

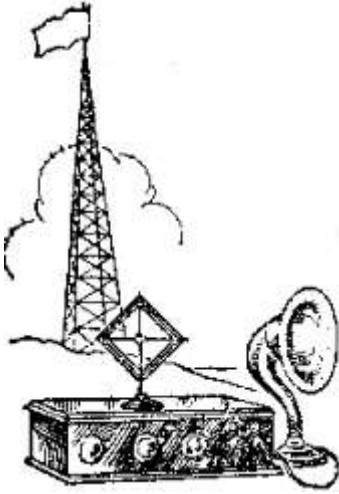
# The Carolina Antenna

Spring 2006

Volume #12

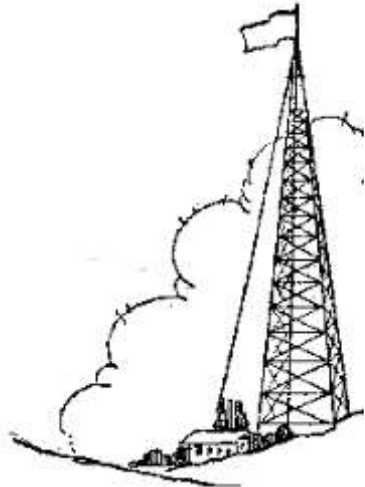
Issue #1

---



Be Sure To Check  
The Calendar on  
Page 1 For  
Changes in  
CC-AWA  
Meet Dates!

Carolinans Chapter  
of the  
Antique Wireless





# The Carolina Antenna

The newsletter of the Carolinas Chapter of the Antique Wireless Association

ISSUE # 12

SPRING 2006

VOLUME 1

## EDITOR'S CORNER

By Barker Edwards



dates for the rest of the year have been changed. Sorry for any inconvenience but the changes were out of our control.

### DUES

If you have not paid your 2006 dues in the CC-AWA yet, please remit immediately to Robert. Membership information and Robert's address are published on the inside cover. Remember you must first be a member of the Antique Wireless Association first. You can check the club's web page for the current status of your membership.

Finally, here is the 2nd part of the Alan Douglas article on the Superheterodyne. In the last issue, it was announced that we would run an article on Reginald Fessenden. Judy and I decided to hold off on running



*Reginald Fessenden  
Early radio pioneer*

this article at this time. With 2006 being the centennial of his historic '06 broadcast, we hope to have a special issue about this remarkable

man. This summer we hope to visit the NC Archives, which has many of his papers from the early experimental days.

### IMPORTANT MEET DATE CHANGES

Please be sure to note the changes to the CC-AWA calendar. All the

### 2006 CC-AWA DATES TO REMEMBER

- May 20—Spring Swap Meet  
Spencer NC
- July 22 - Summer Swap Meet  
Valdese NC
- Oct 21 - Fall Swap Meet  
Greensboro NC
- Dec 16 - Christmas Party

Rain date is the following weekend. Check the club web page for notices of rescheduling. A decision will be made by 6pm the day before the meet.

CHARLOTTE 2006  
THE MEET THAT A LITTLE  
DRIZZLE MADE BETTER

By Ron Lawrence

**T**hursday, Friday & Saturday March 23-25 were the dates for the 30th anniversary of the Spring Meet in the Carolinas. OK, I know that the "Spring Meet in the Carolinas" hasn't been around 30 years but we trace our history back to the first AWA Southeast Conference meet that Lew Elias W4DBT started in 1975. Yeah, I know 1975 to 2006 is 31 years, but the best we can tell Lew skipped 1977 so that's where we get 30 years.

This year we were again at the Sheraton Hotel in Charlotte where we've been for about 14 years. Something new this year were two new food events, a Thursday Kickoff Luncheon and a Thursday evening dinner. One of the reasons for adding these food events was that with most of our attendees being from out of town and there not being many places to eat in the area around the Sheraton, folks can now park their cars and not have to leave the site during the Conference. The other reason is that the Sheraton requires a food and beverage minimum that we have to cover, the more food we sell the less our obligation is. About 21 folks took part in the Kickoff Luncheon, which was provided by the buffet in the hotel restaurant.

Lunch was followed by the first of our afternoon programs, which was again this year a tube collectors forum lead by my buddy and local tube expert Kirk Cline. A number of us are members of the Tube Collectors Association (TCA) and since tubes are a big part of antique radios these tube forums have been very well received for last several years.

Following Kirk's talk, it was my turn. This year marked something new for me, even though I've been involved with hosting these meets for many years, this would be my first program I've ever done. Being a firm believer that it's better to see the real thing instead of just photos projected on a screen, I spent the day before the meet packing the van with 16 pieces of Clough-Brengle test equipment and both of my transmitters they built for the Civilian Conservation Corp. All of this "stuff" along with all the clubs meet equipment I had had my old van just about sitting on the spring stops.

Since there's really very little real history know about the company other than a couple of short paragraphs printed in their catalogs in the 1930s, I spent most of my time talking about where my interest in the company came from and their connection to the CCCs. In the weeks leading up to the conference I had written several versions of the talk I hoped to give but in the end I felt that they sounded too canned and rehearsed so I decided to just "wing it" so to speak. Knowing that I was going to

talk about CCC radio, my good friend Geoff Bourne presented me with an original, dated 1939 CCC overseas cap to go with my transmitters. Thanks again Geoff.

Following my talk and a short break Robert Lozier gave his already twice postponed talk on Italian Television. Robert became interested in Italian radio and television through an Italian radio collector that used to live in the Charlotte area but has since moved back to Italy.

Just a little aside here - this has nothing to do with the meet report, but it's kind of an interesting story about how we came to know Vic Franzoni the Italian radio collector, and by now you folks know how I love to tell stories.

This goes back to the early 80s when we were still new enough to this hobby that we could get excited about seeing an AK model 20 compact at the flea market. My friends Brian Harrison, Dave Keller and I were at the local flea market when we spotted the AK 20C and an AK horn, we were all trying our best to beat the other guys to buying it until we found out just how much the dealer wanted for it, we all quickly changed our minds. A little while later we walked by the table again and the radio and horn were gone. We tried our best but we couldn't figure out who had bought it.

A couple of months went by and the AK was long forgotten until early one Saturday morning the phone

rang and it was my friend Ralph Williams in PA. Ralph was known as "Mr. Atwater Kent" due to his huge collection and vast knowledge of all things AK. It seems that Ralph had been given a letter that someone had written addressed to the Atwater Kent Manufacturing Co. Philadelphia PA. asking for information about an Atwater Kent model 20C and horn speaker.

