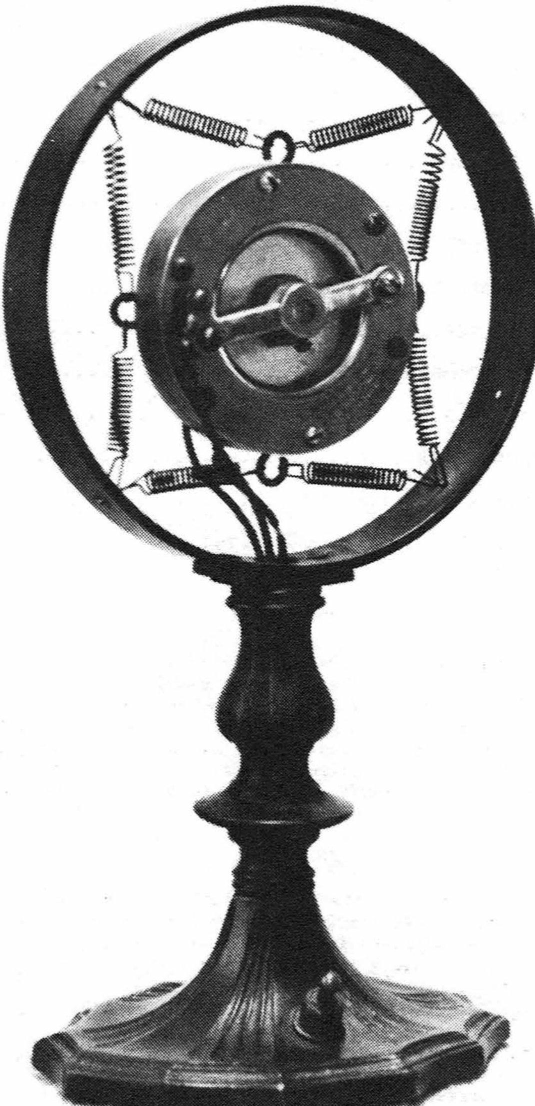
CHRS official

JOURNAL

JULY-AUG 1984



1930 "AMERICAN" MICROPHONE

CALIFORNIA HISTORICAL RADIO SOCIETY

PRESIDENT: NORMAN BERGE
SECRETARY: BOB CROCKETT
TREASURER: JOHN ECKLAND
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PHOTOGRAPHY: GEORGE DURFEY

CONTENTS

THE SOCIETY

The California Historical Radio Society is a non-profit corporation chartered in 1974 to promote the preservation of early radio equipment and radio broadcasting. CHRS provides a medium for members to exchange information on the history of radio with emphasis on areas such as collecting, cataloging and restoration of equipment, literature, and programs. Regular swap meets are scheduled four times a year. For further information, write the California Historical Radio Society, P.O. Box 1147, Mountain View, CA 94042-1147.

THE JOURNAL

The official Journal of the California Historical Radio Society is published six times a year and is furnished free to all members. Articles for the Journal are solicited from all members. Appropriate subjects include information on early radio equipment, personalities, or broadcasts, restoration hints, photographs, ads, etc. Material for the Journal should be submitted to the Editor, Herb Brams, 2427 Durant #4, Berkeley, CA 94704.

MEMBERSHIP

Membership correspondence should be addressed to the Treasurer, John Eckland, 969 Addison Ave., Palo Alto, CA 94301.

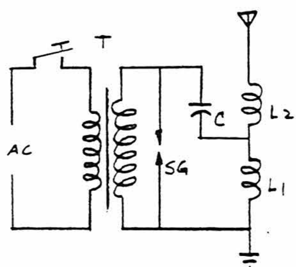
SPARK TRANSMITTERS

by Ed Fistor

One of the most successful of the early radio transmitters was the spark transmitter. These were used by the thousands for shipboard and point-to-point communications, by all government services, and by many private and public communications companies.

The design of these transmitters was quite simple. Only a few parts were used, as shown in Fig. 1.

Fig. 1

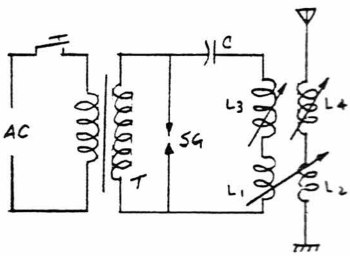


L_1 and C are the components making up the frequency-determining tank circuit, while L_2 tunes the antenna. SG is the spark gap, and T is the power transformer. The primary of the transformer is keyed. The primary voltage was usually 110 volts, while the secondary was 1,000 volts or more.

The operation of the set was as simple as the design. The power transformer stepped up the line voltage to a high voltage. This voltage was applied to the capacitor, inductors, and the antenna. The antenna capacitance to ground, the inductors, and capacitor C formed a tank circuit which oscillated at a resonant frequency when shock-excited by a burst of energy from the power supply. When the key was closed, the capacitor charged towards the peak transformer voltage. As this voltage approached the peak value, a spark jumped the gap, discharging the capacitor through L_1. A magnetic field was built up in L_1 until the energy stored in the inductor equaled the energy stored in the capacitor. The magnetic field then collapsed and the resulting reverse current charged the capacitor in the other direction. When energy equilibrium was reached again, the magnetic field collapsed and the process repeated over and over, with current surging back and forth through the tank circuit at the resonant frequency of L_1 and C. Whenever the peak tank voltage decayed to less than the gap sustaining voltage, the spark would be extinguished and would remain so until the next AC cycle reached the gap firing voltage. The output radio wave was thus modulated by the supply frequency and by the noise generated by the ionized path of the spark gap. Most installations used motor generators to provide high voltages at 500 Hz or so. At these frequencies, the radio signals gave an audible tone in receiver headphones.

The sharp keying pulses, the AC supply, noise from the spark gap, and the inadequate Q of the tank circuit combined to produce a broad wave, some 50 to 100 KHz wide. This caused much adjacent channel interference to other stations in the vicinity. An improved circuit was evolved which used an RF transformer to decouple the antenna from the tank circuit, as shown in Fig. 2.

Fig. 2



As Fig. 2 shows, four coils were used, the two lower ones having fixed inductance, but with variable couplings between them. The two upper coils were variometers, coils whose inductance could be varied, but with no mutual coupling between them. These provided independent tuning of the tank circuit and the antenna circuit with means for adjusting the energy transfer between primary and secondary. By keeping the coupling loose, a sharper selectivity was obtained which narrowed the channel down to 10KHz or so, a big improvement. For distress calls, the operator increased the couplings to widen the bandwidth in order to make himself heard by everyone within range.

