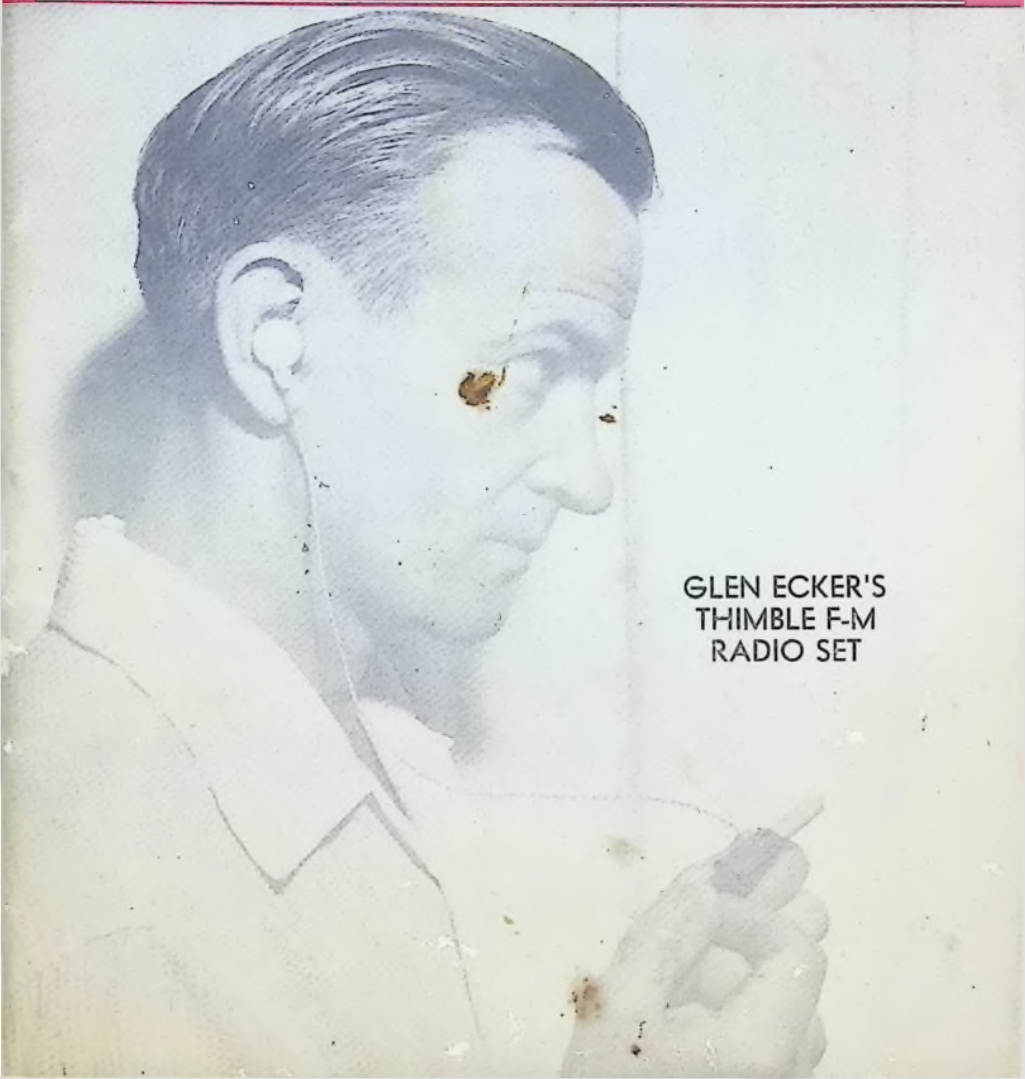
RADIO Work Bench

25c

VOLUME 1 APRIL, 1957 NUMBER 5

Formerly "Radio Supplier" Devoted ENTIRELY to ELECTRONICS

Radio Builder
Experimenter
—FOR THE—
Service Man
Ham



GLEN ECKER'S
THIMBLE F-M
RADIO SET

IT'S READY NOW . . . THE TWO BAND 8 OZ. BATTERY (RADIO RECEIVER)

EKERADIO

THE RADIO NEEDED IN EVERY HOME AND OFFICE FOR ANY EMERGENCY SUCH AS EARTHQUAKES, FLOODS, HURRICANES, AND SNOW STORMS OR AN ENEMY ATTACK, WHEN ELECTRIC POWER FAILS.

NEW Transistor Circuit

THE WORLD'S SMALLEST RADIO WITH SHORTWAVE BAND

YOU CAN TUNE IN ON EXCITING POLICE CALLS, HEAR THE FISHING BOATS AND SHIP TO SHORE BROADCASTS

YOU CAN LISTEN TO AIRPLANES AND GROUND STATIONS. GET THE RADIO AMATEURS ON THE 75 METER (HAM BAND)

ALL THIS AND THE COMPLETE BROADCAST BAND

Yes, It's All at Your Finger Tips, and is Crystal Clear, High Fidelity, Static Free Reception — The Only Dependable Subminiature Battery Radio for the Serviceman in the Field, Boy Scouts, Campers, Salesmen, Vacationists, Businessmen, Office Workers, In Hospitals and has many other uses.

Operates On Its Self Contained Batteries (Can be changed without tools)

Features Switch for Shortwave

Ballbearing Tuning Condenser

The Only Radio for your Serviceman in the Field

Has Metal Calibrated Dial

Uses the Latest Type Earpiece, Same as Used In the Best Hearing Aids

Gold Finish

Just the Radio for the Boy Scout

For That Office Girl or Boy

Employing a Powerful Subminiature Tube And Transistor

Plays Instantly At Anytime, Anywhere Without Disturbing Anyone

Fine for Hearing Aid Users (Eliminating Loud Radios)

Send for your EKERADIO today, show it to your friends and they too will be proud to own one. THE EKERADIO IS WIRED AND AIR TESTED. BATTERIES AND BUTTON RECEIVER ALL READY TO PLAY FOR $29.95.

646 North Fair Oaks Ave. **EKERADIO** Pasadena, 3, California

PRICES SUBJECT TO CHANGE

RADIO WORKBENCH

(Formerly Radio Supplier)

VOLUME 1 NUMBER 5

Address all correspondence to our new address —

SMITH ELECTRONICS
Box 907
Carlsbad, New Mexico

CONTENTS

RADIO WORKBENCH (formerly Radio Supplier) is published bi-monthly by Smith Electronics, Carlsbad, New Mexico and is entered as 2nd class matter at the Post Office in Carlsbad, New Mexico.

Radio Workbench is printed by Beedle Publishing Co., Carlsbad, New Mexico.

Price per issue is 25¢. Yearly subscription (6 issues) is $1.35. Two years subcription (12 issues) is $2.50. Rates for countries other than the U. S. and possessions are as following: Per issue, 35¢. Yearly subscription $2.00. Two years, $3.85.

Dear Reader —

I want to say 'Thanx' to all of the RADIO WORKBENCH (Radio Supplier) readers who have written in complimenting us on RS No. 4 and a special 'Thanks' to George Anglado for his very inspiring letter.

I was also especially proud of RS No. 4 because it was such a vast improvement over all previous issues. Although the name has been changed, I hope we can keep improving the publication with each and every issue by having better material, adding pages, etc. But I must have a little 'outside' help from you, the readers of Radio Workbench. All I ask of you is that you write in and let me know what you would like to see more of in RW, or on the other hand,. what you would like to see less of.

Two sections have been planned for RW. One section for the Radio Builder & Experimenter with a few articles, etc. relative to the servicing of radios which many Builders and Experimenters are interested in. The other section will contain items of interest to you Amateur Radio enthusiasts. Of course many items will be of equal interest to all radio fans such as the Q & A Page, Electronics Parts Review, Feature Articles, Hints & Kinks, short-cuts, etc.

And to you Radio Builders & Experimenters: I receive many letters each month saying "keep RS (now RW) simple, don't get technical, none of that high-classed complicated junk." etc. It's true that I like to get all of your letters and I want you to keep 'em coming, but I do want to take this opportunity to assure you that "Radio Workbench" JUST AIN'T A GONNA GET THAT SMART. I want to point out two things which may help to put you at ease. 1. RW is devoted ENTIRELY to ELECTRONICS and that's the way we intend to keep it. 2. RW 'caters' to small set construction and other than the section for Hams, only a very, very small percentage of RW contents will be even the least bit advanced or 'technical' as you say.

As stated on page 2, RW has moved to larger quarters. We hope to be able to serve you much better as a result of this move because we now have better facilities at our disposal, more space, etc. Good printing is available in Carlsbad and this will relieve us of many headaches and will permit us to devote more time toward improving Radio Workbench.

I'd like to write another page or two but I have a part time job down at the livery stable and my work is piling up — — — —.

Don Smith
Box 907
Carlsbad, New Mexico

BACK ISSUES of "Radio Supplier" magazine: No. 1's, 10¢ each, No. 2's, 10¢ ceach, No. 3's 5 cents each; No. 4's, 15¢ each. One each of all four issues 35¢. Address: Smith Electronics, Dept. RS-4, Box 907, Carlsbad, New Mexico.

FEATURE ARTICLE —

Glen Ecker and His Amazing Little Radios

The photo on the front cover of this issue of Radio Workbench shows Glen Ecker and one of his many extra-miniature radios, the THIMBLE F-M RADIO SET. Measuring only 5/8 x 7/8 inches with the ONE tube extended 1 inch from the set itself, the THIMBLE SET weighs less than one ounce.

Powered by TWO SMALL HEARING AID BATTERIES the Thimble Radio tunes the COMPLETE F-M BAND and Channel 5 TV sound. Its range is up to 175 miles without any antenna or ground wires. It will play even in a car in a tunnel, the motor running and the car moving!

Glen took the Thimble Radio up to San Francisco and tested it in the Oakland Bay Bridge Tunnel. It still brought in all the local stations while other sets tested failed about ten feet inside the tunnel.

It took Glen about 9 months to design and build the Thimble F-M Radio and when you put all the following parts in such a small space (5/8 x 7/8") it does take quite a while:

Tuning condenser to tune from 108.8 to 75 megacycles
Mixer unit
Tuning coil
High frequency choke coil
Discriminator unit
Three condensers
Two resistors
Coil form
Hook-up wire
Solder
Insulated tuning shaft
Tube on the outside
Tuning knob on the outside

And last but not least, a lot of figuring and patience also went into the 5/8 x 7/8 inch space.

