THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

Edited by
O GERNSBACK

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See Page 16

1933

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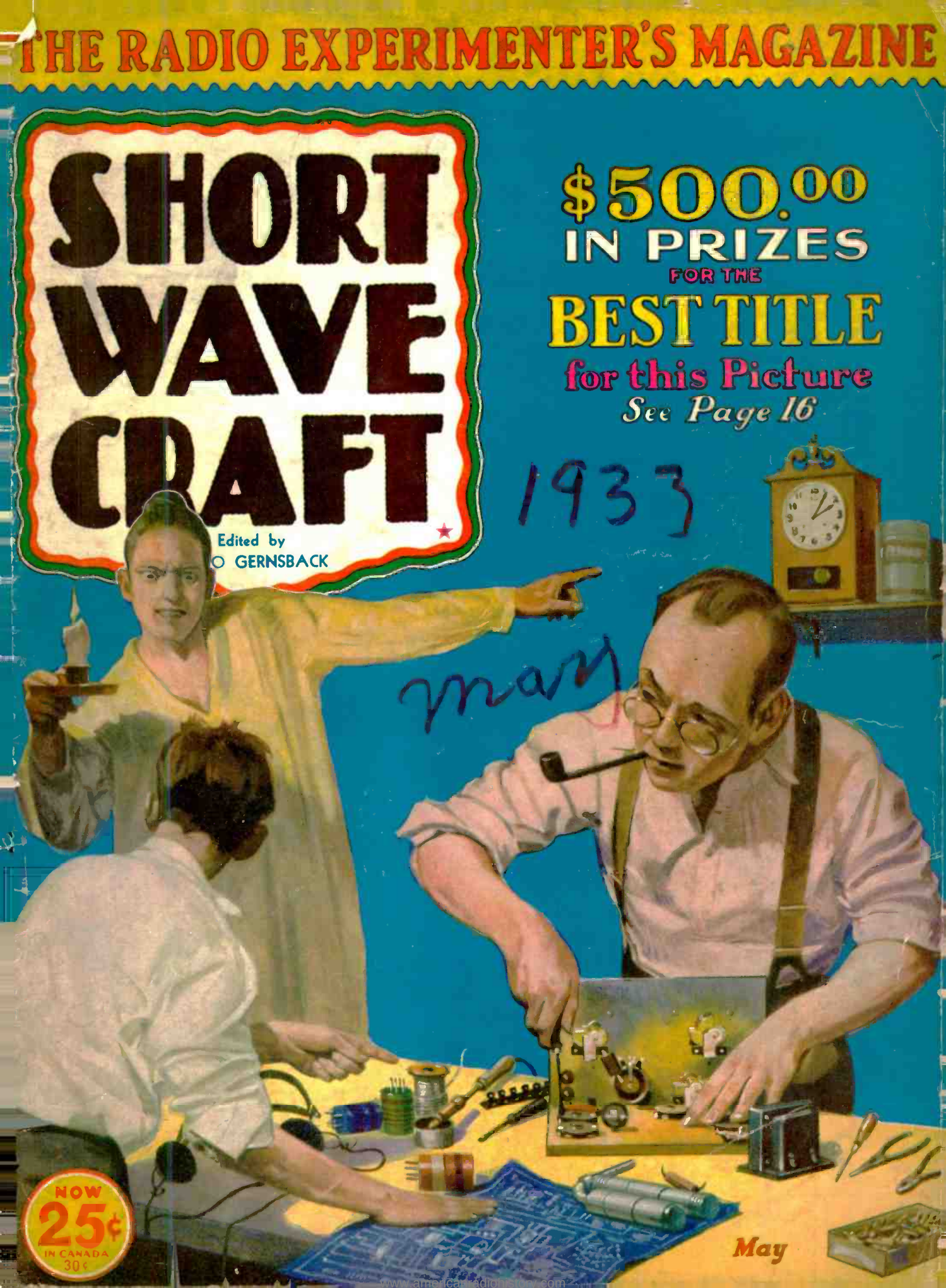

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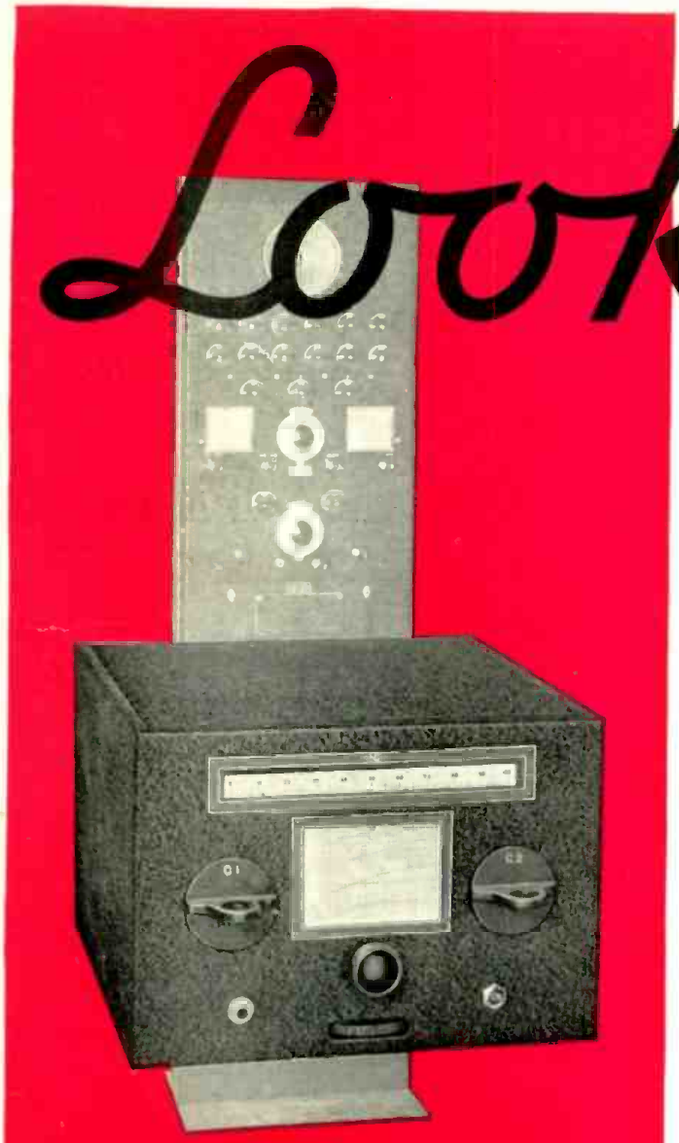

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We are confident of your approval

This new 7-tube short-wave super-heterodyne, designed originally for amateur phone reception, with professional design details, offers the short-wave broadcast listener and the experimenter exceptional distance, selectivity, stability and tone quality in the reception of short-wave broadcasts. From such a receiver, National-built, one expects remarkable performance, and gets it. With its strictly single control tuning, front-of-panel coil changing, full vision dial and single-hand control of tuning and volume, the National FB-7 gives you a simplicity and convenience of operation heretofore not available at such a reasonable price.