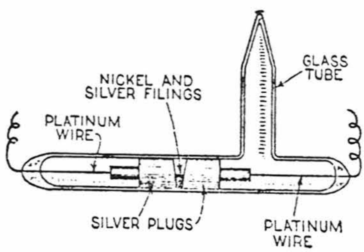
Much early communication was performed by transmitters such as these, running hundreds of kilowatts of power and covering thousands of miles. All of this operation was on long waves...frequencies below 1,000 KHz, or as it was measured in those days, from 300 meters to 10,000 meters.

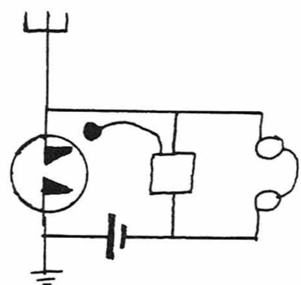
The end to spark transmitter history began around 1915, when sparks were replaced with arc transmitters and then around 1920 when both were replaced by tube transmitters. The last remaining spark units were removed from tramp steamers in 1940. The era of spark may be gone, but the memory of the melodious tones piercing the static on a stormy night will always be remembered.

EARLY DETECTORS

By the late 1880's communication by radio waves had become a reality. At first, the distances covered were short, only a few miles. This could be increased by using more powerful transmitters, but these were large, cumbersome, and expensive. Attention was turned toward improving detectors, those devices that indicated the presence of radio signals and used them to operate a recording device such as an earphone or telegraph recording instrument. Since radio communication at this time was carried out by keyed telegraph signals, detectors not only had to be sensitive but also had to be able to respond quickly to the rapid impulses of these signals. The detectors described below were developed in the 1890's and early 1900's and preceded the development of the vacuum tube diode detector in 1904.

Coherers: The coherer was one of the earliest detectors, being developed for radio use by Marconi in 1894. It consisted of a small glass tube filled with fine nickel and silver filings held between two closely-spaced silver electrodes. The tube was exhausted of its air and sealed. An antenna was attached to one electrode and a ground connection to the other.





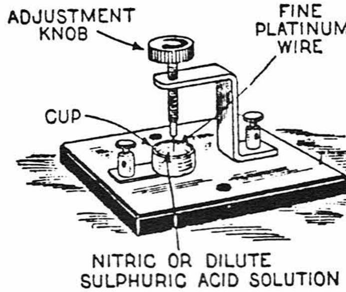
Coherer

Under normal conditions the filings occurred in a loose condition that offered a relatively high resistance to a flow of current through it. When a weak signal from the antenna passed through the coherer, the filings would cling together and conduct electricity more easily.

The coherer was placed in series with a battery and headphone. When a signal was received, the particles cohered and current from the battery flowed through the coherer, activating the headphone. The filings would continue to cling together after the incoming signal had ceased and so Marconi added an automatic tapper to decohere the filings and restore them to their normal non-conductive condition, ready to receive another signal. Telegraph signals could be heard either by sounds in the earphone or by the operation of the tapper. The coherer was simple, sensitive, and reliable and so was one of the most widely-used detectors in the early days of radio.

Electrolytic Detector: Developed around 1902 by Fessenden, the electrolytic detector consisted of a fine platinum wire dipping into a small cup of dilute nitric or sulfuric acid. The wire was lowered until it just touched the surface of the acid solution.

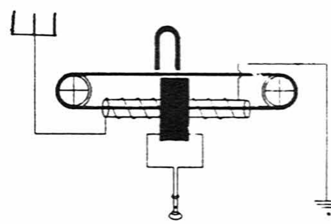
Electrolytic Detector



The electrolytic detector acted as a rectifier, converting the high frequency alternating current signals induced in the antenna by radio waves into pulses of direct current that could be heard in an earphone. The electrolytic detector was extremely sensitive but had to be adjusted very carefully. It was also very fragile and could be knocked out of adjustment very easily.

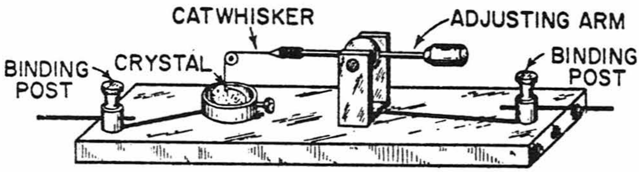
Magnetic Detectors: The magnetic detector was developed by Marconi around 1902. This detector consisted of a circular band of fine iron wire that was moved through a coil. One end of the coil was connected to an antenna and the other was connected to ground. Another coil of wire, wound around the center of the antenna coil, was connected to a telephone earpiece. A magnet was placed near the band of iron wire, magnetizing it.

Magnetic Detector



Signals induced in the antenna coil caused the iron wire to lose its magnetism. The resulting change in the magnetic field around the wire induced a current in the pickup coil, giving an audible indication in the telephone receiver. The magnetic detector was not much more sensitive than the coherer, but it was more rugged and reliable and was much faster in response.

Crystal Detectors: Crystal detectors were developed for radio use by Pickard and by Dunwoody around 1904. These detectors usually consisted of a mineral crystal held in a cup or spring grip with an adjustable wire ("catswhisker") making contact with the surface of the crystal. The wire was moved to various parts of the crystal to find a point of proper operation. Some detectors (e.g. Perikon) consisted of two different minerals held in contact with each other.



Crystal Detector

Many different materials, both natural and synthetic, could be used. The following were most common: galena (lead sulfide), carborundum, silicon, molybdenite, bornite, iron pyrite, cerusite, zincite, and chalcopyrite.

The crystal detector acted as a rectifier, permitting current to flow readily in one direction while offering high resistance to its passage in the opposite direction. Signals from the antenna were converted into pulses of direct current that could be heard in an earphone. The crystal detector could also detect modulated radio signals, making reception of voice ("wireless telephony") possible.

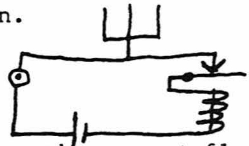
The crystal detector was simple, inexpensive, and efficient. However, the catswhisker had to be adjusted for proper operation and it could easily be jarred out of position. Also, heavy currents induced by strong local transmitters could heat the contact point, rendering the detector inoperative.

The great improvement in detectors made it possible to construct a radio set easily and at low cost from readily-available materials. As a result, interest in radio greatly expanded and increased. Wireless became a household word. Magazines and newspapers carried articles and stories about wireless and printed instructions for building sets. In the homes of many, the kitchen table was taken over as a workbench and Quaker Oats boxes were put to new and strange uses. The radio boom was on and there would be no stopping it for many decades.