All the parts are hand made and Glen says, "Experts still call me up and say, 'You know that's impossible,' had two such calls today."

The tuning condenser measures 1/4 x 1/8 inches and took two weeks to design and make. The tuning coils measure 1/4 x 3/16 inches. The disdiscriminator unit is 1/8 x 1/4 x1/16". Since all the parts were designed and made by hand, it would be impossible for the layman to construct such a set. Therefore, no kits or plans are available for this set.

The POSTAGE STAMP F-M radio. This set tunes the complete F-M band and measures 1 1/8" x 1/8" x 3/4". No antenna or ground wires are needed. The set weighs about 1/2 an ounce and is powered by 2 small hearing aid batteries and can run an earpiece or head phones OR can be used as a tuner with a small amplifier for speaker operation.

This set is available in kit form for $20.00 postpaid. Included in the kit are all parts, transistor, a special high frequency tube, two printed circuit plates, wire and the special Hi Fi earpiece, earmold and cord.

NOTE: This kit is not recommended for beginners.

It is sold in kit form only. A small drill, soldering iron, pliers and a screwdriver are the tools needed to build this set. The POSTAGE STAMP F-M RADIO can be used as an ear ring radio as has been shown on television.

This radio measures the same size as the Postage Stamp F-M Set and tunes the Short Wave Band from 16 to 55 Meters.

Glen says that this set has pulled in stations from London, Australia, Cape Town, South Africa, Radio Moscow and code and Amateur Stations from all parts of the world. A short antenna is used like other Short

Wave sets for pulling in those distant stations.

"We have picked up Radio Moscow on a short length of wire as 'short' as 2 feet long, but conditions were very good," states Glen.

The Short Wave Set will be available for $25.00 in kit form about the first of January, 1957.

Glen says, "I have a pet set like all Radio Men have. It's the same size as the Short Wave Set but I've gone farther, I've made it to tune the complete Broadcast Band and the Short Wave Band and I've made the tube 1/2" long by 1/4" by 1/16". It will put out enough power to run TWO 12" SPEAKERS — WITHOUT an amplifier! The tube is inside this set. The set will run up to 12 months continuously on a No. 6 dry cell as a supply and has run the same amount of time continuously on a 22 1/2 volt B hearing aid battery. (Note: The same set will continue to operate even when the battery tests completely dead!) No transistors are used in my smallest sets, just one of my 'reworked' tubes." (The above set is not for sale.)

Well, you are probably wondering just who this 'master of small set construction' is. Here's Glen Ecker's story of his Electronic Background.

He was born in Stanford, Montana in 1918 and lived in Montana until the War in which he served 4 1/2 years. Glen now lives at 646 N. Fair Oaks Avenue in Pasadena, California.

When Glen was 15 years of age he built his first radio, a one-tuber using the old 30 battery tube. Shortly after reaching the age of 16 he went to work on his first portable set. Glen says that he believes this radio was the first portable and also the first Bicycle Radio. This was in 1934 and '35. "It worked quite well," says Glen, "And measured about 4 x 6 x 9 inches. I had a loop of wire wound around a box as my antenna. It tuned the Broadcast Band. One year later I made my first Short Wave Set. The first station we picked up was LONDON CALLING. It's a moment that I will never forget.

"I even had skeptics at that time and have had since.

"After the war I made an F-M Tuner which has nine tubes. Well, this started me on the way to developing the POCKET EKERADIO F-M SET. I thought the set (the nine-tuber) was too complicated so I went to work. It took me about 2 years to develop the set and the tube as they don't make a subminiature tube that can reflect a high frequency signal. Like when a welder needs a part, he makes it. So I made it.

"When I demonstrated the set in a radio store and told them that it wasn't a hearing aid they all turned away and wouldn't as much see for themselves that the little F-M set would work. Not only 'work' but it worked under water, underground, in tunnels, in a car, at any speed."

And to top all of this off Glen's little F-M Set does not use any antenna system! To date it is the only Pocket Radio in the world that works like this. All others have a loop or loopstick antenna.

Ignoring the fact that 'experts' (?) tell him that it is impossible, Glen just keeps right on doing the 'impossible.' A powerful magnifying glass, mounted above his desk is Glen's principal ally. Other tools in his workshop are tiny welding irons, pliers, screwdrivers, tweezers, soldering iron, drill, metal cutters and a miniature coil winding device which he has perfected. Entire sets are built with a minimum of ordinary tools (and a maximum of patience.)

Glen has overcome the "drift and fade" which hampers many 7 and 9 tube F-M radios. Ecker uses a principle for reception which is completely unknown and unheard of by many radiomen. He calls it the "Ground

(Continued on Page 10)

QUESTION & ANSWER PAGE

Conducted by Leo Meyerson

Mr. Meyerson,

Would you be so kind as to explain what the function of the mica condenser is in the simple crystal radios? The set I have works just as well with the condenser removed as it does with it in.

(Name withheld)

Ans. Assume condenser referred to is one commonly across headset. In this case, it is to provide low impedence for R. F. across ear phones, leaving high impedence for audio across phones. Condenser value is commonly .001 to .0001 MFD, depending on signal frequeuncy.

Mr. Meyerson,

I would like to know if a CK721 Transistor can be used in the place of the CK722 in the Loop Transistor Radio (same circuit as diagram on page 29 of "RS" No. 4). And if it can, will the CK721 increase the output of the set?

Johnny Stepehenson
Fort Stockton, Tex.

Ans. A CK721 transistor can be used in nearly any circuit calling for a CK722, only occasionally requiring a minor adjustment of circuit components.

The CK722 has more power gain capabilities than the CK722, especially at higher frequency, but circuit values must be adjusted to optimum for CK721 to obtain higher gain possible.

Mr. Meyerson,

Will a IN34 pass the same frequency as a IN64 or does the desired frequency have any bearing on the type of germanium diode to be used.

(Name withheld)

Ans. The IN64 has better response at higher frequencies that the IN34. Frequency has a definite bearing on the type diode selected, from a standpoint of noise internally generated in the diode.

Mr. Meyerson,

I am employed as a TV Serviceman and lately I have really had some 'dogs.' I am wondering if it would be possible for a diode to pass sound and not pass video?

(Bill's TV, San Francisco)

Ans. A diode that will pass audio will pass video, but in a particular case the video (20-50MC) output may be very low in comparison to the audio output, negligible for practical purposes.

NOTICE: If you have a problem or question pertaining to Electronics, send it to : Radio Workbench, Dept. QA, Box 907, Carlsbad, New Mexico. Questions are forwarded to Leo and returned to "RW." Your question and answer to same will appear in RW.

Checking Coupling Condensers

First disconnect the grid end of the suspected condenser and with the set turned on, measure the voltage between the disconnected end and B —.

If the condenser is not open there will be a light kick by the meter needle when test lead first comes in contact with the disconnected lead of the condenser. Then needle will return and remain at zero.

If needle does not return to zero the condenser is leaky and should be replaced.

If there is no kick of the needle the condenser is open.

AN INEXPENSIVE TEST SPEAKER

Dale Smith

This substitute speaker is easy to build and you will find that you will use it often. We use ours daily in our shop. I mounted mine in a small wood cabinet for the purpose of portability, but you may want yours mounted on a board or metal to mount in your instrument panel.

The materials needed are:
1 PM Speaker
1 Universal Audio Output transformer (Merit Number A2902 will do nicely.
2 six position band switches
5 Test Lead Jacks
2 Test Leads
2 Alligator Clips
2 Knobs
Hook-up Wire
Misc. mounting hardware

The constant contact tabs on the band switches are wired to the voice coil lugs on the speaker.

Wire the constant contact tab on Bandswitch No. 1 to one voice coil lug on the speaker, the constant contact tab on Bandswitch No. 2 connects to the other voice coil lug on the speaker.

Wire position No. 1 Tab on Band switch No. 1 to one of the Test Lead Jacks, label this jack "Voice Coil" on your panel, likewise label this position of the bandswitch on the "VC."

Wire position No. 1 on Bandswitch No. 2 to one of the Test Lead Jacks, label this jack "VC" on the panel likewise mark this position of the bandswitch knob "VC" on the panel. Obviously these two jacks and these positions on the bandswitches are used to couple a SECONDARY of an Audio Output Transformer.

Mark the other positions of Bandswitch No. 1 as 2, 3, 4, 5, 6, in clockwise order and wire the tabs of these positions to lugs 2, 3, 4, 5, 6, on the Output Transformer.

Mark the other positions of Bandswitch No. 2 as 1, 2, 3, 4, 5, on the panel and wire the tabs of these positions to lugs 1, 2, 3, 4, and 5 on the Output Transformer.

Solder Red Wire of Transformer to a Test Lead Jack, mount the Jack on the panel and label "Pri."

Solder the Blue Lead of Transformer to a Test Lead Jack, Mount the Jack on the panel and label "Pri."

Solder the Center Tap Lead of the Transformer to a Test Lead Jack, mount the Jack on the panel and label "CT." To use these Jacks, clip the test leads to the input terminals of the output transformer of the set under test, plug into the primary jacks and use the numbered positions of the bandswitches to match the Audio Output Stage of the set under test. If the Transformer of the set under test has a center tap, another lead will be needed. You will plug this third lead into the "CT" Jack and clip other end to the proper terminal.

This Test Speaker will enable you to check (by substitution) the Audio Output Transformer and Speaker of practically all Radio & Television sets. You will also save valuable time which would otherwise be spent in removing the speakers from TV & console Radio sets. End.

COMING IN NEXT ISSUE OF R W

Another One-Tuber

More about Glen Ecker

A tubeless Miniature Radio Power Supply for Experimenters

Notes for the Crystal Set Builder

A Full Length Article (and several circuits) about Germanium Diodes

Builder-Experimenter Hints and Kinks

An article on Antennas by George Anglado

SERVICING THE COMMON AC/DC RECEIVER

By G. Anglado

This down-to-earth article if read and practiced carefully will enable you to cut service time in half and raise your profits when the task is servicing the universal AC/DC type of receiver.

It is a well known fact that most of the radios you will service today are the ac-dc sets. The circuits used in most are basically the same and it is the purpose of this article to help you better understand and to service faster, this well known type of universal set.

