FALL 1992

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JOURNAL OF THE

CALIFORNIA HISTORICAL RADIO SOCIETY

FOR THE RESTORATION AND PRESERVATION OF EARLY RADIO

FALL AND WINTER

SEASON'S GREETINGS FROM CHRS

California Historical Radio Society

Journal Co-Editors: Bart Lee and Paul Bourbin

ON THE COVER: 1925, the Good Life, before the Crash ... what's the Radio?

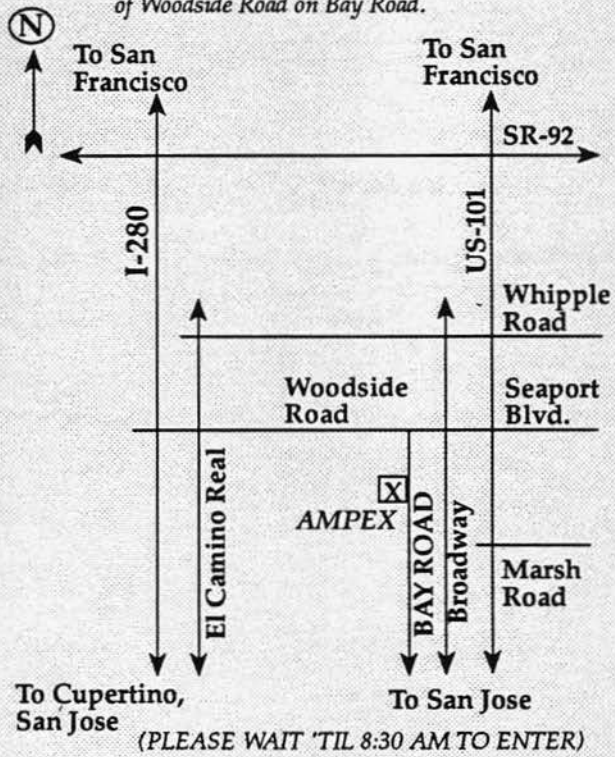
MEETINGS and SWAP MEETS: CHRS meetings are held 2-3 times per year. Locations are announced in CHRS publications and by mail. Swap meets are in February, May, August, and November at Ampex Corporation in Redwood City, PLEASE DO NOT ENTER BEFORE 8:30 AM. Regional meets at various Northern California locations are conducted from time to time. Contact the Publicity Officers if you want to sponsor a swap meet in your area. Local swap meets bring out new old radios!

ABOUT CHRS

The California Historical Radio Society is a non-profit corporation chartered in the State of California. CHRS was formed in 1974 to promote the restoration and preservation of early radio and broadcasting. Our goal is to provide the opportunity to exchange ideas and information on the history of radio, particularly in the West, with emphasis in collecting, literature, programs, and the restoration and display of early equipment. The *Journal* of the Society is published quarterly, alternately in printed and audio tape format, and is furnished free of charge to members. Yearly membership dues are $15.00 (US funds, please). Submissions for the *Journal* are always welcome. Typewritten copy is preferred. Articles submitted on 3.5 inch IBM or Macintosh diskettes in ASCII or Microsoft Word are appreciated. Send all material to editor Bart Lee and include your name, address and phone number. You write about radio, and we'll print it. The *Journal* is copyright © 1992 by the California Historical Radio Society, all rights reserved. No part of this publication may be reproduced in any form, or by any means, without prior written permission from CHRS, except that you may make "fair use" of quotations of text fully attributed by you to source (this Journal) and author.

Map to AMPEX Corp. Swap Meet

Go to Lot "C" Three stop signs south of Woodside Road on Bay Road.



PRESIDENT'S MESSAGE
— JIM MCDOWELL

Well, it has been a year since I was elected president. I want to thank all those members and officers who have worked so hard to make this year's club a success again, including especially Chris Buttery, Bill Helander and Paul Bourbin, as well as the several others who every year put in so much time and effort for all of us, especially on the Journals. The new meeting place at Ampex has worked out well: it is easy to find and very comfortable for swap meets.

On the other hand, the economy has taken its toll on our radio collecting. For example, cathedrals: some people want a small fortune for a common Philco Jr., while others sell a rare Crosley Cathedral for $60, in working condition with a good cabinet. For those who can afford it, now is the time to buy! My advice to sellers is: bring all those radios you have never had time to check out or fix, that have just been collecting dust, to the next swap meets. Now this stuff will sell and you can gain space! Space is something we all need. Several members, and I, too, like old 78 RPM records. If you have any you want to sell, bring them to a swap meet.

I have been doing some traveling the past summer with at least two radios to keep me content. I have come to realize that the Bay Area is lacking in oldies stations. In Seattle, there is a great oldies station on AM that plays a wide variety of music from several decades, and has no talk shows. There are three good ones in Salt Lake City and more than I can remember in Los Angeles. San Luis Obispo even has two good ones. So why is this area a void! KFRC, Magic 61, plays too many remakes of old songs as well as 60s, 70s, and 80s pop music. It also airs talk shows at night. KPIX signs off at dusk and here we are left with as many kinds of rock as Carter has pills. No big band, no 50s, no music of your life. In my opinion, a good oldies FM stereo station would do very well in the Bay Area. —Jim ##

THOUGHTS OF CHAIRMAN PAUL: FAIRFIELD MEET AND PICNIC REPORT

On Saturday, September 26, CHRS held its first annual swap-meet and picnic at the Bay Area Electric Railroad Association's Western Railroad Museum in Fairfield. The Museum is located at Rio Vista Junction half way between Fairfield and Rio Vista on state Route 12 in Solano County. The meet started at 8:30 a.m. sharp with the sellers driving into the park to set up their wares on the grass and picnic tables under the shade trees. The weather gods smiled upon us. Although the Greater Bay Area was in the midst of a hot spell, the weather stayed mild until the end of the meet. Some members thought that this was the classiest place CHRS has ever had a meet. Amongst the broad spectrum of goodies that appeared was a beautiful Orzaka that sold for a rather large sum almost immediately. There was also a nice Federal and a large selection of transistor sets. Members came from as far away as Redding, CA., Minden, NV. and Palm Desert, CA to attend the meet. Some folks, who live in the vicinity of the Museum, brought material that had never been beheld by collectors' eyes before. After the usual transacting, BAERA member, Fred Krock, gave CHRS members a tour of the museum grounds and then a group ride on the streetcar of our choice. The group chose the Blackpool Boat Tram. This car looks like a large canoe with a tower in the middle atop two railroad trucks. This car came from Blackpool, England and is one of over sixty pieces of railroad rolling stock preserved at the museum. After the ride around the museum trackage, many members took advantage of the picnic facilities, had a pleasant lunch and continued to enjoy the museum. Both

BAERA and CHRS members were pleased with the event and have decided to make this an annual event. The Western Railroad Museum has been, and will continue to be, built by mostly volunteer workers. It goes to show what a group can do when it has a central focus. It also goes to show what volunteers can accomplish for the preservation of history for future generations. If you think it is difficult to restore a radio, try rebuilding a streetcar! One of the cars that has been restored spent forty years as a chicken coop before being brought to the museum. [PJB] ##

POPULAR SCIENCE recently recapped major developments in technology in its 100th year anniversary issue. Some, of relevance to us, are excerpted thoughout this Journal as graphics. Issues of Popular Science in the twenties, thirties and forties always had some radio related article(s), often construction pieces. Many were collected in the book RADIO FOR THE MILLIONS, which appears at swap meets from time to time. The magazine covers in the old days were works of colorful art.

HAS THE BUBBLE BURST? The AWA Convention and Some Ruminations upon it.

by Bart Lee (Vice President), 327 Filbert Steps, San Francisco, CA 94133, (415) 788 4072

This year's Antique Wireless Association Convention and swap-meet left some of us in disquiet at Rochester last month. At the auction, the choicest wireless gear I've ever seen went unsold. It was a matched set consisting of a loose coupler, an induction coil, a boxed (presumably glass plates) condenser and an attached, boxed spark gap. It had a perfect dull mahogany gleam to all of the wood, and it had been stored in a silo for many years, which is a controlled environment. It did not sell, even at a reduced minimum bid of $700. An A-K 10 breadboard, also looking pretty good, did not sell at the minimum bid of $650. The swap meet was poorly attended, even taking the occasionally rainy weather into account. Prices seemed higher but buyers fewer.

To be sure, some stuff did sell at auction at high prices. But the auction also had its strange moments. The highest bid price came on a World War One "Mark III" short wave tuner by Johnson and Phillips, but it had a repro wood box and repro instructions. It went for $1,900. A Spartan Blue Mirror with a chip went for $1,400. A Radiola III (Westinghouse RS) went for $450 to an overseas buyer. A Radio-Home one tube receiver went for $1,200. So, in some sense, the top of the market was still there. It is the rest that may give us pause.

Several years ago, the late D.H. Moore warned that our hobby was becoming a business. He saw old radios touted as an investment, as so-called fine art had been. He thought this trend to be pernicious foolishness, and did not hesitate to say so. He reminded us, with some depression era advertisements, that radio prices, like other prices, can go down drastically. One of the advertisements he chose to illustrate his notions is reproduced nearby. The point D.H. wanted most to make is that our shared enthusiasm for old radios and the vintage technology of communications is fraternal. Our hobby is therefore rightly shared without the further incentives of the profit motive and the marketplace. Certainly every hobby has its proper suppliers, which are businesses (such as Antique Electronic Supply in Tucson). D.H.'s concern was rather that we would rue the day when every hobbyist was first and foremost a businessman working in this subspecialty of antique dealership. So too he thought that anyone so misfortunate as to fall into such a trap would also live to regret it, as prices plummeted as they inevitably would. As I write this, Wall Street just went down 105 points, but the pundits were not sure whether it was because of the rumor the incumbent President would win the election, or the other rumor that the main challenger would win the election. By the time you read this, one of them very well may have won this election, and it's any body's guess what Wall Street will do, or will have done in the meantime.

Radiola Superheterodyne AR-812

One of the most famous radio sets in America. This set placed on a table, the battery switch turned to "on", and music will be heard—without an outdoor antenna; it works with a loop aerial built inside the cabinet. The set is super-sensitive and, in certain localities, it is possible, on the east coast, to hear west coast stations. The cabinet holds all the batteries for the six "dry-cell" tubes required. Some experimenters tune in short wave stations and use the AR 812 as the INTERMEDIATE FREQUENCY AMPLIFIER. In that way the tremendous amplification obtainable from this receiver is used to the fullest extent. A push pull switch (center) turns the set on and off; another (lower left) cuts in either one or two stages of A.F. amplification. Although the cabinet is 35 inches long, 11½ deep and 11½ high, the panel of the receiver is only 19 inches long and 9 inches high. The difference lies in the two end compartments for "A" and "B" batteries. Six type UV199 tubes are required for this receiver. Drycell power tubes, the type '20, may be used in this set if a Naabl or similar adapter is used. Shipping weight, 45 lbs.

List Price is $220.00

No. 2103 Radiola AR-812
YOUR PRICE **$10.25**

Radiola 28 Superheterodyne

is a "Second Harmonic" superheterodyne. However, the circuit of the "28" includes 7 type X199 tubes and 1 type X120 tube. The Radiola 28 includes 3 S.L.F. condensers, 2 1-mf. safety lamp by pass condensers; center-tapped loop (necessitated by the stage of neutralized R.F.); 1 off on switch; 2 filament rheostats; 1 1-coil R.F. inductance; 2 jacks; and the special 8 socket "catacomb" containing the I.F., R.F. and A.F. transformers. Coast to coast reception is a rather usual accomplishment! Uses 2 drum dials—space for station logging thereon. Many easy ways of electrifying this receiver. Revolving loop—greatly assists tuning. Access to battery compartment obtained by raising receiver on hinge. A pressed steel frame supports the chassis equipment. The mahogany cabinet has the general appearance of a secretary. Shipping weight, 75 lbs.

List Price $295.00

No. 2106 Radiola 28.
YOUR SPECIAL PRICE **$21.50**

Radiola 25 Superheterodyne

The "25" is a loop operated set requiring 6 "X-199" tubes. No outside aerial is needed. The receiver has "10-K.C." selectivity. Tuning of this receiver is accomplished through large "thumb operated" tuning drums, so designed that stations may be "logged" directly on the drums. The small center knob controls a multiple contact switch which changes the circuit to include one or two stages of A.F. A two tone mahogany veneer cabinet of original pattern houses the chassis and batteries. Comes complete with loop aerial. Its overall dimensions are 28x19x12 inches high. Shipping weight, 55 lbs.

List Price $265.00

No. 2109 Radiola 25.
YOUR SPECIAL PRICE **$9.85**

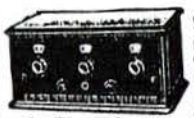
Ware Type T Neutrodyne

This is the most economical in operation of all radio sets. The circuit is that of a REFLEXED NEUTRODYNE incorporating 3 UV-199 tubes. The mahogany cabinet is 11 in. long and 13 in. deep. This design provides room for the "A" supply of 3 dry cells, 2 "B" and 1 "C" battery. There are 2 17-plate variable condensers, 2 neutrodyne type R. F. transformers, 2 A.F. transformers, rheostat, 2 jacks, R.F. choke, 2 tuning dials, shock absorbing mounting for the 3 tubes. Shipping weight, 16 lbs.

List Price $65.00

No. 2108 Ware Type T.
YOUR SPECIAL PRICE **$4.65**

Freshman "Masterpiece" A



It is of the tuned Radio Frequency type. Requires 1 201A, 1 171A tubes, 2 A.F. transformers, and 3 variable condensers. Overall dimensions are: 20½x12x9¼ inches; mahogany bakelite panel. The cabinet is finished in mahogany. 3 19 plate variable condensers used. The dial settings are read through recessed windows, 2 jacks mounted on panel. Shipping weight, 25 lbs.

List Price $80.00

No. 2101 Freshman Masterpiece.
YOUR PRICE **$6.50**

Stromberg-Carlson 523

This fine set uses 1 201A and 1 200A tubes. The cabinet is one of the finest ever made for radio sets. A lasting, beautifully grained wooden panel carries the tuning escutcheons. The panel controls include a "Long-Short Antenna" switch; 3 ohm and 20 ohm rheostats; "On-Off" snap switch; audio output jack; and a Weston 0-7 voltmeter. The jack on the panel is for phonograph pickup. A neutrodyne circuit is used. 26 long x 11 deep x 13 inches high. Shipping weight, 75 lbs.

List Price $160.00

No. 2110 Stromberg-Carlson.
YOUR PRICE **$24.75**

Atwater Kent 20 Compact

Five 201A tubes are used in this very sensitive and selective tuned radio frequency set. Dimensions: 20x6½x6½ inches high. A six wire cable, "color coded," 6 ft. long, is included. Cabinet is finished in walnut. The panel is metal, finished in flat brown. Variable condensers having 16 plates are used. The variable condensers are independent of the receiver chassis. 3 brown molded "full vision" dials are used. A 3 point switch on the panel selects taps on the first R.F. coil, for "local" or "distance" reception. Non-oscillating. Easily re-wired for A.C. operation. Shipping weight, 20 lbs.

List Price $60.00

No. 2100 A.K. Compact.
YOUR PRICE **$9.85**

Atwater Kent Model 35

One of the most compact receivers ever offered to the public. 3 stage R.F. 3 variable condensers are used. Overall dimensions are: 17½x8x5½ in. The chassis is housed in a brown crackle finish pressed metal cabinet. This is a "one dial control" receiver. Incorporated in this set is a 6 wire cable, each wire of which is rubber insulated and "color coded". This shielded receiver has very little "drift" and may be used with antennas of any length without in the least affecting the tuning. The variable condensers are of the "single bearing rotor" type. This set takes the following tubes: 5 type 201A and one type 112A or 117A tubes. Shipping weight, 16 lbs.

List Price $65.00

No. 2104 A.K. Model 35.
YOUR SPECIAL PRICE **$12.25**

Crosley Band Box—Model 601

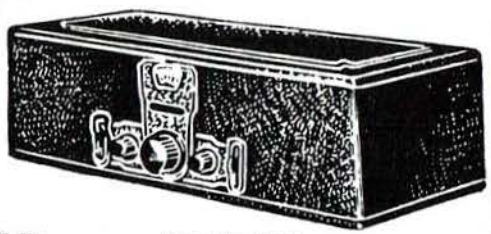
BRAND NEW in Original Factory Sealed Case
VALUE!

Now is your chance to get the finest battery radio on the market at a price that will enable you to close every sale and make BIG PROFITS. Every prospect in your vicinity knows Crosley. There are very few good battery sets available. Crosley is one of the best.

SPECIFICATIONS

The Crosley Band Box is a neutrodyne radio employing 6 tubes. Three are radio frequency and the balance are for detector and audio amplification. It has a single station selector with illuminated dial. Tubes used: 5 201-A, 1 171A. Excellent distance getting ability and fine selectivity with true tone qualities. The cabinet has frosted brown crystalline finish and may be easily removed so that the set can be installed in a console. Shipping weight, 21 lbs.

No. 2112 Crosley Bandbox.



List Price $55.00

YOUR PRICE **$13.95**

Pal Head Phones

A set of 2000 ohm head phones for testing, for the D.X. fan or for late listening. Complete with 6 ft. connecting cord. A superior grade. Shipping weight, 2 lbs.

List Price $5.00

No. 1631 Pal Head Phones

YOUR PRICE

$1.35

RADIO TRADING COMPANY, 25 WEST BROADWAY, NEW YORK, N. Y.