References: Radio Physics Course, by A. A. Ghirardi, 1933.
From Spark to Satellite, by Stanley Leinwoll, Charles Scribner's, 1979.
Radio Theory and Operating, by Mary T. Loomis, 1925.
Antique Wireless Association, The Old Timer's Bulletin, Mar., 1984.
CHRS Journal, May-June 1984.

TRANSMITTER

A simple transmitter can be made from an ordinary buzzer, battery and pushbutton.

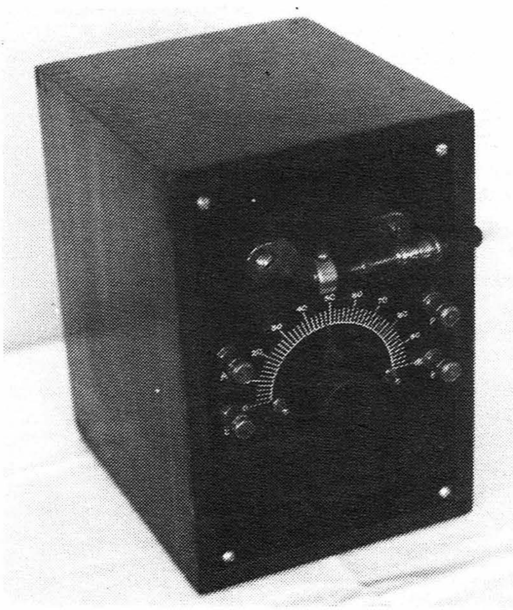


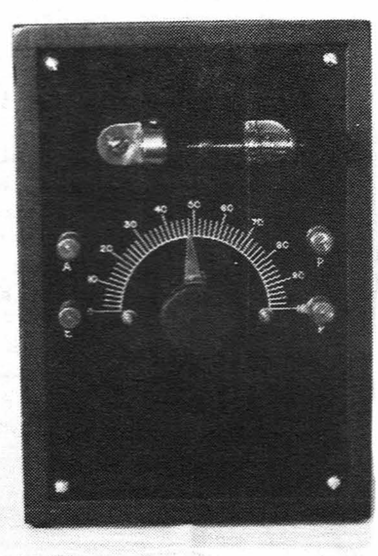
When the button is pressed, current flows through the iron-core coil creating an electromagnet. The magnetic field pulls the flapper contact downwards, opening the circuit. The flapper then springs back upwards, reconnecting the circuit, and the cycle repeats over and over. The sudden changes in current and sparking at the contacts generates a rough radio wave signal that is radiated by the attached antenna.

This simple circuit was used as a crude transmitter for communication over short distances or to provide a broad rough signal when it was desired to adjust detectors for proper operation.

BUSCO CRYSTAL SET

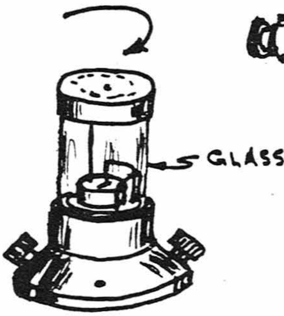
This set is shown in Buscher's Radio Catalog #5, March, 1923, p. 10. It is described as "A supersensitive variometer set. Price $9.00." The set shown above has been restored to original condition. Dave McKenzie, 516 S. Exeter St., Eustis, FLA 32726.





CRYSTAL DETECTORS

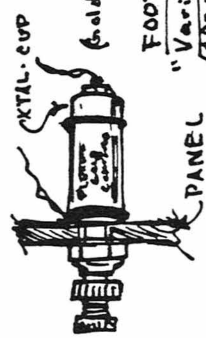
drawn by D. H. Moore



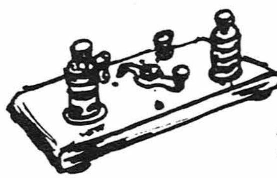
"YELLOWTIP"
Wholesale Radio
(1923 - 2.)

"RASLA"
Davidson Radio,
(1923 - 1.25)

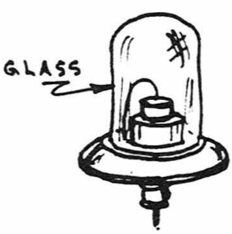
STANFORD RADIO
(1925 - 1.)



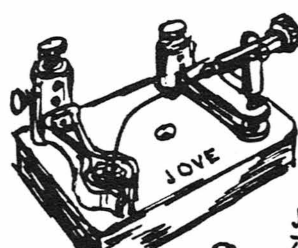
(Gold Contacts)
FOOTE
"Variodetector"
(1924 - 1.75)



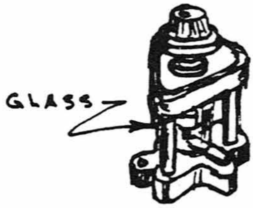
AMRAD
Detector Stand
(1919)



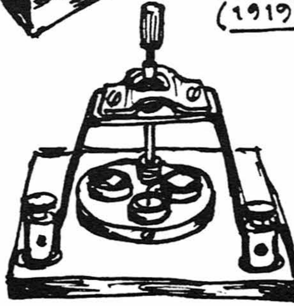
"GREWOL"
Randel Wireless
(1923 - 2.)



JOVE XTAL. DET.
(1919) (1.44)



FRESHMAN
(1925 - 1.50)



Galena
Silicon
Radiocite

3-XTAL. CUP DET.
(Radio Telephone, 1922 - 2.50)

THE GEIGER COUNTER

By Russ Winenow W6AVG

In a previous issue (CHRS Journal, Sept-Dec. 1980) I discussed X-ray tubes and how X-rays were discovered by Roentgen in 1895. In 1909, the first experiment in which a device for counting ionized atomic radiations was performed in the Cavendish Lab at Cambridge University. The experimenters were Ernest Rutherford and H. Geiger (not Geissler). Later this instrument became known as the Geiger counter.

Basically, this type of counter consists of a glass tube filled with a gas such as neon or argon and having two spaced metallic electrodes by means of which a voltage can be applied to the gas. If the voltage is high enough, a glow discharge will occur between the electrodes, similar to that of a neon sign. The counter uses an arrangement for setting the voltage at a point just below ignition so that external radiation will trigger the discharge and create a series of clicks. The rate at which the clicks appear becomes a measure of the relative intensity of the external radiation.