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THE CIRCUIT . . . 7 tubes: one 57, two 24's, two 58's, one 56, and one 59 . . . Electron Coupled Oscillators . . . Separate Oscillator for CW beat frequency giving "semi-single signal" or "offset" tuning . . . High efficiency Litz wound IF Transformers . . . Class A Power Pentode Output . . . R-39 Coil Forms with grounded metal shield handles . . . Band Spread Coils available for 20, 40, 80 and 160 meter amateur bands, each covering 100 full dial divisions . . . Standard coils for continuous coverage from 20 MC to 1500 KC . . . No frequency drift . . . Double Shielding . . . May be used with either conventional antenna or "doublet" with transposed transmission-line lead-in.

THE CHASSIS . . . Single Control Tuning. (No trimmers) . . . Full Vision Dial with SFL 270° condenser . . . Front-of-panel coil changing, without disturbing shielding . . . CW Beat Oscillator Switch on panel . . . Front-of-Panel Switch for "cutting" B voltages during transmission . . . Phone Jack, connecting ahead of final audio stage . . . Calibrated Volume control located under tuning knob, for one-hand operation—gain control calibrated in R units . . . All fixed adjustments, such as I.F. peaking, accessible from top without removal of chassis from cabinet.

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Both the circuit and the chassis layout have been designed for ready addition of mechanical filter (quartz crystal) when desired for full "single signal" operation.

MADE FOR AC POWER-SUPPLY

The FB-7 is designed to be operated by filament transformer and B-batteries, or the National 5887 or 5880 Short-Wave Power Units. Where the maximum undistorted power output is desired for short-wave broadcast reception, the National 5897 is recommended, which furnishes voltages sufficient to drive the type 59 power output pentode at full rating. R. C. A. Licensed.

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Free particulars and prices on the new NATIONAL FB-7 will be sent you on receipt of 6c in stamps to cover mailing costs.

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In about ten years the Radio Industry has grown from $2,000,000 to hundreds of millions of dollars. Over 300,000 jobs have been created by this growth, and thousands more will be created by its continued development. Many men and young men with the right training—the kind of training I give you in the N. R. I. course—have stepped into Radio at two and three times their former salaries.

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Broadcasting stations use engineers, operators, station managers and pay up to $5,000 a year. Manufacturers continually employ testers, inspectors, foremen, engineers, service men, buyers, for jobs paying up to $6,000 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. Dealers and jobbers employ service men, salesmen, buyers, managers, and pay up to $100 a week. My book tells you about these and many other kinds of interesting Radio jobs.

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The day you enroll with me I send you instructions which you should master quickly for doing 28 jobs common in most every neighborhood, for spare-time money. Throughout your course I send you information on servicing popular makes of sets. I give you the plans and ideas that have made $200 to $1,000 a year for N. R. I. men in their spare time. My course is famous as the course that pays for itself.

Talking Movies, Television, Short Wave Money-Back Agreement Included

Special training in Talking Movies, Television, and Home Television experiments. Short Wave Radio. Radio's use in Aviation. Servicing and Merchandising Sets. Broadcasting, Commercial and Ship Stations are included. I am so sure that N. R. I. can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lesson and Instruction Service upon completion.

64-page Book of Information FREE

Get your copy today. It's free to all residents of the United States and Canada over 15 years old. It tells you where Radio's good jobs are, what they pay, tells you about my course, what others who have taken it are doing and making. Find out what Radio offers you without the slightest obligation. ACT NOW!

J. E. SMITH, President
National Radio Institute, Dept. 3EB3
Washington, D. C.

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Dear Mr. Smith: I want to take advantage of your Special Offer. Send me your manual "Trouble Shooting in D.C., A.C. and Battery Sets" and your book "Rich Rewards in Radio." I understand this request does not obligate me.

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M

The Famous Course That Pays For Itself

IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Hertzberg • Denton • Worcester • Appelman • Tanner • Doerle • Palmer

HUGO GERNSBACK
Editor

SHORT WAVE CRAFT

H. WINFIELD SECOR
Managing Editor

CONTENTS FOR MAY, 1933

FEATURES IN NEXT ISSUE

A 3-Tube Band-Spread "Loud Speaker" Set, by George W. Shuart, W2AMN-W2CBC.
A "TNT" Transmitter for 160 Meters, by Hal Sullivan, W1AAD.
A "Hum-less" Power Supply, by Jess M. Reed.
The Ideal "COMPOSITE" Receiver, by Clifford E. Denton.
A Plate Supply Unit Built Around the New 25Z5 Tube.
The Super-Wasp Becomes a "Super-het," by William J. Vette.
How to Make a "Bug" Speed Key.
The 3-Tube "OSCILLODYNE"—With a Stage of R. F., by J. A. Worcester, Jr.