VINTAGE RADIO IDENTIFICATION SKETCH-BOOKS

While Wall Street is but one indicator, so is East Los Angeles, and so are Silicon Valley layoffs. So-called "collectibles," of whatever sort, are an inflation hedge, not a deflation hedge. In a deflation (or as they say we have, a selective disinflation), collectibles are not a store of value. "Dealers" may soon face a squeeze. Others who just love old radios and the like, will be happy surrounded by the sets that talk to them. A hint from the AWA convention is that perhaps there will soon be more to add, at very reasonable prices.

This year AWA focused on General Electric. The banquet speaker was George Metcalf, who as a high officer of G.E. in the early 1950s, personally got the word from Tom Watson of IBM that G.E. had better get out of the then nascent computer business or face the wrath of IBM. G.E. dropped its computer development, including the first working, desk model business computer. Many people have wondered why G.E. did not initially dominate the computer busines. Now, courtesy of Mr. Metcalf, we know. He told me 1) he had waited forty years to tell that story, and, 2) yes, it was a felony! The AWA programs also focused on G.E., and its technical leader for many years, Mr. Walter R.G. Baker. G.E. even named its radio station after him: WRGB. General Electric's role in early radio and electronics was fully explored, especially by G.E. historian John Anderson. The current volume (No. 7) of the AWA Review has an internal history of G.E.'s early radio work up to 1930 (by an unknown author) that is well worth reading.

The contest had a wide range of entries, many relating to G.E. One of the best was a display about one of the earliest regular shows on the G.E. television station, the Weather Girl — including a tape of an interview with her. The contest featured an outstanding collection of receivers and transmitters as well. Once again, Peter Yancer put on a mechanical scanning closed circuit television display. It was fascinating to watch the black-and-white cartoon statuette rotate for real, and at the same time appear to rotate with considerable fidelity in the viewing lens of Peter's 24 line, green-lit, scanning TV receiver. At the AWA Contest, CHRS officer Will Jensby again took a prize . Will's entry of a G.E. wave meter took second place in its category. Last year Will took a prize in the Detector category with his Model D Tuner (and spade detector).

The AWA auction had only half the material offered last year. The swap meet, also smaller, had a low morale about it. At the auction, DeForest gear did again go at a premium: $1,100 for a two tube amplifier, $1,200 for a one tube Radio Home receiver, $140 for a no-box DeForest Everyman crystal set panel in rough shape. Crosley gear held up well: a set of a #5 tuner and #4 amplifier went for $360, and a Crosley 52 went for $210. An Emerson Catalin went for $790 but a Bendix Catalin went for $120. (There were more Catalins in the swap meet than ever before). An otherwise undistinguished Cutting and Washington early 1920s radio (big, black and ugly?) went for a surprising $950, so maybe somebody knows something many others do not, or maybe not. A nice Radiola portable (with a loop in the door) went for $450. The first model of the Zenith Transoceanic went for $60. Crystal sets went for between $110 and $310.

I also learned from an experienced ex-government radioman that the G.E. portable radio known as the Super-Radio II is the best AM (and FM) portable on the market, especially good for AM DXing. Next year's AWA theme is Westinghouse, so polish up your light bulbs and AC power generators., as well as your RAs and DAs. ##

ELECTION AND AWARD RESULTS: -- HERROLD AWARD TO ED SHARPE

Ed Sharpe of Phoenix, Arizona has won the Doc Herrold Award for his contributions to our avocation, particularly his journal and museum. Many an issue of this Journal has benefited from Ed's contributions, including this one!

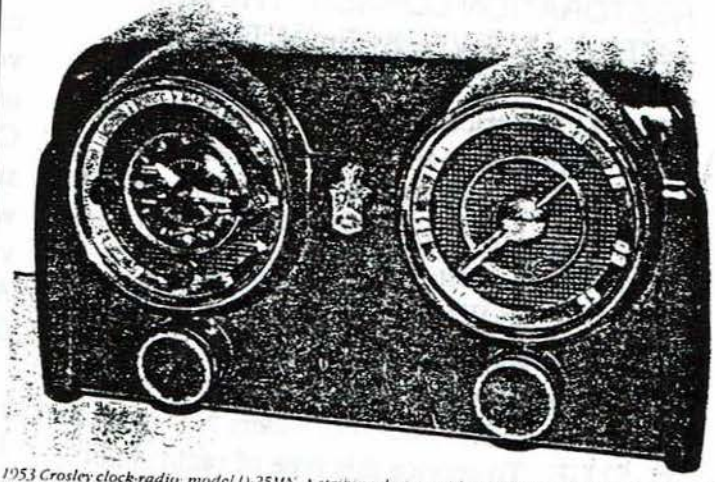
Jim McDowell is re-elected President, Bart Lee Vice President, Russ Turner Secretary, Will Jensby Treasurer, both Norm Braithwaite and Mike Adams Publicity Officers, and the remaining (non-officer) seats on the Board of Directors went to Mike Adams, John Wentzel, John Eckland, and Paul Bourbin, Chairman. ##

FEATURED SET: CROSLEY D-25 MN

By Gary Haskell, 18762 Eisenhower Circle, Salinas, CA 93906

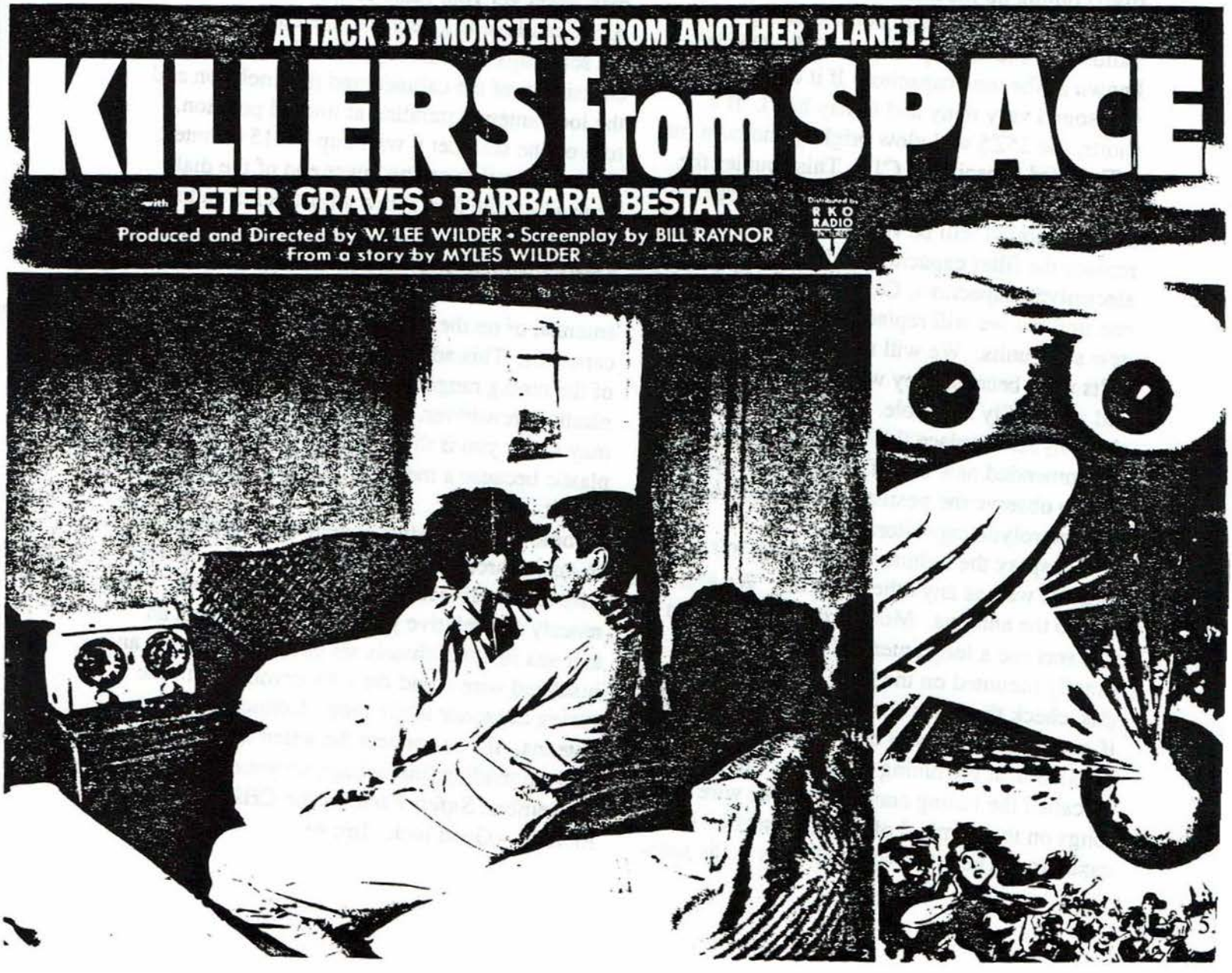
This embracing couple seems more interested in each other than in the really neat little radio on the bedstand. Perhaps it is receiving a broadcast of the news of the startling invasion from outer space depicted nearby. Even so, they should be fondling the radio, not each other! Wouldn't you? What kind of radio is it anyway?

The year is 1954, the year of the film, *Killers from Space*, and the year the radio came out. Reference to the *Guide to Old Radios* by David and Betty Johnson will show the identical set at page 128, identified as the Crosley D25MN. ##



1953 Crosley clock-radio, model D-25MN. A striking design, with gold bezels on burgundy plastic, definitely the 1950s look.

CROSLEY D25MN from the GUIDE



RESTORATION CORNER: THE ALL AMERICAN FIVE, By Jim McDowell

The All American Five tube radio is the most common radio design. This design became popular in the early 30s and lasted until tubes phased out. This circuit is the most widely used circuit in radio history, used in Catalins, Bakelites, and Wooden sets, as well as all kinds of novelty radios.

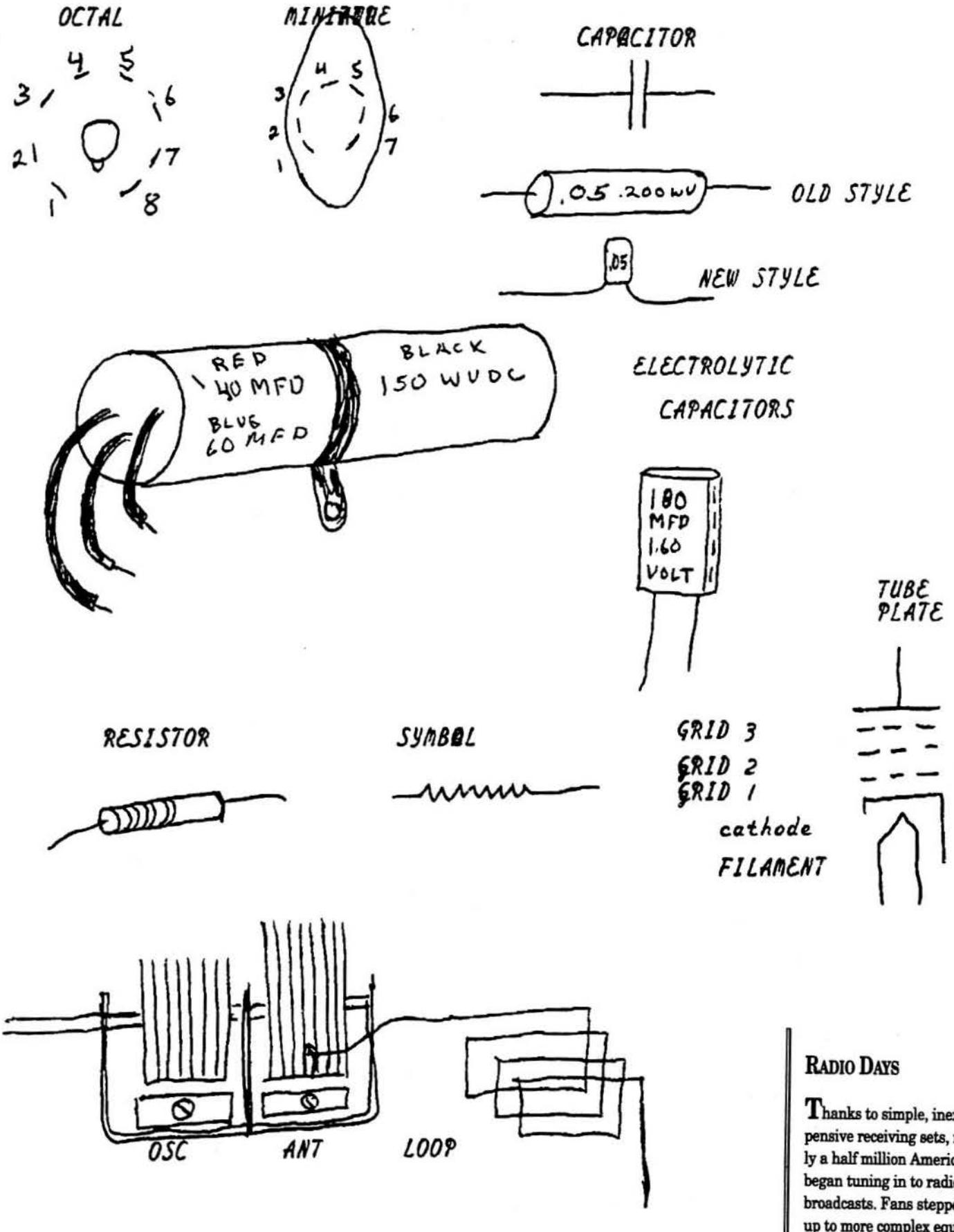
The diagram we will use for reference purposes is a GE No. HJ514 in Riders No. 11, page 11-52 GE. To service this type of radio is not difficult. First, test all of the tubes and replace any weak or dead ones. Next, replace certain key capacitors. The first one is C16 across the A/C line. This capacitor filters out RF signals from coming up the line into the radio, which would result in static and noise entering the radio. The second capacitor is C15. This is known as the tone capacitor. If it opens the radio will sound very tinny and it may howl. If it shorts, the 35Z5 will glow brightly and burn out.

The third capacitor is C13. This couples the first audio stage with the audio output stage. If it fails, the sound will be very distorted. Now let's replace the filter capacitors, otherwise known as electrolytic capacitors, C17a and C17b. This is one unit but we will replace it by two individual new style units. We will use 100-MFD-at-160-volts units because they will eliminate all hum and are readily available. Some sets use a third electrolytic. Replace this one with the above-recommended new style filter capacitor also. Be sure to observe the positive-negative polarity of the electrolytic capacitors.

Now spray the volume control with TV tuner spray as well as any other controls. We will next turn to the antenna. Most of the all American five sets use a loop antenna (a coil of wire usually mounted on the back). If your set uses this, check the wires connecting it to the radio. If one is loose and you do not know where it goes, look at the tuning capacitor, which used to be called the tuning condenser. One wire belongs on the terminal of the large section of the capacitor. The other wire connects to the automatic volume control (AVC) circuit. To find this circuit look for resistor R2 coming off the volume control and capacitor C10. Connect the other loop wire here. The capacitors C15, C16, C13, will be marked with their values on them, such as: .01 at 200 volts. You can replace these with a higher voltage unit but never use a lower voltage replacement because it may short out. Always replace C16 across the A/C line with a 600 volt unit.

In some cases, the AVC capacitor C10 may need replacing. If so, the set will motorboat and howl while tuning. Post-war Zenith radios and some other makes use ceramic disk capacitors. If your set uses these, the only capacitor you will need to replace is the A/C line filter. Capacitors like C4 and C20 are in the RF stages and are usualy ceramic. If you try to replace them, you may never get your radio to work. The All American Five is a very reliable circuit but here are some tips to make it perform better. With the chassis out of the cabinet, and the knobs on and the loop antenna standing at normal position, turn on the set. Let it warm up for 15 minutes. Tune to a station on the lower end of the dial. Now adjust the four screw adjustments on the IF transformers for the most volume. Now tune to a station around 1400 kHz, and adjust the antenna trimmer, sometimes found on the loop antenna, or on the large section of the tuning capacitor. This adjustment affects the high end of the tuning range greatly. Be sure to use a plastic screwdriver, because these adjustments may shock you if the IF cans are "hot." Also, use plastic because a metal scredriver will detune the circuit.

Some of these radios have a metal cabinet. If so, use a three wire cord and ground the center wire to the cabinet, or mail the radio anonymously to a relative you hate! To connect an antenna to a hot-chassis set such as this, wrap an insulated wire arond the wire coming from the tuning capacitor to the loop. Connect it to the antenna. If you connect the antenna directly you may be sending line voltage up your antenna. Remember: ***Safety First!*** is the CHRS AC-DC motto. — Good luck, Jim ##



Radio Days

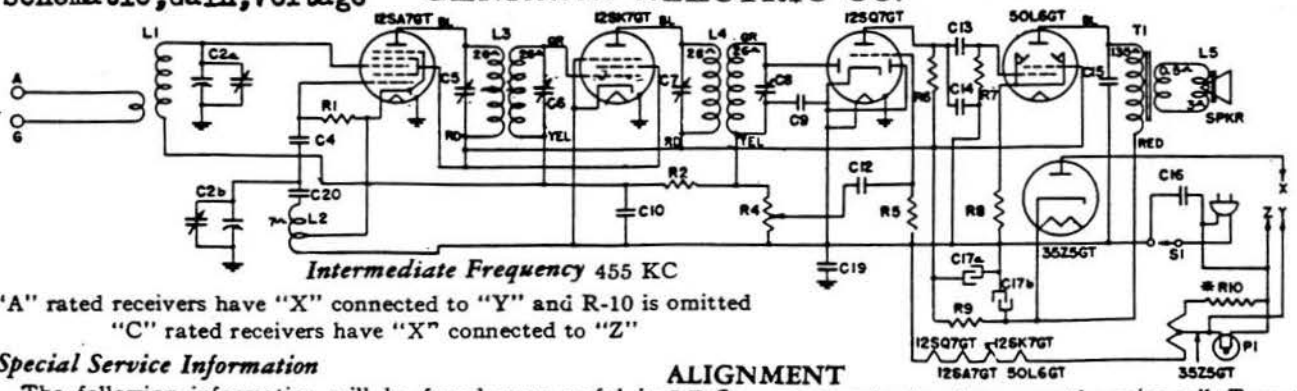
Thanks to simple, inexpensive receiving sets, nearly a half million Americans began tuning in to radio broadcasts. Fans stepped up to more complex equipment, including "tuning" devices and vacuum-tube detectors. • November 1921

MODEL HJ514

Schematic, Gain, Voltage

GENERAL ELECTRIC CO.