The modern 5-tube ac-dc set uses the following lineup of tubes or their equivalents: 12BE6 oscillator-mixer; 12BA6 i-f- amplifier; 12AT6 second detector-avc-first audio; 50B5 audio output; and 35W4 rectifier. Figure 1 shows the diagram of the more common circuit variation while figure 2 lists the type tubes you are most likely to encounter in these sets.

In some cases the maker of the set specifies a certain tube in the first run of the receiver, but substitutes a different type tube later on. He can, by changing the tube socket and the socket wiring, substitute a 50L6 for a 50B5 or 50C5, a 12SK7 for a 14A7, and so on. When such tube substitutions are made it is very seldom any change in the receiver circuit has been altered.

Now, to get down to business and start at the filament circuit of fig. 1. Here you will see that the rectifier tube filament is connected to the "hot" side of the power line. Then the audio tube is next, followed by the i-f- amplifier, the osc-mix., and finally the second detector-avc first audio tube. This latter tube is usually connected to the B— end of the filament string so that one side of the filament is at B— potential. This method helps prevent excessive hum pick-up by the high-gain first audio amplifier stage. You will find this basic order of connection used in almost all present day ac-dc sets.

This information will come in handy some day and will enable you to determine where the correct tubes should be placed should you encounter a set that has had the tubes switched around, or perhaps if the owner should bring them in a paper bag along with the set. The first

(Continued on Page 18)

(Ecker, Continued)

Wave" reception which can be picked up from the body, a steam pipe, or a telephone receiver.

Like most Radio Builders & Experimenters, Glen builds his sets in his SPARE TIME! Glen's occupation is a Sheet-Metal Worker and his Electronics Work is done during his off hours. You may ask, "When does he find time to sleep?"

Well, you've asked the wrong guy, 'cause I don't know. But I do know that Glen is a very likeable fellow with a lot of patience. How many other builders could spend months and months building a set the size of thimble?

Another article concerning Glen Ecker will appear in the next issue of "Radio Workbench." Glen has also promised me 'Something New' in the near future so be on the look-out for another impossible (as the 'experts' say) from Pasadena. If you are interested in receiving additional information relative to his sets, drop Glen a card or letter and I'm sure that he'll be happy to send you his folder. These folders show pictures of Glen's radios, complete descriptions, etc. Write: Glen Ecker, EKERADIO, 646 North Fair Oaks, Pasadena, 3, California.

SO U WANT TO BUILD RADIOS

By Wesley Davis

In part I of this series of articles for the beginner, we recommended the Crystal Set as a 'starter.' Assuming that you have built the Crystal Set and you are eager to get on to something a little more advanced,, we will now take up the one-tube radio.

But first let us find out just what each component (or part) in the crystal set does.

The purpose of the antenna or aerial, as it is often called, is to receive or pick-up the radio frequency (abbreviated as RF) which is transmitted by the Radio Station. Next is the coil to which the antenna is connected. It is through the coil that the RF (audio frequency) passes and is then detected by means of a selector. (See footnote)*

The purpose of the crystal detector is for signal rectification. Note: The mineral which is used in the crystal detector is known as a crystal. The crystal demodulates the modulated RF Signal and by so doing, the audio frequency is extracted from the modulated RF Signal. This audio frequency is then fed to the headphones where further amplification takes place making the signal audible.

THE 1-TUBE RADIO

Since this set is a little more advanced (and a bit more complicated) than the Crystal Set, you should take your time in constructing this radio. If you are a beginner we suggest you take your time because of two reasons:

(1) You can learn more about the set itself and how it operates and;

(2) You want to be sure that you have every little thing properly constructed, properly placed or mounted and properly connected. (It will be harder to correct your mistakes in the 1-tuber than it was in the crystal set.)

The drawings and complete instructions for building the one-tube radio are on page 13 of this issue. Notice that you build practically all the parts yourself. Not only will this save you some money, but you can also learn the basic principal and design of the various parts used. Remember, take your time and study each component which you make.

Here is the Book Recommendation for this issue: ALLIED'S Radio Builder's Handbook. Cost, 25¢. Available from Allied Radio Corp., 100 N. Western Ave., Chicago, 80, Illinois.

I think the following titles of the subjects discussed will give you some idea as to what you can buy for two bits which the book costs:

Early History of Radio, What is a Radio Signal? The Experimenter-Builder and what he does, Getting a start in Radio-Building, How to read Schematic Diagrams, Radio Symbols, The parts of a radio and their functions, Tools needed for Radio Construction, Abbreviations, a few simple diagrams and many other subjects are discussed such as antenna, soldering, radio tubes, coils, Amateur Radio, the battery, capacitance, resistance, etc.

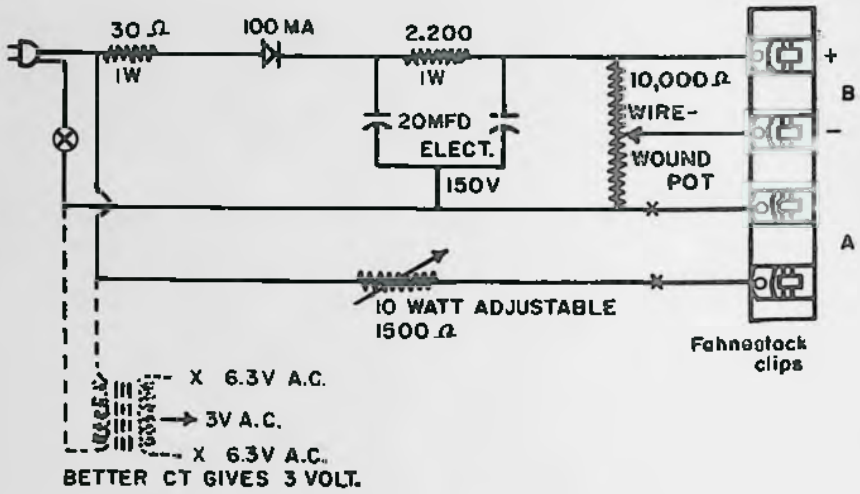
I think you'll agree that the Handbook is worth many times its price and is a book that all Builders should buy. Please mention "Radio Workbench.' Thank you.

* Many various designs of selectors are used in crystal sets but they all do identically the same thing. That is, the selector is moved across the windings of the coil and at various spots on the coil different RF Signals are detected.

POWER SUPPLY FOR EXPERIMENTERS

As was stated in RS No. 4 we had an $8.00 assortment of parts for the contributor of the best power supply circuit diagram for the experimenter. Well, from the many diagrams sent in the best we could do was narrow it down to TWO WINNERS. Henry Brauer, Jr. of Nekoma, Kansas was one of the winners and his circuit is shown below. The other prize winning circuit will appear in RW No. 6. We won't give the name of the other winner in this issue 'cause that would spoil part of the fun, so you'll just have to wait and see No. 6.

This power supply has variable B from 110 volts down to zero and has adjustable A. Henry says, "This is my own design but it works fine." Hi. A carbon V. C. will work in the place of the wire wound pot, as long as not too much current is drawn.



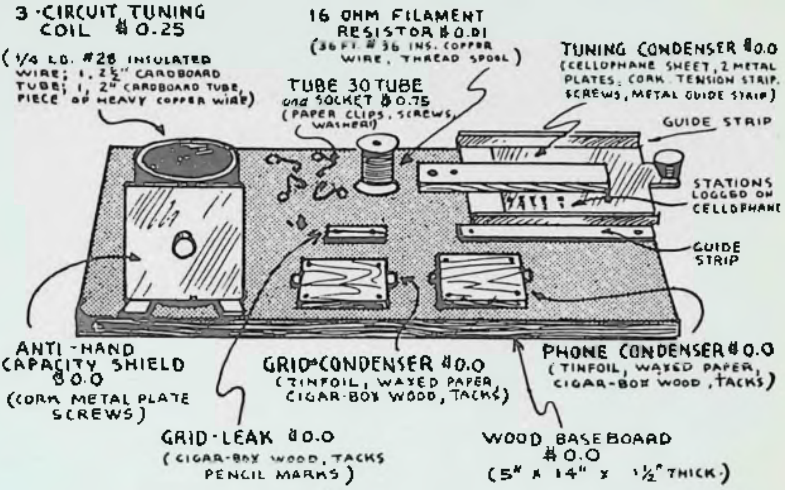
BEGINNERS won't want to miss out on the many helpful hints, suggestions, etc. offered by Wesley Davis in the third and final part of his fine series entitled " So U Want 2 Build Radios." This will appear in the next issue of RW. If you are not already a subscriber and if RW is not yet available at your local newsstand, send 25¢ in coin or stamps today so you will be sure to get RW Vol. 2, number 1. See address on page 3.

Would you like to see a regular column for Novices and prospective Hams? If we receive enough letters to justify the column, we'll see what can be done toward having the first column in RW No. 2 (vol. 2). So if you want this new addition to RW be sure to let us know. Write the editor.

Be assured a copy of each issue of "RADIO WORKBENCH," subscribe today. Yearly subscription is only $1.35 in the U. S. and its possessions. Address: Smith Electronics, Circulation Dept., Box 907, Carlsbad, New Mexico.

Please mention R W magazine when replying to advertisements.

ONE TUBE RADIO FOR $1.00



First of all we get ourselves a board that measures anywhere from 5 to 14 inches to 8 by 20 inches. If you would like a nice classy job when you're through sand the board thoroughly and then appy a coat of shellac or lacquer. While we're waiting for the shellac or lacquer to dry we'll make a full size drawing of the set.

You'll notice that the set calls for fixed condensers, but they are nothing to worry about. Take the foil from a package of cigarets and smooth it out carefully on a flat surface. Use your thumbnail, but be careful not to wrinkle or tear it. Cut out six pieces, 1 by 2½ inches overall, of the shape indicated by the diagrams. Cut 8 pieces of waxed paper 1½ by 2 inches.

Place a piece of paper on the set base in front center for the grid condenser. Then a piece of tinfoil on top of that, with a one inch tab projecting frm one end. Then another piece of paper and the second tinfoil "plate" with the tab projecting one inch from the opposite end. Which, my friends, represents the condenser!

