's activities.

THE JERSEY BROADCASTER is the newsletter of the New Jersey Antique Radio Club (NJARC) which is dedicated to preserving the history and enhancing the knowledge of radio and related disciplines. Dues are $20 per year and meetings are held the second Friday of each month.



"Baby squid," an image of squid embryos taken using bright field microscopy, earned first prize.

Dr. Littman's "Art of Radio"

Please make plans for some important dates coming up in the month's that follow. We'll repeat our Old Equipment Contest on November 13th with full information to appear next month. Our Parsippany swapmeet is scheduled for November 7th and we'll be holding our next Repair Clinic on October 17th at InfoAge. Finally, our Holiday Party is scheduled for December 12th. Although the facilities at the David Sarnoff Library are no longer available, we will now be celebrating at the beautiful and historic dining room of InfoAge's Marconi Hotel.

CALL FOR TONY FLANAGAN MEMORIAL AWARD NOMINATIONS

After considerable procrastination on the part of your newsletter editor and persistent prodding by a few NJARC members, the Tony Flanagan Memorial Award will again see the light of day. Tony Flanagan was the club's founder and first president and the award was established to honor his contributions to the club. The award consists of a plaque and a certificate (with the club maintaining a plaque of past winners) and is presented for outstanding contributions to:

- The promotion of the antique radio hobby.
- The preservation of radio and electronic communication history and the history of their associated disciplines through artifacts and documentation.
- The promotion of the public awareness of radio development and history through books, articles and exhibitions.

It should be noted that primary emphasis should be given to the above considerations and not necessarily to the individual who has done the most for the club.

Previous winners have been John Dilks (1999) and Ludwell Sibley (2001). Nominations must be presented in writing to the Executive Board for voting no later than October 31, 2009. In order to get an idea of the nomination format, the following presentation was read at the club's 2001 Holiday Party:

The New Jersey Antique Radio Club proudly presents its 2001 Tony Flanagan Memorial Award to Ludwell Sibley as merited by his selfless dedication to the *promotion of the antique radio hobby and the preservation of wireless, radio and electronic communication history through artifacts and documentation.*

In 1999, Ludwell was awarded the Antique Wireless Association's prestigious Houk Award for Documentation in recognition of numerous original and authoritative articles on vacuum tube history and his book Tube Lore, a respected reference on the history, development and technical aspects of vacuum tubes. Presently the editor of the association's bulletin Tube Collector, Ludwell has also served as editor of the Antique Wireless Association's Old Timer's Bulletin, the AWA Review and the Oscillator (bulletin of the Delaware Valley Historic Radio Club).

Besides maintaining a diverse collection of radios, tubes and documentation of his own, Ludwell is the custodian of the Dowd-RCA Archive consisting of a large portion of RCA's Harrison plant documentation which he is in the process of indexing, cataloging and restoring.

Ludwell has always been available to share his extensive knowledge and reference material with his fellow antique radio hobbyists. As stated in his nomination submittal for this award: "There are many who have worked tirelessly to promote antique radio collecting, but I know of none personally who approached the task with more energy, expertise and humor than Lud."

Nominations do not have to be as extensive or "flowery" as the one above, but they should summarize the relationship between the nominee's credentials and the spirit of the award. With all the deserving club members who have supported our hobby, expectations are high for a number of candidates to choose from.

SAD NEWS FROM ONE OF OUR MEMBERS

Although most of us arrived home from last month's InfoAge swapmeet in good spirits, for one of our members, it was quite a different story. As reported in the NJARC Reflector, member John Tyminski and his mom had to contend with a very bad storm. In fact, John said that they almost did not make it home. Fighting extremely poor visibility, they had to navigate around trees, wires and parts of roofs coming down right in front of them.

When John finally got home, his heart sank as he looked at the yard. A 150-year old oak had fallen on his house and brand new workshop that he had just built in the Spring. The house was in relatively good shape, just needing a new window and storm door, but the workshop took the major brunt of the oak. It took out the roof and windows, and the shock sent radios, 45 players, TV's and records in all directions. Luckily, John, his mother and brother and the family cat who lived in the shop all fared much better.

When John was finally able to assess the damage, things looked even worse. Six 45 players, 1 Motorola VT71, 1 NOS CRT for a VT71, 3 cathedral radios, 4 Bakelite radios, some tubes and some ads and a Thorola horn speaker were all trashed. Other items in John's collection were slightly damaged. To add insult to injury, the tree was infested with red ants, leaving John covered in welts after attempting to remove it.