Socket, Alignment, Trimmers



Intermediate Frequency 455 KC

"A" rated receivers have "X" connected to "Y" and R-10 is omitted

"C" rated receivers have "X" connected to "Z"

Special Service Information

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains

	Gain
Antenna to 12SA7GT grid	3 to 3.5 at 1000 KC‡
12SA7GT grid to 12SK7GT grid	50 at 455 KC ‡
12SK7GT grid to 12SQ7GT detector plate	50 at 455 KC ‡

Gains shown in the first two stages do not contain the conversion gain which amounts to 1.1 at 1000 KC.

(2) 0.15 volt, 400 cycle signal across the volume control will give ½ watt speaker output. (Volume control turned to maximum.)

(3) Average DC voltage developed across oscillator grid leak ..... 15 volts

‡ Variations of +10%, −20% permissible.

The glass tubes used in the I.F. amplifier and 2nd detector stages are interchangeable with metal tubes.

Stock No.	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-179	BRACKET—Cabinet back chassis mounting bracket	.10
*RB-626	BUSHING—Tuning shaft bushing	.10
*RB-1015	BOARD—Terminal board (1 lug)	.10
RB-1102	BRACKET—Condenser mounting bracket	.10
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-13)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-15, 20)	.25
*RC-060	CAPACITOR—.03 mfd. 600 V. paper (C-12)	.25
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-10)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-16)	.30
*RC-130	CAPACITOR—0.2 mfd. 400 V. paper (C-19)	.30
*RC-232	CAPACITOR—47 mmf. mica (C-4)	.25
*RC-274	CAPACITOR—330 mmf. mica (C-14)	.30
*RC-293	CAPACITOR—470 mmf. mica (C-9)	.30
*RC-863	CORD—Power cord	.65
RC-5159	CAPACITOR—30 mfd. 150 V; 40 mfd. 150 V; dry electrolytic (C-17a, 17b)	.70
RC-7026	CONDENSER—Tuning condenser (C-2a, 2b)	2.05
RC-8160	CABLE—Tuning condenser drive cable	.10
*RC-9015	CONE ASSEMBLY—4-inch Dynapower speaker cone assembly	.80
RD-147	DIAL—Dial scale	.05
*RH-111	HAIRPIN COTTER—Tuning shaft retaining cotter (Pkg. 10)	.50
*RK-074	KNOB—Volume and tuning knobs (Pkg. 5)	.90
RL-525	BEAM-A-SCOPE—Cabinet back and Beam-a-Scope assembly (L-1)	.30
RL-2025	COIL—Oscillator coil (L-2)	.10
*RTN-001	NUT—Volume and tuning control pal nut (Pkg. 5)	.20
RP-173	POINTER—Dial pointer	.70
RQ-1214	RESISTOR—13 ohms, ¼-W. carbon ±5% (R-10) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½-W. carbon (R-8) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½-W. carbon (R-1) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½-W. carbon (R-6, 7) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 meg. ½-W. carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 meg. ¼-W. carbon (R-5) (Pkg. 5)	.70
*RQ-1460	RESISTOR—1,200 ohms, 1-W. carbon (R-9) (Pkg. 5)	.70
*RS-238	SOCKET—Octal tube socket	.15
RS-278	SOCKET—Dial lamp socket assembly	.30
*RS-426	SPRING—Drive cable tension spring (Pkg. 5)	.10
RS-954	SPACER—Cardboard dial spacer (Pkg. 5)	.05
RS-1030	SPEAKER—4-inch Dynapower speaker (Complete with output transformer)	$3.25
RS-4002	SPRING—Dial scale retaining spring (Pkg. 3)	.05
RS-9000	SHAFT—Tuning control shaft	.10
RT-352	TRANSFORMER—1st I.F. transformer (L-3)	.70
RT-353	TRANSFORMER—2nd I.F. transformer (L-4)	.70
RT-482	TRANSFORMER—Output transformer (T-1)	.90
RT-955	TERMINAL—Antenna or ground terminal (Pkg. 5)	.10
RV-091	VOLUME CONTROL—0.5 megohm volume control (R-4)	.80
RW-046	WINDOW—Dial scale window	.15
RW-121	WASHER—Pointer felt washer (Pkg. 10)	.05

* Used on previous receivers—(Prices subject to change without notice).

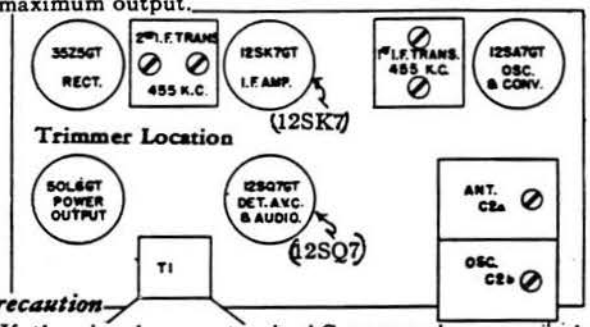
ALIGNMENT

I.F. Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid of the 12SA7GT through a 0.05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans. Do not remove the grid lead from the 12SA7GT.

R.F. To insert the R.F. signal use either a standard I.R.E. dummy between the signal generator and the receiver antenna post or a loop connected across the generator output which can be magnetically coupled to the receiver Beam-a-Scope. When using an I.R.E. dummy antenna for R.F. alignment, the ground lead from the signal generator to the receiver ground post should be omitted.

With the gang condenser wide open, align oscillator trimmer (C-2b) to 1650 KC. Change generator signal to 1500 KC, tune receiver to the signal and peak antenna trimmer (C-2a) for maximum output.



Precaution — If the signal generator is AC operated use an isolating transformer between the power supply and the radio receiver power input.

Rating	Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
A	115—AC or DC	40–60	30
C	115—AC or DC	25	30

Electrical Power Output (117-line volts)

Undistorted ..... 1.3 watts

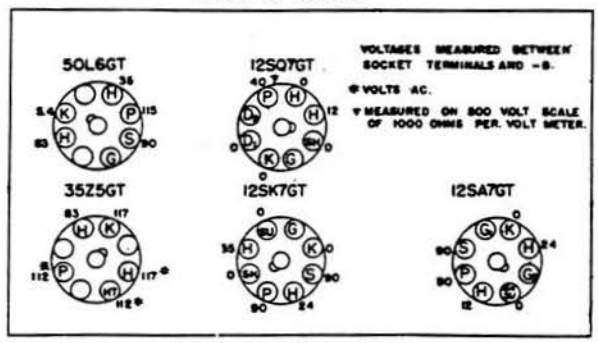
Maximum ..... 1.9 watts

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter ..... 4 inches

Voice Coil Impedance (400 cycles) ..... 3.5 ohms

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

AC LINE VOLTS - 117 MAX. VOLUME GANG CLOSED NO SIGNAL

Real Radios that Glow in the Dark!

BOOK REVIEW OF

COMMUNICATIONS RECEIVERS

The Vacuum Tube Era: 1932 - 1981 (2d ed),
By Raymond S. Moore, RSM Communications,
ISBN 0-9618882-1-0

Reviewed by Bart Lee, Special to the CHRS Journal

We found a new world beyond the broadcast wavelengths, and to explore it we needed short-wave radios. This recently new frequency range of 1.5 mHz to 30 mHz was (and is) always exciting. Amateur operators in the early 20s sought distant contacts on CW and later phone, and later talked to Antarctic explorers as well as sea-faring adventurers. Aviators and the occasional aviatrix talked to home bases, also on CW and phone. Police dispatchers called their cars to action, and Chiefs dispatched fire engines to save lives and property. By 1928 the spark stations were no longer licensed, replaced by CW for commercial, maritime and amateur traffic. By 1938, the old sparkers could no longer splatter the ether with their decremented wavelengths. The era of the single-signal receiver, as well as the single frequency transmitter, was upon us.

At first, as early as 1925, broadcast band stations were relayed on short-wave. E.H. Scott and others soon sold high performance home radios that reached into the short-wave bands, as the second radio craze, short-wave, caught on. By 1929, a new and international industry sprang up: international broadcasting. It was soon dominated by governments, most of which were bent on dominating the world. Those of an anthropological bent or who were bored with propaganda, could listen in on both domestic and international telephone calls, point to point and to ships at sea.

The technically inclined could display mechanical television signals (broadcast as low as 2 mHz) through spinning disks, for small but startling moving pictures. True technological heroes could receive the telefacsimile photographs and even newspapers experimentally broadcast or sent point to point.

But all off of this required sharply tunable, stable, selective receivers, with beat frequency oscillators to permit copy of the dominant mode of communications for amateur and commercial operations alike, CW. Primarily responsive to demand from amateurs, the market began to supply the single-signal superhets that could slice through the QRM. The paradigm of the modern communications receiver came out in 1933, the RME-9, with all of the features both amateur and commercial operators came to expect: a calibrated dial, band switching, a signal meter, AVC and an RF amp.

This book is about such receivers. It defines its field as super heterodyne short-wave receivers with BFOs. It thus cuts itself off from many of the impressive early developments in short-wave radios, such as the 1928 Pilot Wasp and Super Wasps, and the later National SW-3 and Thrill Boxes. The story it does tell, however, is all the more remarkable: astonishing technical developments in the midst of the worst economic times the country had ever known. These radios cost big money in those days, but once you had one, all you had to do was plug it in.

For National, Moore starts with the AGS of 1933 (AGS stood for Air-Ground System, and although Moore doesn't say so, the successor HRO's nomenclature was originally HOR for Hell Of a Rush-order, transmuted to HRO (Heck of a Rush Order?)). He starts Hallicrafters with the S1 Skyrider of 1933 and Hammerlund with the 1931 Comet, the first of what was to become an industry of communications receivers. Along with RME, these were the Big 4 of the 1930s. RCA got into the game in 1934 with the ACR-136. Collins came in in 1946 with the 75A, and led the field to SSB reception requiring advances in stability and detection modes. By the late 50s, bigger was better, as in the massive NC-303. Drake, however, saw the future, in the small but effective, ham-band-only Model R1A.

A great strength of this book is the capsule treatment of every known vacuum tube communications receiver of every known U.S. manufacturer. If you are ever going to come across one of these radios, you can find it here first. This includes the military versions of the workhorses and the special military radios, so many of which came on to the surplus market after WW II. The great strength of this second edition is that almost every radio described is depicted with a decent photo as well. What makes Mr. Moore's work truly outstanding is that he has researched and presented all of the men and companies who were the makers of these sets, not just National, Hallicrafters, Hammerlund, Collins and Drake. Every tube radio I've ever used for short-wave monitoring is here (except my regenerative, one tube, first set). Every radio I ever wanted when it was new is here. Every receiver I've ever seen at a swap meet is here. Reading this book (both editions) renews my interest in my old favorites, but also makes me want to restore and operate so many of the lesser known sets he catalogs in detail and with distinction.

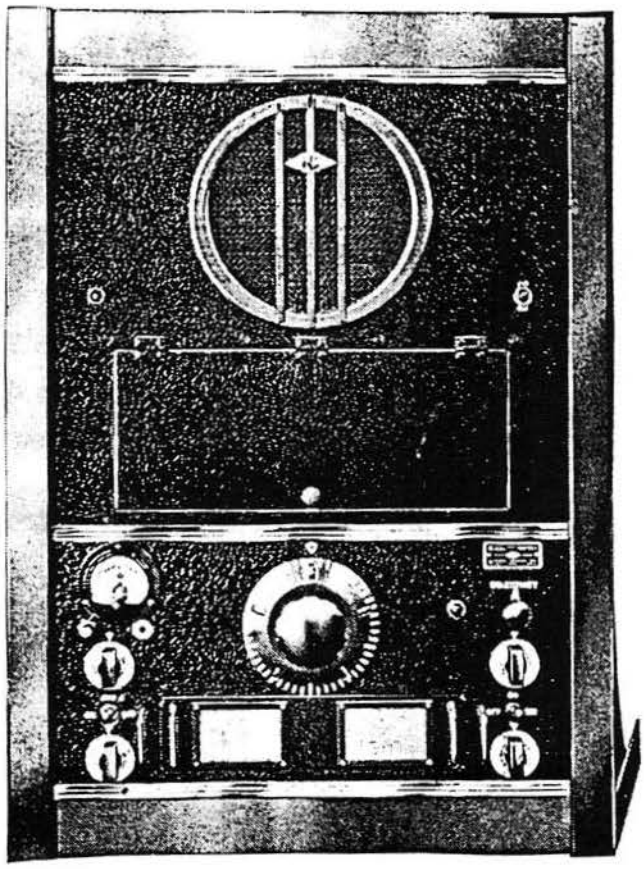
Beyond the technical, Mr. Moore also goes into the histories of the companies that made these sets — they were born of great ideas and high hopes, and many flourished for many years, but all of the old names are gone now. This book also tells the stories of many of the men who put these receivers out to the amateur, commercial and military markets. But now, their companies are dead (except for Collins as a military contractor under Rockwell, and Drake in the satellite TVRO business).

The "product-space" is now filled by the Japanese PLL chips-in-appliance-boxes. To be sure, modern radios, e.g., those from NRD and ICOM, are impressive performers. They are, however, hard to love, and they do not glow in the dark. (As every real DXer knows, in-the-dark is the only way to DX!) On the other hand, Drake just came back to short-wave with the R8, powerful, full featured and sounding good, a worthy successor to these distinguished progenitors.

Anyone who likes old radios that can hear more than the AM broadcast band, will want this book. It is a reference that one can read for pleasure. This is especially true those nights when WWV has proclaimed a magnetic storm and the bands are dead ... on the other hand, that's when to listen for those elusive Peruvians, especially on one of the radios Mr. Moore catalogs so well!

Fans of the communications receiver may also want to know that Sams put out two volumes of its data on the leading receivers of the 1950s. These are big, red covered books, CR-1 and CR-2. The monthly journal *Electric Radio* often features communications receivers and the back issues are a gold mine, especially for the military sets. The 1992 PROCEEDINGS of Fine Tuning features a National history and a Hallicrafters SX-28 history as well as Jerry Berg's superb history of short-wave listening. ##

NATIONAL



MODEL: HRO-C REMARKS: HRO in table rack with SPC coil storage unit, power supply and speaker.

FEATURED SET: ZENITH ROYAL 7000R TRANS-OCEANIC®, By Jim McDowell

The 7000 series was the last of the Trans-Oceanics made in America, introduced in 1968. Zenith went all out on features and performance on this transistor (advertised as "tubeless") model. Zenith put 12 bands on the 7000R, introduced in 1981 and made in Taiwan:

Longwave	170-450	KC
Broadcast	540-1600	KC
Shortwave	1.8-4.0	MC
Shortwave	4.0-7.4	MC
Shortwave	7.4-10.4	MC
Shortwave	11.25-15.5	MC
Shortwave	15.5-22.0	MC
Shortwave	22.0-30.0	MC
Citizens Band	26.9-27.5	MC

FM 88-108 MC with AFC, and 0-Center Tuning Meter.
VHF Aircraft 108-138 MC with Squelch Control.
Public Service 144-172 MC, with Squelch Control.

A signal strength meter is in circuit on all bands as well as an RF gain control (most useful for single sideband reception). Other controls include tone, volume, band width wide-narrow switch, a BFO on-off switch, ANL noise limiter on-off, a dial light switch and a switch that indicates battery condition using the tuning meter. A map of the world is located in the lid with an adjustable world time zone indicator. The tuning dial has a fine tuning control in the center of it which makes SSB tuning a snap. The set will operate on 8 D cells or a 12 volt car cord. There is also a 110-220 switch and an A/C line cord.

The nice thing about this set is that the handle is *not* the Waverod® antenna and you can close the cover or carry the radio without putting the antenna down. The large Ferrite rod antenna does an excellent job of pulling in the hardest to get AM stations and also works on long wave. There are also five terminals for outside antennas and ground. Further information may be found in the book: Zenith Transoceanic, the Radio, "Powered to Tune the World," by Bob Moore (Box 27232, Denver, CO, 80227 @$7) There *is* one drawback with this radio! It weighs 15 pounds without batteries. This radio, although a newer set, is one of my favorites in my collection. — Jim. ##

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9

12.

KXCH, *or*, C.H.R.S. AT-SEA on the *S S JEREMIAH O'BRIEN*

By Bart Lee, xWPE2DLT
327 Filbert Steps, San Francisco, CA 94133

KXCH is the seagoing maritime radio station of the *S. S. Jeremiah O'Brien,* the National Liberty Ship Memorial usually tied up at Fort Mason in San Francisco, welcoming visitors. While KXCH has not operated in many years, the vessel goes out several times a year. The most recent voyage circumnavigated the Bay observing the Fleet Week Parade of Ships and the Blue Angels aerobatics October 10. During that trip, Paul Bourbin and other members of CHRS aboard the *Jeremiah* met the ship's radio operators and surveyed the equipment, old and new.