Contents for MAY—Continued

OUR COVER

This month's cover is a "human interest" idea caught in fine spirit by our artist, Mr. Howard V. Brown. $500.00 in prizes are offered for the best title for this month's cover. See page..... 16

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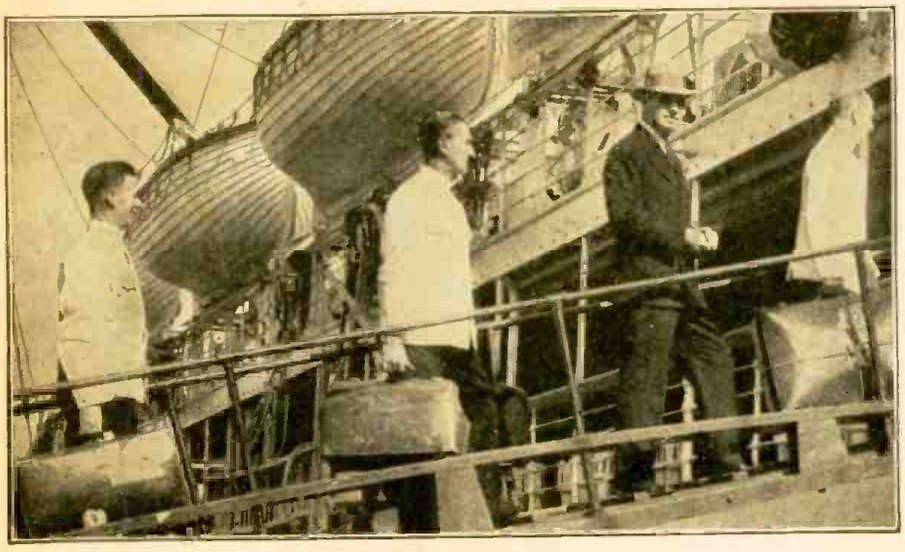
SCOTT TAKES 20,000-MILE CRUISE TO GIVE RADIO ANOTHER HARD TEST



E. H. Scott, designer and builder of the famous Radio Receiver bearing his name, boards the SS. Maunganui to start 20,000-mile cruise.

Research To Prove Perfection Of Scott All-Wave Deluxe

E. H. Scott, whose genius created the marvelous SCOTT ALL-WAVE DE-LUXE RADIO, sailed recently on an adventurous 20,000-mile voyage to give his receiver still *another* series of gruelling reception tests.

Thousands of miles from any land the SS. Maunganui plows her way down the trackless Pacific enroute to New Zealand. Her passengers are gay as they gather in the luxurious Grand Salon each evening. They enjoy an excellent dance orchestra's rhythms. The tunes come from a loud-speaker that reproduces the music of orchestras six or seven thousand miles away, back in "the States."

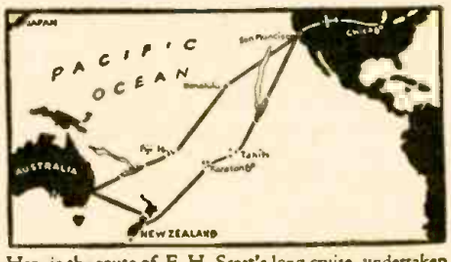
E. H. SCOTT

To E. H. Scott, and the world's-record-shattering receiver which he designed and builds, must go all the credit for this exceptional feat. But bringing music, daily news flashes and other radio treats to the Maunganui's company is but a small part of the thorough research Mr. Scott is carrying on during his cruise to test his receiver. From his experimentation with the Scott All-Wave Deluxe, which is his most important piece of baggage, will come new inspiration and still further justification of the consistent world-wide reception guarantee under which this radio known as "The World's Finest Receiver" is sold.

The radio-wise will watch with interest for final reports of Mr. Scott's research. They confidently expect news of the breaking of still more reception records as one outgrowth of this long trek.

WORLD-WIDE RECEPTION GUARANTEE BASED ON CONSISTENT PERFORMANCE

Backing the Scott All-Wave Deluxe Radio with a positive guarantee of consistent world-wide reception, with loud speaker volume, of foreign stations 10,000 miles or more distant, was not justified by scientific laboratory tests alone. Rather such tests, under actual owner-operated conditions, as the reception in Chicago of every program broadcast from VK2ME and VK3ME in Australia (9,500 miles distant) throughout an entire year's time, were considered more conclusive. Likewise were the more than 19,000 verified foreign reception logs submitted by Scott owners within a six months' period contributory to the maker's decision to back his receiver with such a startling warranty. On his present 20,000-mile experimental cruise Mr. Scott will cover many localities where radio reception is extremely difficult. He is wholly confident that even in these so-called "dead spots" his set will function perfectly for him as it is doing for many owners in places where radio reception was always before considered impossible.



Here is the route of E. H. Scott's long cruise, undertaken to test reception under most difficult conditions.

WORLD-TRAVELING RECEIVER

This Scott All-Wave Deluxe Radio which Mr. Scott is using on his research trip is an exact duplicate of the custom-built sets sold to discriminating buyers. It receives broadcasts on all wave lengths between 15 and 550 meters. Of true one-dial type, it uses no trimmers or auxiliary tuning dials, and has no plug-in or tapped coils or other old-fashioned wave band-changing devices. It is equipped with automatic volume control, visual tuning, static reducer, and every new scientific betterment of proved value. Despite its tremendous distance range, high selectivity, absolutely natural tone, and general excellence, it is sold at a remarkably moderate price.

ENTHUSIASTIC OWNERS CONTINUE TO LAUD PERFORMANCE OF ALL-WAVE DELUXE

Letters expressing perfect satisfaction with the marvelous Scott All-Wave Deluxe Radio pour into the Scott Laboratories daily. Here are excerpts from a few recent ones: "Most sensitive radio I have ever seen," SGP, Ala. . . . "Nothing finer in tone—in fact, perfect in every way," FW, Calif. . . . "Stations all the way from Berlin to Tokio and Australia," . . . JBT, Conn. . . : "Foreign reception every day. France best—Rome, England, Germany and Spain come in very good," RPH, Conn. . . . "Tone cannot be improved—it is already perfect," GL, N. Y. . . . "Australia with the volume of a local station," Dr. HPC, N. Y. . . . "Amazed at results—would not take $500 in exchange for it," JLH, Pa. If *you* would like such a set—the ultimate in radio ability—why not send NOW for all details regarding it?

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E. H. Scott Radio Laboratories, Inc.
4450 Ravenswood Ave., Dept. SWC-53. Chicago. Ill.

Send me all details regarding the SCOTT ALL-WAVE DELUXE RADIO, including technical data, performance proofs and prices. This is not to obligate me.

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Television is already here! Soon there'll be a demand for THOUSANDS of TELEVISION EXPERTS! The man who learns Television **now** can have a great future in this great new field. Get in on the **ground-floor** of this amazing new Radio development! Come to COYNE and learn Television on the very latest, newest Television equipment. Talking Picture and Public Address Systems offer opportunities to the Trained Radio Man. Here is a great new Radio field just beginning to grow! Prepare NOW for these wonderful opportunities! Learn Radio Sound Work at Coyne on actual **Talking Picture** and **Sound Reproduction** equipment.