The Encyclopedia Britannica describes the Geiger Counter as the most sensitive device for the detection of radiation. It will detect individual particles of all kinds. An improved version of the original device was widely used in 1947 in the Geiger-Muller counter. This consisted of a conductive cylinder with a coaxial wire that was insulated from the cylinder. The cylinder was filled with gas at reduced pressure together with a quenching component such as alcohol and was operated with a negative voltage of 500 V or more on the outer cylinder. The passage of an ionizing particle through the counter caused a temporary breakdown between the cylinder and the central wire. This pulse was amplified to provide an audible signal or to operate a recording device. The recording instrument registers the number of clicks in a given period of time. The faster the clicks, the stronger the radiation. By putting different kinds of insulating materials around the Geiger tube, the counter can be made to be responsive to different kinds of radiation.

Other methods of detection include the electroscope, ionization chambers, and others. Fig. 1 shows an instrument that was widely used by the military. Fig. 2 shows a somewhat later model used by uranium ore hunters. For further information consult the encyclopedia which has a very good section on radiation and radioactivity.

__Refs__: Scientific American, July 1950
Encyclopedia Britannica

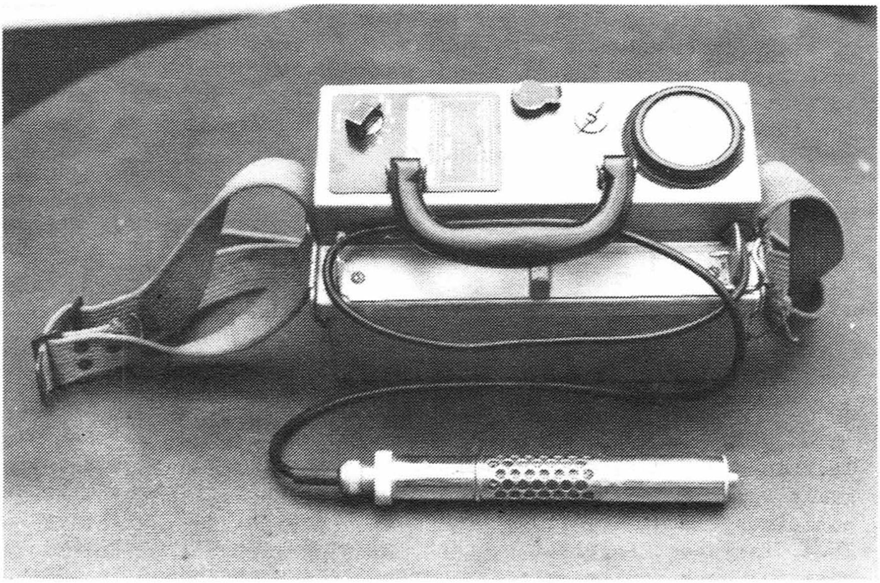
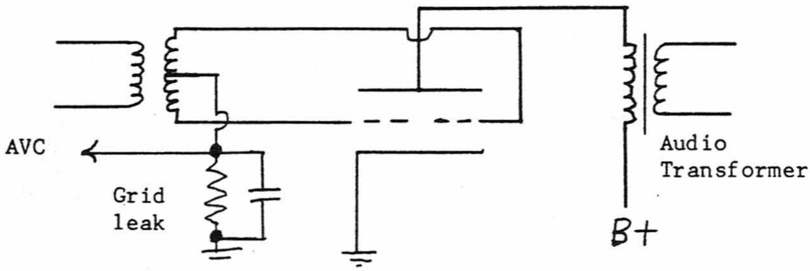


Fig. 1

Fig. 2

WUNDERLICH DETECTOR TUBES

Wunderlich detector tubes consisted of a triode or tetrode with two independent control grids. The grids were spaced the same distance from the plate and cathode and were intermeshed so that the control characteristics for each grid were identical. The tubes were used primarily as grid-leak detectors in a push-pull arrangement with a common grid resistor.



In this configuration, the signal voltages applied to the two grids were 180° out of phase; that is, as one grid became more positive, the other grid became more negative, and vice versa. Thus, increases in plate current caused by one grid becoming positive were counteracted by corresponding decreases in current caused by the other grid simultaneously becoming negative. As a result, radio-frequency variations in plate current caused by signal voltages on the grids were cancelled out. On the other hand, the negative bias voltage that developed by grid-leak action across the common grid resistor was applied to the two grids in parallel (i.e., in phase) and so the effect of this voltage on the plate current was not cancelled out. As a result, the plate current varied only at an audio rate, in accordance with the modulation of the incoming RF signal.

The advantage of the Wunderlich detector was that radio-frequency currents were prevented from entering the audio system and generating what is known as "fringe howl." The negative bias voltage that developed across the grid-leak resistor could be tapped, filtered, and used to provide an AVC controlling voltage.

The Wunderlich tube could also be used as a push-pull plate detector. In this mode of operation, however, the RF-cancelling effect of the grid-leak operation was lost, and so there was little advantage gained over the usual single-ended operation.

Wunderlich detector tubes were manufactured by the Arcturus company and by Sylvania and were used mainly by the E.H. Scott company in their sets around 1932-33. The tubes were made in several forms: five-pin base with a grid cap and six-pin base without a grid cap. The filament voltage was either 2.5v or 6.3v AC.

References: Modern Radio Servicing, by A.A. Ghirardi, 1935.
CHRS Journal, May-June 1984.

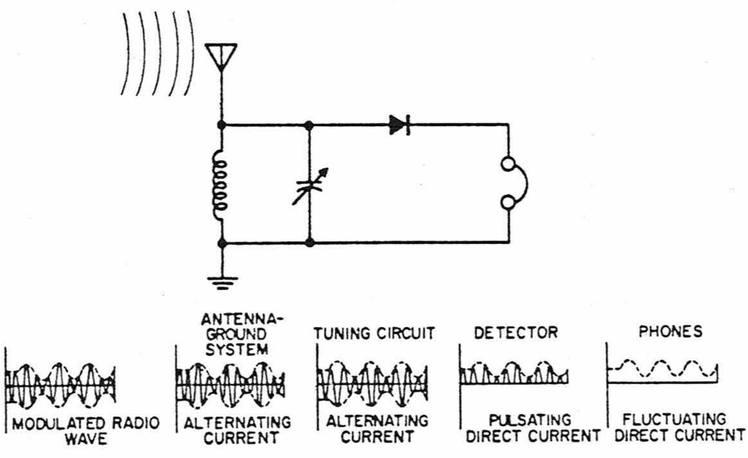
MEMBERSHIP RENEWAL

Have you sent in your membership fee? It's due this month. Send $10.00 to CHRS, P.O. Box 1147, Mountain View, CA 94042-1147.

BOOK REVIEW

From Spark to Satellite: A History of Radio Communication, by Stanley Leinwoll, Charles Scribner's Sons, New York, 1979, 242pp.