Of course the Atwater Kent company was long gone, the only thing in Philly now with Atwater Kent on it is the Atwater Kent museum, which is a art museum originally founded by the original Mr. Atwater Kent. When they saw the letter was about AK radios they sent it to Ralph, he looked at the return address and knew I lived near the letter writer who turned out to be our friend Vic Franzoni the future Italian radio collector. Vic had bought the AK 20C at the flea market and not knowing anything about it had written the company looking for information.

After Robert's talk we had our annual CC-AWA membership meeting. The main topic of the meeting was money and how to keep the meet going with the continued rising cost of everything. No conclusions were reached other than to continue gradually raising fees to try and cover the costs.

The Thursday evening dinner was followed by the viewing of a DVD that Gary Carter WA4IAM had found on the Internet called "Television under the Swastika" about early TV development in Nazi

Germany. "Very interesting" to say the least...

One of the persistent nightmares I have about this event is RAIN. I woke up about 3AM Friday morning and looked out my room window to see a wet parking lot. Needless to say I didn't sleep much for the next 3 hours. When I got up at 6AM I turned on the local news and they were saying that the rain that had happened overnight was moving out of the area and should be gone by 8AM.

I walked outside at around 6:30AM to a light misting drizzle. The first thing we talked about was should we move the flea market inside or not. After talking with several members of the meet committee and also several of our long time vendors we decided to stay the course and leave it out side. I now know that this was the correct decision. Even though it continued to drizzle on and off, most of the vendors had come prepared for foul weather and had no problem. As a matter of fact several reported having their best Friday ever at Charlotte. Some of the dealers that had no cover put a large portion of what they had brought to sell in the Friday afternoon auction. This ended up making the auction really good. There were some really nice items sold including a nice AK breadboard for \$650.

Brad Jones did another fine job as our auctioneer. The total auction was 140 items with total sell of over \$10,000.00.

Friday evening following the Auction, we again had our Annual Banquet that was enjoyed by all. The evening continued with an open house viewing of the many contest entries.

Saturday morning started off a little frosty but at least it was clear and DRY. The drizzle on Friday had the benefit of making Saturday which is historically smaller than Friday turn out to be about as good as a Friday could be. At 10:30 AM I was standing in the middle of the flea market looking around and things were really hopping.

Our end of swap "Radio Rescue Auction" was a great way to dispose of unsold goodies. There were also a number of items that were donated to be sold with the proceeds going to the club, this amounted to \$120 worth of junkie. Thanks for the donations.

At 1pm we had our annual Saturday luncheon that was followed by Robert Lozier's contest report which is always a highlight.

In closing this was another GREAT year, thanks to everyone for all the help, in particular those that pitched in Saturday afternoon and helped with taking down the snow fence and PA speakers. After 3 days and with all the stuff we have to pack Saturday afternoon, it was a big help to have this equipment taken care of.

We look forward to seeing everyone next year.

# LOOKING BACK

## 1ST CC-AWA MEET 1976

### COMING EVENTS

#### ANTIQUÉ WIRELESS ASSOCIATION

ANTIQUÉ WIRELESS ASSN.

Regional Conference

#### SOUTHERN MEET

JULY 11 - 12

HOLIDAY INN NORTH

3050 N. Cherry St

Winston-Salem, North Carolina

#### PROGRAM

#### Friday P.M.

REGISTRATION and get-together for early arrivals

#### SATURDAY

Morning: Antique radio display  
Tour of Old Salem for the ladies

Afternoon: FLEA MARKET  
Antique radios  
Components  
Magazines, etc.

Evening: Social hour  
BANQUET- Prizes  
Guest Speaker:

WAYNE NELSON, W4AA

Registration: \$2.00

Banquet: \$5.00

Radio Amateurs: Talk-in on 04/64

For full details, registration card and Motel information, write:

L.W. ELIAS, W4DBT  
3939 Poindexter Drive  
Winston-Salem, N.C. 27106  
"EVERYONE WELCOME !"

#### A.W.A. SOUTHERN MEET

Our First Southern Meet almost had a problem -- only 30 or 40 were expected -- and nearly 100 showed up! However, Lew Elias and his Committee handled the situation without difficulty. In fact, the group did a superb job in planning and organizing the affair -- so much so, they are having another in 1976 -- July 9-10 [same place, Holiday Inn, Winston-Salem, N.C.].

It was not altogether a local "meet" -- members registered from N.Y., Ark., Ind., Fla., Ga., S.C., etc. There was the usual fine exhibit [and flea market] of early broadcast receivers -- and even an amateur transmitter plus some early tubes and bulbs.

Old pro's dominated the program: Wayne Nelson, Lou Moreau, Ed Redington and others with a new luminary: Paul Klipsch of loudspeaker fame. Mark the next date on your calendar: JULY 9 - 10, 1976

*Left: Meet notice of the 1976 Southern Regional Conference held in Winston-Salem NC, the first CC-AWA meet!*

*(Vol. 16 - Issue 1 of the AWA Journal)*

*Above: Review of Meet (Vol. 16 - Issue 1 of the AWA Journal)*

*Below: Part of Bob Lozier's exhibit at the Southern AWA meet (Vol. 16 - Issue 3 of the AWA Journal)*



# PRESERVATION OF A CLOUGH-BREngle MODEL 87 TRANSMITTER

By Ron Lawrence, kc4yoy

The transmitter that's the subject of this article is a Clough-Brengle model 87. To answer one of the first questions I usually get asked, No they're not a German company, they were located in Chicago Ill. The company was formed in 1932 by Kendal Clough & Ralph Brengle, Kendal had been Chief Engineer for Silver-Marshall.

Their main product line was radio and laboratory test equipment, but they also built at least 2 models of radio transmitters. In more than ten years of searching I have not been able to find any mention of their building transmitters in any of their advertising or catalogs. No original company records are known to exist. But I do know for sure that they did build at least 2 models because I own examples of both. The best supposition about these 2 models is that they were built under contract for the US government to be used in Civilian Conservation Corp. (C.C.C.) radio stations.

I first became aware of the CCC's use of radio and Clough-Brengle transmitters shortly after my first Clough-Brengle (C-B) transmitter a

model 4581 was featured in John Dilks' "Old Radio" column in QST's March 2000 issue. I received 2 letters from a couple of old timers that had been radio operators at CCC stations. Both of them told me about their having used C-B transmitters in their CCC stations. Neither of them could remember the model number of the transmitters, but they fortunately did have original photographs of these stations. What surprised me was that the C-B transmitters in their stations were different from my model 4581, but there was a definite "family resemblance".