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The right way to learn Radio is the **Coyne** way—not by books, but by actual, practical work on actual Radio, Television and Sound equipment. Here at Coyne you'll service and operate scores of modern Radio receivers, huge Broadcasting equipment, late type Television apparatus, Talking Picture machines, Code transmitters and receivers, etc. In 10 weeks you can step into a REAL JOB, leading to a salary of $50 a week and UP!

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

What Short-Wave Set Shall I Get?

An Editorial by HUGO GERNSBACK

● SINCE short waves entered upon their present activities we have been flooded with inquiries from readers who wish advice as to what sort of set they should buy. I am in receipt of literally thousands of letters from people asking my advice on purchasing this or that set.

This obviously is a difficult thing for me to do, as in practically all cases the writers give little information as to what sort of set they really want or how much they can afford to pay for it.

The remarks I am about to make, therefore, are naturally of a general nature, and each prospective purchaser may draw his own conclusions within his own limits, as to price and the service to be rendered.

There are all sorts of short-wave sets which may be purchased from manufacturers or otherwise made by the enthusiast himself. Some people may not wish to buy the best manufactured short-wave set, while others are not able to or do not care to build their own.

Then, too, the cost is usually the one important item that inquirers, as a rule, leave out entirely. You can build a short-wave set from $3.00 upwards to $5,000 or more, should you wish to do the work yourself. You can buy excellent short-wave sets from $6.00 upwards to $1,000 in the manufactured class. From this, it will be seen that the matter of cost should be the first consideration, because that gives you your starting point.

Before going further, I might as well discuss *adapters* and *converters*. While these were considered satisfactory at one time, they are no longer rated 100%. For the man who wishes only occasional short-wave reception, and is not too critical as to what stations can be tuned in, the *converter* or *adapter* is satisfactory. However, it is not as good as a *straight* short-wave set.

If you wish to build your own set, again the matter of cost is the most important. You have your choice of combinations from one tube to ten tubes or more—all depending on what you are after.

A *one-tube* set, with few exceptions, requires headphones for reception purposes. While we have described some sets that operate loudspeakers on one tube, such results are exceptional. Even two-tube sets, as a general rule, require head receivers. While in ideal locations and under unusual conditions, the usual *straight* type, two-tube set may bring in a few stations on the loudspeaker, this is not *normal* loudspeaker reception. An article in this issue describes a two-tube set which actually gives *loudspeaker* reception, but this again is an exception. As a rule, it takes a four-tube set to give fair loudspeaker reception. If, therefore, you want *headphone* reception, you will choose a set with one or two tubes. If you want good *loudspeaker* reception, you will want a set with at least four tubes.

Now we come to the matter of *noise*. As yet, short wave reception has not been perfected to the point where all extraneous noises are eliminated. Apartment house elevators, light switches, vacuum cleaners, even automobiles passing nearby, give rise to *noise*. As a general thing, the more tubes there are in the set, the worse the noise becomes. Thus, with a two-tube set, you will not be bothered nearly as much as with four-tube sets and over. Remember, this is a general remark. If you use one of the new type *transposition* lead-ins, or even a twisted lamp cord as a lead-in, a good deal of noise is sometimes suppressed—enough, as a matter of fact, to make reception enjoyable.

Again, speaking generally, the novice frequently starts with a two-tube set and after he becomes used to short-wave reception he gets more ambitious and he builds himself a more powerful set, or, what happens more frequently, he is in the market for a first-class manufactured set.

Here again there is a split in classification, because in the manufactured class we have the *straight* short-wave sets, tuning as a rule from 10 meters up to 200, and also the *short-wave and broadcast* combination sets, which tune from 10 to 200 meters on *short-waves* and also from 200 to 545 meters for *broadcast* reception. In the latter instance, the modern sets are usually made without plug-in coils and the wave-changing is accomplished by means of a single, convenient rotary switch.

If you are out for *short-waves* you will want only a *straight* short-wave receiver, of which there are many now available on the market.

While most short-wave enthusiasts will have nothing to do with *broadcast* reception, it very often, to preserve family harmony, becomes necessary to have a set which covers the broadcast wavelengths. Usually, these sets are quite elaborate. There are a number of very excellent sets of this kind on the market in this country, far surpassing similar sets made anywhere else. These "universal" all-wave sets are not only excellent on the short-waves, but being of the superheterodyne variety, are also superlative for broadcast reception.

Another question that is asked frequently is—Are battery sets superior to A.C.-operated sets?

Truthfully speaking, battery sets are somewhat less noisy than A.C.-operated sets, but in multi-tube receivers this difference is not very evident. While a two-tube battery set may be a good deal less noisy than a two-tube A.C. set, it should be noted that a good deal of noise also comes from the tubes themselves. The more tubes you have, the more noise there is; consequently, a ten-tube battery set may be almost as noisy as a ten-tube A.C.-operated set.

Tube noises, while they may not be very objectionable except in exceptional instances, are still to be conquered by our engineers and so far not a good deal of headway has been made. From this, it will be seen that there is not much choice between battery sets and A.C. sets unless, of course, the noise coming in over the line is extraordinary. Such conditions may arise from vacuum cleaners in the house, x-ray machinery, etc., but even such noises can be suppressed to a great extent by filters.

The answer, therefore, to the perennial question, "What radio set shall I buy?" depends largely upon yourself, your tastes and the size of your pocketbook.

SHORT-WAVE CRAFT IS PUBLISHED ON THE 15th OF EVERY MONTH

This is the May, 1933, Issue - Vol. IV, No. 1. The Next Issue Comes Out May 15th

Editorial and Advertising Offices - 96-98 *Park Place, New York City*

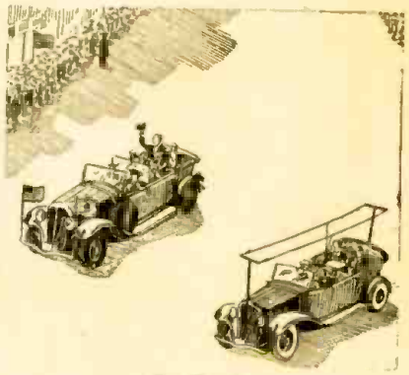
C. B. S. Uses Short Waves In Inaugural Broadcast

Short wave transmitters mounted in an automobile and also on a blimp aided the national broadcast of the inaugural proceedings.