Now we tack a piece of cigar box wood, a little larger than the paper, over the pile by the corners, being careful that the tacks do not touch the foil. From there we move over to build up the phone bypass condenser the same way, using two right and two left hand "plates" alternately.

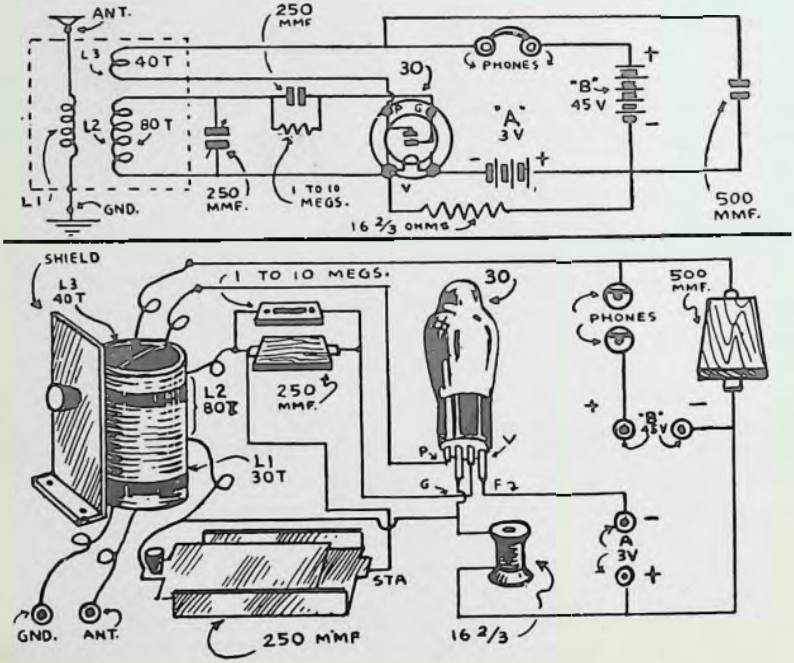
You will notice that the grid-leak is merely a high resistance path past the condenser and we tack that next. A piece of cigar box wood 1½ inches wide is blackened on top with a soft pencil and then fastened lightly to the base with two brass-head screws or tacks 1 inch apart. We won't drive them down until connections are made later.

Check carefully to make sure you get the details for the tube socket. The tube socket consists of 4 holes halfway through the base as indicated, the two rear ones being slightly larger than the others (⅛ and 1/16

inches will do.) Note that contact is made to the tube prongs by means of four ordinard paper clips which are bent so that the smaller part makes a spring contact with the prongs. Three of these clips are fastened to the base with washers and screws, but not all the way in. The fourth clip, bent as shown, is lightly secured by the washer and screw to be used as the "A" terminal. Do this according to instructions and you'll have a mighty nice socket.

The variable condenser will tune easily and well. Cut a piece of tin, copper, brass or aluminum $2\frac{1}{2}$ x $4\frac{1}{2}$ inches. Smooth it out flat, with sharp edges filed or sanded off. Punch a hole in the center of one end. Shellac that portion of the base and one side of the plate. When the shellac is thick press down firmly in the place indicated. Slip a washer over a screw, twist the end of a 2 foot length of wire under the washer and screw tight. Cut another plate from the same material $2\frac{3}{4}$ x $4\frac{1}{2}$ inches, (not counting the half inch square tab at one end). Smooth and flatten as before. Punch a hole in center of tab and screw a cork on, with the end of a piece of flexible wire (old lamp cord, or any wire not stiff) 12 inches long under the washer. Soak a piece of cellophane 3 x 5 inches in water for a few minutes, then place it on the lower plate, leaving an even margin around the edges. Press down tightly and shellac the edges to the wooden base. Guides are fastened to the base. They are simply strips of tin fastened with thumb tacks, and serve to keep the movable plate on the right track. A piece of cigar box wood, $\frac{1}{2}$ x 4 inches is screwed **with two screws** in the position shown, tightening or loosening the screws serves to produce just the right tension on the movable plate.

For a three-circuit tuning coil, get



a **cardboard** tube 2½ inches in diameter (baking powder, coffee, salt carton) and cut with a razor to 4 inches in height. Begin ¼ inch from one end and wind on 30 turns of No. 28 insulated wire (cotton, silk or enamel). Bring the ends down through pinholes in the tube. Put little markers on each lead indicating which is which, so that when the coil is mounted you will have no difficulty with wrong connections. Next leave a gap of ⅛ inch and wind on 60 more turns. Don't break the wire here, but leave a 3/16 inch gap and continue for 30 more turns. Bring the ends down inside the tube to the same end as the primary coil and mark for identification. Punch the center of the 3/16 inch gap to admit a piece of stiff wire used as a shaft for the "tickler" or feed-back coil. This coil is wound on a 2 inch tube 1¼ inches high. (Cut a 1 inch piece out of a section of the 2½ inch tube, overlap ¼ inch and glue or tie in place, or use a 2 inch tube if available.) Wind 20 turns on each side of the center, leaving ⅛ inch gap for the stiff wire shaft. If felxible "cord" is handy, attach 1 foot pieces to each end of coil. Otherwise just leave ends that long. Now straighten out a 5 inch piece of stiff wire (a package handle wire is fine) and push it through the hole in the outside coil.: Now a washer, punch through both sides of the tickler at the enter gap, another washer, ,and the back side of coil, projecting ¼ inch. Sealing wax on the shaft and inner surface of the tickler will secure both very nicely. Shellac all coils (although not really essential.)

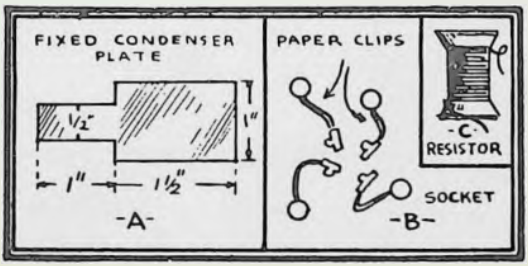
Now mount the coil in any way you like, so long as it is upright, with tickler near the top. Bring the 4 leads out at different parts of the bottom of the tube to eliminate any possibility of short circuits. The tickler leads come out at the top.

The shield in front of the coil is a square piece of any metal available, with bent-over feet at the bottom and a hole punched to pass the tickler shaft. At this point you can make the first complete connection. Bring the top end of the antenna coil (L1) to one foot of the shield, scrape off the insulation and secure under foot, bringing the end back to post "G" (ground). The shield should be ¼ inch from the side of the coil Drive a cork on the wire shaft, pushing it far enough to spring the shield toward the coil slightly. This provides friction, necessary to make the tickler stay where you turn it.

Wind 36 feet of No. 36 insulated wire on a thread spool, securing the ends in slits cut in spool end, and leaving 6 inches free at each end This is the filament resistor, to reduce the 3 V. dry battery to 2 V. for the 30 tube filament. A long screw or nail holds the spool upright on the base just to the right of the tube socket.

Now for wiring. If you have left the proper lengths as instructed it will be easy, and no solder need be used. Run the bottom lead of L1 to post "A" (aerial.) The bottom

(Continued on Page 17)

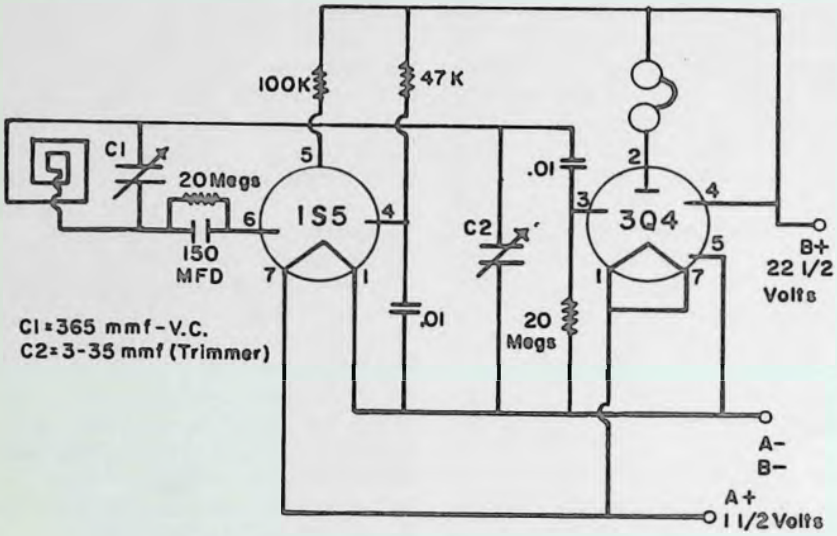


Showing shape and dimensions of fixed condenser plates (A), unique socket (B), and tube filament resistor (C).

The only place where trouble might be encountered is in making the fixed condenser plate. Study the directions and also take a good look at Figure 2, which also gives excellent clues to the construction of the paper clip connections.

2 TUBE LOOP AERIAL RADIO —

Prize Winner: M. E. Bungo, 185 Knapp Ave.
Clifton, New Jersey



SWAP: Tower mimeograph Machine in good operating condition complete with all accessories including stencils, extra ink pads, 2 -1 pound cans of ink, lettering guides, styli. This 'automatic' ink control machine is also equipped with automatic counter and paper tray.

Will swap everything above for a good receiver (all-band), books, parts or what have you? Please describe (model No., make, etc.) of items you have to swap and give condition of same. Gary Smith, c/o L.A . Stephenson, 2421 Violet St., Carlsbad, New Mexico.

lead of L2 (grid coil) goes to one tab of the grid condenser and one end of grid-leak, along with one lead from the variable condenser. Roll the foil around the wires and press them tightly together. The top of L2 goes to post "A-positive," where the other variable condenser lead joins it. (All "posts" are just plain wood screws with washers.) One lead from tickler (L3) goes to one phone post and to one tab of the by-pass condenser. The other end of L3 goes to the tube plate clip. One end of the spool wire connects to "A-positive." Run a wire from the "B-negative" post" to the other end of the bypass condenser and then to "A-negative' (which holds one socket clip.) T he grid clip of the tube socket goes to the grid condenser and grid-leak. The remaining end of the spool wire goes to the remaining clip, 'A-positive,' of the socket. The last wire connects post B-positive to the remaining phone post.