John started replacing the roof last week. He's glad he used 2 x 12 rafters for the original roof (the building code allows 2 x 4 trusses). He said that if he "did not use overkill, I would have nothing left. Things can be replaced but people can't! I feel like I was a winner in all this...no one was hurt!"

With an attitude like this, John deserves all the support and help we can give him. John is one of our younger club members and he has come a long way since joining. He and his family are always there to help out at club events and now is the time for the club to reciprocate. It would be nice if members could drop John a line to at least to cheer him up and perhaps give him a hand in getting back on track. John can be reached at tubeularelectronics@gmail.com.

WHAT'S A RADIO BLOG?

By Dave Sica

What the heck is a RADIO BLOG? For that matter, what's a blog? Unless you've been successfully ignoring the Internet (and if you have been, you very well may be a better person for it) you've probably noticed how many people seem to be "blogging." I have always been amused by the word, which comes from the phrase "Web Log." Take away the first two letters and you're left with "bLog." I still think it's a dumb name.

I've been equally amused by the fact that so many people with so little to say seem to be saying it with such gusto. Between blogs and "Twitter" (which is entirely another story), I now know more about what some people's cats are doing than I know about my own family. Let's just say that in my opinion, there's a heck of a lot of useless drivel being published on the web.

A blog is just a way of publishing information on the web. It's different than a traditional website; the classic blog form is sometimes nothing more than a simple listing of articles or even just the blogger's random thoughts posted chronologically. You can also use a blog to create a web presence that's quite similar to a conventional website. And as with so many things Internet, many blogs are free. It's essentially a free website.

Lately, I've noticed more and more examples of blogs that can be useful and interesting. In fact, entire websites, fairly complex ones, are now being created based on a blog publishing platform.

I have stayed away from this web tool for a long time for any number of reasons. First, there was that funny name! Second, since I administer my own website as well as the club's, it's relatively easy for me to publish nearly any information I want. Although the club's website has places like the "Member-to-Member" page and plenty of room to accommodate submissions by all our members, it's not so easy for anyone but me to get material posted.

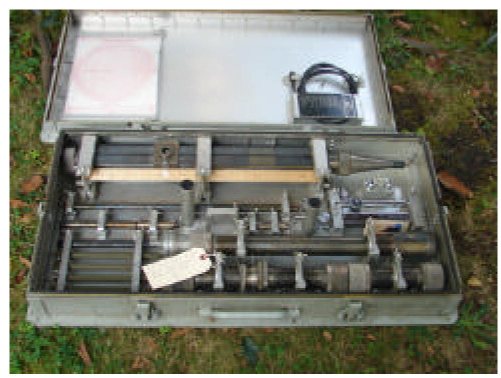
One of the biggest advantages of a blog is how incredibly easy it is to publish your material. Just type it into your blog and it appears - headlined, sorted, categorized and reasonably presentable - even if you have absolutely no artistic or computer skills at all.

I got to thinking how the best blogs can be great sources of interesting information. Maybe information is too specialized to ever hit the newspapers or magazines or perhaps too fleeting to even get shared in a conversation with friends weeks after you first thought of it...but **(Continued on page 5)**

INFOAGE SWAPMEET

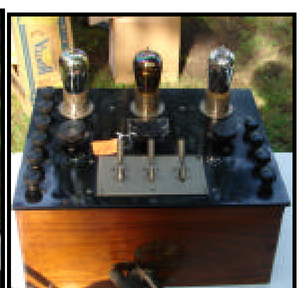
A day in the shade.

Gobs of knobs and cubes of tubes.



A 10% discount was offered if you could describe what you were buying.

The walk-around auction was very active.



(**Radio Blog...continued**)
interesting nonetheless. In our club, we're all doing interesting things; finding a new treasure, tackling a restoration challenge, participating in a show, etc. Yet outside of some conversation at a meeting or within our own close circle of friends, little of this interesting news gets shared. I like to know what other people find interesting, what other folks are doing. Passing around great ideas is what this club is all about.

So I figured why not try to amplify this sharing of information using blogs? Well, I put my money where my mouth is by posting a blog. Check it out at http://www.davesica.blogspot.com. Better yet, sign up for your own free blog at www.blogger.com.

Now, you might find the things I write to be more useless drivel, but perhaps not. I urge you to give it a try and see what comes of it.