This book covers the history of radio communication from its earliest days up to the present. It is packed with information. Many technical details and methods of operation are explained. A very broad range of topics is covered. The information is accurate and clearly presented. The author proceeds step-by-step, citing the significance of each new development and discussing its effect on the development of radio. Despite the wealth of information, the book is written clearly and is easy to understand. It will be of value both to the beginner interested in learning about the history of radio and its operation and to the expert seeking to put his knowledge into perspective.



Hookup of a complete crystal receiver showing waveforms of electric currents flowing in the various parts.

Those interested in the early days of radio ("wireless") may want to subscribe to the SPARKS JOURNAL, published quarterly by The Society of Wireless Pioneers, Inc. This authoritative journal is loaded with information and will give hours of fascinating reading. It is well worth the $10.00 membership fee. Write to: Membership, Sparks Journal, P.O. Box 530, Santa Rosa, CA 95402.

THE FRIENDLY B.E.A.R.

If you are a radio collector who likes his sets to work, this article is for you. You may hesitate to hand your expensive acquisition over to a stranger for repair, but what other choices do you have? Look for another collector who fixes radios? This puts you in your peer group, but does it put your radio in competent hands? Ask to see this collector's sets and listen to them perform. If all seems well, entrust your set to the person--if he or she is willing to work on it free of charge. FREE? Yes, FREE! Unless, of course, the collector is also a licensed repair dealer. It is a violation of California State law for anyone not licensed by the State Bureau of Electronic and Appliance Repair (B.E.A.R.) to charge for the repair of any electronic device, and yes, a radio, no matter how old it is, is an electronic device.

So, what's the big deal as to whether or not the repairman has a valid license? If the repair is satisfactory and the price is reasonable, you come out OK. BUT--the repair-man is still doing something illegal. If the set is returned in unsatisfactory operating condition or even worse than before, what can you do about it? You could have the repair person fined or even imprisoned by reporting him. This might make you feel better, but it wouldn't do much for your radio or recover your money or articles you might have traded for payment.

So where can you safely take the old beauty that needs parts replaced, alignment, and whatever? The California State Department of Consumer Affairs includes a section called by its licensed members "BEAR", an appropriate acronym for the Bureau of Electronic and Appliance Repair. This Bureau licenses, regulates, controls, and supervises the legally-operating repair dealers. It forbids them under threat of dire punishment against deceiving or defrauding customers. The BEAR is a friend of both the customer and the legitimate repair shop because it has forced some unsavory characters to clean up their act, closed the shops of some who would not conform to the regulations established, and even sent some to prison.

Shop around. If a repair dealer has a BEAR license, it will be prominently displayed, as prescribed. If you do not see one, ask. If the shop owner doesn't know what you're talking about, you should leave quickly. Many licensed shops do not have the parts or tubes to repair tube-type radios; ask them if they repair many pre-WWII sets. Remember, most recent training programs for electronic technicians are transistor and module oriented with only a light brush on tube circuits. If you cannot locate a licensed repair shop in your area, write B.E.A.R., 909 S St., Sacramento, CA 95814 and request a list of those in your geographical area. Branch offices are located in major cities - look in your phone book white pages under "Government Offices."

So you locate a licensed repairman/dealer. What can you expect? For starters, a receipt showing the dealer's name, address, license registration number, phone number, make and model of set and serial number, if available, of your radio. No chance of it getting "lost," and you have a full identification to use in case you have to make a complaint or recommend the shop to friends in the future. If you ask for a written estimate, you will receive one and you can be charged for it (in case you decide against the repair) due to the time and labor involved. If a licensed dealer repairs your old radio, you will receive:

A. All old parts that have been removed - even the dead spiders and roaches if you want them.

B. An itemized list of parts installed and the prices you are being charged for them.

C. An itemized "labor" statement detailing what was done to restore your radio to good health, such as "adjust" or "align" - there is a difference.

The dealer can ask to be paid in full before the set is turned back to you. The new parts are the dealer's property until you pay for them. After notification that your set is repaired, you must pick it up in a specified number of days or the dealer has the option of charging for storage or selling the set for the cost of repairs.

Now you can see why the BEAR is your friend - it is protection against being ripped off by an unscrupulous dealer. It is also the friend of the industry because it works to eliminate those who would otherwise create an unsavory image for the public.

One last thing. A frequent question asked dealers is "how much is this particular radio worth?" Licensed dealers (or unlicensed, for that matter) are not appraisers - those people have their own governing organizations and licenses. It is illegal for a repair shop to quote the radio's owner a falsely high value in order to entice him to consent to an expensive repair job. So, they may tell you "my estimate is

$25.00 to repair your Aunt Mary's 1954 plastic mail-order store radio. You couldn't get $10.00 for it at the flea market even if it is completely restored, but if it has sentimental value for you, my price is still $25.00 and we'll do our very best. If it has no sentimental value, then the garbage can is your best bet."

On the other hand, if your radio is obviously very old and restorable, a qualified dealer in radio repair can identify, document, and otherwise authenticate your set's age with data from technical manuals and other available literature. It is also permissible for him to tell you, if true, that one like it sold for $____ at a show, swap meet or auction, but he cannot promise that you will be able to sell yours for that amount. To repair or not to repair - (sorry, Mr. Shakespeare) - that is the question for you, as the set owner, to decide.

This article is not an advertisement for any particular repair shop that fixes old radios. It was written in the public interest. So, to borrow a line similar to those who write to Ann Landers, just sign it:

No name, No city,
BEAR License 019794 and 021008

Serviceman: "Doggone! Just when I thought I had everything fixed something else has to go flooey!!"

VOLTAGE MEASUREMENTS

Determining voltages at various points in a radio is important in locating problems, indicating whether voltage or power ratings of components are being exceeded, and in knowing whether the set is operating correctly.

Before taking voltage measurements, always set your meter on a scale higher than the estimated voltage. This will prevent the meter needle from being driven off-scale and damaging it. Use a vacuum tube voltmeter (VTVM) since a simple multimeter draws current from the circuit and may change voltages in the set. With most sets the chassis is the ground point. However, in many AC-DC transformerless sets, there is a "floating" ground system, not connected directly to the chassis for safety reasons. In this case, the ground point is usually found at the B- connection of the filter capacitors. Of course, you can check the voltage across any component by attaching the ground lead to one side and the probe to the other. Every few months check the voltage calibration of your meter by determining the reading for a fresh flashlight battery. This should be 1.55v.