Figure 1



Figure 2

The photos in Fig. 2 and 3 show CCC stations WUEV, Wausau WI. & WUCR located in Fort Lincoln ND.

This just added to the puzzle, here was another model of C-B transmitter, different from mine and still no company data. In

response to the QST article I also got a phone call one afternoon from a ham in Texas telling me about his C-B transmitter. At first I expected it to be like the ones in the CCC photos. But it turned out to be a model 4581 like mine. It was also interesting that this transmitters serial number is 157 and mine is 156. What are the odds that here are 2 nearly 70 year old transmitters, a thousand miles apart with sequential serial numbers... The whole story of the C-B 4581s is for another telling, but I had to digress just a little to help put the story of the model 87 in context.

About a year after the QST article an old friend Brian Harrison KN4R emailed me an eBay auction link, I almost couldn't believe it, here was a C-B transmitter just like the ones in the CCC radio station photos. Beside the photos on the eBay page the seller had a web page with about 30 close up shots of it. This eBay listing is where I learned what the model number was. I contacted to seller and found out that he knew nothing about, it had been found in his father's house and no one in the family knew why it was there. Brian KN4R had put an opening bid on it but he told me that if I wanted it he wouldn't bid against me. As fate would have it, when the find of the decade shows up I was out of work. I worked up my courage and went to talk to the XYL. Some how I convinced her that I had to have this transmitter. I promised her that I would sell something out of the collection after the auction to put the money back in the checking account. I figured that it would

probably sell for between \$300 & \$500. Well, to make a long story a little shorter, I got out bid by someone with a faster internet connection and deeper pockets than I had. After the auction ended I email the winner and told him that if he ever wanted to sell it to please let me know. I got sickening email from him a couple of weeks later telling about how UPS had dropped it and that it was severely damaged.

Several years passed and I hadn't thought about this transmitter for a long time, one day I got an email from Bill Fizette telling me that a friend of his knew someone that had a C-B model 87 for sale. At the time I had been doing a lot of research of Clough-Brengle test equipment of which there are models 88 & 89, so a model 87 didn't ring the bells that it should have.

Thinking that it was just another piece of C-B test equipment I told Bill that I would be interested, but really didn't think much about it.

He put me in touch with his friend Doc who was a friend of the guy selling it. A couple of days later I got an email from Doc with a photo attached and when I scrolled down the page to see the picture I almost fell out of my chair, I thought "Oh my god, it's a transmitter". At first I thought it had be to be another one, but after looking closely at the photo and checking the photos I had saved from the original eBay listing I found that it was the same one. Then when Doc told me the name of the seller I knew it was the same one. I promptly email the



seller and asked about it. He told me that it was indeed the same one that was on eBay and that since it had been damaged he had just never gotten around to doing anything with it and had finally decided to let it go to someone else. He didn't remember me after all these years and that I had wanted it. I ask about how badly it was damaged and he promised to send me some photos of it. Unfortunately for someone as impatient as I am I wanted the photos right then, but it took almost 2 weeks for him to send them to me. It seems the transmitter was packed away and he was tied up with home projects at the moment.

When I finally got the new photos of it was clear that while there was some damage, I didn't feel like it was anything that I couldn't take care of. There didn't appear to be any structural damage to the cabinet either internally or externally, and the meter wasn't broken. Also the large ceramic tank coil was OK even though the small ceramic standoffs that it was mounted on were broken. This is apparently what caused the damage to the internal components. When it was shipped after the eBay, there was no packing inside the cabinet to protect the tubes and coils. Sometime during it's trip from Philadelphia to Pittsburgh, UPS dropped it (big surprise). This is when the standoffs that supported the large, heavy ceramic tank coil broke.

The heavy coil, now held only by it's attached wires was free to smash the two type 802 finals, the type 83

and both antenna coils and their mounting standoffs.

Being afraid that someone else would come along a scoop me on it, I quickly accepted his asking price and sent him the money. It took almost two more weeks for him to locate a proper box and get it packed and shipped to me. I seriously considered renting a car and driving from Charlotte to Pittsburgh to pick it up, just to not have to worry about more possible damage during shipment. But the seller assuring me that he knew how to properly pack something like this, and the fact the gas was now over \$3 a gallon I decided to save the \$200+ dollars it would cost for car rental and gas, and let him ship it. I usually prefer to ship via the US Postal Service, but the shipping weight was almost 75 pounds which is over the USPS 70 pound weight limit. Don said he had had a lot of luck using FedEx ground, so I agreed. Over the next four days I almost wore out the FedEx Tracking page on the internet watching it every step of the way.

Not wanting it to sit on my front porch all afternoon, I had him ship it to my work address. We get a couple of FedEx deliveries a day so I knew it wouldn't be a problem. As soon as I heard it had arrived I rushed to receiving with a cart to carry it on.

I couldn't stand it any longer and just had to open it up check it out. It didn't take long to decide that the FedEx truck really hadn't needed to stop to make this delivery, they

could have just tossed it out the door as they drove down the street, it was packed that good.

*Just a little aside on packing and shipping. A lot of folks in our hobby (including me in the past) do a lot of complaining about how shipping companies, UPS getting the most of the heat, damage radios. It's not the shipping companies fault! If the item is precious, you should pack it that way. The people that work for shipping companies don't know or care what is inside the box you're shipping, nor should they. You should always pack to the extreme. If it gets damaged in shipment (unless it's run over by the truck or in a plane crash) it's your fault because you didn't pack it good enough, PERIOD.*

When I finally got it unpacked I was really pleased with what I saw. Not only is it a really neat looking piece, the previously reported damage was not nearly as bad as I had expected.

The first thing I did after getting it home was to get out the digital camera and take some "before" photos and get a quick inventory of the know damaged parts.

After the initial photos, it was time to get busy. I first went to the computer and posted a quick message to the AWA & CC-AWA email reflectors about what I had found and what parts I would be needing—the 4 four ceramic standoffs and a chipped osc. tuning knob.

The damage that concerned me the most were the large chunks of

phenolic missing where the mounting screws broke out of the phenolic antenna coil forms. These 2 coils had been mounted atop the ceramic standoffs and when the ceramic tank coil hit them they broke away leaving chunks of the phenolic form behind.