We've got some folks in the club who have already shared their thoughts with us; several of our members have great websites and have written articles for the *Broadcaster, Antique Radio Classified* or the *AWA Journal*. It can really be a lot of work to write a magazine article, or to update a website, but it's really easy to update a blog. I compare it to publishing a newsletter versus a magazine. I hope that all of you who already have a nice website, and all of you who do not, take a stab at publishing a radio blog. I'd love to know what you're thinking, what you're reading, what you're working on. Start a blog and send me the link and I'll put together a listing on the club's website. I think this could be interesting.

WHAT...NO TUBES?

THE MAGNETIC AMPLIFIER

By
Marv Beeferman

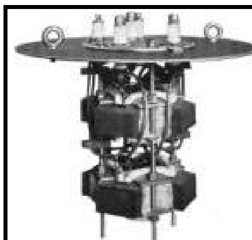
About two years ago, NJARC president Richard Lee sent me an article from the February 2006 issue of *Nuts and Volts* magazine that he thought I might be interested in..."The Magnetic Amplifier: A Lost Technology of the 1950s." The word "magnetic amplifier" (mag amp for short) immediately struck a chord, since I remember it as a basic component of the instrument system of the nuclear submarine I served on many years ago. Its major application was that of a bistable amplifier. It was used as part of the circuitry to monitor system parameters such as pressure, level, etc. and would "trip" (reach saturation) when limits were exceeded, providing protective features and activating remote alarms. (For those of you who are more technically orientated, positive feedback in a magnetic amplifier can be increased to more than 100 per cent by increasing the turns in its feedback winding. This gives rise to abrupt load current changes with changing control current...such amplifiers are called "bistable.")

Your editor at the controls.

The bistable amplifier that was used aboard the U.S.B.N Abraham Lincoln was only one of many more intriguing applications of the magnetic amplifier. Close to the end of World War II, the Allied Forces captured the German heavy cruiser Prins Eugen. The Allies discovered that the fire control equipment of the ship's 8-inch guns relied on magnetic amplifiers, which the Germans operated <u>without attention</u> for the life of the vessel. They were also using magnetic amplifiers in a wide range of applications, from stabilizers for range finders and gun mounts to the steering of buzz bombs and V-2 rockets. They also used them in electric brakes for trucks, streetcars and locomotives, high-voltage utility power controls and even in early computers. The Germans took a relatively crude device developed in America, assigned their best scientists, invested millions and turned it into a faster, lighter electronic tool competitive with the vacuum tube in performance but more simple, dependable and rugged...and nearly indestructible. (No wonder that, by the 1950's, they were being designed for use in our nuclear submarines!)

By the 1950s, the frequency capability of magnetic amplifiers was up to a megacycle and switching rates were in microseconds, suitable for even computer applications of that time. In later years, magnetic amplifiers were used extensively as the switching element in switched-mode power supplies as well as in lighting control. They have been largely superceded by semiconductor-based, solid-state switches, though there has been some regained interest in using magnetic amplifiers in compact and reliable switching power supplies. PC ATX power supplies often used magnetic amplifiers for secondary side voltage regulation.

However, the one application that probably holds most interest for wireless enthusiasts (and those familiar with the history of InfoAge and its sister station in New Brunswick) was a major component of the Alexanderson system for radio communication using the new Alexanderson alternator. In 1912, E. F. W. Alexanderson of the General Electric Company applied for a patent on a method for modulating the current from a high-frequency alternator so that it could be used for transmitting code (radio telegraphy) and voice (radio telephony). The Alexanderson patent for the magnetic amplifier is considered to be the first device to meet all the requirements of the definition for power electronics.



Magnetic amplifier used in the 1920 Alexanderson CW transmitter.

But let's start with the basics...what exactly is a magnetic amplifier?

At the heart of the magnetic amplifier is the saturable reactor. From fundamental transformer theory, you might recall that the voltage induced in a winding usually far exceeds the resistance drop in that winding. In other words, winding open-circuit reactance usually is much greater than winding d-c resistance. Further, you might recall that a relatively small amount of direct current flowing into the winding of a transformer, where there is no air gap in the core, causes the core to saturate. Thus, the reactance of the transformer may be varied by a small amount of d-c power. Now, if one winding of a transformer is connected between an a-c supply and a load, the amount of power delivered to the load may be controlled by a small amount of d-c power flowing in another winding. Based on the fact that open-circuit reactance ordinarily exceeds d-c resistance, the possibility of power amplification is inherent in a transformer. When one winding of a transformer is used for d-c control power (which effectively controls core permeability) and another for a-c output power, the transformer is called a saturable reactor. A saturable reactor is a part of a magnetic amplifier, either used alone or connected with other circuit elements in such a manner as to obtain signal amplification for the control of a load.