Robert Trout of station WJSV, recently designated as the official announcer to President Roosevelt for the C. B. S. All broadcasts by the President over the C. B. S. network hereafter will be introduced by Mr. Trout.

C. B. S. engineers on the roof of the Willard Hotel, Washington, D. C. In foreground Mr. Bowman, Technical Director of WJSV, tuning short-wave receiver. At the "mike," Robert Trout. "Auto" waves were picked up here.

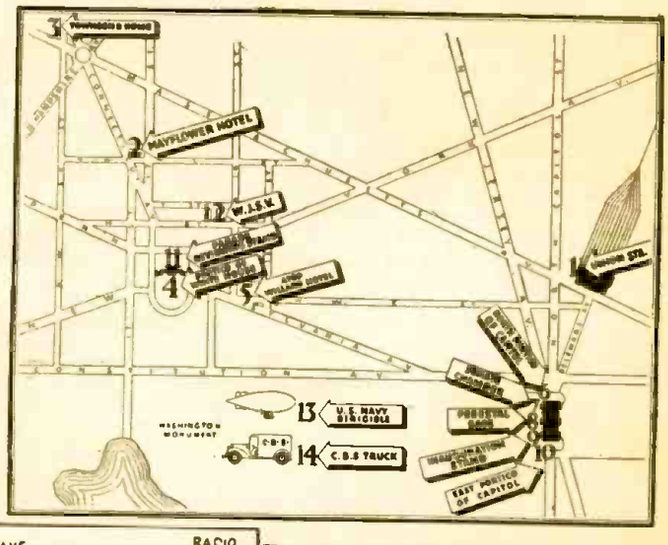
Below—We see how valuable short waves were to the broadcast system engineers. A portable short wave transmitter was mounted in a car which followed the President in the inaugural parade.



● AN ARRAY of broadcasting talent and equipment greater than any ever assembled for a single event was brought into play by the Columbia Broadcasting System when it covered the inauguration of Franklin D. Roosevelt as President of the United States in Washington on March 4.

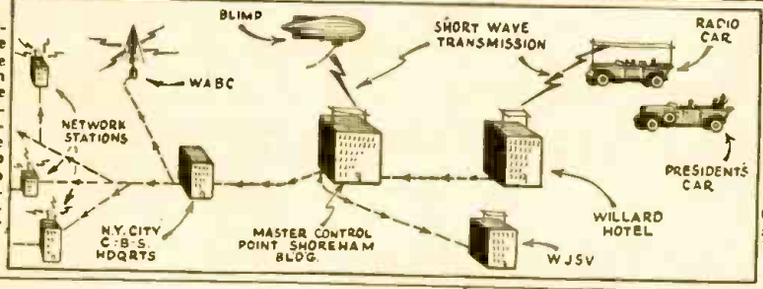
Herbert B. Glover, Director of News Broadcasting for the Columbia network, drew up plans for the broadcasting of the event to report the activities of Mr. Roosevelt at every point of importance from the Capitol, at one end of famous Pennsylvania Avenue, to the White House on the other. From the air, the ground and from subterranean passages in the musty recesses of the Capitol proper, Columbia provided descriptions to a background of martial music. In addition, the nation's listeners heard a "dress rehearsal" of the actual broadcast from 9:00 to 10:00 A.M., EST, when the entire Columbia staff went on the air with an outline of what was to happen later in the day. The day was climaxed by a rapid-fire description of the gigantic parade from more than a dozen points along the line of march and a colorful description of the time-honored Inaugural Ball.

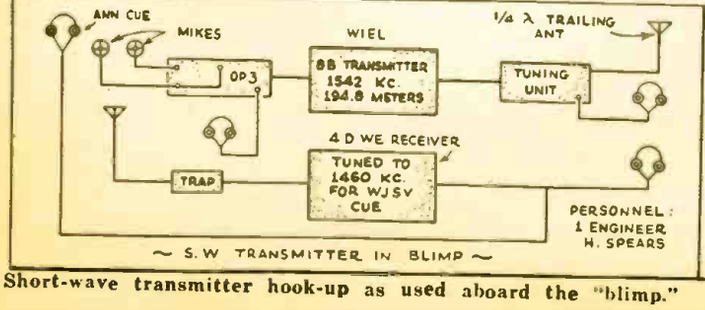
The announcing staff was headed by Ted Husing, who was in charge of that assignment during the Chicago Conventions. The engineering performance was under the supervision of Edwin K. Cohan, Columbia's Director of Technical Operations, and A. B. Chamberlain, Chief Engineer of CBS, with L. H. Bowman, *(Continued on page 57)*



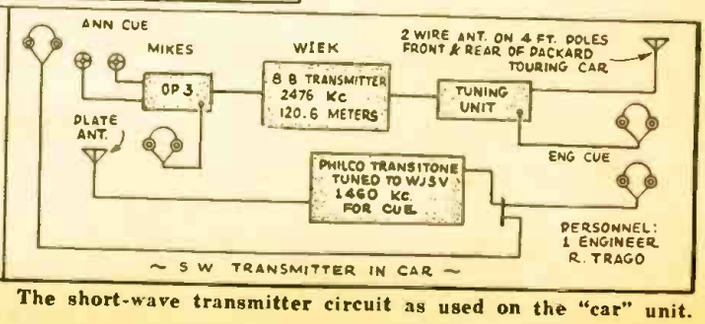
How the Columbia network reported the reception of the incoming Chief Executive from fourteen points of observation in the Capital. Map above shows points at which announcers were stationed from time to time. The announcers and their stations follow: No. 1, Ted Husing; No. 2, Husing and Don Ball; No. 3, Don Ball; No. 4, Edwin C. Hill; No. 5, Announcer Church; No. 6, Announcer Slater; No. 7, Frederic William Wile; No. 8, Husing; No. 9, Church; No. 10, Slater; No. 11, Husing, and No. 12, H. V. Kaltenborn. In the Navy blimp and CBS truck were Announcers Mayo and Trout, respectively.

Diagram at right indicates how the remarkable national broadcast of the presidential inauguration proceedings and parade on March 4th were handled by the C. B. S. engineers. The short wave transmitters on the blimp and in the auto helped to give a complete word picture to the waiting millions sitting before their loud speakers.