Elliott Secondari and Alex Newbold, K6TW and W6MMG respectively, man the radios. The old gear is RCA Radiomarine, part of the standard Model 4U Radio Unit. The *Jeremiah* has the ET 8024 main transmitter (350 to 500 kHz) and the AR-8510 LF receiver, 15 to 650 kHz. The *Jeremiah's* radio panel set also contains the standard emergency transmitter ET-8025 and the crystal set then mandated by maritime rules.

An auxiliary panel provides the operators with HF capability; a very nice old militarized Scott short wave receiver CZC-46209 and an HF transmitter, RCA ET-8024, two to 24 mHz. This panel also has a crystal set, Type D, for emergency back-up. VHF has long supplanted this equipment, and the *Jeremiah* now operates at 156 mHz like everybody else (not on the high seas).

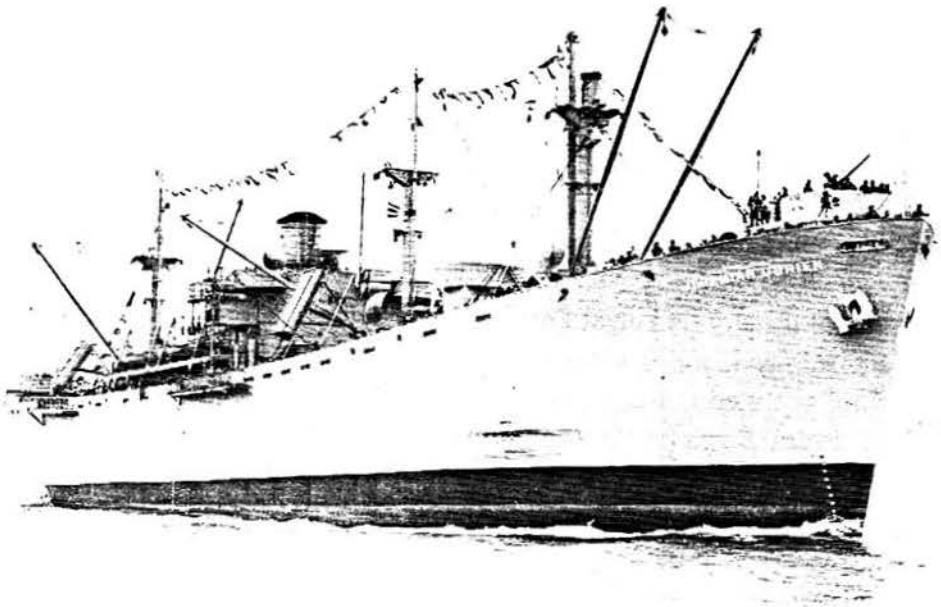
The crystal sets were required by international law in ships of this vintage. (The *Jeremiah* was launched July 19, 1943). The 1947 instruction book for the Radiomarine 4U Unit says its Type D Crystal Radio Receiver: "...is...designed to meet the requirements of the Safety of Life at Sea Convention and the Rules of the Federal Communications Commission ...requir[ing]...a radio receiver which is capable of receiving radiotelegraph signals, A2 or B emission, on all frequencies within the band 350 to 515 K.C. [kHz} by means of a crystal rectifier."

Aficionados of World War Two Naval Radio will also want to visit the submarine, the *U.S.S. Pompanito,* tied up at Pier 45. The radio room sports a matched pair of receivers, the RBA and RBC, for LF and HF respectively. These were the mainstays of fleet communications early in the war, and known as the Battleship Radios.

The opps on the *Jeremiah* also run a shipboard ham station, W6PW, on at least 2 and 20 meters, under the aegis of the San Francisco Amateur Radio Club. This group was founded in 1916, according to its QSL card. Its address is P.O. Box 741, San Francisco, CA 94101. Although there is a very nice 50s vintage Radiomarine HF receiver in the working corner of the radio room, the transceiver is a Yeasu FT-101.

The *Jeremiah* is scheduled to go to Normandy beach in 1994 for the fiftieth anniversary of the D-Day landing of Allied forces in France. It may well fire up the old Radiomarine transmitters for that voyage from San Francisco to the English Channel. If anyone is thinking of running away to sea, call Marci Hooper at Pier One, Fort Mason, (415) 441 3101 for further information on the D-Day trip.

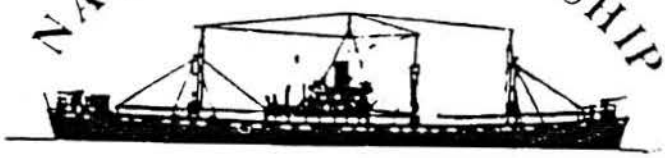
Incidentally, the distinguished American for whom the *S.S. Jeremiah O'Brien* is named highjacked two British merchantmen at the beginning of the American Revolution. He used them capture a British Man o'War, no mean feat. His victory was the new country's first (and quite heroic) naval engagement. Captain O'Brien went on to several happy years of privateering and plunder under the Stars and Stripes if not the Jolly Roger. (A pompanito, on the other hand, is a fish). ##



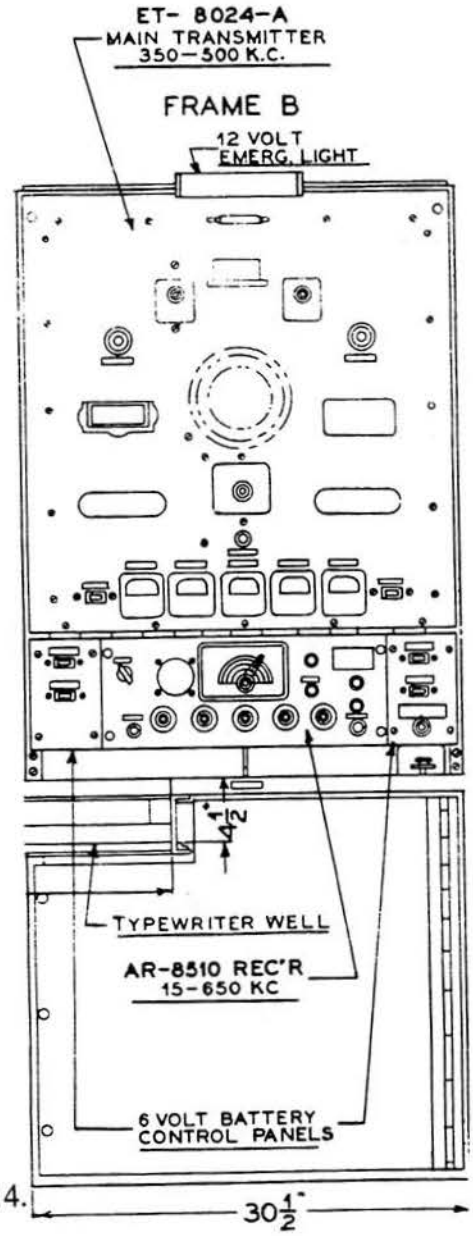
KXCH

SS Jeremiah O'Brien

NATIONAL LIBERTY SHIP



MEMORIAL

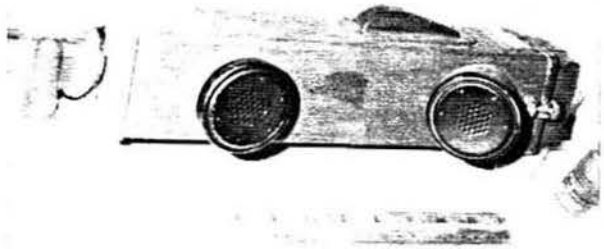


MODEL 4U RADIO UNIT OUTLINE		
RADIOMARINE CORP. OF AMERICA		
ENGINEERING DEPT.	S. PROSAK	TS-335
NEW YORK	Sub. 8	Date 1-14-43

TYPE D
CRYSTAL REC'R

FOR SURPLUS HOUNDS: THE BC-611, SCR-536 HANDY-TALKIE

By Bart Lee, xWPE2DLT
327 Filbert Steps, San Francisco, CA 94133
Special thanks to Henry Engstrom



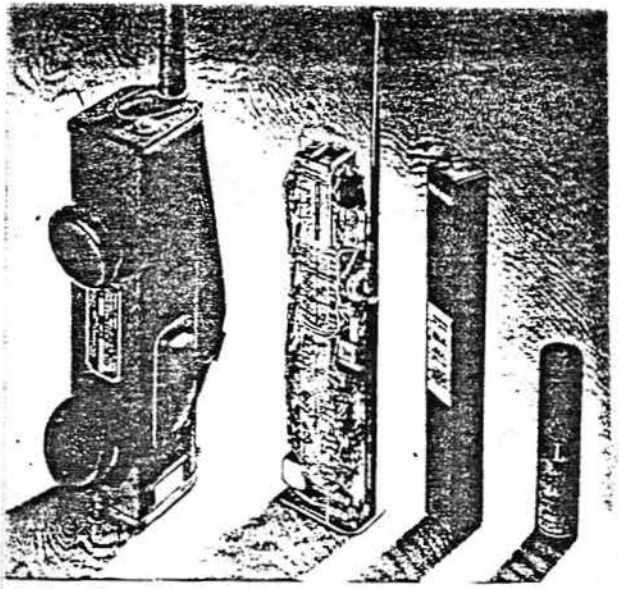
The first of the hand held transceivers appeared in World War Two as the BC-611 Handy-Talkie. It looks like a squared off and all too large telephone handset, with a 39" antenna sticking out. It weighs in at just over 5 pounds. Nearby are several contemporary illustrations. A near-mint example came up at the AWA auction last month in Rochester (it sold for $110), and photographs of it also appear. These and similar sets sometimes show up at swap meets for as little as $10 in rough shape.

Motorola (then Galvin Mfg. Co.) designed and built the Handy-Talkie. They called it "the 'fightingest' radio set in the army!" because it was used primarily in the front lines. The set uses low filament voltage, miniature glass tubes of the sort developed for civilian portable radios just before the war, e.g., the 1R5 and the 1S5 and 1T4, announced in 1939, and the 3S4 of 1941. The circuit is a superheterodyne receiver, with the local oscillator and RF stage converted to a master oscillator-power amplifier for transmitting. It operated crystal controlled AM between 3.5 mHz and 6 mHz. The chassis is solidly constructed with spring clips for the tubes. Pulling the whip antenna out the top snaps an internal toggle switch to turn the set on. Range was of course limited to squad and platoon and maybe company uses, up to one mile. Nonetheless, it sure was an improvement over the BC-745 Horsey-Talkie on a stick (examined in this column last year), or a heavy back-pack radio.

The BC-611 implemented innovations beyond miniature tubes: "cups" of small parts placed together, powdered iron cores in the IF transformers, and miniaturized capacitors and resistors. The set is also watertight as well as rugged.

During the Second World War, CHRS member George Durfey had occasion to use this set on the front lines in Europe, when he wasn't firing his B.A.R. His comments to date on the set have been limited to: "It worked allright." Towards the end of the War, the Signal Corps developed a loop antenna accessory so that the set could be used as a direction finder. This would only have permitted American troops to locate an American beacon transmitter on the pre-set frequency, because the set did not tune. The last models of the Handy-Talkie, the BC-611F, had 50 available crystal channels, and a plug-in mike and headset. The Handy-Talkie was operational as early as 1942; by the end of the War, the Signal Corps had implemented its policy of FM line communications, with the so-called "Walkie-Talkie" manpack radios such as the SCR-195 (52 to 66 mHz, at 27 pounds). FM had about twice the useable range and improved clarity.

The BC-611 was followed, during the Korean conflict in 1952, by the banana-shaped AN/PRC-6 Handy-Talkie, an FM set operating on 47 to 55 mHz. This was, if anything, more awkward to use and heavier. It did have as an accessory a lightweight plug in handset. By Nam-time, the hand-held AN/PRC-68, the size of a pack of Camel-wides, and with a microphone and speaker, provided line-unit communications, along with later developed helmet radios. The BC-611 was the first of these workhorse radios, and a modern expert calls it "...one of the outstanding designs of all time." (Walt Hutchens, "The BC-611 Handy Talkie," Electric Radio in Uniform, *Electric Radio* (No. 24, April, 1991 at p. 4); see also Robert F. Scott, "Inside the Handy-Talkie," in *Radio Craft* (July, 1946 at p. 684)). ##



Inside and outside views of Motorola Handie-Talkie and batteries.

Antenna switch detail.

Handie-Talkie signals the attack!

The "FIGHTINGEST" Radio in the Armed Service.

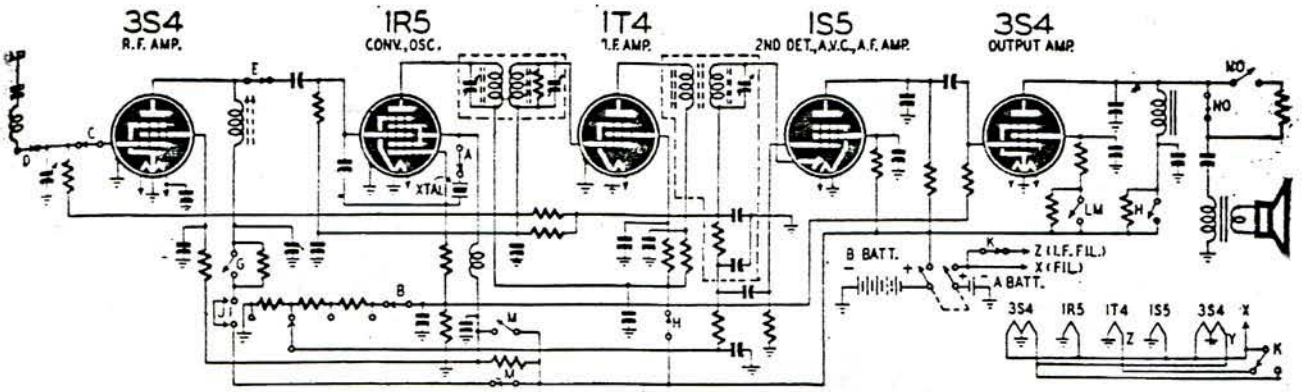


Fig. 1—Handie-Talkie switched to the "receive" position. Letters refer to switches shown in schematic form in the drawing below. Note that only one side of the two 3S4 filaments are heated when the set is used as a receiver. Tuning is controlled by the oscillator crystal.

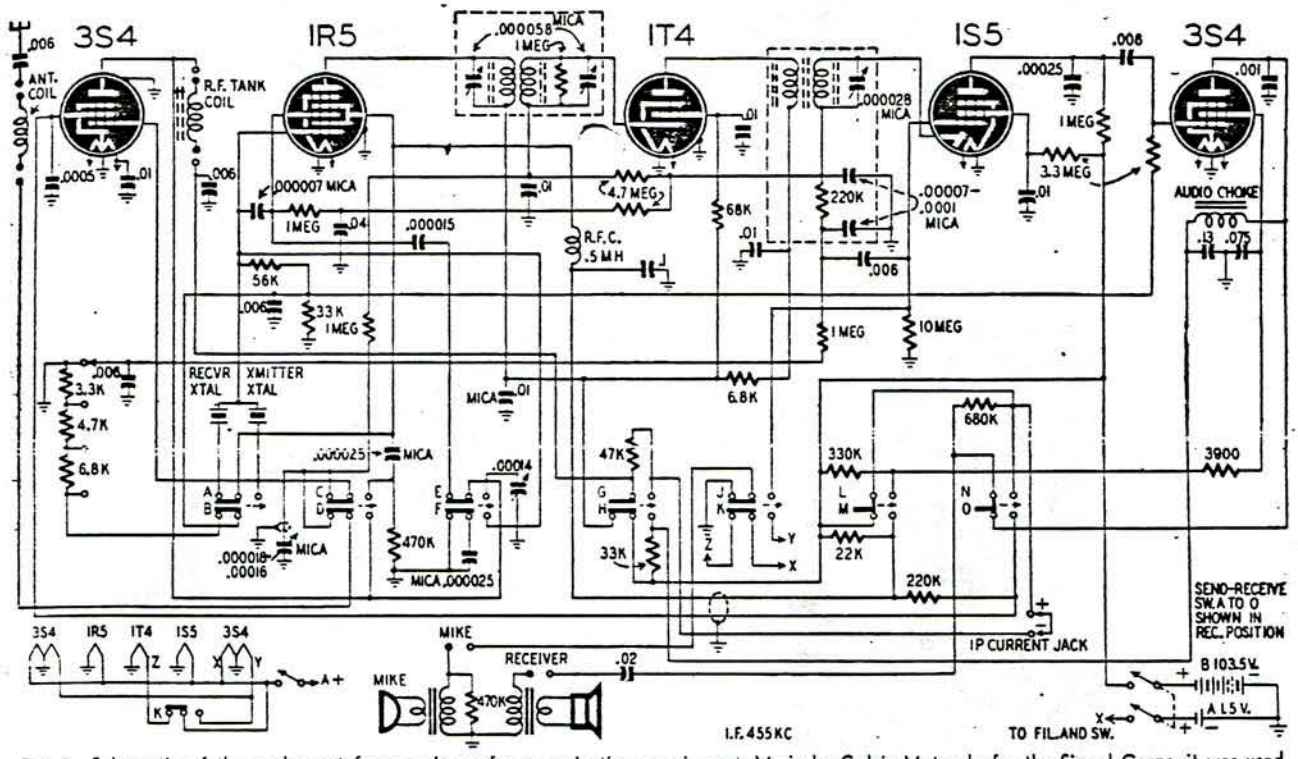
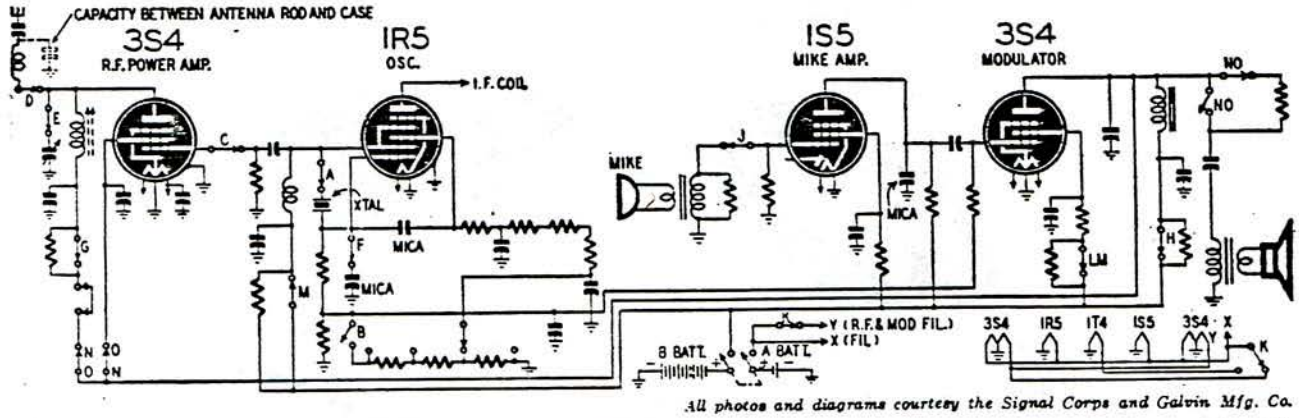