Figure 1 is a way of illustrating the above principle. With the core completely within the coil, the impedance to current flow is high, permitting perhaps only a fraction of a volt to appear across the load. Pulling the core out causes the load voltage to rise progressively to 115 volts. Since it takes only a few watts of muscular energy to move the iron core within the coil, which may, in turn control several horsepower, the device is an amplifier.

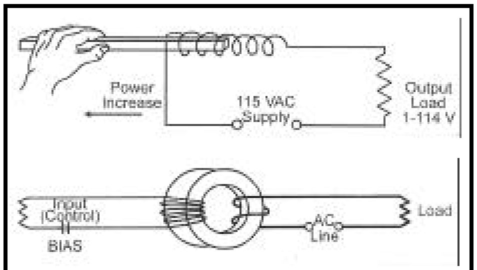


Figure 1 - The saturable reactor.

Now let's return to the period between 1915 and 1920 when the General Electric Company, under the direction of E. F. W. Alexanderson, developed a system of transoceanic radio communications utilizing continuous wave (CW) transmission over great distances. The first result of this work was a 2-kw alternator which produced radio frequencies from 50 to 100 kHz and which critics had previously denounced as impractical. Later, Guglielmo Marconi took an interest in the project and installed a 50-kw, 50 kHz alternator in the transoceanic radio station of the American Marconi Company in New Brunswick, N.J. Woodrow Wilson's famous 14 Points leading to the armistice was broadcast in CW (continuous wave) from this station to all of Europe.

The experimental demonstrations of telegraphy and telephony that were made during 1917 with this installation attracted the attention of the U.S. Government and scientific commissions that were sent to the U.S. on account of the war. A circumstance that brought the new system into prominence was the partial failure of the Atlantic cable system and the urgent demands for transoceanic radio communications that developed in connection with American military operations in France. In January 1918, the 50-kw alternator in New Brunswick, though installed as an experiment, was commandeered for official transoceanic service by the United States Navy. It was operated until it was replaced by a 200-kw alternator in 1920.

The magnetic amplifier as a modulator was in response to the problem resulting from the control (modulation) of the large antenna currents involved in continuous wave, alternator-based high-power radio transmitters (either by telegraphy or voice). For telegraphy, this was particularly true when transmitting at high speeds (at the time, considered 500 words per minute). Rapid transmission required a device that would not cause destructive arcs while still providing the desired modulation of antenna power without carrying full power during the interval between each signal (when the telegraph key was open-circuited).

The magnetic amplifier met these requirements perfectly. Its characteristics were such that a relatively small current in an excitation winding could control many hundreds of amperes in an antenna system. It provided non-arcing control with a minimum current in the key circuit while assuming only a small proportion of the total alternator output. By acting like a variable impedance in shunt with the external alternator circuit, its function was to a) reduce the voltage of the alternator by short circuiting it and, b) detune the antenna system and reduce antenna current when not sending (telegraph key open). This effectively reduced antenna current to 9% of its normal value. When sending (telegraph key closed) the opposite occurred, with the full power of the alternator fed to the antenna system.

A general idea of the operation of this simple amplifier is shown in Figures 2 and 3. (Note: The terms and figures used in the text that follows are based on reference 6.)

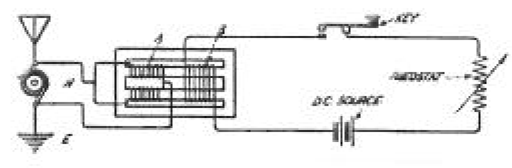


Figure 2 - A simplified magnetic amplifier for CW telegraphy.

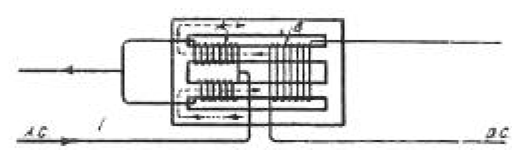


Figure 3 - Inductive action of the amplifier windings on the contr ol windings.

RF coil A and control (excitation) coil B are mounted on a common iron structure such that control is obtained through flux variations in the RF coil. The RF coil windings are connected in parallel and shunted across the alternator. Since the tendency to induce an emf in one side of the control coil by one branch of the RF coil is counteracted by an opposing emf in the other branch, no voltages are induced in the control coil by the RF coil. The impedance of the amplifier is dependent upon the degree to which the iron core is saturated by the control winding. Saturation, in turn, varies as a DC current varies in the control winding.