Connect two dry cells in series (that is, with the 'positive' or center post connected with a wire to the 'negative' or side post of the second cell) to posts marked 'A-positive' and 'A-negative' (the center connection of a dry cell is positive.) Connnect the phone and 45 V. "B" battery to their respective screw posts and plug in the tube. Now all you have to do is to turn the tickler slowly and move the condenser at the same time. There is a slight click when tickler coil goes into "oscillation." A little practice will enable you to tune easily. Use a pencil eraser to erase part of the grid-leak, a little at a time, until the tickler works smoothly and programs are the loudest.

We should assume that you know operation will be better with fresh batteries, but make the suggestion anyway. One of the principal causes for trouble with radios of this type often comes from loose battery connections. If the batteries have the so-called 'clip' type of connection make sure they are clean and bright. If the batteries have the screw and cap type of connection it is essential that they be as tight as possible.

We might add also that no effort was made to give this set a classy, o r n a t e appearance. The whole scheme might be described as a stunt, to see how little can be spent in the construction of a receiving set. We doubt that anyone can get much lower. We believe that no radio can be much simpler because in this set everything but the tube is made by the builder and that's where the real economy lies.

COMING SOON! ! A special edition about those 'little wonders' that are so popular in the field of small set construction, TRANSISTORS! Yes volume 2 number 2 of RW will feature numerous projects using the CK722 transistor. Along with these useful projects for the builder - experimenter will be a full length article telling all about the functions, dos and don'ts, applications, etc. for transistors. DON'T MISS OUT! Be sure you get a copy of this 'special edition.'

What type articles, projects, etc. do you want to see in RW? Let us hear from you, we welcome all suggestions. Send all correspondence to Don Smith, Box 907, Carlsbad, New Mexico.

COMING SOON! Three entirely new contests for builders - experimenters. Be on the look-out for complete details in RW soon.

Have you entered one of the RW Contests? See page 29 for complete information.

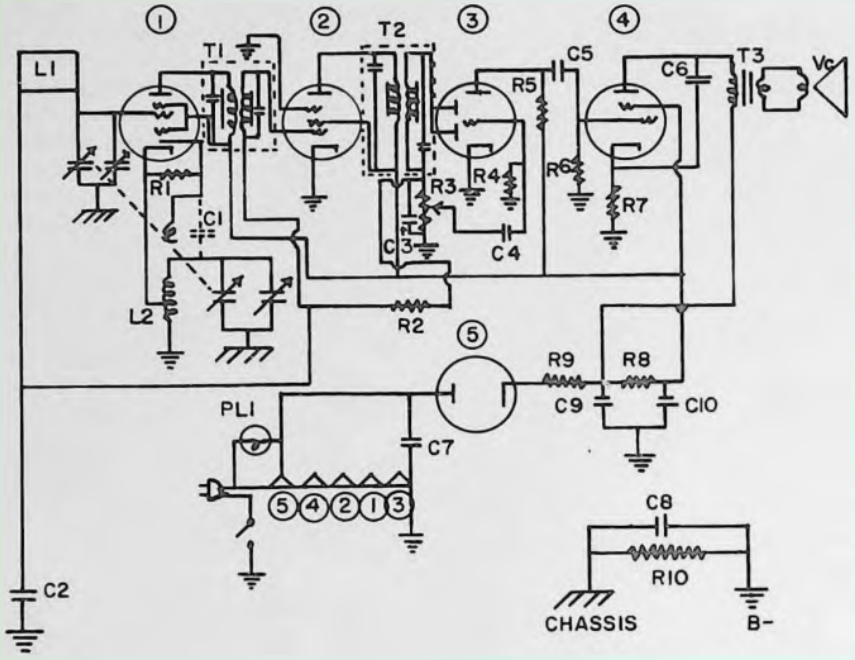


Fig. 1. Basic AC/DC Schematic Diagram
NOTE: Some sets will have a resistor of 68, 120 or 100 ohms connected between the cathode of the i. f. tube and ground.

Fig. 2 TUBE LIST
V1-Osc. Mix.
12SA7
12BE6
14Q7
V3-2nd. Det. 1st. A. F.
12SQ7
12AT6
14B6
V2-I. F. Amp.
12SK7
12BA6
14A7
V5-Rectifier
35Z5
35Y4
35W4
V4-Audio Output
50L6
50B5

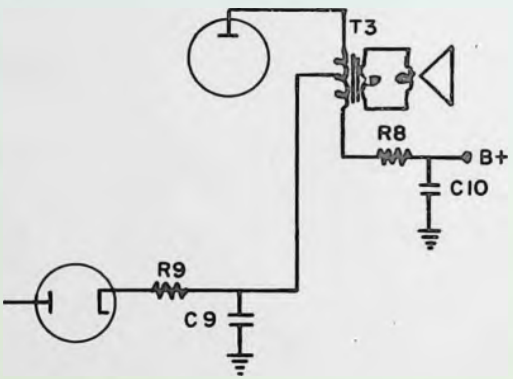


Fig. 4. Tapped output transformer as part of filter network.

(Continued on Page 26)

LEARN THE CODE

By Ray Bilger (W3TDF)
of Tapedcode

So you want to learn the code! No matter what the reason, there is a definite procedure, which when followed will shorten the learning period and get you off to a proper start. This article will be more applicable to a club or group where one person is reasonably proficient in the code to act as instructor. However, this is not the sole purpose.

Although machine sent code is a thing of beauty and makes for easy copy, a student will benefit more from teaching which has the human variation, (i. e. length of dashes and spacing is not precise to the nth degree.) It is a known fact that many operators who are schooled in, and spent considerable time copying machine sent code, have difficulty in copying even comparatively good hand sending. On the other hand the instructor cannot be a poor sender or the student will benefit even less.

The practice material used by the instructor should be chosen with a little forethought. It should include both coded groups and plan language, and they both should include as many of the letters and numerals as possible. Material repetition should be avoided so that the students do not become accustomed to the material. If this happens the student tends to memorize the text and anticipate what is to come. This is OK for practice but will not increase the receiving speed of the operator. Here is a tip for the preparation of coded groups. Prepare a sheet of paper with 50 rectangles, each large enough to hold a 5 letter group. Then place the letters of the alphabet and numbers (in order) in random positions throughout the sheet. Continue this until you have filled all the blocks with 5 characters each. This method insures equal use of all the letters and numbers.

To assist the student in distinquishing between similar letters and numbers, such similar characters are taught together in a group. Since there are 36 characters they may be divided into either 4 or 6 groups. The suggested groupings are: for six groups: EISH52 - TMOOC8 - AUV 4FL - WJ1KR3 - NDB6PX - GQY7-Z9. For four groups: EISH5AUV4 - TMOØWJ1CZ - FLKR3PX78 - NDB-69Y2GQ. You will note that the zero is a letter O with a slant through it, also numeral one has a base line (like a T upside-down), so that it will not be mistaken for a letter I. Also letter Z may be written with a dash through it, thus Ƶ, so that it will not look like a 2.

The more time spent with each group the better acquainted the student becomes with them. A good rule to follow is 10 minutes or more per letter in each group, at about 2 minutes at a time. After the second and each subsequent group is taught it is then combined with the previous groups for review.

If you, the student, have memorized the code by dots and dashes you have wasted some valuable time. The proper method is to learn each letter by the rythmic sound produced by the specific combination of dots and dashes comprising such letter. So that the student may become familiar with these rhymic sounds, and to preclude his temptation to count the number of dots etc. The instructor should send the individual characters at a speed of 18 to 22 words per minute. Then by adjustment of the spacing between characters the overall speed is adjusted.

As the instructor teaches each

(Continued on Page 22)

A POWERFUL ALL-WAVE CRYSTAL SET

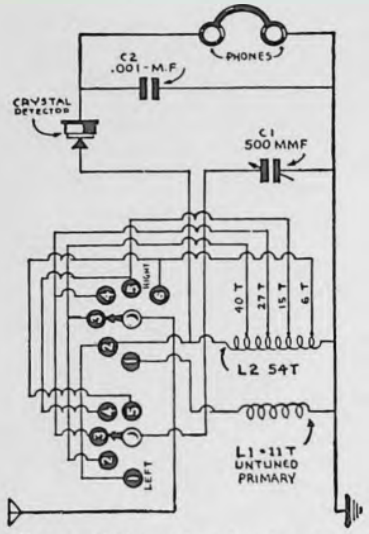


Fig. 1. Schematic circuit of the receiver described.

A new circuit for a super-sensitive all-wave crystal set using plug-in-coils has been brought out which is much more sensitive and selective.

Using but two plug-in coils, one for each wave band, there is but one basic change in the circuit, as shown in Fig. 1.

A long antenna and a ground connection brought in a 640 kc. station. Lower part of the broadcast band and short-wave are received with as much volume and far better selectivity by using this long outdoor antenna; instead of a ground connection, a 50 ft. indoor antenna is used as a sort of counterpoise. This counterpoise lowers the tuning limit somewhat.

The coils can be built on celluloid, bakelite or paper forms 3 ins. in diameter. Use No. 18 or 20 S. C. C. or D. C. C. wire, spaced about 18 turns to the inch.

The largest coil, L2, in Fig. 1, has 54 turns, tapped from the ground end ,at 6, 15, 27, and 40 turns. This coil, goes far below the broadcast band. For the real short-wave band the coil L2 should have 15 turns tapped at 3, 6, 9 and 12 turns from the ground end. This coil, using a counter poise goes up into the broadcast band **and separates stations better with good volume, than the large coil.** It is not known how far this coil will tune below 46.96 meters.

Coil L1, the untuned, fixed, 11-turn primary, is made on the general manner described for coils L2; coil L1 must be made just small enough to slip inside and at the ground end of either of the coils which are used as L2. This primary is not a very important winding and is used but little, although, if loosely coupled when using a ground, it results in increased selectivity on the loud signals.

(Continued Next Page)

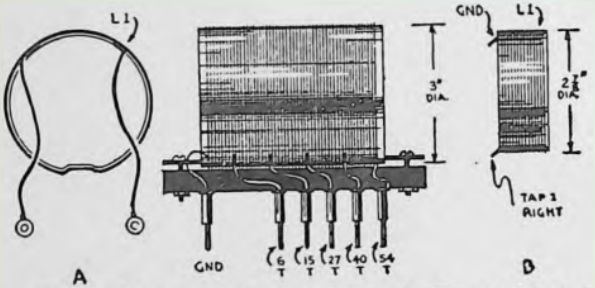


Fig 2. Sketch of the tuning coil. Two coils are needed to cover broadcast and short-wave bands.