When I took the chassis out of the cabinet I was really pleased to see that it had never been "hamed". It is completely original under the chassis. All the original parts are intact. It looks like it's never been touched. This finding really confirmed my feelings about not doing anything to damage the originality. It was exactly like it was when it was built in 1935.

I next vacuumed out dust and loose dirt and the remains of three broken tubes, being very careful not to let the vacuum cleaner suck up any loose screws and nuts. Now it was time to get some of the 70 years of dirt and grime off the chassis. I use a Multi Surface foaming cleaner that I found at the dollar store, it works great and hasn't damaged anything yet. To really get in there and clean in the tight spots I use a modified tooth brush with the head bent back a little, I also use long handle cotton tipped swabs. I am careful to wipe down anything I clean with distilled water just to make sure I don't leave anything behind that might cause damage in the future. All things considered it really wasn't very dirty so the cleaning process quick.

When the ceramic standoffs were broken most of the mounting

hardware was lost. The main missing pieces were 8-32 X 3/4" nickel plated brass machine screws, #8 nickel plated flat washers and matching nuts. Something I found when I was taking the remaining standoffs apart is the 8-32 thread nuts were not standard size. Modern 8-32 nuts are 11/32" wrench size, these are 5/16". The next day I stopped at the local hardware who I knew stocked a wide selection of hardware. Thank goodness they still have brass hardware too. I bought the needed #8 hardware plus four 6-32 brass nuts. It was easy to retap the 6-32 nuts to 8-32. Robert Lozier has a nickel plating setup in his shop and he was kind enough to do a quick plating job for me.

At the CC-AWA's Fall Swap Meet I picked up a pair of type 802 tubes from my friend Kirk Cline to replace to ones that were missing.

When I got the newly plated hardware back from Robert I found that while it looked great, nice and shiny, it didn't look like the rest of the original hardware in the transmitter which had turned a dull gray over the last 70 years. I emailed Robert and asked him if he knew a way to dull down the finish, before he could reply I thought of another solution. There was enough original hardware that I could swap the bright stuff for original where it couldn't be seen.

After the replacement standoffs were installed it was really looking good, now I get to do the hard part, the phenolic coil forms.



I had found in the "Old Radio Parts Warehouse" other wise know as our detached garage a box full of old coil forms that I've had so long I don't remember where they came from. I'm a dyed in the wool pack rat, I have boxes of radio junkie that I've been squirreling away for 35 years. Most of the time when I need a part, even though I may know I have it, it would take days and days of searching to find it. Luckily I found the coil forms while I was looking for something else.

The idea for repairing the broken coil forms was to cut pieces from the spare forms and graft them into the broken forms. Expecting the phenolic to be a problem to cut I visited our local WoodCrafters store to look for a fine cutting saw. Ten minutes later and \$20 lighter I had a nice super fine cutting little saw.





# WHO INVENTED THE SUPERHETERODYNE?

"THE LEGACIES OF EDWIN  
HOWARD ARMSTRONG"  
PART TWO

By Alan Douglas

Editor's Note: This article was originally published in the *Proceedings* of the Radio Club of America, Nov. 1990, Vol. 64 No. 3. It is reprinted here with permission from Alan Douglas. Part one appeared in the Summer 2005 issue of the *Carolina Antenna*.

## RCA'S GAMBLE

**B**ut in February 1923, just a month after Goldsmith had seen Western Electric's 4A, Howard Armstrong walked into David Sarnoff's office at RCA with his own simplified model. By using WD11 tubes and combining functions, he had whittled his model down to a (just barely) portable [24]. It would need further work to adapt it for commercial production—much more, in fact, than anyone thought—but it looked feasible and Sarnoff convinced his associates to take the gamble. He cancelled millions of dollars' worth of just-placed orders with GE and Westinghouse, hoping to scoop the industry with a model that no one else could match [25].

Time was very short, to be

designing an entirely new radio model for the 1923-24 season. Most manufacturers tried to have their engineering done by June, to take orders during the summer, and to run their factories from September through December. Neither GE nor Westinghouse was especially fast on its feet, yet RCA expected them to scrap their existing designs and put an untried circuit into commercial form in three or four months!

Westinghouse declined [26] and for a time GE wished it had done the same. At one point during the development, the GE engineers were ready to give up, a sentiment echoed to Sarnoff by the usually-optimistic Goldsmith. A blank look and the question "What'll I do now?" by Sarnoff to his secretary Marion MacInnis brought the response, "Why don't you call Armstrong?" [27] He did, and along with Hull and Langmuir of the GE Research Laboratory, Armstrong helped solve the problem of hiss in the mixer tube [28] while his associate Harry Houck solved the oscillator-pulling with his "second harmonic" invention [29]. For this bail-out work, the two received an additional 18,900 RCA shares, making Armstrong the company's single largest stockholder. And Howard did even better: he married Marion MacInnis.

As the 1923 Christmas selling season came and went, with nothing available but last year's leftover turkeys, Sarnoff must have been besieged by RCA's panic-stricken dealers. But in February 1924 the new lineup finally appeared. It was a

tremendous success, with eventual production of 148,300 superheterodynes, and made more money for RCA than anything up to the AC-powered sets of 1927-1928. To remove competition, Leutz was now hit with lawsuits and injunctions [30], and AT&T was convinced not to upset the ongoing arbitration with RCA by publicizing its new 4B model [31].

## Achieving New Wonders!



### Radiola Super-VIII

The greatest of the new standards by its first column in the recent Radio-Magazine review, its excellence in its performance.

Without a comparison without ground sets or any other device in the present market, it is the only one that can be called a true superheterodyne, and it is the only one that can be called a true superheterodyne, and it is the only one that can be called a true superheterodyne.

Essential for the true radio of the present, Radiola Super-VIII has a new development, specially designed, built with care and the highest of materials, and it is the only one that can be called a true superheterodyne.

"There's a Radiola for every purse"

Radiola Corporation of America  
 1115 Broadway, New York, N.Y. 10036  
**Radiola**  
 The World's Greatest Radio



Armstrong wrote a lengthy

paper for the I.R.E. detailing the many development steps he had gone through, and this paper also appeared in the widely-circulated magazine Radio Broadcast [32]. RCA's considerable ballyhoo even reached Japan; a radio magazine there printed photos of Howard and Marion on the Florida beach, listening to her wedding present, a portable superheterodyne. Armstrong's name was by now closely linked to his creation, and he was recognized

universally as its inventor. In all of the universe, that is, except for France.