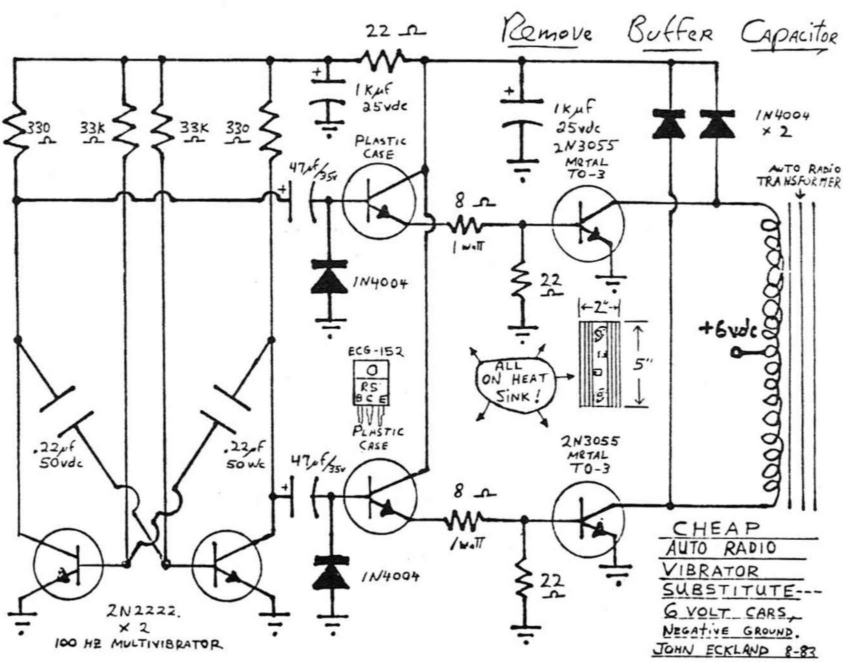
Compare your measured values with those given in the data sheets. Voltage readings normally can be about 15% above or below published data. Usually the values are obtained with the radio tuned off-station and with the volume turned up full. I find it helpful to make measurements with the radio tuned on-station and at normal volume. If my reading is significantly different, I tune off-station and turn up the volume control to see if this brings the reading in agreement with the published value. Voltage measurements are most easily done tube by tube or stage by stage, working back from the rectifier and audio output stage to the antenna. Voltages to be checked include rectifier, B+ supply, B- supply, tube plates, screens, signal grids, and cathodes, AVC voltage, and oscillator grid and plate voltages. Typical values are as follows:

Rectifier:	350
B+ Supply:	250
B- Supply:	-16 and -1
Plates:	250
Screens:	90
Signal grids:	0 or negative (AVC voltage)
Cathodes:	0 to 16
AVC:	0 to -20
Osc. grid:	-6 to -15
Osc. plates:	160

Alternating current (AC) voltages are checked similarly. For these measurements, set your meter and probes for AC input. AC measurements include filament voltages, power transformer high voltage supplies, and audio signals. If your meter has a crystal rectifier probe, you can also measure high-frequency signals such as RF, IF, and oscillator voltages. Finally, by setting the VTVM on its highest resistance range, you can measure the leakage of capacitors. Good tubular and mica capacitors should show very high resistance (above 500 megohms) but electrolytic capacitors normally show some leakage. With capacitors of 0.005 mfd or higher capacity, the meter needle will show an initial "kick" downwards and then a gradual rise due to the capacitance of the component. The lack of a kick may indicate an open capacitor. Of course, it is always preferable to test capacitors with a capacitor tester, but the VTVM method is fairly reliable.

For trouble-shooting more particular problems in a set with a VTVM, consult the references listed below.

References: Profitable Radio Troubleshooting, by W. Marcus and A. Levy, McGraw-Hill, 1956.
Modern Radio Servicing, by A.A. Ghirardi, Murray Hill Books, 1935.



USING DISCRETION IN ALIGNMENT

by Charles Siegfried

Everyone who has ever worked on old radios probably has had an experience like the following. The customer brings in an early 30's superhet -- a 1934 Philco, say, with double IF stages -- that is absolutely mint, speaker cone perfect, original finish on the chassis, underchassis never worked on. The capacitors need replacing, so you do that, then fire up the set to see what it sounds like. The sound is excellent on both voice and music, good enough that you actually sit and listen for a half hour instead of tuning around. What a great radio!

But finally you do tune around, and find that the sensitivity is down enough to offend your sense of perfection. Most of those stations that sound so good are strong locals; weaker stations hardly come through at all. The shortwave bands are practically dead. So out comes the alignment data, the signal generator, and the VTVM. Peaking up the last and middle IF transformers pins the meter needle so you reduce the generator output. Peaking up the first IF brings a high-pitched squeal and the AVC shoots up to 40 volts -- oscillation --so you back off on the trimmer a little and it stops. Now for the front end. Usually these trimmers aren't as far off as the IF trimmers, but they are off significantly, and you feel a definite thrill of satisfaction as you line everything up. Right away the shortwave bands come alive, and tuning around on the broadcast band you find something popping in at every index mark. Fantastic!

But what has happened to the sound? On strong local stations it is mushy, distorted, edgy. With a sinking feeling you realize you no longer want to <u>listen</u> to the radio. Frankly, it sounds terrible. What will the customer's reaction be? Of course, you can always tell him that these old radios sounded like that when they were new, but you know better. Definitely alarmed, you detune some of the IF trimmers slightly, hoping to get the original clarity back. Instead, you get an increase in highs and lowered sensitivity, but the muddled quality of the sound remains. If you're lucky, after a half hour or so of fiddling with the trimmers you <u>may</u> get the original sound back. Or, you may not, and after running out of time and patience you will probably wish you had never touched the alignment.

After having gone through this experience many times I have this advice to offer: when you get very good sound out of a mint-condition overhauled radio, <u>leave the IF alone</u>.

Concentrate instead on the front end where adjustment will bring up the sensitivity without usually affecting the fidelity. If sensitivity is still down enough to be a problem on the broadcast band, try very slight (1/8 turn) alterations of the IF trimmers, keeping track of how you change them so you can put them back if the sound gets bad. Most customers will value good sound on the broadcast band over high sensitivity on the short waves, so align accordingly.

The sets to watch especially are most pre-1935 superhets with 175 kc IF's, especially the 1931-32 RCA's. The Philco double IF stage models are particularly critical. Generally speaking, the models that are prone to be very sensitive and selective with tight alignment are those that will benefit most from detuning or from leaving the old adjustments alone.