Parts Required

One crystal detector; tuning condenser, 500 mmf., C1; fixed condenser, .001 mf., C2; set of coils (see text) L1, L2; headphones; two tap switches, "left," and "right"; 11 taps; baseboard, 7 x 12 x 5/8"; panel, 7 x 7 x 1/4"; hookup wire, screws, etc.

SHORT WAVE LISTENING POST

By George Anglade

Beginning with this issue of RW starts another interesting column for all SWL'S. Each issue will have complete station list of some foreign country. You can help make this column a success by writing and telling what type of SW column you prefer, whether it be a complete list of stations from one country or an assortment of different stations and countries.

Any comments, stations lists you have and so on, should be addressed to the Editor of RW.

NATIONAL ASSOCIATION OF BRODCASTING STATIONS IN PERU

All stations private commercial except those marked, which are Govt. controlled. Language is Spanish. Address all mail when writing for QSL's to: A cargo de "Radio Victoria," Bajos de la Cabana, Paseo de la Republica, Lima.

CL	KC	MB	KW
OAX4P	5955	50	.25
OBX4Q	5970	50	2
OBX4M	5980	50	.5
OBX4V	6010	49	1
OAX4Q	6020	49	1
OAX8B	6028	49	1
OAX6B	6035	49	.15
OAX6A	6042	49	.2
OAX6E	6055	49	.3
2A	6057	57	.25
4Z	6082	49	15
4H	6095	49	1
6F	6105	49	.3
7A	6128	48	1
1A	6150	48	.25
OBX4G	6153	48	.5
4B	6170	48	.35
OAX7C	6175	48	.3
OBX4P	6180	48	.3
OAX4G	6190	48	.25
1B	6198	48	.3
4S	6216	48	.3
6H	9505	31	.1
6W	9510	31	.1
6W	9510	31	.5
4U	9520	31	.25
4K	9545	31	.3
4R	9562	31	10
5C	9590	31	.2
8C	9610	31	1
OBX4R	11914	25	50
OAX4T	15150	19	10
OBX4C	15150	19	01
OBX4T	21600	13	50

ATTENTION SWLS!

I received an encouraging letter the other day from P. J. Kavaleski. Along with 'patting RW on the back,' "Pete" coughed up a buck for seven issues of RW. Thanx OT.

Pete is very interested in "Tape Recording" and also says that he will swap cards with all SWLS anywhere, anytime. The "Nutty Net" meets on 39.20 KC in the 80 M. Band on both fone and CW.

He sent yours truly a very nice card — here's hoping that more of ya'll will do like-wise. Hi.

Pete's address is P. J. Kavaleski, P. O. Box 17, Franklin Mine, Mich.

Don

Crystal Set, Continued —

The same station will come in on several taps, but use the one which places the station lowest on the tuning condenser setting for loudest signals. To tune to the higher frequencies, move the right-hand switch, (marked "right" in Fig. 1) forward, clockwise, one to three taps before advancing the left-hand switch arm. The efficiency of this set seems to lie partly in the low-loss coils, but mostly in the one basic change in the circuit, in which the detector is connected permanently to the last turn (from ground) on the tapped coil.

Learn the Code, continued

group, he must announce each character in voice and then send it several times, repeating this 2 or 3 times before going to the next character. The student then must print each character on paper and every time that it is sent. This establishes the association between the characters and the sounds.

After you have learned the code, fundamentally, do not spend too much time copying at a speed which you have already attained. Always attempt to copy a speed slightly beyond that which you are proficient. By continually striving to copy that which is beyond you, the so called 'hump' will be passed without your fully realizing it. Sending to yourself from a book or newspaper is a very very slow way of increasing your speed but allows you to hear and form your own sending habits. You should try to imitate good sending, either from your instructor or from commercial machine sending which can be heard on the short wave bands.

The instructor should occasionally vary the tone of the code oscillator being used, as a steady unchanging tone will become very boring and cause fatigue in the student. If you were to sit and copy code for four solid hours, machine sending at 18 to 30 WPM, without changing the pitch of the tone now and then, it would eventually put you to sleep. This is no joke. It has happened to me many times, even when I did change the tone now and then. Another item along these same lines, but but sometimes not readily accessable is an oscillator which gives tones that are rich in harmonic content. This point, however, is not quite so important.

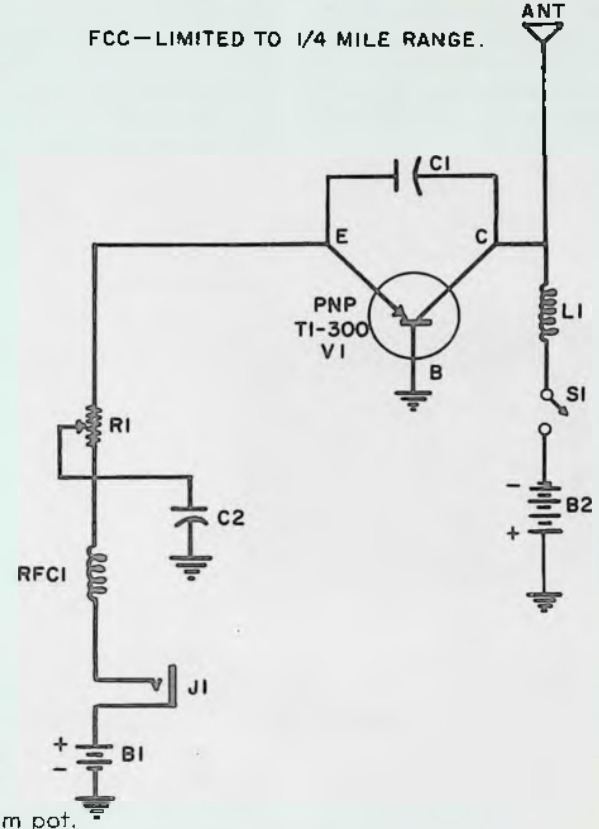
Another essential to shortening the time the student requires to learn the code is quiet and uninterrupted classes. If you plan to run classes longer than an hour or an hour and a half, it is a good idea to allow a few moments in the middle of the class period for relaxation. Although very difficult to achieve, it has been proven that when the mind is fresh and rested it can absorb new things more readily. This of course almost always necessitates morning classes, an almost impossibility.

So to those of you who wish to teach code or to learn, you have just read some of the Tapedcode System trade secrets. Don't tell anyone tho, 'cause we wouldn't want them to get out.

PORTABLE TRANSISTOR TRANSMITTER

Prize Winner: Charles Dobaski, 349-B Kukuau Street
Hilo, Hawaii

FCC—LIMITED TO 1/4 MILE RANGE.

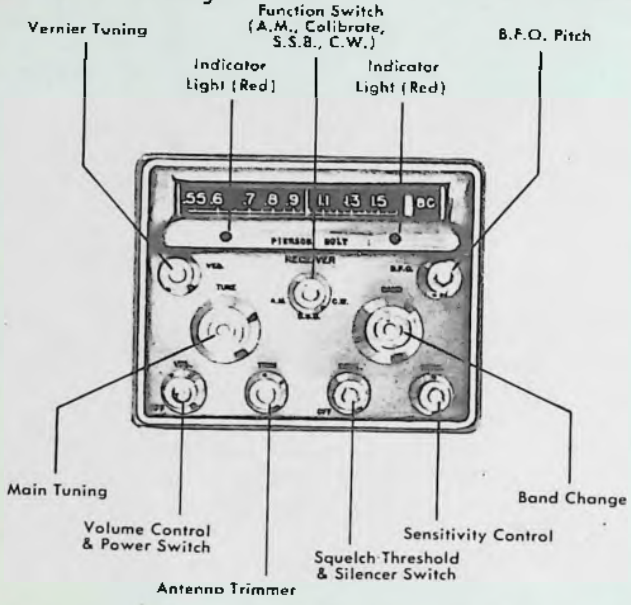


PARTS LIST

R1 1000 ohm pot.
C1 290 mmfd. 200 V. mica condenser
C2 .25 mfd. 6 V. miniature capacitor
RFC1 1.5 mhy R. F. choke (Miller No. 4664)
L1 Antenna Coil (Miller "High-Q" Ferrite" No. 6300 or equiv.)
J1 Microphone jack
S1 SPST toggle switch
B1 1 1/2 volt penlight cell
B2 30 volt miniature "B" battery (Eveready 413 or equiv.)
V1 "pnp" junction transistor (Texas Instruments type TI-300)

EXPLOITING THE KE-93 RECEIVER

"The KE-93 Dual-Conversion Superheterodyne, 12-tube, all-band communications receiver is in a small, Mobile package and whether in motion or on the table top, this tiny receiver makes tough conacts easily and holds 'em longer."



Despite its extraordinary compactness (5" high, 6" wide, 9" deep), the KE-93 is a full-fledged communications receiver. It delivers high overall performance on seven bands: 10, 15, 20, 40, 80 and 160 meters, and the broadcast band.

The KE-93 is a precision Mobile or Fixed Station communications receiver featuring advanced circuitry which reflects the finds of more than 25 years of Pierson research. Its squelch circuit is highly sensitive and may be adjusted by its front panel control to open on A. M. signals too weak to be readable.

RIGID, DIE-CAST construction helps the KE-93 take "In-Motion" knocks.

The advanced circuitry of the KE-93 consists of one stage of R. F., first mixer, local oscillator, second mixer and crystal oscillator,, 2.2 M. C. intermediate frequency, 2 stages quadruple-tuned 265 K. C. intermediate frequency, second detector, separate A. G. C. detector, two stages audio including output, beat frequency oscillator and a full complement of noise elimination and squelch circuitry involving four tubes, some dual.

The wide use of die-cast construction in the KE-93 assures an extremely rugged overall package. Much of the dial assembly is cast as an integral part of the front panel, affording accurate assembly and permanence of adjustment. The entire front panel assembly is silver plated and sulfide finished, providing a durable, corrosion-resistant finish and strong highlighting of lettering for day and night legibility. The case is heavy perforated steel in Hammertone sil-

ver grey finish. Handsome in appearance, the die-cast control panel has an oxidized silver antique finish.