## FRANCE

In France an entirely different line of development was going on, dating from 1916. In that year Lucien Lévy, an officer with the Télégraphie Militaire, was working on the 1½ kW radiotelephone transmitter at the Eiffel Tower, under the direction of Col. Gustave Ferrié [33]. Lévy had the idea of obtaining secrecy by modulating the RF carrier with a supersonic wave which would itself be modulated by an audio signal. This scheme, neither practical (at that time) nor original, suggested however to Lévy that if the supersonic wave were instead produced in the receiver, by heterodyning the received signal against a local oscillator, this wave could be selected by a tuned circuit before being finally converted to audio. In other words the signal could be doubly tuned: once at the incoming frequency, and again at the "intermediate" (to use the modern term) frequency. Lévy applied for a French

patent on this arrangement on August 4, 1917 (issued August 19, 1919, no. 493,660) [34]. On October 1, 1918 Lévy's second French application disclosed an even more elaborate multi-stage amplifier and filter at the intermediate frequency (issued May 27, 1920, no. 506,297).

Information on Lévy's original circuit had been publicized among his military colleagues as one page of a report by C. Gutton [35] in 1917,



## LÉVY WINS



*Lucien Lévy presenting Lee de Forest with one of his superheterodyne models (Hemardinquer, La Superhétérodyne et la Superréaction, 1926, p.166. Reference 48. Copy courtesy of the John Crerar Library, Chicago).*

and his final scheme in a hectographed paper distributed to the AEF radio-research branch in Paris on October 20, 1918.

Lévy in 1919 tried to sell his American patent application to entrepreneur Emil Simon for \$5000, telling the skeptical Simon that Armstrong had stolen his idea [36]. Later that same year he offered the rights to Le Matériel Téléphonique, the French arm of Western Electric, and in this way Lévy's work came to the attention of AT&T's engineers. They of course had been working along the same lines for years, but had evolved the superheterodyne principle so gradually that they essentially didn't know what they had [37]. Lévy's patent seemed to cover the most practical form, so AT&T bought his American application for \$20,000 [36].

Lévy eventually formed his own company, Les Établissements Radio L.L., which he headed for some years [38]. His superheterodyne patents were publicized in the magazine Radioélectricité in April and May 1921, but it was April of 1923 before he could advertise a superheterodyne broadcast receiver. As he explained in 1924,

"The superheterodyne could not reach its ultimate capabilities in France, on account of the government's slowness in expropriating the (German) Meissner patents covering the heterodyne and high-frequency amplifier coupling. Nonetheless, a model was built in 1919 which at Paris, with a 1-meter loop antenna, easily picked up boats in the Mediterranean." [39].

Les Établissements Radio L. L.  
46, rue de l'Université, PARIS — Tél. Fleuret 00-27  
constructeurs de postes d'écoute de toutes puissances, depuis 50 watts.

Poste écoute Radio L. L. 1 kw 2  
et inventeurs du double hétérodyne et de l'amplification Lévy, présentés aujourd'hui aux amateurs

**AUDIONETTE**  
gamme de réception de 150 à 2.000 mètres

AMATEURS.  
Ne devez-vous pas d'Audionette vos postes de table ou les recevoir sans

Amplification remarquable grâce au système H.F. et à la bobine S.G.O.G.

Représentations et Délégations sur demande.

*L'Onde Électrique, Feb. 1923*



April  
1924

Radio L.L. produced three home models in 1923 and, as the superheterodyne became more and more popular, other companies joined in too. By the end of 1926 Lévy had 65 French licensees.

In the United States—but not necessarily in France, at that time—two valid patents could not cover identical subject matter. Lévy had filed first, but because his patent had a different purpose from Armstrong's, and the claims were quite different, the patent examiner had apparently not noticed the conflict and had allowed Armstrong's patent to issue on June 8, 1920 (no. 1,342,885). But Lévy—or AT&T—noticed. Lévy broadened his claims to purposely create an interference, by copying Armstrong's claims exactly. The Patent Office would then have to choose between the two inventors.

Now despite the indignant rantings of Armstrong's biographer Lawrence Lessing [40] there was nothing sneaky or underhanded about Lévy's procedure. Copying a rival's claims was in fact required by Pa-

tent Office rules, to remove any ambiguity over whether or not an interference existed. The only question was whether the invention that Lévy disclosed, in 1917, would cover the new claims. The disclosure was not altered. After several years of legal wrangling, the Court of Appeals of the District of Columbia ruled that Lévy's original disclosure would indeed support the new claims; in other words, all the features of Armstrong's superheterodyne were spelled out in Lévy's description [41]. Therefore, since Lévy's filing date was seven months earlier than Armstrong's first date of conception, Lévy was entitled to a patent and accordingly one was issued on November 5, 1929 (1,734,038) with a priority date of August 4, 1917. It incorporated seven of Armstrong's nine claims; the two remaining went to Alexander-son of GE and Kendall of AT&T in similar fashion (Aitken, reference 36).

While French patent procedure was fairly lax, the Germans were even more thorough than the Americans, and a similar interference proceeding there resulted in a patent to Lévy on October 1, 1931 (no. 536,049) again with a priority date of August 4, 1917. [42].

There were in fact a number of quasi-superheterodyne systems invented earlier than either Armstrong's or Lévy's. Walter Schottky, who was active in this field himself, listed three in 1926: [43]

The idea of employing the advantages of heterodyne recep-



tion for radio telephony also, by selecting an inaudibly high beat frequency, was probably published originally in 1913 by Mr. Hogan in the course of a discussion {8}. The idea of producing a beat frequency by means of a local source of oscillation, which was not intended to make the signals audible, but expressly to provide for another tuning and thereby increased selectivity, has been patented by Graf Arco and A. Meissner {9}, and by H.J. Round {10}. Round's application also lays stress on providing inaudible beat frequencies, but actually offers no good selectivity against interference owing to the inherent necessary detuning of the aerial.

{8} Hogan, Proceedings of the Institute of Radio Engineers, 1, 97 (1913)

{9} English Pat. 252, 1914, filed January 5, 1914 and D.R.P. 300896, January 15, 1917.

{10} English Pat. 27,480, 1913, filed November 11, 1913.

A.M. Morse in the Electrician of July 31, 1925 also cited the equivalent British patents of the various contestants, with much the same comments [44].

### LÉVY LOSES

Even in France, the very birthplace of chauvinism [45], the Frenchman Lévy found it tough sledding to obtain public credit for his invention. RCA's 1924 publicity reached his

country when Radio-Review published a translation of Armstrong's 1924 I.R.E. paper in which, unlike the 1921 article, Lévy's name did not even appear. This oversight prompted a lengthy rebuttal by Lévy in the same issue (reference 38).