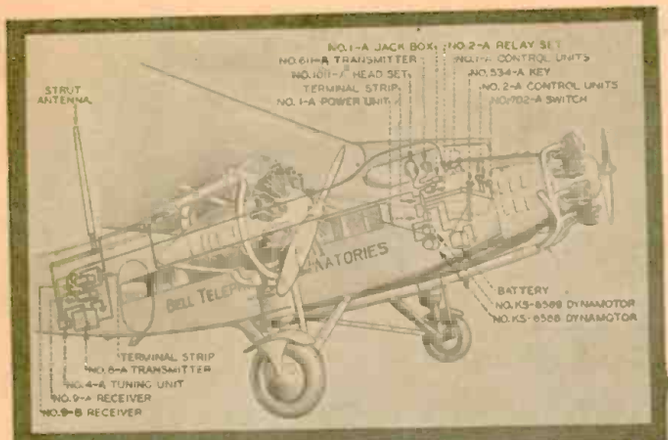


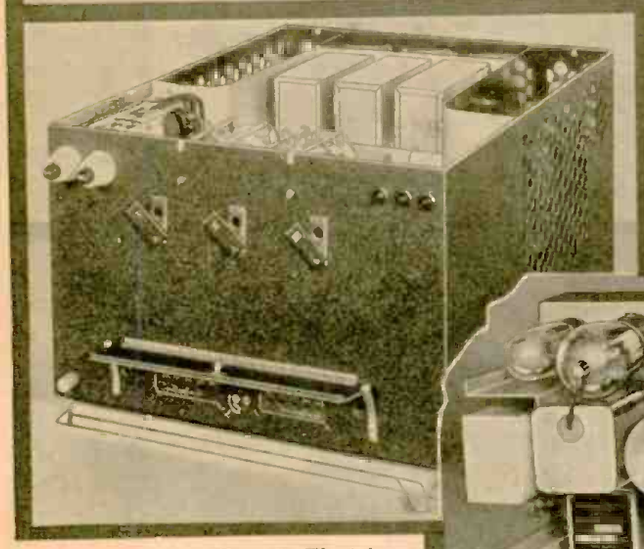
Short-wave transmitter hook-up as used aboard the "blimp."

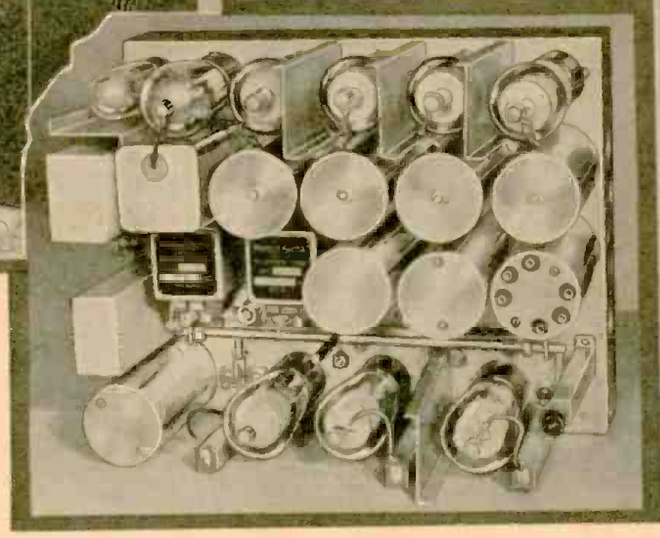


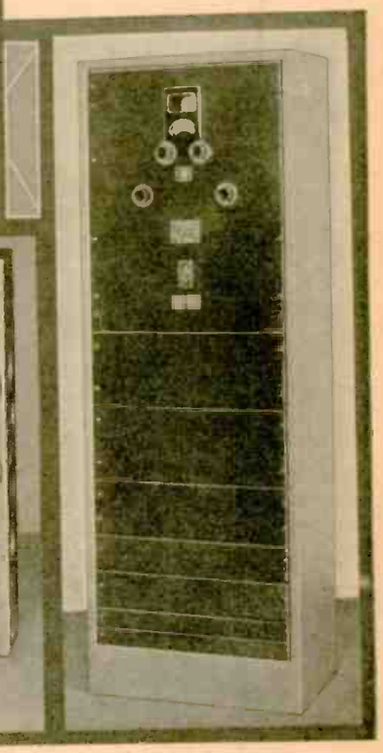
The short-wave transmitter circuit as used on the "car" unit.

SHORT WAVE SETS THAT FLY!









Top diagram—how Western Electric radio equipment is installed on the airplane.

The apparatus shown immediately above is the new W. E. Co., short-wave phone transmitter; stability is maintained by quartz crystals.

Right—new W. E. Co., high-frequency superhet aircraft receiver; showing quartz crystal holders for stabilizing frequencies.

Left—receiver and transmitter controls placed near pilot. Below—newest S-W superhet receiver for aviation "ground" stations.

● THE accompanying photos show the very latest style short-wave radiophone equipment rapidly being installed in many of the planes carrying passengers all over the country today. By means of the highly improved short-wave transmitters and receivers developed by the Western Electric Company's engineers and here illustrated, reliable communication between the pilots of a passenger-carrying plane and the ground stations is assured. Sudden storms can be reported to the pilots ahead of time, so that they can "ground" the plane, if necessary, without taking undue chances with their human cargo. The latest type short-wave superheterodyne receiver designed for installation on aircraft as here illustrated, utilizes carefully ground quartz crystals for stabilizing the frequency. As the lower center photo of the superhet receiver shows, suitable wave-changing mechanism is provided. The proper design of aircraft radio equipment calls for the highest engineering skill as, not only must the sets be ultra-efficient, owing to the unusual operating conditions, but they must also be as strong and rugged as possible to stand vibration. The frequency to which the receiver or transmitter on the plane is tuned can be instantly changed at the will of the pilot, by simply turning a dial, these tuning controls being connected with apparatus by flexible metal shafts.

"Short Waves In England"

By L. H. THOMAS (G6QB), A.M.I.R.E.

● NOW that short-wave work is becoming so truly international, much may be learned from a magazine with a world-wide circulation like SHORT-WAVE CRAFT regarding the conditions under which our fellow-hams and fellow-listeners work.