For S. S. B. and C. W. operation, the B. F. O. pitch control affords a swing of plus or minus 3 K. C. The tuning vernier control effects an average of a few hundred cycles plus or minus swing for precision S. S. B. tuning.

R. F. SECTION OFFERS HIGH FREQUENCY, JITTER-FREE

Excellent S. S. B. and other types of reception are possible under "in-motion" conditions because of the sturdiness of the R. F. assembly. The tuning portion (front end) of the KE-93 is the revolving turret type. Mica filled alkyd molded parts which include contact strips, coil mountings, trimmer housings, etc., provide maximum insulation qualities. The turret drum is housed in a rigid, die-cast frame and revolves on ball bearings. Thurst is adjustable to compensate for any possible play created by wear. Most of the R. F. components are silver-plated for maximum high--frequency efficiency.

SPECIAL MODELS: The KE-93, which is most in demand, is strictly an amateur band and broadcast coverage model. However, the extreme flexibility of the KE-93 design permits almost any conceivable combination of band coverage arrangements to as high as 300 M. C., fixed crystal control, turnable or a mixture of both. It will operate on either 6 or 12 volts. No wiring or tube changes are necessary to switch from 6 to 12 volts D. C. or 110 volts A. C.

For complete information and price listings on power pack combinations, speakers, receivers, etc., address a card or letter to PIERSON-HOLT ELECTRONICS, 2308 West Washington Blvd., Venice, California.

(Continued from Page 18)

way to find out as to what tube goes where is to locate the socket that has one of its pins connected to the hot side of the power line, and installing the rectifier tube in that socket. Then, locate the tube that has one of its filament pins connected to one of the filament pins of the rectifier tube socket, and plug-in the audio output tube in that socket. Next, the I-f- amplifier tube, the oscillator-mixer tube, and finally the second detector tube.

There are two more ways for finding the correct tube for the correct socket. One, is to start at the B— end of the filament and trace the circuit in the other direction. Another method is to get to knowing that the oscillator-mixer tube is always the closest to the tuning condenser — the i-f- amplifier tube between the two i-f- transformers — the audio output tube connecting to the output transformer, and the second detector the closest to the audio output tube.

The most frequent defect in the filament circuit of an ac-dc deceiver is an open filament in one of the tubes. The surest way of locating such a defect is by removing each tube from its socket and checking across the filament pins with an ohmmeter until the one with the open filament is found. Before going any farther, let me state here that there is an important point you must remember when you run across open tube filaments. If you notice the diagram, you will find that the pilot light is connected in parallel with a portion of the rectifier tube filament. Notice also, that the rectifier plates connects to the tap on the filament, which means that the B supply current for the entire set must flow through the parallel combination of a portion of the rectifier tube filament and the pilot light. If you encounter an open rectifier tube filament, always check for a possible short in the power supply circuit before installing a new tube. This is particularly true when you find that the pilot light is burned out.

To check for a possible short, first unplug the receiver, short the two prongs of the power plug, and turn the set on. Connect one lead of an ohmmeter to the shorted prongs of the power plug, and the other lead from the ohmmeter to the cathode pin of the rectifier tube socket. Note the reading on the meter and then reverse the leads, again noting the reading. The highest reading read is the one to use. Both readings are suggested because electrolytic condensers are involved, therefore, polarity of the ohmmeter leads must be observed. Only one reading, with the positive ohmmeter lead connected to the rectifier tubes cathode pin, is required, if you know your ohmmeter polarity. A low resistance reading of 10,000 ohms or less indicates a short, and the shorted component should be found and replaced with a new unit before a new rectifier tube is installed. Most likely you will either find the electrolytic condensers shorted (one or more), the audio by-pass condenser connected between the output tube plate and cathode or the condenser connected from either B+ to ground, the rectifier tube plate to filament, or from one side of the rectifier tube filament to ground.

Occasionally you will encounter a set that "blinks." What I mean by this, is that the tubes will start to light and then suddenly go out. Then after a minute or so, the tubes will light up again, and then go out again. The symptom is the result of an open in the tube filament. Since the filaments are connected in series, an open at any point will cause all of the filaments to "go out." When the circuit opens, the entire voltage

(line voltage) will appear across the "break" and there will be no voltage drop across the rest of the tube filaments. To find the tube that is causing this "thermal" condition, take an ac voltmeter and set it to measure the line voltage, across each tube filament in turn. Leave the meter connected until the set starts to blink. If the tube is good (the one you have the meter connected to) the voltage across the filament will drop to zero. If the voltage increases, then the tube should be replaced since it has a thermal open in its filament.

Another common filament defect prevents one or more of the tubes in the set from lighting. Look at the diagram in fig. 1 that shows the filament of the second detector tube as the only tube filament that connects directly to B —. Now, if a heater to cathode short existed in the i-f- amplifier tube then the filament of this tube would be connected to B —. The full line voltage would be applied to the rectifier tube filament, the output tube filament, and possibly the i-f- tube filament. The oscillator tube filament and the second detector tube filament would receive no voltage. Consequently, they would not light.

When this unusual condition is encountered, it is difficult to decide just which tubes are receiving voltage. Although the metal tubes used in some seets do not display the visible filaments; and although a tube that feels cold indicates a lack of filament current, you should always use a voltmeter to check the filament voltages. The meter will tell you which filaments are receiving voltage — thus you can decide which tube is most likely to have a heater to cathode short.

Now, let's get back to the circuit of fig. 1, and start tracing from the antenna loop to the speaker.

The loop antenna does not give much trouble as to opening, but it will give trouble when it absorbs moisture. Moisture in the loop will cause the set to have decrease sensitivity, motorboat, and to block on some stations. Some loops are wound on porous cardboard and it has been found to be the cause, in some cases, of displaying broad tuning.

(To Be Continued, Next Issue)

Parts List & Values
R1-22k ohm 1/2 watt
R2-2 meg. 1/2 watt
R3-1 meg. vol.
R4-10 meg 1/2 watt
R 5-470k ohm 1/2 watt
R6-470k ohm 1/2watt
R8-2000 ohms 2 watts
R9-33 ohm 1/2 watt
R10-470k ohm 1/2 watt
C1-50 mmfd. mica or ceramic
C22-.1 mfd.
C3-250 mfd.
C4-.01 mfd.
C5-.01 mfd.
C6-.005 mfd.
C7-.1 mfd.
C8-.1 mfd.
C9-30 mmfd. 150 volt, May be dual
C10-50 mmfd. 150 volt
PL-No. 47 pilot light

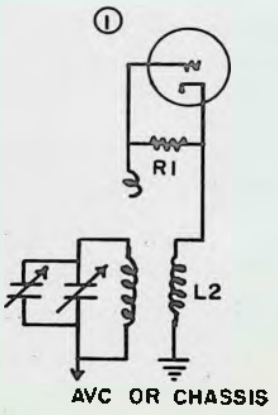


Fig. 3. Oscillator circuit showing circuit with 3-winding coils.

CLASSIFIED ADS

Rates 15¢ per word. Minimum words per ad is 10. Address all ads to: Smith Electronics, Dept. CA, Box 907, Carlsbad, New Mexico.

FOR SALE

SPRAGUE TEI-OMIKE $40.00. JACKSON 707 CRT tester $35.00. 250 watt isolation transformer $20.00. 350 watt $30.00. Hickok 600 Tube Tester with CRT adapter $75.00. Superior 660-A Signal Generator $30.00 — All items in perfect condition. — Harold Kroll, Box 117, Seymour, Wisconsin.

NOW A POWERFUL TRANSISTORIZED RADIO — 12,000 mile range. Complete with Transistor Kit. $7.95. Ekeradio, 646 North Fair Oaks, Pasadena, California.

OPPORTUNITIES

MAKE, SELL, POWERFUL MIDGET Shortwave Adapters, costing less than 25¢ to make and selling for $3.00 or more. Hooks on back of any standard battery or electric set, pulling in stations up to 15,000 miles away without antenna. Get all foreign short wave stations plus amateurs, police, marine, etc. Use no tubes, crystals, transistors, condensers or any sort of power. Guaranteed to work. Nothing to unsolder, no parts to take out of set. Simple foolproof plans, drawings, instructions tell all. Mailed anywhere in U. S. and Canada for only $3.00 cash or money order. Fully protceted by Copyright law. Lisenby Co., Troy, North Carolina.

MONEY IN RADO, TV, AND APPLIANCE REPAIR. Make your own tester. Most parts from old radios. Complete information $1.00. R. Manning, P. O. Box 2216, Kansas City, Missouri.

TAPE RECORDERS, ETC.

TAPE RECORDERS, COLE OFFICE EQUIPMENT, Slide Projectors, wholesale! Unsurpassed values! Don's Box 5116, Orlando, Florida.

MISCELLANEOUS

HOW TO PLAY 6 & 12 VOLT Auto Sets from 110 volt line without using converters, batteries, tubes, rectifiers, etc. Simple foolproof method I have been using for 17 years. Also Stage by Stage Analysis and Secret method of Souping up radio sets. Everything for $1.00 ppd. ANGLADO, 719 Doris, Biloxi, Mississippi.

LOGIC COMPUTERIZED. Use Industry as analog. Simuated Kit 10¢ Sample. — Increment Research, Wanaque, New Jersey.

BUY-SELL-SWAP ADS

Rates: 2 ads run in two issues for 25¢. Maximum word limit is 30 Only non-commercial ads are accepted for this section.

RADIO PARTS, FOR TUBE, TRANSISTOR & CRYSTAL SETS. List requirements and items to swap. Wilburn W. Clay, 1803 Childress Drive, S. W., Atlanta, 11, Georgia.

RADIO MAGAZINES — Buy, sell Swap. Farmer Nursery, Plainview, Texas.

WANTED FOR CASH, Early Wireless Transmitters, Receivers, Tubes & Parts. W6MEA, 2341 Ivyland, Arcadia, California.

TRADE: USED BUT COMPLETE Onan Generator Plant. 110 VAC, 60 cycle 5 KW - 4 cylinder continental engine. Want: Hi-Fi Tape recording and reproducing equipment. Bob Farmer, Plainview, Texas.