*Radioélectricité, Dec. 25, 1924.*



But Lévy's struggles were not solely with Armstrong. In the popular weekly L'Antenne, a discussion began in late 1925 on the relative merits of the frequency-changing circuits used by the Lévy and Ducretet companies. Lévy used a separate oscillator tube, and called his mixer tube a "detector," while Ducretet's engineers used a "bigrille" or double-grid tube for both functions and called theirs a "modulator." By late 1925 Lévy was beginning to sign up his competitors for royalty licenses to use his invention, and it is more than likely that Ducretet had commercial reasons for not admitting its circuit to be a superheterodyne. It is also more than likely that many

others in the French radio industry felt similarly hostile toward Lévy, since L'Antenne quickly became a forum for vituperative personal attacks on him, chiefly by the magazine's own editor, Henri Étienne. When Étienne learned that another engineer attached to Ferrié's group during the war, Paul Laüt, had proposed most of what Lévy had patented, in a memo written six months earlier, he reprinted the original memo and demanded that Lévy explain himself. Lévy could only offer some weak excuses and "arguments specieux" and there the controversy rested, with his opponents having the last word. [46]. Lévy had his patent and, as Étienne put it, "filled his pockets" but as late as 1955 had to write a bristling full-page reply to L'Onde Électrique, France's foremost electronics magazine, to correct a published story crediting Armstrong with the superheterodyne (reference 42).

Lévy always felt that Armstrong had stolen his invention, but there is no direct evidence for this [47]. Lévy's ideas had indeed been published in military reports distributed to the American radio personnel; however the first such report had arrived before Armstrong was in Paris, and the second came after he had already done a good deal of experimental work and was preparing his patent application.

It is true that Armstrong, in his capacity as head of the radio research laboratory, was in close contact with French manufacturers, since inspection of incoming French equipment was being done at the

same Paris location. And it was his job to keep abreast of French technical developments and to coordinate his group's research with them. Given Lévy's emphasis on secrecy systems and selectivity, Armstrong probably felt that he had contributed little of novelty to the prior art, and only discovered the superheterodyne's potential after Armstrong pointed the way. Lévy, conversely, knew that Armstrong did not deserve an all-encompassing patent, and he was stung by Armstrong's unwillingness to credit prior researchers in his 1924 paper ("It is unfortunate that Mr. Armstrong, who in his 1920 I.R.E. paper had recognized our priority, has forgotten, in the midst of his glory, the source from which he drew)."[48].

## SUMMARY

Walter Schottky summed it up accurately in 1926:

"Finally, the aforementioned patent of Lucien Lévy is of fundamental importance to the whole field; he must be considered, at least from the point of view of patent law, as the true originator of the superheterodyne method, since the super-imposition of an adjacent frequency, an intermediate circuit tuned to inaudible frequencies, and a further rectification in order to convert into the desired signal, are described explicitly in his application (as one of several constructions). In regard to earlier existent publication, there may be a doubt as to whether the

information would have brought about the desired technical progress we owe to the super-heterodyne method, as conceived by Mr. Armstrong and also described in the German application. After all, the actual aim of the high-frequency transformation or super-heterodyning principle consists in providing a suitable and relatively convenient radio-frequency amplifier for short waves, whereas the selectivity effects that Lévy solely had in view are less important, according to the above considerations, and might be obtained as well by the use of a slightly attenuated or reaction-coupled radio frequency syntonizing circuit. The drawings of this application also leave it doubtful whether the elimination of the square-law rectifying action, which is so essential for the commercial use of the apparatus, would have been obtained by means of experimental sets constructed on the principle indicated in the application.

"The "word" seems, at any rate, to have been far less important than the "deed," and there appears to be no doubt that it is Mr. Armstrong and his collaborators to whom we owe the deed, which has made the super-heterodyne method such an invaluable instrumentality in radio engineering." (reference 43)

#### FOOTNOTES

[24] Figs. 9 and 10 in Armstrong's

1924 I.R.E. paper (reference 32). The Westinghouse WD11 was electrically equivalent to Western Electric's 215-A "peanut" tube, drawing 0.25 Ampere at 1.1 Volts from dry cells. GE's belated answer, used in all its portable sets including the superheterodynes, was the UV199 which consumed .06 Ampere at 3.3 Volts. The standard radio tube of the day, the UV201A, drew 0.25 Ampere at 5 Volts from a storage battery.

[25] Archer, History of Radio to 1926 (New York: The American Historical Society, 1938), p.297.

[26] Author's correspondence with W.L. Carlson, superheterodyne design engineer at GE 1924-1930.

[27] Lessing, Man of High Fidelity: Edwin Howard Armstrong (Philadelphia: Lippincott, 1956. New York: Bantam Books, 1969), p.148/119.

[28] Hull's screen-grid tube grew out of this work. See Physical Review 27 (April 1926), pp.432-438, 439-454. Also Proc. I.R.E. 16 (April 1928), pp.424-446; 16 (June 1928), pp.840-843.

[29] To allow use of silicon-steel transformer cores, and to get the proper bandpass, the IF was set at 42 kHz. To economize on tubes and battery power, one triode served as oscillator and mixer, and the RF tube was also the first IF amplifier. But it proved impossible to avoid interaction between the RF and oscillator tuned circuits, only 42 kHz apart. Houck's solution was to run

the oscillator at half the usual frequency, so that its second harmonic was 42 kHz from the RF signal. One disadvantage of this arrangement was that a station could be tuned in at several points on the dials, but at that time there were fewer stations on the air, than now. These models in fact work quite well, even today.

**[30]** RCA had already incurred Congressional wrath with its monopolistic practices, prompting a full-scale Federal Trade Commission investigation in 1923. If it had sued Leutz in 1923, before its own superheterodynes were on sale, RCA would surely have been denounced as a dog in the manger.

**[31]** This time AT&T actually delivered a 4B to the White House, to RCA's consternation since it beat the top-of-the-line Radiola Super-VIII in competitive tests (but it had three more tubes, and a better loudspeaker). RCA and AT&T finally settled their differences in 1926 with the sale of WEAF to RCA. WEAF became the flagship station of the new National Broadcasting Company (later WNBC). See Archer, *Big Business and Radio*.

**[32]** Edwin H. Armstrong, "The Superheterodyne--Its Origin, Development, and Some Recent Improvements," *Proc. I.R.E.* 12 (Oct. 1924), pp.539-552. Also (with a different fig.1) *Radio Broadcast* 5 (July 1924), pp.198-207.