The English "ham" knows a good deal about his brothers in the States; but they often seem curiously ignorant about the Europeans, and that is the main reason for this little story.

Dealing first of all with the ordinary short-wave listener, we in England are the first to admit that we are very well placed. At hardly any time of the year do conditions become so bad that we cannot hear a goodly selection of "real" DX broadcast. When the Americans are poor we can usually turn our attention to Sydney, Nairobi, Rabat, Moscow (if we ever want to!) and, until their recent close-down, we had our friends at Bandoeng keeping us interested.

The Composite Set

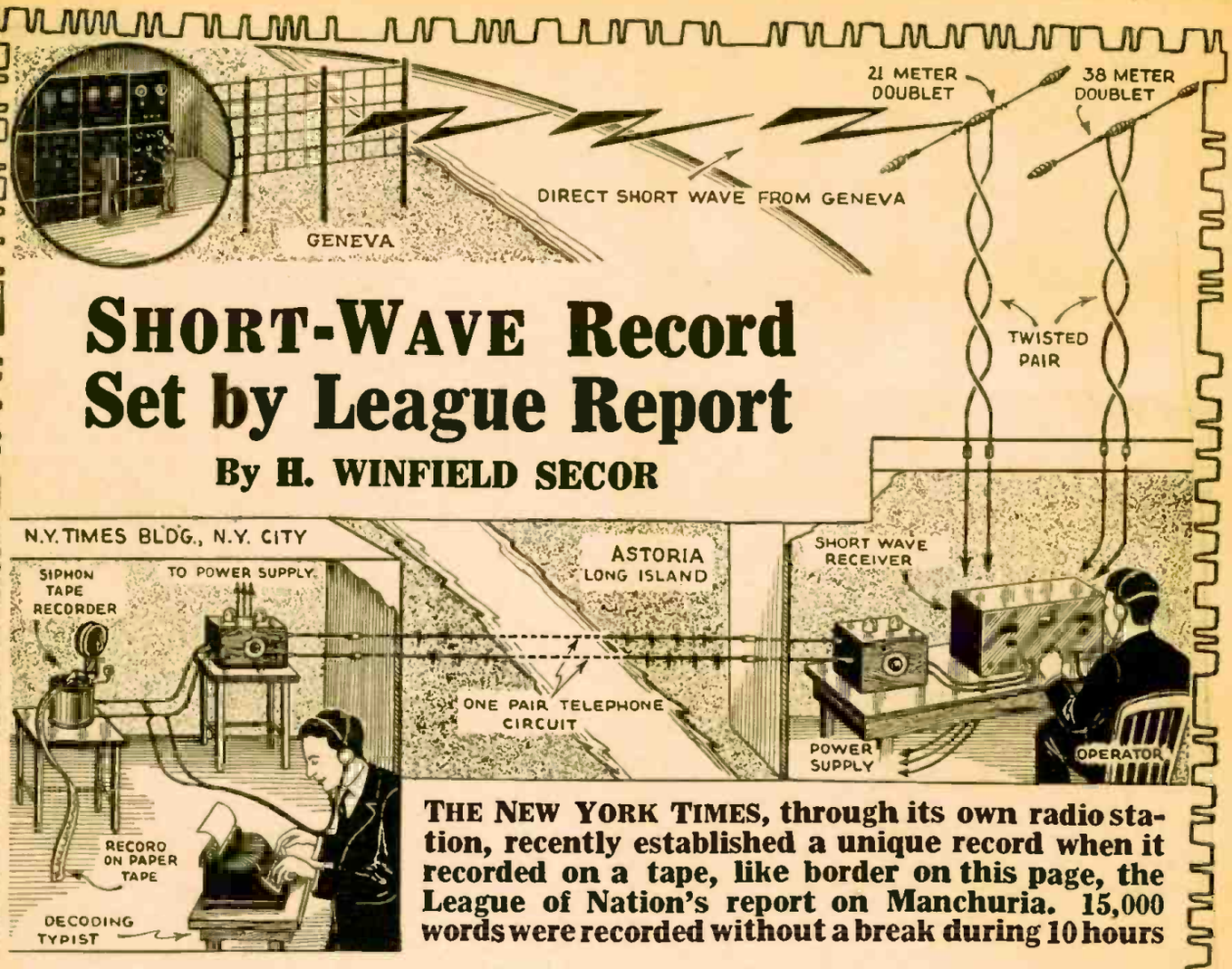
The features of which were voted on by our readers some time ago, will appear next month. A little more laboratory work had to be done on it, preventing its publication in this issue. Watch for this Receiver—"It's got everything"!—The Editors.

W2XAD has the "Punch"!

G. M. T. is, of course, five hours ahead of E.S.T. This fact accounts for the burning of many "midnight watts" over here, for, although W2XAD is generally an excellent transmission by 9 p. m. or earlier, we have to wait until nearly midnight before we can enjoy much in the way of "program value" from the 49-meter stations, or even from W2XAF and W1XAZ.

It is only fair to "XAD" to state here and now that he is the "star" station for sheer *strength*. For consistency the 49-meter fellows have it all their own way, but they rarely

(Continued on page 44)



SHORT-WAVE Record Set by League Report

By H. WINFIELD SECOR

THE NEW YORK TIMES, through its own radio station, recently established a unique record when it recorded on a tape, like border on this page, the League of Nation's report on Manchuria. 15,000 words were recorded without a break during 10 hours

● Radio operators of THE NEW YORK TIMES, who have established many records in long-distance reception of news, broke one of their records of another kind on February 18th, 1933, by copying 15,000 words of the Manchurian report of the League of Nations' Committee of Nineteen.

The report was broadcast to the world by short-wave wireless from Geneva, Switzerland. It was the longest message in time duration, as well as in words, ever intercepted by THE TIMES radio men.