All of this does not mean that you should dodge the IF alignment on poorer-condition radios. Those suffering from dust in every nook and cranny, nicotine coatings on the chassis and tubes, or showing damage due to moisture will probably need thorough re-alignment. With these, the best approach is to peak everything up as instructed, then detune if necessary to improve fidelity, starting with the last IF transformer and working forward. Sometimes on the poorer-condition sets the coils will have suffered reductions in "Q", enough that the set will sound very good with simple peak alignment. Every set is an individual case.

Another area requiring discretion is alignment of radios with expandable IF stages. On 1937-38 Philcos, where the expander control moves the IF coils physically, you have no problem: peak align in the SHARP position and as the expander is turned to BROAD the highs will come through with no need to retune the station and no reduction in sensitivity. Whatever one may think of Philcos as examples of the radiomaker's art, their expander controls do everything an IF expander is supposed to do with a minimum of fuss. The troublemakers are the big E.H. Scott and Stromberg-Carlson sets that employ small variable capacitors operated by gears or levers. If you peak align in SHARP, expansion will shift the IF peak enough that you will have to retune the station, and on some sets you will get obnoxious distortion of the highs. These types of misbehavior are not discussed in the Scott instruction manuals, nor are they discussed in the only manual I have ever seen for a Stromberg-Carlson set. Now the question is: what can one reasonably expect? If the radios did not have this defect originally, can it be eliminated by very careful or unusual alignment technique?

For years I put myself through mental turmoil whenever the big Scott sets appeared on my bench. I tried every possible strategy to keep the IF peak constant -- peaking above and below the specified IF frequency, tuning some stages high and others low, leaving some stages detuned and peaking others, and so on. Nothing helped. But after much thought, I have the following two theories to propose. I invite discussion from readers as to the correctness of either or both theories.

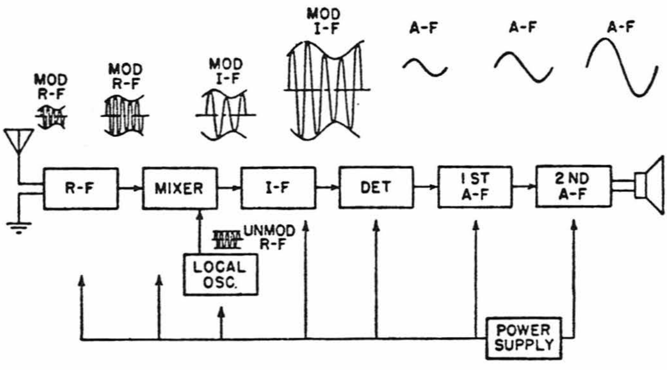
Theory #1 takes notice of the many photos in Scott promotional literature that show men in white lab coats hovering over sets of coils. The captions explain that they are matching the coils to very close tolerances with the aid of special instruments. The coils are then impregnated to maintain their characteristics over time and through changes in humidity and temperature. The text also makes much of the fact that air trimmers are used for long-term stability of the IF strip.

Now, everyone who has worked on Scott sets knows that their IF alignment will usually be off significantly. How is one to account for this, knowing how stable air-trimmer caps are over long periods of time? My suggestion is that, after forty years, the meticulously-matched coils are no longer as closely matched as they were when they left the lab. If their Q's have altered haphazardly, their resonance curves will no longer spread out uniformly with changes in the shunt capacity, and this condition will manifest itself as a shift in the IF peak when the expander is used.

Theory #2 is that <u>all</u> radios using shunt-capacity and switched coils for expansion move their IF peak, but the manufacturers don't always tell us about it. Recently, I worked on a 1934 Atwater Kent that had an IF expander that switches taps on the IF coils. With the radio was the original instruction sheet, which clearly stated that, when switching from SHARP to BROAD, the operator would have to retune the station slightly. Now of course this is a production radio and its coils were never matched as closely as a Scott's -- but in the case of this set, the instruments clarify any expectations the restorer may have about the operation of the expander. I submit the possibility that the Scott company may have been less honest than the Atwater Kent company regarding this particular situation with the expander.

At the present time, then, my procedure on these radios is to peak align on SHARP and let the IF peak fall where it may in the expanded position. If the radio has distortion on the SHARP or expanded position, minor detuning of some trimmers will usually get rid of it.

(Editor's note: do any of our readers have an explanation for this problem of increased distortion with "correct" alignment? It may be worth noting that with perfect alignment, IF circuits are all tuned to the same frequency so that chances of regeneration are increased. Even if actual regeneration does not occur (with obvious symptoms such as oscillation, squealing, blocking, etc.) the shape of the IF bandpass may become irregular, causing distortion. Instructions in Rider's manuals for many high-quality sets point out that alignment with an oscilloscope and sweep generator is preferable to "peaking" since it displays the actual IF bandpass curve. Moreover, they point out that after "perfect" alignment, it is often necessary to tweak an IF trimmer or two to get the correct symmetrical bandpass curve. Radios were made to be listened to, and adjusting for high-quality sound may be more important than adjusting for perfect alignment or maximum sensitivity. Perhaps the last step in alignment should be to connect a distortion meter to the set and adjust for minimum distortion.)



Block diagram of a superheterodyne receiver with signal waveforms

THE TROUBLE WITH TRANSISTORS

Nearly twenty years ago, the first Telstar satellite went into orbit and promptly began to malfunction as though its semiconductor components were wearing out. Bell Labs scientists eventually figured out that the satellite was being affected by the Van Allen Belt, an intense band of high-energy particles trapped in the Earth's magnetic field at a height of 600 to 40,000 miles. The satellite's transistors were actually being done in by radiation.

Since then, further research has shown that semiconductor materials can be both temporarily and permanently damaged by many kinds of radiation - gamma rays, X-rays, and even the cosmic radiation that bombards us constantly. Recent studies by Dr. Mayrant Simons at North Carolina's Research Triangle Institute have indicated that both gallium arsenide and silicon dioxide can be altered by radiation. The former is a promising new semiconductor material; the latter is often found as an insulator in microcircuitry.

Among the implications: world-wide data-processing chaos as the result of a large-scale release of nuclear radiation, whether intentional or accidental. Newer, more extensive integrated circuits are becoming increasingly vulnerable to damage from a single subatomic particle. "If it were hit in just the right way," says Simons, "a memory cell of a very large-scale integrated array could have its stored data bit altered by a single high-energy particle."

Research continues into both the cataclysmic implications and possible shortfalls in the useful life of semiconductor devices exposed to plain, everyday radiation. Meanwhile, if you've saved an old tube radio around the house somewhere, that's the one to put in your fallout shelter.

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ADVERTISEMENTS

For Sale/Trade: RCA Radiola 28 console with loop antenna and 104 amplifier-power supply, working, with original tubes, very good condition, $250. Atwater Kent 37 with tubes, good condition, $40. Super Zenith VII, AC version, with tubes, very good condition, $150. Dick Eckert, 1623 Ben Roe, Los Altos, CA 94022 (415) 964-0561.