**[33]** Col. (later General) Gustave Ferrié (1868-1932) was an influential proponent of military radio, and his Eiffel Tower laboratory was at

the center of new developments.

*L'Onde Électrique* 11 (Feb. 1932), pp.45-52.

**[34]** Corresponding foreign patents:

U.S. 1,734,038 applied Aug.12, 1918, issued Nov.5,1929

Britain—143,583 accepted June 3, 1920

Germany—536,049 issued Oct.1, 1931

In accordance with international convention, these all had priority dates of Aug. 4, 1917.

**[35]** Gutton collaborated with Gen. Ferrié on short-wave studies in the 1920s, and later was director of the Laboratoire National de Radioélectricité.

**[36]** Aitken, *The Continuous Wave* (Princeton, NJ: Princeton University Press, 1985), p.467.

**[37]** Espenschied, reference 22.

**[38]** 15 years, according to Champeix. Lévy also ran his own broadcast station.

Champeix, "Qui a Inventé le Superhétérodyne?" *La Liaison des Transmissions* 116 (March-April 1979), 117 (April-May 1979).

**[39]** "Le superhétérodyne Lévy ne put atteindre tout le développement dont il était susceptible en France, à cause de la lenteur avec laquelle les services de l'Etat procédaient à l'ex-

appropriation des brevets Meissner, dont l'emploi était nécessaire pour la réalisation des hétérodynes du super-hétérodyne et pour le réglage facile de l'accrochage des amplificateurs à haute fréquence. 1955), p.548.

"Pourtant, malgré ces difficultés, un modèle fut créé en 1919, lequel permettait facilement à Paris sur cadre de 1m. la réception des côtières et bateaux de la Méditerranée."

Lévy, "L'Histoire du Super-Hétérodyne," *Radio-Revue* 3 (Oct. 1924), pp.186-188.

[40] Lessing, *Man of High Fidelity*, p.118 (original ed.) or p.93 (paperback ed.)

While Lessing is usually trustworthy, occasionally hero-worship gets the better of him. His statement here that the French government never allowed Lévy's claims is absolutely false. And his description of Lévy's patent and AT&T's conduct is, to say the least, misleading. Lessing also forgets to mention that Armstrong's superheterodyne patent was void after 1928. Champeix (reference 38) after paraphrasing Lessing's account in his very thorough 1979 paper on the superheterodyne's invention, follows with a single sentence, "Voilà comment on écrit l'histoire." (Loosely, "See what passes for history.").

[41] 29F(2d)953. *Armstrong v. Lévy*, decided Dec. 3, 1928.

[42] Lévy, "Au Sujet du Superhétérodyne," *L'Onde Électrique* 35 (May

[43] Schottky, "On the Origin of the Super-Heterodyne Method," *Proc. I.R.E.* 14 (Oct. 1926), pp.695-698.

Hogan's comment, by the way, was an answer to "How do you receive radiotelephone signals with a heterodyne detector?" His reply was to keep the beat frequency inaudibly high. The "correct" answer of course is to zero-beat them with the local oscillator, which makes you wonder about the state of the art in those days! Hogan, it should be noted, was an extremely competent experimenter and engineer.

[44] Morse, "The Superheterodyne," *Electrician* 95 (July 31, 1925), p.121.

[45] Chauvinism: vainglorious or exaggerated patriotism, from Nicolas Chauvin, whose demonstrative patriotism and attachment to Napoleon came to be ridiculed by his comrades. (Webster).

[46] Champeix, "Qui a Inventé le Superhétérodyne?" (reference 38).

Champeix met Paul Laüt by accident in 1968 and heard the story from him, later reconstructing the affair from the published letters in *L'Antenne*. In the end, however, Champeix awards the laurel to Lévy and Armstrong.

Laüt contracted tuberculosis and was sent away to the countryside to recuperate, for a year. He used this time to grapple with theoretical

problems assigned by Ferrié, reporting his conclusions by letter. His superheterodyne proposal involved frequency-changing by the heterodyne, amplification at the intermediate frequency, and detection. But it did not include any IF tuning. Lévy claimed in 1926, "Il me semble bien qu'à ce moment, le 'remarquable' petite note de M. Laüt a'avait pas attiré outre mesure l'attention" ("It seems to me that at that time, Mr. Laüt's 'remarkable' short note did not attract much attention"), an opinion corroborated by his superior in a subsequent letter to L'Antenne;. Laüt stated in 1968 that on his return to Paris in 1917, he was chagrined to learn that Lévy had patented some of his ideas, but was told by Ferrié not to let personal considerations interfere with the war effort. Of course, it is a matter of record that Laüt did not contest Lévy's patent and, whatever he stated later (hindsight is always 20-20) he must have felt at the time that the matter was not worth pursuing. And in truth, Laüt seems not to have gone much beyond what Round or Arco and Meissner had devised.

[47] As Champeix points out, Laüt had good reason to feel the same way about Lévy!

[48] "On pourra enfin regretter que M. Armstrong, qui avait, dans sa première communication à la Société des Radio Engineers de New-York, reconnu notre antériorité, ait oublié au sein de sa gloire, la source à laquelle il était venu puiser." (Radio-Revue, reference 39). When the same material was re-

printed, with additions, in a 1926 book on the superheterodyne, cooler heads prevailed and the phrase "au sein de sa gloire" was omitted.

Hemardinquer, *La Superhétérodyne et la Superréaction* (Paris: Étienne Chiron, 1926).

[49]

*Superheterodyne assembly and testing at GE. (photos courtesy Hall of History, Schenectady).*



*A.F. Van Dyck moved from GE to RCA in 1922, heading the Technical & Test Dept. One of his pet projects was a*





*portable superheterodyne; the two models shown had evolved by 1925 into the Radiola 26. Model #2 is now in the Ford Museum.*

(Lund, Sweden) for introducing me to Champeix's paper on Lévy, to John M. Anderson of General Electric for searching that company's photographic archives, and to Joseph de Veer of the Marine Biological Laboratory Library (Woods Hole, Mass.) for tracking down elusive references. Other contributors are credited under particular illustrations.



Copyright © 2004 by Alan S. Douglas.