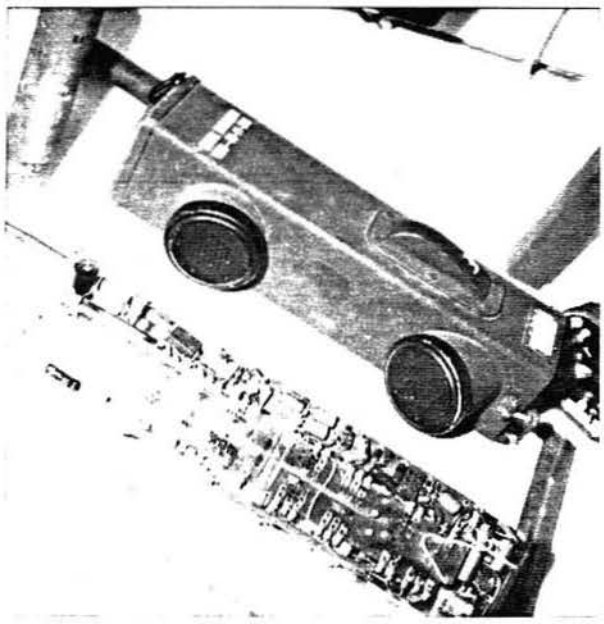
Fig. 2—Schematic of the war's most famous piece of communications equipment. Made by Galvin Motorola for the Signal Corps, it was used "in the air, on land and on the sea." Each set employs two crystals ground to frequencies 455 kc apart. The 1R5 acts as a Pierce oscillator in both transmitting and receiving circuits. The 14-section changeover switch is lettered to agree with the other two figures. Early Handie-Talkies had crystal earphones, but later ones used the inductor type illustrated in these diagrams.

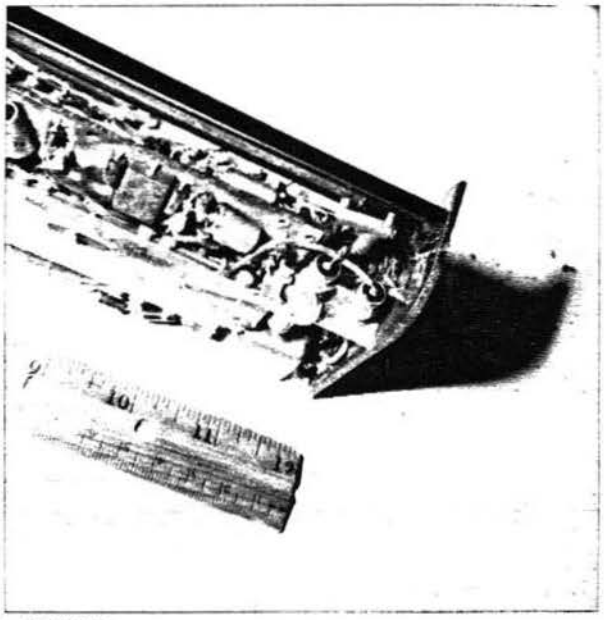


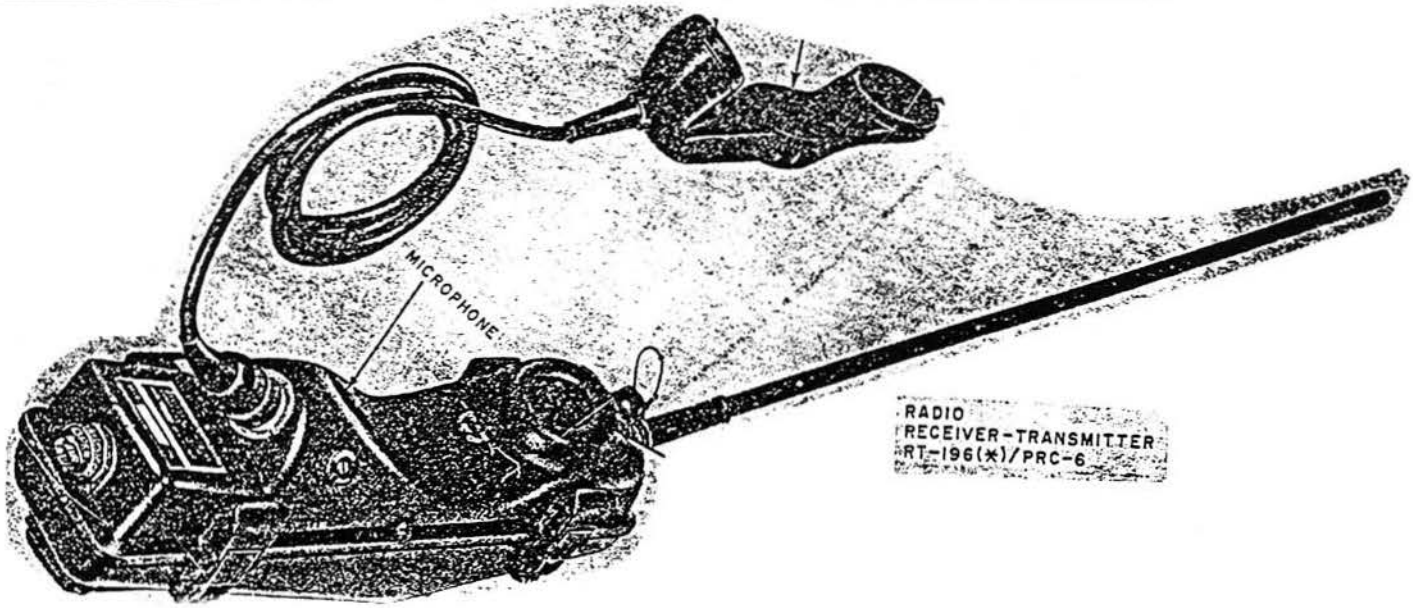
All photos and diagrams courtesy the Signal Corps and Galvin Mfg. Co.

Fig. 3—As a transmitter, the Handie-Talkie is a four-tube set. The 1R5 functions as master oscillator in a Pierce circuit, driving one of the 3S4's as r.f. power output tube. The 1S5 and the other 3S4 are speech amplifier and modulator, Heising system being used.

BC-611, EXTERIOR VIEWS AND DETAIL OF ANTENNA SWITCH. The lower graphic is the BC-611's successor, the AN/PRC-6 (1952).







The Radio Proximity Fuze - A survey By Edward A. Sharpe Archivist, SMEC (c)

Introduction

In this fast paced, high tech era of warfare where bombs are smart, and a pilot can hit something the size of a football at near supersonic speeds, we take you back to an earlier, more simpler time. But, this was a time when many lives were lost, and a war was to happen that did not end as swiftly as Desert Storm, the war against Iraq to reclaim Kuwait in the early part of 1991.

The dilemma

During all of the wars that proceeded, and during the beginning of World War II, we needed a method for detonating a shell near the target. If we were to detonate the shell either too early, or later after the shell had passed through the target, the effect would be minimal.

In the earlier days of warfare, many of these shells had been manually timed, which gave the gunner one more thing to contend with, in addition to calculating the correct course, speed, range, bearing, and position angle. Of course, any error in calculations resulted in the target escaping damage.

Early in the days of World War II, fire-control radar was developed, which helped with many of the calculations that must be considered for a successful launch of a shell towards the target. The accepted method of shelling prior to the marvel of radar, was to saturate the area, wasting a large number of shells and most of the time resulting in the escape of the target. Fire control radar was to solve the problems of positioning the guns, but now, on to our problem of when to detonate the shell.

The burst range for a 5 inch shell is 70 yards, and we must have our target within this region when the explosion occurs. It took the inventiveness of the Navy, and civilian American scientists to invent the technical marvel of the Proximity Fuze. It took the electronics industry in the United States to manufacture a reliable and compact system.

Early attempts to solve the dilemma.

For a decade prior to World War II, the Navy's Bureau of Ordnance had thought of building an infrared fuze which could be triggered by the heat developed by an aircraft engine. Due to the complicated engineering problems this project was never implemented.

In the summer of 1940, aircraft technology had improved by many countries, and the international situation started by Hitler's invasions made the United States take a look at developing a fuze which would detonate a projectile when in proximity of an aircraft. In July of that year, a group consisting of members of the National Defense Research Committee and the Navy Department Council for Research, decided that the development of such a fuze was possible by using either electronic or photoelectric devices.

There were no holds barred as to the techniques to be investigated! A month later, the Bureau of Ordnance gave the fuzes top priority over all projects that it had requested the National Defense Research Committee to look into.

What a surprise it was for the NDRC, when they learned that two of our largest electronics manufacturers were providing the British with thousands of vacuum tubes and photoelectric cells. This led the committee to believe that the components were being used for some type of proximity fuze.

After the arrival, in September 1940, of the British Technical Mission, headed by Sir Henry Tizard, the NDRC received a report from the British that, although they were consuming supplies, they had not made a workable fuze. The Tizard mission claim to fame was in bringing a magnetron to the United States. This early magnetron was to be used as a pattern that set us into production of better radar equipment! (See McMahon's Radar section, Vintage Electrics Vol. #3).

During August 1940, Section T of the National Defense Research Committee was established under Dr. M. A. Tuve of the Carnegie Institution. Research was to be conducted at the laboratory of the Department of Terrestrial Magnetism of the Carnegie Institution, Washington.

People for this effort were recruited from all over the United States. The work on the proximity fuze was very secret, and when interviewing Dave Smith, son of K. D. Smith, Dave tells us that although his father was involved with Proximity Fuze development, *"It was never discussed at home."* Even after the war was over Dave said that anything connected with the war effort on the fuze, as well as his fathers efforts on Radar were never talked about in detail. What we do have, however, is the picture included in this article of K. D. Smith's NDRC Identification card while involved with the VT Fuze project. K.D. was to be presented with an award after the end of World War II, and this may be seen in Volume #2 of Vintage Electrics, where K.D. Smith's life at Bell Laboratories and the his war efforts are documented.


NATIONAL DEFENSE RESEARCH COMMITTEE
SECTION T OF DIVISION A
This certifies that the bearer
SMITH, K. D.
is engaged in work of Section T of Division A, N.D.R.C. at
DEPARTMENT OF TERRESTRIAL MAGNETISM, CARNEGIE INSTITUTION OF WASHINGTON
5241 Broad Branch Road, Northwest, Washington, D. C.
Director, OSRD
Chairman, Section T, Division A, NDRC
Bearer's signature
Card No. 64 Expires Feb. 1, 1942

The Radio Proximity Fuze, Cont.

In November 1940, the Bureau of Standards joined section T on the project and for a few months both of these activities conducted independent research, each working on a variety of devices applicable to a wide range of projectiles.

Since the Navy's basic and urgent requirement was for a fuze for anti-aircraft projectiles, fired from rifled guns, the work of the two activities was separated in July 1941. Thereafter, Section T devoted its entire energies to this problem, while the Bureau of Standards concentrated on influence fuzes for non-rotating projectiles.

In November 1941, the Bureau of Ordnance contracted with the Crosley Co. to conduct independent research in fuze construction under the technical supervision of the National Defense Research Committee. This industrial concern was expected to provide realistic engineering design rather than development. Meanwhile, the National Defense Research Committee contracted with many other companies and universities.

The growth of the project was so great that it required increased administrative support. In March 1942, it was placed directly under the Office of Scientific Research and Development, which contracted with Johns Hopkins University to provide for its administration. The secret classification of the project necessitated the provision of secure space for this. The University established the Applied Physics Laboratory at Silver Spring, Maryland, a suburb of Washington D. C.

During the early months acoustic, thermal, electrostatic, and magnetic types were studied, but were found to be unsatisfactory. Considerable emphasis was placed on the utilization of photoelectric cells and one was practically completed in early 1941, but the cells failed to withstand the centrifugal force developed by the rotating projectile, as well as working in only daylight! Although optical and magnetic methods were not well suited for shells, they found use in 4 1/2 inch rockets and mines.

A call to development

In early 1941, all contractors supported by Navy funds were directed to concentrate on the development of an electronic fuze.

One method that was experimented with used radio waves transmitted from the ground. These radio waves would be reflected by the target and received by the fuze. Once the radio waves were at a sufficient level, the fuze would activate causing the shell to explode.

Another method that was more logical and became the accepted means, was to develop a fuze which was capable of obtaining its own intelligence and of using it to ignite the shell. When assembled this fuze consisted of four major parts: A miniature radio transceiver, complete with amplifier and capacitor; a battery; an explosive train; and the necessary safety devices. The theory was that the fuze transmitter, alone, would not produce sufficient signal intensity, to trigger a thyratron tube switch. However, as the projectile approached a target the radio waves reflected by the target would gradually increase and come more and more into phase with the fuze-generated signal. Once the signal level was high enough, the fuze would know that the shell could do a maximum amount of damage, and the thyratron tube switch would be triggered releasing the energy in a charged capacitor and thus igniting the shell.

It was a brilliant concept! To convert it to a workable device required the development of radio components rugged enough to withstand an acceleration force 20,000 times stronger than normal earth's gravity and a centrifugal force set up by approximately 500 rotations per second. Once these specifications were met, it was necessary to shoe-horn all of this electronics along with batteries and detonator into a space approximately the size of a pint milk bottle.

With American lives being lost daily, the electronics manufacturers became very inventive! Had the requirement for miniature components of the required ruggedness been submitted to any electronic equipment manufacturer during peacetime, he would have most probably shaken his head and declared them far beyond the engineering capabilities of his staff. But, the issue was saving the lives of our soldiers, and this pushed the developers beyond the labors that would have been undertaken normally.

Miniaturization had already been seen in electronic hearing aids, but the ruggedness needed was not an essential requirement of that field.

During the development period, the tubes were handmade by engineers of the Western Electric, Raytheon, Hytron, Erwood, and Parker-Majestic Companies. Although varying in quality periodic tests conducted through the latter half of 1941 offered promise. Constant test and re-design were of paramount importance anytime weakness was discovered in any part of the fuze.

The big test.

On January 29, 1942, a group of fuzes with miniaturized components and dry cell batteries, built on a pilot production line, were installed in standard 5-inch anti-aircraft projectiles and fired from a 5-inch 38-caliber anti-aircraft gun. At the end of a 5-mile trajectory 52 percent had successfully activated themselves by proximity to water. Although this appeared to be a low percentage, the protection given by these shells was far greater than that achieved by saturation shelling. The Bureau directed the Crosley Corp. to commence pilot production of the fuzes without delay. The name that was assigned was the 'VT Fuze', with the VT standing for variable time.

The Radio Proximity Fuze, Cont.

One of the key items that had to be developed during this project was a reliable battery. It was found that a small dry cell battery, although providing power, would fail to withstand the shock of gunfire. Another large problem was short battery life under shipboard storage conditions in the South Pacific.

A parallel research effort to develop improved dry cells and a wet battery, wherein the electrolyte would be kept separated from the electrode until after the projectile was fired, was concentrated at the Cleveland, Ohio plant of the National Carbon Co. The outcome of this research was the development of a cylindrical battery resembling a fountain pen. The way this battery worked was ingenious! The electrolyte was contained in a glass ampule at the center of a cylindrical cell of thin plates. Upon the firing of the projectile the shock breaks the ampule, the electrolyte is released and the centrifugal force generated by the rotation of the projectile forces the liquid between the plates and activates the battery. This battery was ready for experimental testing in February 1942.

Development of the fuze continued concurrently with the pilot production at the Crosley Corporation plant. In April 1942, firing tests in which the new battery was utilized were conducted successfully. A small plane suspended from a barrage balloon was used as the target. Success! But safety and self-destruction devices needed to be added to the fuze before it was formally ready to go to war.

In another test, similar to the one conducted on January 29, it was found that reliability of the fuze technology resulted in 70 percent of the shells detonated. The next logical step was to conduct a shipboard firing test.