FOR SALE: HALLICRAFTERS SX-25, NC57, 2 Meter and all band mobile Receivers, Test Equipment, Crystals,, Johnson VFO, many other Ham units — All at Bargain Prices. Stamp for list. G. Samkofsky, 201 Eastern Parkway, Brooklyn 38, New York.

CONTEST INFORMATION

WIN $10.00 IN RADIO PARTS

Yes, that's right, you can receive FREE OF ANY CHARGE, $10 worth of NEW parts. These parts are given to the persons sending in the best short articles of interest to the radio-builder, experimenter, service man or Ham. All articles, hints, new methods, etc. which are used in RW will be awarded prizes of various values.

HINTS & KINKS: If you have a 'pet' hint or kink send it in to us and if your hint or kink is used in RW, you will be awarded a yearly subscription (6 issues) PLUS a copy of the Radio Plans book.

DIAGRAM CONTEST: Prizes of $10, 7.50, $5.00 and $2.00 in the form of NEW radio parts (tubes, condensers, resistors, transformers, knobs, coils, crystals, chassis bases, books and other miscellaneous items) are sent to those sending in diagrams of interest to the Radio Builders, Experimenters and Hams.

HAM DIAGRAM CONTEST: For each and every diagram of interest to Hams which you send in, that is used in RW, you will receive an assortment of parts, etc. worth at least $10.00.

PHOTO CONTEST: To those sending the best pictures to be used on the front cover of RW, will be sent an assortment of parts, etc. worth at least $12.50. A short article of not less than 60 words should be sent with each photo.

Other photos which are used in RW (other than on the front cover) will also be awarded parts prizes.

NAME AND ADDRESS AWARDS:

For every 10 names and addresses sent to us we will give you 3 FREE issues of RW. For every 25 you send in we will give you 3 FREE issues of RW PLUS a copy of the Radio Plans book!

NOTE: the names and addresses must be of persons whom you think would be interested in "Radio Workbench" and who are active in Radio Building and Experimenting. (No Ham names and addresses will be accepted.)

For each name and address of Radio Clubs which you send to us we will give you a FREE copy of the Radio Plans book. Please state whether you are a member of the club or not. For two or more such names and addresses we will send you either an assortment of NEW RADIO PARTS or FREE copies of RW, which ever one you prefer.

All diagrams, photos, articles, drawings, hints, kinks, etc. become the property of "Radio Workkbench" and will not be returned unless request is made by the sender for the same said items.

OUT THEY GO!!

We've got a bunch of tubes which have been taking up space for quite some time and we wanta get rid of 'em. Maybe you can use some. ALL THE TUBES ARE GUARANTEED and each tube will be checked before we send it out.

Will swap any one or all tubes for just about anything you have in the way of receivers, variable condensers, vernier dials, coil forms, crystals, transformers, coils, chassis bases, cabinets, books, mags., etc.

Make us an offer. State what tubes you want and describe what you've got to swap. If you haven't got something to swap and want to pay cash, make an offer. We won't turn down anything that's reasonable.

One each of the following:

1C5	7E6
1 LA4	7G7
1 LA6	7J7
1 L84	7L7
1 LE3	7R7
1Q5	7V6
2B7	7V7
3F6	7W7
5X4	7X6
5Z4	7Y4
6A8	12J7GT
6AB5	14Q7
6AL5GT	14X7
6AQ7	25Z5
6C5	26
6C8	35Y4
6D6	35/51
6F7	45
6H6	70L6GT
6K7	77
6L6	78
6N6	VR 53
6Q7	VT 83
6S57	FM 1000
7A4	7A6
7A8	7B5
7B6	7C4

Two each:

1T5
3LF4
5W4
6A7
6AC5GT
6K8GT
6SF5
6Y6G
7A5
7AG7
7B4
7F7
7F8
7Q7
12A8GT
12SH7
12SR7
14F8
24A
32L7
35Z3
39/44
46
80
84

Three each:

5AZ4
6F8
7H7
14H7
14R7
1632

Four 7X7 tubes

Twenty-eight 7A7

Also have these misc. items to sell or swap:

1 Drake Soldering iron (pistol grip type) Used. 80 watt.

2 Rear Seat Speakers (4") mounted in grey plastic case with vol. control mounted in center of cabinet.

1 Hudson Auto Radio in excellent condition. Factory No. 6MH889, Model No. ZN 184642. Without speaker.

You pay the shipping cost on all cash purchases. On swap buys we'll pay our shipping cost and you pay shipping cost on items you swap.

Will ship C. O. D. on orders with 25% deposit.

Box 907 **SMITH ELECTRONICS** **Carlsbad, N. M.**

PLEASE READ BEFORE ORDERING.

ORDERING.

This order blank is for your convenience. Not necessary to use it to send in an order. Refer to latest CAT for prices. Prices subject to change without notice. Please use MRL CATalog numbers to distinguish sizes, colors, etc. Please list DP and plan numbers in order. Advise in circle if we may substitute. Please PRINT name and address so it will be delivered promptly. No special kits made up from diagrams; please select your parts you need. Use INDEX of CAT for locating parts. Min. order 1.00.

SERVICE.

In most cases 24 hr. service. Exceptions are Kits and parts not on hand which must be made up. Send orders by Airmail if over 200 miles away. C.O.D.'s are slower and are not shipped on Sat. or Holidays. Goods shipped by Parcel Post. Advise if U want your package insured.

FIGURING POSTAGE.

Obtain Parcel Post rate sheet from local Postmaster. Also our Parcel P. zone No. and write it down on sheet. Send enough postage extra. We refund or credit any excess postage. Mark in circle which you desire. If no preference is given, balance will be credited. We show even 1¢ balance in your or our favor. Our economical packing usually saves any difference in prices elsewhere, although we have a minimum size to prevent loss in the mails. If marked PPd or Postpaid, we pay all shipping charges.

C. O. D. ORDERS.

$1 deposit required on ALL C.O.D. orders. P.O. allows no C.O.D. to Canada, Mexico, Canal Zone, etc. It is cheaper to send cash with order. No C.O.D. mailed from here Sat. or Holidays. No C.O.D. on plans unless accompanied by a parts order.

FOREIGN ORDERS.

Since 1932 we have sold to over 53 countries. No extra charge for packing. Postage from here to Canada and Mexico the same as N.Y. or Chicago. Please send International Money-order, N.Y. Bank draft or U.S.A. cash or stamps. Canadian Postal Notes and stamps not negotiable here. Foreign money will be returned, as discount here is too high. P.O. allows no C. O.D.'s, so please send cash in full.

OUR AIM- FASTER SERVICE.

CHANGE OF ADDRESS.

Our cards are filed by States, etc. so if you moved since last buying from us, please give old address as well as the new one. Thanks. Credits cannot be carried forward unless we find your card.

SENDING MONEY.

For your safety it is best to send a Money-order or Certified check. USA stamps up to 25¢ value accepted at face. Personal checks must clear. Cash may be sent if in a coin envelope or wrapped well. Loose coins can be flipped out thru envelope. SEAL Ur envelope well. Mark 'HAND CANCEL' so coins won't be lost in a cancelling machine. Use heavy envelope. No money; no goods. Count money over B4 sending as we receive many orders short. Likewise, we give credit for over-payment. Write return address in upper left-hand corner or back of envelope, as well as inside.

NO REFUNDS OR EXCHANGES.

Please be sure order is right. No refunds or exchanges unless we make a mistake,as it takes too much time.

CORRESPONDENCE.

Please keep correspondence to a minimum. Send 3¢ stamp for reply, unless sending in an order. Leave a blank space after each question. If U have latest CAT. try to use it for prices instead of writing us. Radio research work is limited. With Radio since 1915, the owner has a large file and library of miscellaneous Radio material at your disposal.

SAVE YOUR CATALOG.

As we have a large file of customers and more new ones every day, the RB supply is limited. If 2 or more MRL Fans live at same address, please try to share your CAT. Thanks. A big percentage of our business has been due to our satisfied customers showing their CAT to others. We are very grateful for this favor.

IF WE CHANGE ADDRESS.

Our ads have run continuously since 1932 in National mechanical mags. If you aren't sure, or forget our address, - look it up in Clas. section as 'Laboratories'in Radio column. If you get away from Radio - write us later. Once a Radio Fan, always one.

WE APPRECIATE YOUR BUSINESS.

ORDER BLANK

MODERN RADIO LABS., 1131 Valota Rd., Redwood City, CALIF., U.S.A.

Ship to (print)

St. or Rt.#

City Zone State

How Many?	Catalog # or Type	Name of Article	Each		Total	

If you previously bought from us while living in another state, give name of state.

Shall we credit balance? ◯ or refund? ◯

May we substitute? Yes ◯ No ◯

No order less than 1.00. Please read other side before ordering. Thanks for order.

Total mdse.	
Postage	
Enclosed	
$1 COD Dep.	

TAPEDCODE

BOX 31 — LANGHORNE, PA.

THE ORIGINAL MAGNETIC RECORDED COURSE IN THE INTERNATIONAL MORSE CODE

If you have failed your Novice, General or Commercial code exam, don't let it bother you. Get TAPEDCODE tapes and be sure next time, absolutely sure.

If you have not as yet learned the code and have a desire, here is the easiest and surest method known. Thre is no code course available today that is as long or has the amount of research and planning behind it a TAPEDCODE. But this is not of near the importance as the fact that TAPEDCODE is a pleasure , not a chore. You just can't miss with such a thorough system.

The Novice course (3 tapes) teaches you the code and then increases your speed to 8 WPM.

Think of it — 4 HOURS OF INSTRUCTION for only $11.00.

What would you pay for a 7 inch and two 5 inch tapes for your tape recorder?

If you now are a Novice or Technician and just can't seem to get up to the requirements of the General (or Commercial Telegraph) license, then get our Advanced course (3 - 5 inch tapes) covering from 9 to 17 WPM, 3 FULL HOURS of instruction for only $10.00.

The Complete course (all 6 above tapes) only $20.00. Or any individual tape available, further information on request.

All tapes are dual track pastic tapes recorded at 3¾ inch speed.

Would you believe that you could learn the code sufficient to pass the Novice exam in a week's time? Depending on your own enthusiasm and desire, this is not only possible, but probable.

Our purpose is to put into your hands the best and most modern method of code instruction known at the lowest possible cost. Try us, you'll never regret it.