I am grateful to Dr. Anders Widell



"He pulled out the filament switch and the tubes lit up—oh, they lit up beautifully—"

# ALL FOR NAUGHT! WELL MAYBE NOT

By Robert Lozier – KD4HSH

A couple of years ago Ernie Hite started working to preserve/restore a pretty good Wireless Specialty Apparatus Co. Type IP-501A communications receiver of about 1924 vintage. It was missing some wiring, an audio transformer, the buzzer (I think) and the brass door, hinges, pull knob & latch over the tube well. The cabinet looked a little rough but basically sound. If I recall correctly, the only thing that the set now is missing is one correct binding post.

Last year Ernie 'volunteered me' to make the missing goofy brass hinges, the nickel plated brass pull knob and door latch. Back just before Christmas Ernie brought the set over to the shop, plunked it down on a bench and told me that he did not have the necessary tools to solder the brass hinges to the heavy brass door. Over the holiday I made up a fixture to hold the parts in place and got out my 200 Watt American Beauty soldering iron with it's 1/2" diameter chisel tip. ( That mother throws down some serious heat! ) Those hinges were soldered in place in about five seconds each...

I painted the door, mounted the knob & latch and was pleased to see that the door worked like a charm. OK time to drop the panel down

into the cabinet.... That is when I noticed that one of the 10 brass blocks that act as brackets to attach the panel to the box was missing.... #\*\$&! I called Ernie and he said that if the bracket was not in his little plastic bag of parts, he never had it... Jeez! Something else to burn personal time....

This little bracket is not a garden variety L-bracket.... Instead it appears to be a green sand - cast brass bar with an unusual profile. This bar stock was saw cut into 5/8" lengths, nickel plated and then three holes were drilled and tapped into it. ---- Two to attach it to the cabinet and one to attach the radio panel.

First of all, I had no way to make a green sand brass casting at home. I finally settled on milling the odd profile on a block of brass.... I did not have a brass block so wound up getting out the American Beauty for another job... This time using it to solder up a stack of brass plates to the proper thickness. Then the stack went into the milling machine to cut the right profile....

All well and good but this little chunk of brass looked nothing like the 9 other crude sand cast brackets. What to do ??? .... I got out a jewelers file to rough up and soften the edges. A larger file was used to simulate the saw cutting of the bar stock . Then I got out a crummy old Sears vibrator type engraving pen that certainly had not been used in over 10 years and started to buzz the brass surface in random patterns. It was starting to look fairly



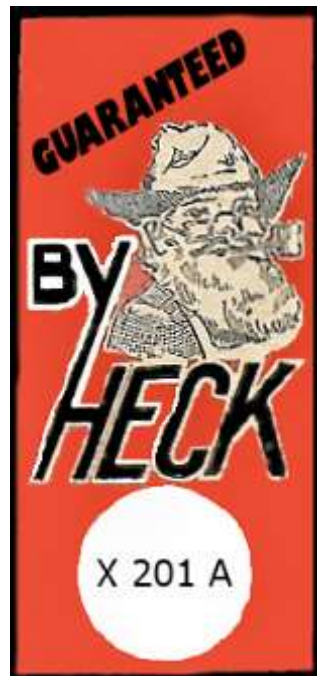
convincing..... Then I put the part in a shallow plastic dish and covered it with sand and began pounding on the sand with a miniature ball peen hammer. Bingo! Almost perfect simulation of the rough casting.

Time to set up my nickel plating outfit and plate the part just fine. I then drilled three #36 holes in the part and tapped the holes 6x32. I then rubbed a bit of gray primer and oak stain into the rough surface to make it match the old parts.... Five hours down the drain but I had a nifty replica to finish Ernie's set.

Another call to Ernie had him driving over a few days later to pick it up. Ernie was very pleased with the work I had done and I complimented him on the fine job he had done re-wiring, cleaning and retouching the cabinet. Time for me to drop the panel into the cabinet so it could travel safely.... I turn the cabinet 90 degrees and hear a little 'plick'..... What is that?.... Oh s%\$#! It's the missing cast brass bracket! Imagine my disgust when I realized that I had blown five hours on a great replica Ernie really didn't need.... Why Ernie and I did not spot the loose bracket before hand we will never know. (Maybe it really did just appear at that moment out of thin air after having slipped into some other time dimension for a few decades.)

End of story? Not quite.... Ernie gets home and does as I had suggested, remove my replica bracket from the cabinet and install the original part. Then Ernie discovers

that the panel mounting hole just won't line up with the panel! It is clear that these crude brackets were mounted in the cabinet and then the panel mounting holes were marked with a scribe, drilled and tapped. This one odd bracket had to come from another cabinet... Go figure!.... I do know, however, that these sets were used all the way up to WW-II and would have been in for depot service at one time or another.... Maybe one lazy tech was ready to go home and just decided that 9 brackets were enough and tossed the 10<sup>th</sup>. into the cabinet when he found it would not fit. So my replica is going to get used after all and Ernie and I have another little story to tell over & over & OVER at future radio meets.



*Tube*

*Box—Circa 1920s*



Super-Zenith De Luxe English Model

Super-Zeniths priced from \$240 to \$355

—in De Luxe Art Model Cabinets from \$500 to \$2000  
Other Zenith Sets \$100 and \$175



Super-Zenith De Luxe Colonial Model

## Why Does the Zenith Cost More?

Any Super-Zenith owner will tell you that the instrument *does* more—consequently is worth more.

It does more because it brings in distant stations with ease and simplicity. It gives reproduction with full, rich tone values faithfully preserved.

The Super-Zenith costs more to make simply because it is a perfectly balanced radio instrument—produced with the skill and exactitude that goes into a fine watch or any other piece of delicate mechanism.

After all is said and done, performance, not words, should be the deciding point in your purchase of a radio.

Hear a Super-Zenith—make comparisons—draw your own conclusions.

If you care to write, we'll gladly send literature and the name of nearest dealer.

ZENITH RADIO CORPORATION  
Struss Bldg., 310 S. Michigan Ave., Chicago, Ill.



Super-Zenith Model VIII

Same as VII except—built with mahogany legs of well proportioned, appropriate design, converting model into console type.



Super-Zenith VII

Six tubes—3 stages tuned frequency amplification—detector and 3 stages audio frequency amplification. Installed in a beautifully finished cabinet of solid mahogany—24 1/2 inches long, 10 1/2 inches wide, 10 1/2 inches high. Compartments at either end for dry batteries.

Why did Commander MacMillan take Zenith to the Arctic?

Because—on his previous expedition, Zenith kept him in touch with civilization. Naturally, he again chose it because of first hand knowledge of its absolute dependability.

**ZENITH**  
—LONG DISTANCE—  
**RADIO**  
*It Costs more—but it Does more*