The VT Fuze gets sea legs

On August 12, 1942, the first pre-combat service tests were made by the newly commissioned U.S.S. *Cleveland*. The commander, Capt. S. E. Burroughs, USN, had the ship on a shake down cruise in the Chesapeake Bay. Radio controlled planes (drones) were used as targets. The Gunnery Officer, Lt. Commander. Russell Smith, USN, was an experienced fire-control officer. His gun crews consisted of approximately 10-percent experienced personnel and the remainder were newly enlisted. Smith, with his nucleus of experienced personnel, worked hard before and during the shakedown period to train his fire control and gun crews and achieved magnificent results. The tests were scheduled for a period of 2 days and were to be conducted under simulated battle conditions. All three available drones were destroyed early on the first day while going though all possible evasive maneuvers, by the bursts of only four proximity fuzed projectiles. This was an amazing event to all who witnessed it! Here was a device which would force enemy aviators to be more respectful!

Specifications are created

Following the *Cleveland* tests fluid specifications, which permitted incorporation of later developments, were drawn up for mass production of the fuze and manufacture was commenced. Those produced were shipped to the Ammunition Depot, Mare Island, Calif., for assembly into anti-aircraft projectiles. Samples of these were flown back daily to the U.S. Naval Proving Ground, Dahlgren, Va., for verification of quality.

Combat, the ultimate test!

In the middle of November 1942, 5,000 rounds of proximity-fuzed projectiles in storage at Mare Island were rushed to Noumea for distribution to ships of a task force in the southwest Pacific. The first ship to introduce them to the enemy was the U.S.S. *Helena*. On January 5, 1943, four Japanese bombers attacked the task force and the *Helena* downed one with the second salvo of proximity-fuzed ammunition.

The secret must be kept!

Realizing that the details of the fuze must be kept from the enemy, the Combined Chiefs of Staff issued a ban against its use in any area where duds or live shells might be recovered by the enemy. During World War II, the Japanese were famous for being able to copy captured radar equipment, and the Americans did not wish this fuze copied and used against the allied forces. This restricted the fuze's usage to naval warfare and also prevented it from being used in naval shore bombardment of enemy-held territories.

The production lines crank up

Following the Crosley Corp. contract, production was increased to great numbers. Beginning in September 1942, newly established facilities commenced production of the ruggedized miniature tube in large quantities. In October 1942, an average of 500 tubes were being manufactured daily. After the fuze had been proven in combat the expansion of manufacturing facilities was rapidly increased. By the end of 1943 almost 2 million had been delivered. By the end of 1944, 87 contractors, operating 110 plants, were manufacturing parts of the fuze which at that time were being delivered at the rate of 40,000 per day. Procurement contracts increased annually from $60 million in 1942, to $200 million in 1943, to $300 million in 1944 and were topped by $450 million in 1945. Of course, as volume increases cost decreases, and the cost per fuze that had started at $732 in 1942 dropped to $18 in 1945. This permitted the purchase of over 22 million fuzes for approximately $1,010 million.

Many companies involved

Fuze assembly was concentrated in the plants of the Crosley Corp., the Radio Corporation of America, Eastman Kodak Company, and the McQuay-Norris Company. Mass production of the ruggedized miniature tubes had to be limited to Sylvania Electric Products, Inc., since they proved to be the only firm capable of combining quality and quantity. Cost of tubes declined with increased production from $5.05 in 1942 to $0.40 in 1945.

The Radio Proximity Fuze, Cont.

K. D. Smith, whose collection resides at the Southwest Museum of Electricity and Communications, obtained many of these miniature Sylvania tubes following the completion of World War II. He collected them as a memento of his involvement with the Proximity Fuze project with the NDRC. You may view some of the actual tubes that were the heart of the electronics that made this project a success.

A striking combat success!

During 1943 approximately 9,100 rounds of proximity-fuzed and 27,200 rounds of time-fuzed 5-inch anti-aircraft projectiles were fired. Fifty-one percent of the hits on enemy planes were credited to VT-fuzed projectiles. The proximity Fuze equipped shells success in repelling air attacks against fleet units reached its peak when a task group in the Pacific reported the destruction of 91 of 130 attacking Japanese planes. This high level of effectiveness was to save many servicemen's lives from the onslaught of Kamikaze attackers. Had not these Samurai minded pilots been removed from the air, they would have rammed their planes onto the decks of our navy vessels causing the death of many servicemen. The VT Fuzed shells were also used with great success in the Mediterranean and Atlantic theaters.

Security restrictions removed

During 1944 the intense warfare in the European theater of operations necessitated the lifting of the ban against the use of the fuze where it might be recovered by an enemy. On 12 June 1944 the first V-1 "buzz bomb" fell on London marking the start of Hitler's massive effort to level the city by rocket. The all-out valiant effort of the Royal Air Force was not able to devise a good defense against this new weapon.

The Combined Chiefs of Staff reluctantly agreed upon the necessity of using the proximity fuze in the defense of London. Large numbers of anti-aircraft guns were moved to the channel coast where they could fire at the bombs over water. Success in destroying the V-1 rocket bombs by gunfire increased proportionally with the increase in the use of VT-fuzed projectiles. In the last month of the terrifying 80 days, 79 percent of the bombs engaged were destroyed as compared with the 24 percent destroyed during the first week of the attacks. On the last day of large-scale attacks only 4 Of 104 bombs succeeded in reaching their target. Some of the 100 destroyed are credited to the Royal Air Force and to the barrage balloons, but the majority of the V-1's were victims of proximity-fuzed projectiles. There was little profit to the enemy with such a small percentage of success so Hitler turned the weapon on the port of Antwerp, which at that time was vital to the Allied supply lines. In the autumn of 1944 the devastating damage wrought while the Allies were redeploying anti-aircraft guns threatened to close the port. As the number of guns firing the proximity fuze increased, the damage decreased and the Allies were able to move their guns closer and to assume the offensive against the aerial targets. The defense of Antwerp resulted in the Combined Chiefs of Staff removing all bans against the use of the fuze which was most fortunate for the allied soldiers fighting there.

In late December 1944, von Rundstedt launched a counterattack which developed into the Battle of the Bulge. The use of the fuzes entered a new field, that of artillery fire against ground forces. The results of this usage was devastating to German troops and put fear into their hearts. No longer were their foxholes heavens against shrapnel burst, for with the use of the *"funny fuze,"* as it was termed by General Patton, the shrapnel bursts occurred before the projectiles hit the earth, and high-velocity fragments rained down on the German attackers!

Electronic countermeasures

A move to develop countermeasures against proximity fuzes stemmed from the Germans, who during the "Battle of the Bulge," captured an Army munitions dump that contained a large number of the new radar proximity-fused shells. Concerned that the Germans might attempt to copy the proximity fuze, the Research Division of the Aircraft Radio Laboratory at Wright Field, along with the help of the RLL, was called in begin the development of jamming equipment. Lieutenant Jack Bowers, an engineer with the Aircraft Radio Laboratory at Wright Field, recounted the following to Alfred Price:

> *"The proximity fuse had been a closely guarded secret on our side. Even though we had been working on countermeasures for a long time, we at Wright Field had never heard of the device. Now we were asked to investigate, on a crash basis, the possibility of a jammer to counter the fuse. We asked why such a jammer had not been developed earlier, and were told that the developing agency had conducted tests and concluded that the fuse could not be jammed! We worked on the problem, and within two weeks, a jammer had been built which would detonate the proximity fuses prematurely."*

Since the body of the shell served as the antenna for the radar proximity fuse, it limited the frequency spread of the transceiver from 180 to 220 MHz. The APT-4, a high powered jammer, already covered that part of the spectrum. A motor-driven tuner was added to sweep the jamming transmitter's signal up and down the band theoretically covered by the fuze. Several modified APT-4's were installed in a B-17, and a top priority full scale test was arranged at Eglin to see whether the countermeasures would be effective.

Price, in another interview with Lieutenant Ingwald Haugen, one of people involved with the test, Haugen tells him:

> *"For the firing test, the Army sent a battery of 90 mm anti-aircraft guns. These were emplaced near Eglin. We had requested that during the test the guns would fire VT (proximity fused) shells with spotting charges, so that when the fuses operated, the shells would burst with only a puff of smoke. We were told this was not possible. The VT fuse was about 1 1/2 inches longer than the normal mechanical fuse and it would not fit in a shell carrying a spotting charge. So, we were going to have to use live high explosive VT fused shells for the test. As a safety*

measure, the guns were to be offset by a small angle, initially 30 mils (about 1.7 degrees), later decreased to 12 mils (about .6 Degrees)."

"It was the sort of test that would never be allowed today under the prevailing flight safety guidelines. At the time, however, there was a war on, and the small risk to our one aircraft had to be weighed against the far larger risk to our whole bomber force if the Germans used such a weapon against us. We who were to fly the test were confident we would be all right - we hoped that the jamming would work as planned, and if it didn't, the offset fed into the guns would burst the shells at least 240 feet away from us at a range of about 20,000 feet."

"The test lasted about 3 months, during which about 1,600 VT shells were fired, individually, in our direction. Sitting in the fuselage of the B-17, the two RCM operators could pick up the radar transmissions from the shells coming up. The VT fuse radiated CW (continuous wave) signals, but the projectiles would often yaw a little in flight. This, in combination with the spin of the shell, would modulate the signal. We in the back could not see out, but the pilots and the navigator would get a kick out of watching the shells burst well below, or if there was a late burst because the jamming had taken some time to sweep through the shell's frequency, it might explode close to our altitude. The general conclusion of the test was that, modified to radiate CW swept across the VT fuse band, the APT-4 jamming could significantly reduce the effectiveness of the proximity fused AA shell."

The war ends...

The proximity fuze was a valiant contributions of American scientists, engineers, and manufacturers to the winning of the Second World War. Although security prevented the developers and manufactures from receiving the praise they so well deserved during the early years, they were to have full payment in the knowledge of their own great contributions.

General Benjamin Lear, USA, described the VT Fuze as *"...the most important new development in the ammunition field since the introduction of high-explosive projectiles."*

General George Patton, USA, also paid tribute to the Fuze developers stating, *"I think when all armies get this shell we will have to devise some new method of warfare."*

Patton's prophecy might well have come true except that within the year, the success story of the VT Fuze was dimmed by the development of atomic weaponry. The Atomic Bomb was a far greater and more damaging concentrated explosive power than the world had ever seen. Even this development necessitated the continued use of the proximity fuze in the control of when the 'A-Bomb' was to detonate.

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'The K. D. Smith Collection' at the Southwest Museum of Electricity and Communications, Phx. AZ.

In addition, many conceptional views were provided by footage and narration of film from the World War II era. Views also have been provided to me over the past 39 years by those who I came in contact with, that either worked on the Proximity Fuze, or were users of the device. - *Edward A. Sharpe Archivist, SMEC.*

About Edward A. Sharpe

Edward A. Sharpe is founder and archivist of the Southwest Museum of Electricity and Communications, which is the fruit of his life-long interest in technology and its history. He is presently owner, president, and chief engineer of Computer Exchange, an independent dealer in and services of Hewlett-Packard computer hardware. He is a senior member of IEEE. Mr. Sharpe was the 1992 recipient of the prestigious California Historical Radio Society 'Herrold Award' for significant contribution to the preservation of electronics and broadcasting history.

The Southwest Museum of Electricity and Communications is looking for more artifacts, manuals and written or taped recollections relating to World War II Electronics. The Museum seeks to preserve all aspects of electrical, electronics, broadcasting and data processing history. Please contact us if you can be of assistance!

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Optical and Magnetic Proximity Fuzes-a Survey By Edward A. Sharpe, Archivist SMEC (c)

In the previous article, we studied how the radio, or often called Radar, proximity fuze operated and learned the history of its development. In this article we are going to examine the optical and the magnetic proximity fuzes designed by Bell Laboratories employees during World War II.

Optical Proximity Fuzes

Unlike early attempts of optical methods we discussed in the earlier article that were tried on 5" shells, this fuze was able to withstand greater 'G' forces than some of the earlier experimental models. Also, since this fuze was to be used on rockets, there was not the centrifugal force caused by the rotation of the projectile to contend with. This rotating was caused when a shell was fired from a rifled barrel.

As the name indicates, the optical proximity fuze was a device on a projectile which operated on the light signal produced by the target as the projectile approached it.

There were three basic parts of the Optical Proximity Fuze, they were: a toroidal lens, a photocell, and an amplifier. The lens was part of the conical nose of the rocket. It was arranged to collect light from all directions during its line of flight, and to focus it upon the photocell tube. The photo-sensitive cell then would transform the light into electrical energy which was then sent to an amplifier.

No amplifier output was present until there was a sudden change in the amount of light entering the lens. This change was produced when the rocket approached the target and the light present to the photocell increased. The amplifier output developed a voltage that would then trigger a thyratron tube which, in turn, caused detonation of an explosive charge in the rocket. To operate the fuze, the change in the amount of light entering the lens needed to be just a small percentage of the total light regardless of the ambient light level from dawn to dusk.

This fuze was also provided with a method that would prevent the amplifier from operating and a firing pulse being generated until after the rocket had been fired and is well on its way towards the target. Another consideration for safety was to equip the fuze with safety features designed to prevent premature operation should the rocket, prior to firing, was dropped accidentally. Another novel feature was the self-destruction arrangement, whereas, if the projectile should miss the target, it would explode before reaching the ground. This safety feature was found to be very desirable, especially if the rocket landed back in your own territory.

As noted in The Proximity Fuze, a Survey, many experiments were made on optical fuzes, both in England and in our country, before the Bell Laboratories Optical Proximity Fuze was developed. In 1942 Dr. Alexander Ellett, Chief of Section E of the National Defense Research Committee (NDRC) in Washington, assigned the Laboratories the task of developing for the Army Ordnance Department a working design of an optical fuze to fit on the 4 1/2-inch rocket. These fuzes were intended to be used against aircraft, as well as to be mounted on rockets fired from aircraft. Collaborating with the engineers of the National Bureau of Standards, the Apparatus and Transmission Development Departments at the Bell Laboratories jointly undertook the design and development of such a fuze.

The two main objectives to be met in the design were that the fuze had to fit the nose of the rocket, and had to be capable of withstanding the force of acceleration, which was 1,000 times the force of gravity. Another consideration was that the design of the fuze had to lend itself to easy mass production at a low cost.

There had been little precedent to guide the designers in the production of a photocell, a lens, electronic tubes and other circuit components which could withstand the large forces of acceleration previously mentioned. What was available, however, was the vast expertise of the Bell Telephone Company's designers experience with materials that had been used in the production of telephone equipment. This knowledge base consisted of: the processing of plastics, die casting, impregnating compounds and electrical wiring.

F. A. Zupa, who during the war, was in charge of the apparatus group engaged in the design and development of proximity fuzes, rocket-firing mechanisms and magnetic mines at Bell Laboratories, provides us with a more technical description of how the fuze worked.

> *"The toroidal lens is an integral part of the nose piece, the entire part being made of optically clear methyl methacrylate, commercially known as lucite or Plexiglas. The curvature of the toroidal lens was designed to transmit only the light which came through a narrow angle, throughout its circumferential surface, and to have the focal axis at any point around the lens lie on a conical surface. It was manufactured by injection molding to the final dimensions, and no polishing of the lens surface is required after the molding. The portions of the surfaces that had to be opaque to light were coated with a black finish by spraying. Close cooperation between the Laboratories and the Manufacturing Department was required to determine the correct molding time and temperature to produce this part to the required accurate dimensions. The choice of opaque finish presented some difficulties because a number of the common lacquers were found to be destructive to the lucite, the destructive action being known as crazing. A similar difficulty was encountered in the choice of a waterproofing compound, which had to be applied at the junction of the lens piece and housing to protect the photocell from moisture."*

"To obtain the desired sensitivity to light when the projectile is in the most effective position with respect to the target, the glass tube portion of the photocell was made opaque to light except for a slit suitably located with respect to the lens. Many designs were conceived for providing such a slit opening, but the search was for a simple and durable construction. As finally adopted, the glass tube is first completely covered with the opaque finish and then the slit is produced by cutting away part of the finish. This technique was new, and it required rather skillful development work before it was reduced to a simple manufacturing process. The photocell and the lens were held in proper relation to each other by securing both parts to a molded phenol plastic part, which accurately positioned the photocell cathode in the focal plane of the toroidal lens. With this arrangement the photocell cathode was made to "see" the target at the angle required to place the target in the densest part of the fragmentation pattern when the projectile exploded."

Shockproof mounting for the amplifier consisted of the components being individually mounted in holes in an oil impregnated wooden block. In addition, many of the component parts were potted in a ductile wax to hold them in place. The advantage of mounting components in a permanently fixed manner was important to decrease any chance of capacitance coupling or regeneration in the amplifier circuit. The variable characteristic values of the miniature amplifier tubes were compensated for by preselecting the tubes and matching them with suitable grid-bias resistors and by-pass condensers before these parts of the fuze reached the assembly line.

Large quantities of the optical proximity fuzes were manufactured by the Western Electric Company, and the product satisfactorily met the rigid specification requirements. A sample number of each group of 1,000 fuzes was tested by Signal Corps engineers before each lot was approved for acceptance. The fuze was not adjustable and although it had to function only once, it had to fire the first time. The effectiveness of this fuze was indeed a testimony of the quality standards that the Bell System was noted for!

Magnetic Proximity Fuzes.

Another form of proximity fuze that was developed at Bell Laboratories personnel during World War II, was a fuze that detected changes in the earth's magnetic field produced by the presence of ships. The work on fuzes for magnetic mines was an important part of this work in which the extensive knowledge and long background of experience with magnetic alloys, particularly permalloy, were of the utmost importance.