When the flux produced in the core by the control coil is sufficient to fully saturate it, the impedance of the RF coil windings becomes that of a coil without a core. On the other hand, with zero current in the control coil, the core will be magnetized by the RF coil windings and their impedance will be maximum. In order to obtain large flux variations in the RF winding, the opposing ampere-turns in the control winding must be approximately equal to those in the RF winding.

The characteristics of the Alexanderson magnetic amplifier are shown in Figure 4 where antenna current is plotted against different currents in the control coil. Curve A shows incomplete modulation, but more complete modulation could be obtained with stronger currents in the control winding.

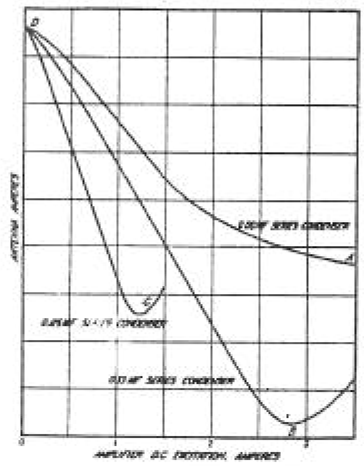


Figure 4 - Control characteristics of the Alexanderson magnetic amplifier.

A more sensitive control of the alternator output (a much smaller control current is required to vary antenna current) was obtained by by Alexanderson by use of a series capacitor (C1) as shown in Figure 5. If a capacitance value is chosen to neutralize the inductance of the RF windings for some definite value of control current, the impedance of the capacitor-coil (LC) circuit becomes minimum. The impedance at any lower excitation is determined by the difference between the inductive reactance of the amplifier coil and the capacitive reactance of the series condenser. The smaller the difference, the lower the alternator voltage.

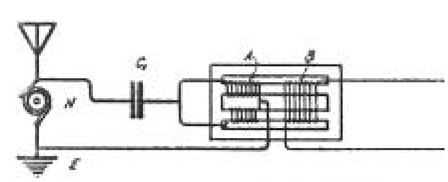


Figure 5 - Magnetic amplifier with a series capacitor.

Curve B of Figure 4 shows the control obtained with a series capacitor of 0.33 mfd and curve C with a 0.125 mfd capacitor. Curve B shows almost complete modulation of the antenna current. Note that the curve shows a linear proportionality between control and antenna currents almost throughout its range. This was an essential requirement for satisfactory speech reproduction in telephony. In the operating system, the constants for capacitor C1 were selected for the particular frequency at which operation was to take place. Therefore, it was only necessary to vary the control current until the most complete modulation of the antenna current was obtained.

A magnetic amplifier consisting of a single saturable reactor with a battery-fed d-c source controlling one winding and with a-c power fed through the other winding would have an a-c voltage induced in the d-c winding. Therefore, in its final form, capacitors C2 and C3 (Figure 6) were added to the RF coil of the magnetic amplifier. If currents were introduced into the control coil without these capacitors, a short circuit current would flow between the branches of the RF coil without producing any flux variations in the RF current. This was prevented by choosing capacitor values that have a low reactance to radio frequency currents and a high reactance (impedance) to audio frequency currents. These capacitors had no appreciable affect on the tuning of the amplifier circuit. (Future magnetic amplifiers would overcome this difficulty by using two saturable reactors, one with reversed d-c windings with the a-c windings adding normally.)

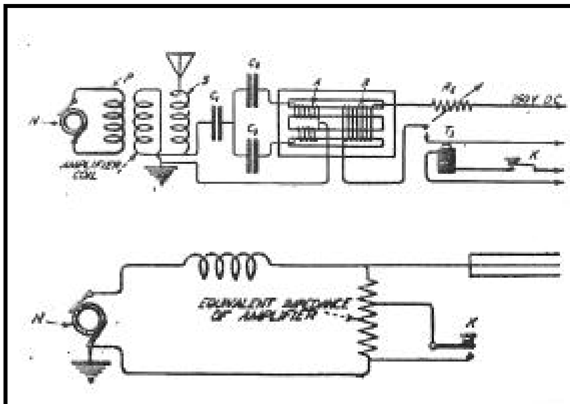


Figure 6 - Magnetic amplifier with series and "short-circuiting" capacitors and its equivalent circuit.