Wanted: Circuit diagram and advice in restoring a Majestic model 70 or 72 electric receiver, made by Grigsby-Grunow. Bob Stueland, 21711 Alcazar Ave., Cupertino, CA 95014.

Wanted: Tubes: 2A3, 10, 24, 27, 45, 50, 80, 81, 82, 83, 202, 203, 211, 242, 801, 845, VT-52. Also, Western Electric tubes, amps, consoles, speakers, tweeters, etc. David Yo, P.O. Box 832, Monterey Park, CA 91754 (818) 576-2642.

For Sale: Old transmitting and receiving tubes. Wanted: Any literature on wireless telegraphy, high voltage equipment, Tesla coils, Oudin coils, high frequency medical equipment, etc. Anyone interested in Tesla Coils? Harry Goldman, Tesla Coil Builders Assoc. RD3, Box 181, Glens Falls, NY 12801.

Wanted: McMurdo-Silver Masterpiece V in a Bristol cabinet. Ken Smith, 2321 Cal Young Rd., Eugene, OR 97401.

For Sale: Bar radio. Radio is rebuilt 5-tube superhet with new 600v Mylar capacitors and new filter condensers and new resistors where old ones were off by more than 20%. Cabinet finish is in excellent original condition. Has all original glassware decanters and one original shot glass. Set can be delivered to Bay Area if time is not a critical factor. Also willing to trade same for certain Scott or McMurdo-Silver sets or perhaps a real nice Masterpiece V cabinet for the chassis that I already have. Pictures are available for viewing at John Eckland's house (969 Addison Ave., Palo Alto, CA 94301 (415) 323-0101). Also for sale: Scott 800B, $120 FOB my doorstep. Norman Braithwaite, 4415 Greenwood Ave. N., Seattle, Wash. 98103 (206) 782-4864.

For Sale: 1946 Packard-Bell radio-phono-recorder console model B19 in fair condition, Best offer. Donna Hill (707) 823-7488 eves.

For Sale: Philco model 29/45 console radio, 6-tube superhet, $75. 948-0684.

For Sale: 1939 Wurlitzer 700 jukebox, exc. original condition, $2900. Macintosh MC-2300 600w stereo power amplifier, exc. cond. $800. Stromberg-Carlson mirror-top chairside radio, 1937, good physical condition, chassis unrestored, $400/BO. Wanted: Anything relating to Scott or McMurdo-Silver radios made before 1939, pre-1938 record changers, Green Flyer motors, Astatic B-2 pickups and tone arms. John Eckland, 969 Addison Ave., Palo Alto, CA 94301 (415) 323-0101.

For Sale: 1928 Pfanstiehl console radio, very rare, in good restorable condition, $100. 1948 Capehart AM-FM radio-phono console with rare flip-over record changer that plays LP's, works, $150/BO. Several early 1940's Philco radio-phono consoles, $40 each. Nice Brunswick 1928 radio-phono console, $225. RCA console radio, 15 tube, rough condition, $15. Philco radio console model 680 (1935) with controls under lift-up door on top, fair condition, $65. Mike Simpson, 1515 Floyd Ave., Sunnyvale, CA 94087 (408) 733-6069 eves.

For Sale: 1929 Philco console with doors and big brass ornamental hinges, cabinet excellent, chassis needs restoring, $200. 1928 Edison console, interesting cabinet--desk-type with drop type door, dual chassis, dual speakers, push-pull 50's in output, works, $300. 1956 Philco lamp radio with clock, missing shade, $15. 1939 Airline console, looks like a dresser with doors that look like drawers, $75. Four all different spice-rack radios, $25 each. 1937 Fairbanks-Morse console with beautiful oval dial, $200. Ken Zander, P.O. Box 2652, Sunnyvale, CA 94087.

For Sale: 1947 Seeburg M100A jukebox, plays 100 sides, 78 rpm records. George Durfey, 912 La Mesa Dr., Menlo Park, CA 94025 (415) 854-4041.

For Sale: Philco 112X console radio, needs work, $25. 1928 Brunswick 5KR table radio with matching speaker, $40. Wanted: Western Electric tubes, drivers, transformers and Peerless and UTC interstage and output transformers, and 6A5, 2A3, 45, 50, 76 and 300B tubes. Don Pettee, 600 E. Weddell Dr., #35, Sunnyvale, CA 94089 (408) 734-5276.

For Sale: 1935 Philco console radio, model 680, with controls under a lift-up door on top, fairly good condition, $50. Paul Mundt, P.O. Box 1220, El Cerrito, CA 94530.

Wanted: Schematic for a 5-tube TRF battery radio, manufactured by Remington Radio Company Ltd. No model number can be found and no tubes in set. Robert G. Weamer, 390 E. Foster Rd., Santa Maria, CA 93455, 937-3157.

For Sale: Two marine transceivers: mid-60's Raytheon and mid-70's Coronet, Hammarlund receiver signal corps model BC 1004, audio signal generator, cathode ray tube tester/rejuvenator, Hallicrafters SX 53A receiver, 0.54-54 MHz. Wanted: Operator's manual for Hammarlund HQ 180 shortwave receiver, Hammarlund transmitter, 100w or more output, and manual for Hallicrafters SX 101 receiver. Mark Hucko, 2010 California St., Apt. 5, Mountain View, CA 94040 (415) 964-8772.

For Sale: 1936 Zenith tombstone table radio, very large, model 6S128 (see Flick of Switch), cabinet excellent, chassis restored, big dial, very nice set, $180. Other restored tombstone radios, $110. Philco model 51 mantel clock radio. Clock, radio, speaker, and cabinet all need work but otherwise in fairly good condition, $70. Philco model 60 cathedral radio, excellent original finish, chassis restored, works well, $225. Speaker for RCA 100A mantle-clock shaped metal cabinet, works, grill cloth very good, $5. Escutcheon for 1936 Silvertone table radio that had unusual 3" x 6" stepped square gold metal dial with shortwave bands and magic eye tube. This set was sold or given away about four years ago at a CHRS swap meet because, although it was complete, it was missing this escutcheon. Herb Brams, 2427 Durant #4, Berkeley, CA 94704 (415) 841-5396.

All ads should be sent to the Editor, Herb Brams, 2427 Durant #4, Berkeley, CA 94704 within three weeks after you have received your previous Journal.

The editor would welcome articles or other information on what kind of programs were heard on radio in the 1920's, 1930's and 1940's.

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