During the war, G. W. Elmen, the inventor of permalloy, was called out of his Bell Laboratories' retirement by the Navy to work at the Naval Ordnance Laboratory on magnetic mine fuses. Back on the job, Mr. Elmen became actively connected with the Navy's development program on magnetic mine fuses, and throughout the war he worked jointly with the engineers at Bell Telephone Laboratories In addition, he had the help of three other retired Bell Laboratories' employees as associates during his development work at the Naval Ordnance Laboratory on mine fuse work. These former Bell Laboratories employees were J. F. Toomey, E. Montchyk, and J. N. Reynolds.

Naval mines, during World War II, were important offensive weapons. One method used to lay mines was by dropping them from airplanes into enemy waters. This magnetic mine, equipped with its associated proximity fuse mechanism, manufactured by Western Electric Company, was the most modern magnetic mine of the United States Navy. The mines were manufactured throughout the war by Western Electric, which was the part of the Bell system that conducted any mass manufacturing. Bell Laboratories dreamed and designed, Western Electric built the dream in quatity!

This mine worked very simply. When a steel vessel passed over it, the steady magnetic field of the earth surrounding the mine was altered, first shifting slowly away from the normal steady condition as the ship approached, and then drifting back to normal as the ship receded. The fuze mechanism recognizes the passing ship whenever it detects a magnetic disturbance with a slow flux change, and causes an explosion when the ship is over the mine. The mine was provided with a novel anti-sweep feature, protection for counter-mining, and was equipped with a mechanical memory so that it might be set to blow up a certain numbered ship in a convoy, rather than to just destroy the first ship.

The principle indeed was simple, but the development and manufacture of the magnetic proximity fuze was not as easy. The vital elements of the mine fuse were the search coil that detects the feeble magnetic influence of an approaching ship, and the magnetic amplifier which increases the strength of the feeble detected signal about a million times. Both the search coil and the magnetic amplifier required permalloy of excellent quality and precise manufacture to operate satisfactorily.

Sensitive as the most delicate jeweled instrument, the electronic mine fuse was constructed very ruggedly. Mines equipped with these fuzes were dropped into the sea from airplanes several thousand feet in the air. Amazingly enough, these mines containing the magnetic proximity fuse was used successfully in mines laid by planes from altitudes up to 30,000 feet in a free fall without parachutes. These free-falling mines could be aimed more accurately because the drift without parachutes was much less.

An amazing example was the test mechanism without explosive charge that was dropped from over 10,000 feet. It struck the shore instead of the water, and although the mine case broke and the contents were strewn over a vast area, the fuse mechanism was intact and was found to operate after this rough treatment.

Optical and Magnetic Proximity Fuzes, Cont.

After a mine was dropped into the water, it was made alive by the usual arming devices and began to search for the presence of ships. As a ship approached, the change in the earth's field generated a voltage in the search coil, and the resulting signal current upsets a delicate balance in the magnetic amplifier circuit, firing the mine.

Magnetic proximity fuzed mines were used in operations that cut Japanese life lines and ruined the shipping-dependent economy at the close of the war. This strategic mining blockade, called "Operation Starvation," was undertaken late in March of 1945. The ports of Kure, Hiroshima, Tokayama, Sasebo Naval Base, and Shimonoseki were mined by B-17 superfortress to prevent Japanese naval units from participating in the defense of Okinawa. The blockade was extended later in the campaign to major shipping lanes between industrial cities which depended largely on water transportation for their goods. Shipping was cut to 10 per cent of normal within two months. Heavily used and direct shipping routes to the continent of Asia were then severed by mining the ports of northwestern Honshu.

The last phase of the operations was an intensification of the existent blockade around major shipping centers in Japan, plus additional mine laying in Fusan and other Korean ports. During this final phase, the Japanese shipping that was sunk by mines has been estimated to exceed 300,000 tons.

The development of magnetic mine fuses at Bell Laboratories was carried out under contract with the Navy Bureau of Ordnance. The work was done in close cooperation with the Naval Ordnance Laboratory. In making an appraisal of mine operations by our naval fighting forces, Admiral Nimitz has said:

> *"The technical planning and operational execution of aircraft mining on a scale never before attained has accomplished phenomenal results and is a credit to all concerned."*

It was not only the Americans that were to praise the magnetic proximity fuze! Japanese naval authorities had the following to say about the magnetic proximity fuzes of the U.S. Navy, as reported in a publication of the Naval Ordnance Laboratory:

> *"The detonators show superior construction and speak well of the ability of the specialists and the manufacturers. Furthermore, the application of new fundamental principles to mines shows the skill and farsightedness of the technical experts which was far beyond that of those in Japan at the time. That is to say, the mine fuse ... circuit using a small type of glow tube (cold cathode tube developed by the Bell Telephone Laboratories and manufactured by the Western Electric Company) is indeed a clever idea."*

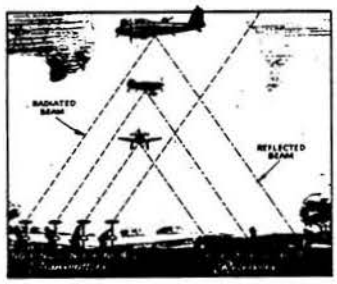
With respect to earlier mine fuses on which the Laboratories did extensive development work with the Naval Ordnance Laboratory and the Leeds & Northrup Company, the following was said by the Japanese experts:

> *"It is clear that these detonators are an application of designs by telephone communication engineers, and the fact that they were perfected with telephone materials speaks well for those specialists in the application of their knowledge. There were no mine technicians in Japan comparable to those in America, and the display of such ability by America was the occasion for surprise among the mine specialists in the Japanese Navy."*

Sources:
F.A. Zupa, Bell Laboratories Record February 1947.
H. 0. SIEGMUND Bell Telephone Laboratories Record Magazine July 1947..

About Edward A. Sharpe

Edward A. Sharpe is founder and archivist of the Southwest Museum of Electricity and Communications, which is the fruit of his life-long interest in technology and its history. He is presently owner, president, and chief engineer of Computer Exchange, an independent dealer in and services of Hewlett-Packard computer hardware. He is a senior member of IEEE. Mr. Sharpe was the 1992 recipient of the prestigious California Historical Radio Society 'Herrold Award' for significant contribution to the preservation of electronics and broadcasting history.



SPOTTING THE ENEMY

"U.S. Army experimenters are trying out a secret new weapon for use against possible invaders—a 'mystery ray' device reputedly capable of locating an enemy vessel as far as 50 miles at sea." The "mystery ray" was radar, which was also being developed in Germany.—OCTOBER 1935

Real TELEVISION Sets in Black and White!

BOOK REVIEW OF

CLASSIC TVs Pre-War thru 1950s

By Scott Wood, L-W Book Sales,

ISBN 0-89538-001-3

Reviewed by Bart Lee, Special to the CHRS Journal, (Review Copyright Bart Lee, 1992)

At their best, they are like burnished lab equipment from another era, these old television sets. With their 7 inch screens, some three inches like the Pilot, some ten inches like the 1948 Philcos, its almost as if they want to show you something important. What? Milton Berle? Howdy Doody? Baseball? Richard Nixon? Still, these color photos, 50 pages, mostly three sets to the page, shine with a vintage technology, one that followed on radio like night follows day. It did not replace radio, anymore than depictions replace imagination. But the world has not been the same since these television sets came into America's homes.

This book has them all. The first thirty pages are old print ads for TVs. Judging from the contents of the screens in the ads, in the late forties, sports sold televisions. Later, entertainment programming appears on the screens in the ads. In the election year of 1952, politics fills the screens. So what else is new? The sets grow in picture size from the Pilot three inch TV-37, (designed to sell for under $100 in 1949) to the 24 inch sets of 10 years later. The screens go from often round to nearly square. Color begins to appear about 1954, after RCA beat CBS with a mode compatible with black and white.

All of the pictured sets are eminently collectible, as objects of fascination and history. The favorite collectibles, such as the Philco Predicta, the Pilot and the Hallicrafters sets, are well represented in the color photos. So are many other wonderful little sets from the early days, and some pretty nice big ones too. This book is the only source I know for photos of the scanning disk sets available before the Second World War. So too it presents English sets from before and after the War, rarely seen here.

The appended price guide for the illustrated sets is helpful in showing relative value. The rarer and prewar sets list as high as $4,000, or $3,500 or $3,000. The first 1954 color sets list at $1,000+. Most sets, however, range from $75 to $350. This is the range such sets have retailed for recently. One would expect less at a swap meet (and next to nothing at a garage sale). These old sets will also show up at estate sales, and unless we save them, they will be gone forever.

This is quite a nicely done book for those of us who cannot resist an occasional old TV among the radios. For those of us who permit the odd radio among the TVs, it is a must. The editor contemplates a second volume, and solicits photos and other materials: L-W Books and Publishing, P.O. Box 69, Gas City, IN 46933.

##

CLOSE TO COLOR

Inside prototype color TV sets, a revolving disc changed the screen's picture between red, green, and blue so quickly that the human eye "fused" the images into one colorized version.—JULY 1941

A TV IN EVERY HOME

"With 10,000 TV sets in the United States today, almost 50 manufacturers expect to market several hundred thousand in the next twelve months and millions in the next five years. Prices start at $100 and range upward to $1,000."
•NOVEMBER 1945

San Francisco Examiner

COMPUTERS & TECHNOLOGY

Triumph of color

Color TV was once a marvel; now the black-and-white set is an endangered species

By Jonathan Yenkin
ASSOCIATED PRESS

YOU PROBABLY have never heard of Bruce DuMont, but he was a celebrity in his Chicago neighborhood back in 1952 when he was 8 years old. His family owned a television set.

The picture was a bit fuzzy, and all in black and white. But it was "the hottest thing" around, and DuMont recalls that people came from all over for a look-see.

DuMont is head of the Museum of Broadcast Communications in Chicago now, and literally part of television history. But the vehicle for those early days of television — the black-and-white set — has almost disappeared.

Except for miniature models, black-and-white TVs have faded from view, their sales shrinking as fast as the size of their screens. The sets rarely are seen even in discount stores anymore, and prisons are among the few remaining customers.

Many of the nation's biggest retail chains, such as Sears, Roebuck & Co. and K mart Corp., don't sell any traditional black-and-white sets. The last time Sears sold them was in 1990, and then it was just for the Christmas season when the chain offered a 12-inch model for $79 to drum up customer traffic.

Only the small survive

Stores that do sell black-and-white TVs usually won't sell anything bigger than the small models, with screen sizes typically ranging from a few inches to 7 inches, and the same holds true for electronic appliance chains.

"That's really a dead market," Pat Ruggieri, a marketing manager for Sony Corp., said of larger black-and-white sets.

Emerson Radio Corp. of North Bergen, N.J., still markets a 12-inch black-and-white set made in factories in the Far East, but a company executive, noting the razor-thin profits, thinks the future of the medium is anything but black and white.

"Nobody really likes the business anymore," said Executive Vice President Marino Andriani. "I don't think you'll see a day where you couldn't sell a black-and-white set. But will people continue to make them? That's another question."

The Electronic Industries Association estimates that nearly all of America's 94 million households have at least one color TV set, and that about half still have some kind of black-and-white set around.

While the trade group projects more than 20 million color TVs will be shipped in the United States this year, the estimate for black-and-white sets is only about 1 million.

The revolution

The end of black-and-white broadcasting was on the horizon as early as 40 years ago. Limited color telecasts began in 1953, and the television networks shifted to color in the mid-1960s.

"At the beginning, it was very strange," said Julius Barnathan, who recently retired as an ABC executive after 37 years. "Actors didn't realize how much additional makeup they would need. And we couldn't quite get yellow. They had to paint a different color to come up with yellow."

Color brought new opportunities for programmers and advertisers, who could use graphics more creatively.

The NBC peacock was a symbol of this new world, and viewers were amazed by the hues they saw in shows such as "Bonanza" or the spectacular Rose Bowl Parade.

In sporting events, viewers suddenly could identify teams by the colors of their jerseys.

"You think of baseball in the '40s and '50s, and you think in black-and-white," said Ron Simon, curator of television for the Museum of Television & Radio in New York.

"Then people discovered home movies in color. You see the players in color. You see the grass in color. It's a whole different sensation of what the stadium looked like. It's almost like two different levels of experience."

Radio squared

The roots of black-and-white television go back to the 19th century with the discovery of radio waves. Scientists eventually tinkered with systems to transmit pictures and, in 1929, a Russian immigrant named Vladimir Zworykin demonstrated a television system complete with a camera and picture tube.

ASSOCIATED PRESS

When Museum *of Broadcast Communication director Bruce Dumont was a kid people came from all around to watch his family's black and white TV.*

After several years of experimental telecasts in Great Britain and America, RCA Corp. installed TVs in 150 homes in the New York area and began regular broadcasts through its subsidiary, NBC, in 1936.

The number of sets in the country climbed from about 10,000 near the end of World War II to about 6 million by 1950.

In those early years, sets were more like a piece of furniture — big wooden cabinets with tiny screens, resembling somewhat the radios of the day.

"It tried to fit into people's lives by looking familiar," said Larry Bird, curator of a TV exhibit a couple years ago at the Smithsonian Institution's National Museum of American History.

"There was an uneasiness of where to put this thing," Bird said. "But pretty soon, the arrangement of domestic space turned toward the set, whether it was on or off."

Color-blind script

For some who rose to stardom during TV's early days, the notion that Americans were watching black-and-white television rather than color made little difference.

Milton Berle, television's first star, says simply: "Funny is funny."

"Color isn't going to enhance the performance or the script," said Berle, who entertained viewers on "The Texaco Star Theater" from 1948 to the mid-1950s.

Everett Greenbaum, a writer for "The Andy Griffith Show" and "MASH," agreed. He recalls the first time he saw one of his products in color, a "Mr. Peepers" show, starring Wally Cox.

"I remember the first five minutes. We were astonished," Greenbaum said. "But after six minutes, we realized it was a lousy script, and that's what we concentrated on."

Even if black-and-white sets go by the wayside, black-and-white programming still remains popular and, in some cases, is viewed as avant-garde rather than outdated.

"Black-and-white has a certain appeal in creating beautiful imagery," said Stephanie Apt, director of broadcast production for the J. Walter Thompson Inc. advertising agency.

"Particularly in a world where everything is in color," she said, "black-and-white really stands out."

Some aficionados of TV reruns say they actually prefer to watch black-and-white programs. For them, there's a simple solution, even in a world dominated by color sets, said David Lachenbruch, editorial director of Television Digest.

"Anybody who wants a black-and-white picture can just turn the color down," he said.

American Classics

When he isn't on the road with the Grateful Dead, sound wizard Dan Healy turns from state-of-the-art technology and restores old radios

BY NANCY REIST

Dan Healy had to move most of his antique radios out of the house to give his wife and son a little room. Still, dozens remain. His father's and grandfather's radios dominate the living room. A radio shaped like a giant Pepsi bottle leans against a wall next to a bed-lamp radio. Others crowd corners and tabletops throughout his Marin County home, especially in his workshop.

"Before there were hundreds," Healy explained. "I never notice things like that, as long as there's a trail through the middle and I can make it to my bed when I can't stand to be awake anymore. But fully realizing that not everyone feels that way about it, I've had to make concessions."

Restoring radios is Healy's hobby. His full-time job for the past 25 years has been mixing live sound for the Grateful Dead, the veteran San Francisco rock band that has been in the forefront of sound innovation throughout their career. On the road for 70 to 80 shows a year, he has his hands on state-of-the-art audio technology.

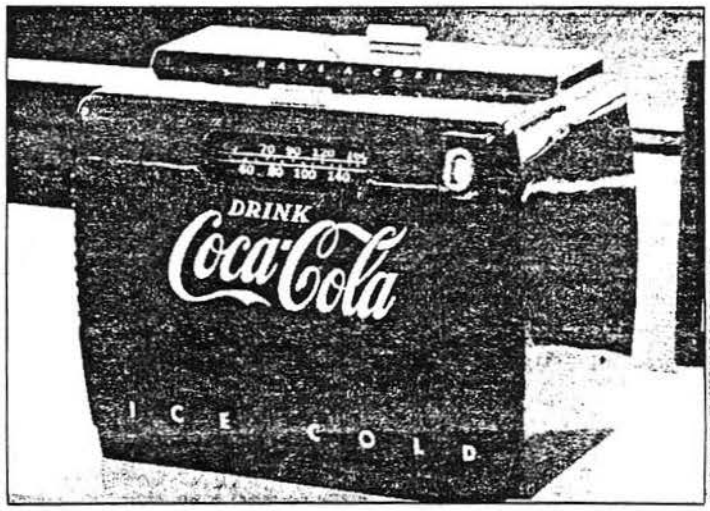
To relax at home, he steps back to the days when vacuum tubes were innovations and restores old radios. "One side of me works with this cutting edge of sound and the other side of me is like this old doting doctor that sort of pets and prods his little old radios around."

Nearly 300 of these radios currently are on display at the San Francisco Airport United Airlines domestic terminal, where collectors regularly show their treasures. A friend of Healy's who works at the airport encouraged him to display his radios.

He's not sure exactly how many radios he's accumulated, but he's documented more than 1,000 and has at least 500 more. They span the period from the 1920s through the 1950s when radios were crucial links between their owners and the world, miraculously carrying events thousands of miles into people's living rooms. He has radios that families huddled around during the Great Depression — a time when many people would give up iceboxes or furniture before they'd surrender their radios; radios that brought the news of World War II — complete with the sounds of bombs and Big Ben — to the families and friends of soldiers; radios that brought the steamy music of the cities into rural homes across the nation; radios that carried Orson Welles' infamous announcement that Martians had invaded Grovers Mill, New Jersey.