When the Alexanderson system was used in radio telephony (voice), the control circuit of the magnetic amplifier was placed in the output circuit of a bank of vacuum tube amplifiers. The input circuits of the amplifier bank were controlled by three preceding stages of tube amplifiers, which in turn were actuated by a microphone. Using this arrangement, satisfactory voice transmission of up to 2500 miles from New Brunswick was obtained.

Magnetic amplifiers were used early on to control large, high-powered alternators by turning them on and off for telegraphy. However, the alternator's frequency limits were rather low to where a frequency multiplier had to be eventually utilized to generate higher radio frequencies than the alternator was capable of producing. Even so, early magnetic amplifiers incorporating powdered-iron cores were incapable of producing radio frequencies above approximately 200 kHz. Other core materials such as ferrite and oil-filled transformers would have to be developed to allow the amplifier to produce higher frequencies. But for trans-oceanic communication, frequencies of between 12 and 17 kHz were easily produced using a magnetic amplifier at high power levels. This capability would later prove useful for communications with submerged submarines and surface ships thousands of miles away.

References:

1. George Trinkaus, "The Magnetic Amplifier: A Lost Technology of the 1950s," Nuts and Volts, February 2006.
2. E. F. W. Alexanderson, "Transoceanic Radio Communications," General Electric Review, October, 1920.
3. E. F. W. Alexanderson, "A Magnetic Amplifier for Radio Telephony," Procedings of the IRE, April 1916 (Vol. 4, Issue 2)
4. Reuben Lee, Electronic Transformers and Circuits (e-book), release 0.92 (09/17/09)
5. Mohamed E. El-Hawary, Principles of Electric Machines with Power Electronic Applications, Wiley-IEEE Press, June, 2002.
6. Elmer E. Bucher, "The Alexanderson System for Radio Communication," General Elec- ew, October 1920.

CONNECTIONS

Free exposure for buyers and sellers! Unless requested otherwise, each ad will run for two months in both the *Jersey Broadcaster* and the Delaware Valley *Oscillator*. All buying and selling transactions are the responsibility of the parties involved.

Are you aware that NJARC now has a resistor program which includes many commonly needed replacements? Contact Walt Heskes at any club meeting for details.

FOR SALE

Check out NJARC's capacitor program for those most commonly needed replacements. Contact John Ruccolo at any club meeting or call him at home (609)-426-4568 to find out what's available. All proceeds go to the club.

WWII AN/PRT-1 jammer. Basically a spark transmitter with a timer made in the last months of WWII, complete with a copy of the manual. Asking $150 + shipping, or pickup. Contact Gary Berg, 24 Pat Road, Newburgh, NY 12550. bergg@hvc.rr.com

WANTED

Rare or unusual wire recorders such as Soviet Type MH-61, WWII Signal Corps RD-15/ANQ-1, GE model 20N. Also wanted is an un-modified BC-652A with dynamotor. Contact Gary Berg, 24 Pat Road, Newburgh, NY 12550 bergg@hvc.rr.com

Ivory colored, 1946, RCA 56X2 radio. Contact Richard Brill rgbent@aol.com 732-607-0299

Good 17PKP4 crt. John Tyminski tubeularelectronics@gmail.com

WANTED: Radio repairmen and restorers. Run out of your own radios to work on? The club and Infoage have received a quantity of radio donations, some of which would look good in our museum. Others will be set aside for traveling displays, trading or resale as fundraisers. Many of these radios only need a good cleaning and polishing and a minor electrical checkout. Take one or two home with you and practice your skills...even if you just want to clean them up. Contact Ray Chase at our next meeting, at 908-757-9741 or at enrpnr@erols.com.

SONY'S HITS AND MISSES

Last month, CNN Money.com ran an article on Sony's highlights and low points over the last 50 years. I have found that a lot of the radio collectors in the club are also ardent technology buffs, if not outright consumers. See if you can identify the following Sony products as either "hits" or "misses." Perhaps you still have one in working condition and a good story to go with it? Send it to me...I'll list the answers in the next issue of the *Broadcaster* and perhaps a story or two.

1

The success of this item later stalled Sony's entry into the flat screen market.

2

Although U.S.-based Regency Electronics produced the original, Sony was the first to recognize this gadget's consumer appeal and to successfully market a model built entirely from its own components.

3

Superior in technology to its competitor, Sony continued making this item through 2002.

4

I still have a working model of this product which served the *Broadcaster* well for many years.

5

The first large U.S. delivery of this item flew off the shelves.

6

This little "puppy," at $2,500, sold out its first 3,000 available units in 20 minutes.