Healy started his collection with a 1930s console radio he saved from a junkyard. He soon added others he found in Bay Area thrift shops during the 1960s. "In those days, partially because of the fact that we didn't make a lot of money, but also because it was fashionable, we'd go to places like Goodwill stores and buy strange old clothes and wear them. The generation of radios from before and after the Second World War were beginning to become discarded appliances. When transistorizing equipment came out, a lot of the old guys went out of business. The new guys started up and they refused to work on tube gear, so you couldn't get these radios repaired and people would give them to the Goodwill. I'd be cruising Goodwills and there'd be some wonderful little radios and they'd be 25 cents."

BY JOHN WERNER/SPECIAL TO THE CHRONICLE



BY JOHN WERNER/SPECIAL TO THE CHRONICLE

Above, Dan Healy in his workshop. Right, a 1946 Coca-Cola radio, currently on display in Healy's show at San Francisco International Airport.

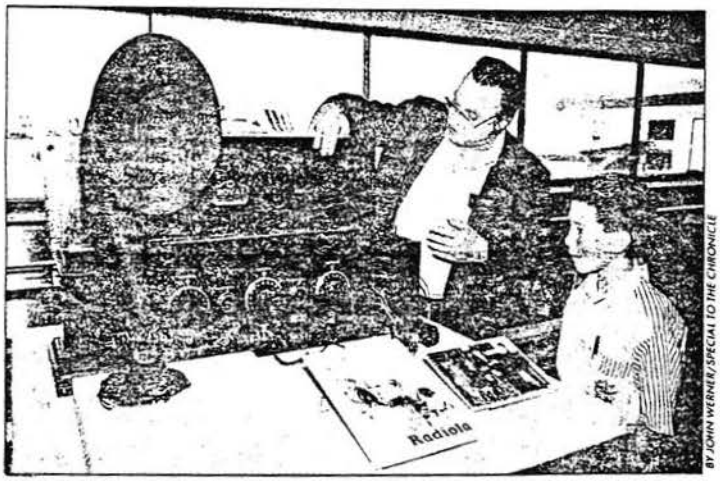
After a while, he noticed that the radios he used to buy for a quarter had gone up to $5. Today the old discards are worth hundreds, even thousands of dollars. "It has turned into quite a little business," Healy explained, a little sadly. "But I've never sold a radio. I've purchased them and I've taken care of them and I've restored them and I've given them away a couple of times, but I haven't ever sold one and I won't ever sell one, because there's something, at least in my own mind, that sort of separates me from the people that buy them and sell them."

Healy disdains the collectors' practice of determining that some radios, such as Catalin Bakelites — plastic radios from the Art Deco era with dark swirls — are far more valuable than others. For the airport exhibition he chose to display a wide range of radios from several periods to demonstrate the diversity and artistry of radio design. "I'm really into it for the preservation of a really artistic form. The physical appearance of radios was a fantastic art in the '20s and '30s — some of the most elaborate appliances that have ever been made and some of the most elaborate design work. I have radios that look like the Empire State Building, Art Deco radios, art nouveau. Some of them are just staggering.

"The radios talk to me," he said. "They tell me who owned them and what was listened to and what they did with them. I have radios that tell great stories. I have radios that housewives listened to when their husbands were in the war, during the Second World War. Things like that. They talk to you in a way."

The Adler Royal, a 1920s breadboard radio with an RCA horn amplifier, on display at the airport, goes back to the time when radios were becoming user friendly. The earliest radios were exclusively operated by enthusiasts who went to a great deal of trouble to put them together and had to struggle patiently even to tune them.

Nancy Reist is an assistant professor in the department of Broadcast Communication Arts at San Francisco State University and a free-lance writer. John Werner is a free-lance photographer based in San Anselmo who specializes in the environment and world music.



BY JOHN WERNER/SPECIAL TO THE CHRONICLE

Healy shows a 1920s Adler Royal with RCA horn to a young radio enthusiast

Healy has radios that families huddled around during the Great Depression — a time when many people would give up iceboxes or furniture before they'd surrender their radios

"My great-grandfather used to have to keep his radio out in the barn. My great-grandmother wouldn't let him bring it in the house. It had wet cell batteries — lead acid batteries — and that was always spilling around everywhere. Also that's where the men went, you could smoke your cigars and play with the radio and all that stuff. Then by my grandad's era, they were sort of packaged to go into the living room."

A 1940 cabinet-style Motorola with a built in phonograph is displayed at the airport in a living room setting. A portrait of Franklin D. Roosevelt hangs above the Motorola — a reminder of the president who first used radio to rally popular support with his fireside chats.

The airport exhibition also features several of Healy's novelty radios — receivers that look like something else. A 1948 "Porto Baradio," which holds glasses and decanters, shares a display case with a 1945 microphone radio and a 1954 Guild spice chest radio. Healy explained that novelty radios really took off after World War II, building on the momentum of the war effort electronics production. But he added that there had been earlier novelty radios, such as his 1937 beer keg radio from the World's Fair.

Healy went to Chicago, where most of the U.S. receivers were made, to talk to people who worked in radio manufacturing plants in the 1930s, 1940s and 1950s. He heard about life on the assembly lines, in the art departments, in the wood shops and in the advertising departments. He admires the spirit of craftsmanship of that era and the old-time dedication to durability.

The big challenge in radio restoration is to return the radio to its original condition. Healy considers it heresy to put modern electronics into an old radio, so he collects antique parts as well. He's driven to Oregon to buy a batch of original radio shellac. He has several drawers filled with vacuum tubes, and large bags of capacitors and resistors are piled on shelves in his workshop. He's learned darkroom skills so he can photograph broken dial glasses and blow up the negatives up to make straight lines when he retouches them. He's also learned to create silk screens made from these negatives to replicate multicolored dial glasses.

Healy finds his workshop a "secret island," a place he goes to relax after weeks or months on the road with the Grateful Dead. "At the end of the tour it's like, 'OK, Uncle.' Then I come home and I sit at my desk there and I can restore a few radios and everything washes out of me and cools out. Not too long ago a friend of mine brought me a radio that was his father and mother's. It was their wedding present in 1941 and his father was terminally ill and he had this old radio. It was his dream to have the thing fixed, and of course he couldn't find anybody to work on it. So I took this radio and I completely, fully restored it. I did a new dial glass, and when I was finished it was just like the day it was bought and I gave it back to this old guy. Those are the joys and the pleasures of a little hobby like this. I mean, to see this guy's face said the whole thing."

Healy has received hundreds of nostalgic phone calls from people who were moved by seeing his radios in the airport exhibit, and he heard many reminiscences while he was there installing it.

"I see people my parents' age going through the exhibit lamenting the fact that that represents an age when there *was* hope and there *was* brotherly love and there was a society and a way and a lifestyle and an ethic. That's what I see. I see it making people sad when they remember a time that was a good time." ■

HOME

HOT STUFF

BY JOHN O'HARA/THE CHRONICLE

RADIO, RADIO

Grateful Dead Wizard Unveils Collection

From a 1935 Midwest console centerpiece to a 1964 Standard pocket-size portable transistor model, the rise and fall of radio is mirrored in "Old Time Radio," a new exhibit at San Francisco International Airport.

Some 400 examples are on view, drawn from the collection of more than 2,000 owned by Dan Healy, well known in rock music circles as the Grateful Dead's concert sound production wizard. Healy, who began collecting radios 30 years ago, repairs the electronics himself. His son, Mike, restores the often exquisite cabinetwork.

The exhibit begins with a 1925 Atwater Kent "breadboard" model radio. As the role of radio in American culture increased, so did the design of the models. By the end of the '30s, radios were beautifully built pieces of furniture, ranging from a floor model Philco (ancestor of remote control tuning) to the end-table Zenith, which doubled as bookshelf and magazine rack.

After World War II, manufacturers introduced molded Bakelite plastic designs that often featured sweeping curves and rounded edges redolent of the bold new Buck Rogers world that radio brought to American lives.

By the time television began to dominate the cultural landscape in the '50s, imagination and daring visions began to seep out of radio design. The exhibit ends with a case of transistor radios from the late '50s and early '60s.

When the exhibit closes, Healy will pack up his collection and move it to a modified old barn in the small Northern California logging town where he grew up.

"I promised my wife she could have her home back," he says.

"Old Time Radio" runs through August 10 at the United Airlines concourse.

—JOEL SELVIN

Radio Days

BY ROBERT P. HEY

Anyone old enough to recall the years before television remembers that radios, large or small and usually with gleaming wooden cabinets, were the nerve centers of the country's living rooms.

Around them huddled America's families, with only each other to look at, listening intently to Jack Benny's jokes and Benny Goodman's notes, President Franklin Roosevelt's fireside chats and Edward R. Murrow's London reports.

After decades of dusty silence in grandma's attic, nearly three-quarters of a century of radios are sputtering to life again in thousands of American homes. This time the people crowded around them are a swiftly-growing family of collectors.

"Our objective is to preserve this equipment, to let people know about it. It's a heritage," says Bruce Kelley, 77, a longtime collector. Forty years ago he and two other men founded what now is America's largest and oldest radio collectors club, the 4,000-member Antique Wireless Association.

"Collecting got off to a slow start in the '50s and '60s, picked up some in the '70s, and really took off in the '80s," says Brian Belanger, 51, a collector and newsletter editor of the Mid-Atlantic Antique Radio Club (MAARC). Founded in 1984 with 15 members, it now has about 850 and is America's largest regional radio club.

During the same time the number of regional radio clubs has grown with similar speed. Today there are two national clubs and about 40 regional ones, Belanger says, and more regional clubs are forming.

Collectors have various motives: nostalgia, the beauty of the venerable radios or the fun of being able to repair them.

Belanger, an electrical engineer from Rockville, Md., himself heard the siren song of radio collecting in the late 1970s. One day he was killing time in a shopping center while his wife bought fabric and wandered into an antique store. He came out with his first antique radio, an aptly-named "American Beauty," made in 1926 in Missouri. He was hooked; he now has "about 80 radios, the last time I counted."

Days he works with the most modern technology as deputy director of the advanced technology program of the National Institute of Standards and Technology. Evenings he works with the technology of the '20s and '30s, repairing his venerable radios at home.

They include wonderful old names, now long gone, in the history of American radio. There's an unusual Federal 61, a hard-to-find black-fronted box with 14 dials, made in 1924. A 1922 Aeriola Sr., by Westinghouse: You had to listen through headphones. A battery-powered Radiola 18, with its long-and-low shape.

And the classic "antique radio" to most Americans—a graceful, arch-shaped set known as cathedral-style. Many makers built cathedrals; Belanger has several, including a restored 1931 Philco model 70. A dominant '30s brand, Philco epitomizes antique radios to many Americans.

Collecting antique radios is practically an addiction, Belanger says.

Joe Koester knows what he means. A 50-year-old Defense Department manager from Laurel, Md., he says dryly: "I never met an antique radio I didn't like," paraphrasing Will Rogers' view of people.

Koester, a founder and president of the Mid-Atlantic Antique Radio Club, has certainly met a lot of radios: He admits to having "about 250" in his collection.

Kelley has been collecting since before Belanger and Koester were born. He and a friend started in 1936. When they saw a radio they thought should be preserved "we repaired it and set it aside," says Kelley, fittingly now the curator of the Antique Wireless Association's museum.

The kinds of radios they set aside then are much desired now. Particularly in demand by collectors are cathedrals; Atwater Kent "breadboards" from the early '20s, made without cabinet and with innards fastened atop a breadboard-shaped piece of wood; splendid-toned Scott radios; and colorful, Catalin-plastic sets of the late '30s and '40s.

Prices of these and other antique radios depend on condition, manufacturer and model, and location (the East Coast is more expensive). Most range from $50 to several hundred; some, like particularly desirable Catalins, run into the thousands.

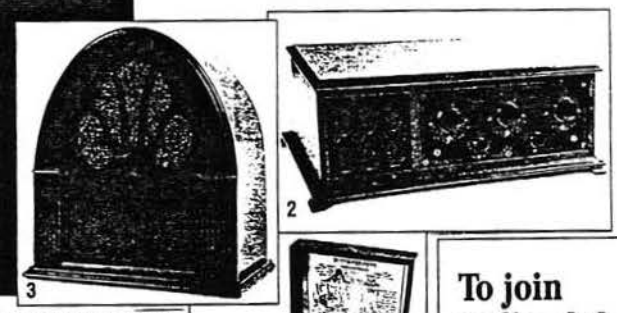
As with anything else, high prices reflect scarcity. But most collectors think some oldtime radios will always be available. One reason, Koester says: "Younger collectors are also interested in the radios of their youth, and are beginning to collect the much-later transistor radios and TVs."

Many radios aren't working when collectors purchase them. Their new owners restore a lot of them, both for the pleasure of seeing them gleam and the joy of hearing them crackle.

And when they crackle they bring back another era. Once in a while Belanger rigs up a '30s set so that he can listen to a recording of an old radio show through its speaker. With 1930s fidelity the raspy voice of Jack Benny fills the room, deadpanning a punch line and convulsing an audience.

"It's fun," Belanger says. "At night you can draw the drapes and turn the lights down low and by the glow of your radio listen to Jack Benny. It's a time warp."

Antique-radio collector Brian Belanger tunes his 1938 Zenith floor model. With the addition of shortwave to radios in the late '30s (including this set), many Americans listened nightly to European broadcasts of World War II before America's entry.



Early radio manufacturers made major advances every few years, as these sets in Brian Belanger's collection illustrate. (1) Aeriola Sr., 1922. Early radios like this one ran on batteries. Inexpensive early sets lacked speakers; listeners used headphones. (2) American Beauty, 1926. Battery-operated. Most early radios required several dials to tune them; this has three. This set contains a major advance: a built-in speaker. (3) Philco 70, 1931. Cathedral. By 1930s radios used household electricity, had built-in speaker, single tuning knob. These improvements spurred many Americans to buy new radios frequently and tote their old ones up to the attic. Thus, many '20s and '30s sets were available for collectors.

To join radio clubs:

For membership information about the three largest radio clubs, write:

- Antique Wireless Association, 59 Main St., Bloomfield, N.Y. 14469.
- Jim & Barbara Rankin, Antique Radio Club of America, 3445 Adaline Dr., Stow, Ohio 44224.
- Joe Koester, Mid-Atlantic Antique Radio Club, 249 Spring Gap South, Laurel, Md. 20724.

Why is this man smiling? —>>

FM Radio

"A static-free system of radio transmission that turns accepted principles topsy-turvy has just been announced by Maj. Edwin H. Armstrong, one of America's leading radio engineers."•JULY 1935

TENTATIVE SWAPMEET CALENDAR FOR 1993:

JANUARY 16 — BENICIA,
Jim McDowell, 510 676 2605

FEBRUARY 6 — AMPEX,
NO EARLIER THAN 8:30 AM

MAY 1 — AMPEX, 8:30 AM

MAY 15 — PICNIC TILDEN PARK,
Paul Bourbin, 415 648 8489

JUNE TBA — SAN LUIS OBISPO,
Dan Steele, 805 544 2904

JULY 10 — SAN FRANCISCO,
John Wentzel, 415 731 1920

AUGUST 7 — AMPEX, 8:30 AM

SEPTEMBER 18 — FAIRFIELD,
Paul Bourbin, 415 648 8489

OCTOBER TBA — REDDING,
Norm Braithwaite, 916 246 4209

NOVEMBER 6 — AMPEX, 8:30 AM

NOW IS THE TIME FOR ALL GOOD MEN TO RENEW THEIR MEMBERSHIP TO THE CALIFORNIA HISTORICAL RADIO SOCIETY.

A Renewal Form is Enclosed. Send it in! Continue to receive this Journal, be welcome at swap meets, get tapes! Only $15. *Such a Deal!*

Send your renewal (or new application) to: Chris Buttery, No. 71 Tenth Street, Apt. Three, Oakland, CA 94607

CHRS' OFFICIAL ADDRESS IS,

for correspondence other than renewals: CHRS, c/o Jim McDowell, 2265 Panoramic Drive, Concord, CA 94520. ##

SCARS SWAPMEET

Don't miss the next SCARS swapmeet! This is their annual two day meet, with a banquet dinner and presentation on Friday night. Folks even come from the Mid-west for this one:

Location: Saddleback Inn, Norwalk, CA

Dates: Friday November 20, Noon to 8 PM
Saturday, November 21, 7 AM to 2 PM.
Info: call Bob Baumbach, 818 845 7807 ##

AUDIOTAPES DUPLICATIONS -- we may well be duplicating some audio Journals on special request. If you want to replace a lost or damaged tape, or just want another copy, please send a note to the editors or Bill Helander, so we can do them all at once.

RESEARCH PROJECT: — WEST COAST WIRELESS, COMMERCIAL, AMATEUR, MILITARY AND NAVAL:

If you have any leads on wireless operations on the west coast of any sort, to 1920 or so, especially photos or diagrams, please send the information on to Bart Lee, 327 Filbert Steps, San Francisco, 94133. You will be rewarded with an autographed copy of *America's Wireless Spies,* reprinted from the AWA REVIEW.

WRITE FOR THIS JOURNAL

If you would like more about any aspect of our hobby to appear in this Journal, put pen to paper and either write us to tell us, or write a piece yourself. However much or little you write, we can use it for a column, sidebar, or article. Just about anything any member thinks is important enough to write down will be of interest to other members, because we share this hobby. Your editors will make sure what you write will look as good in print as you want it to. We need your help, though, in topics and text. You write, we print. Think of it as a benefit of membership!