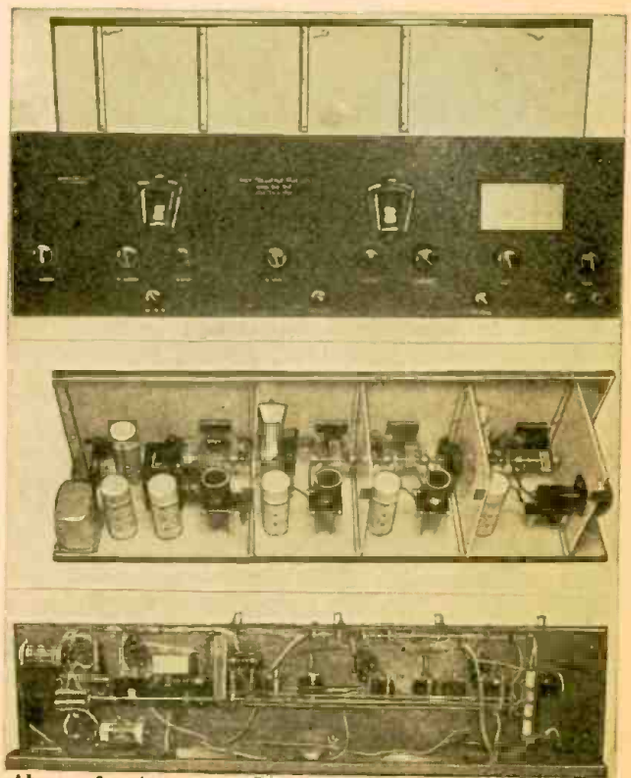
Transmission began at 9:00 a. m., New York time, and at 7:22 p. m. all the words had arrived through the air from Switzerland. The wave used for transmission to the United States was 20.64 meters, while another transmitter operating on the 38.47 meter channel projected the waves into the Far East. The former wave is suited for transmission through daylight. The latter channel gives the best results at night.

Soon after night surrounded the Alps and the shadow of darkness swept westward, the 20.64 meter waves began to weaken in New York. So the operators here at 2:45 o'clock in the afternoon switched to the 38.47 meter channel and the strong signal was restored.

The words were automatically transmitted in Continental code. The signal was exceptionally loud when it flashed across New York.

The operators took every precaution not to miss any part of the fleeting sentences. To guard against any ill effects from absorption by the sky-scrapers in the Times Square district, a special doublet antenna was erected on a roof in Astoria, L. I., a few miles away. There the signal was plucked from space, amplified and relayed over a

(Continued on page 46)

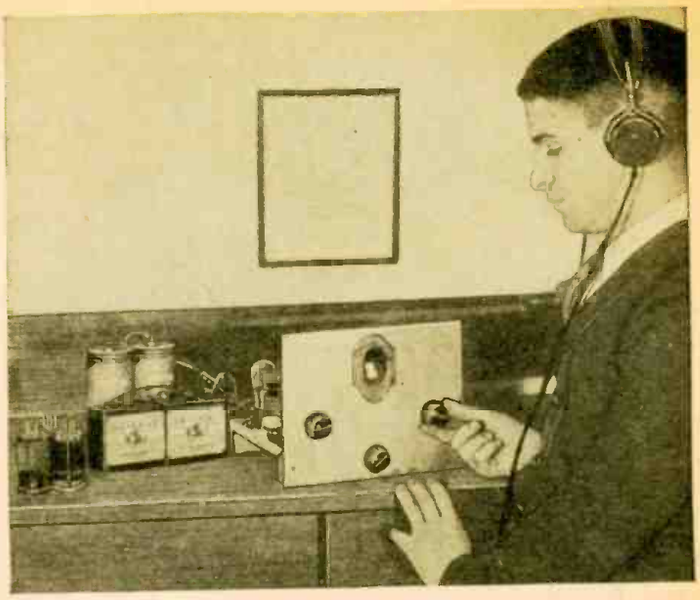


Above—front, rear, and bottom views of the "New York Times" specially built short-wave receiver, which employs four tuned R. F. circuits, with all stages shielded.

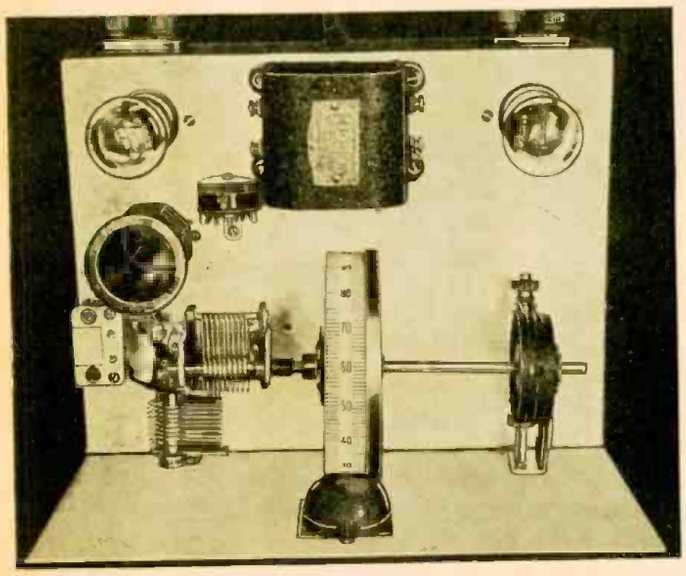
THE "BEGINNER'S TWIN"

By ROBERT HERTZBERG

A Simple, Reliable, 2-Tube Receiver for the newcomer to the Short Waves: Easy to Build and Economical to Operate: Gets "Foreign" Stations easily



The author running an actual listening test on the "Beginner's Twin." This photo shows the entire outfit, complete with accessories.



Inside view of a completed "Beginner's Twin." The parts have been placed so as to make the connections short and direct. The tuning condenser is controlled by the vernier dial; the regeneration condenser is directly in front of it. The plug-in coil and detector socket are at the left. The R.F. choke, the A.F. transformer and the amplifier tube are along the back; a neat and simple layout.

● Their interest aroused by numerous published reports of direct foreign reception on the short waves, many former radio experimenters and constructors, and new "fans" as well, are window shopping, studying the radio catalogs and asking many questions about suitable receiving sets. While there are several very fine short-wave receivers of advanced design on the market, they are for the most part a little too complicated and expensive for the casually interested persons who want to investigate the mysteries and delights of the short wave channels but do not care to make an initial investment of any considerable size.

To meet the requirements of these people, whose number is evidently very large, the "Beginner's Twin," illustrated in these columns, was designed. This is a two tube, dry battery operated receiver of exceedingly simple and reliable construction, using the minimum number of parts consistent with satisfactory results. It can be assembled and wired in a couple of evenings by anyone capable of using a screwdriver, pliers and soldering iron. It may also be obtained in ready-to-work form.

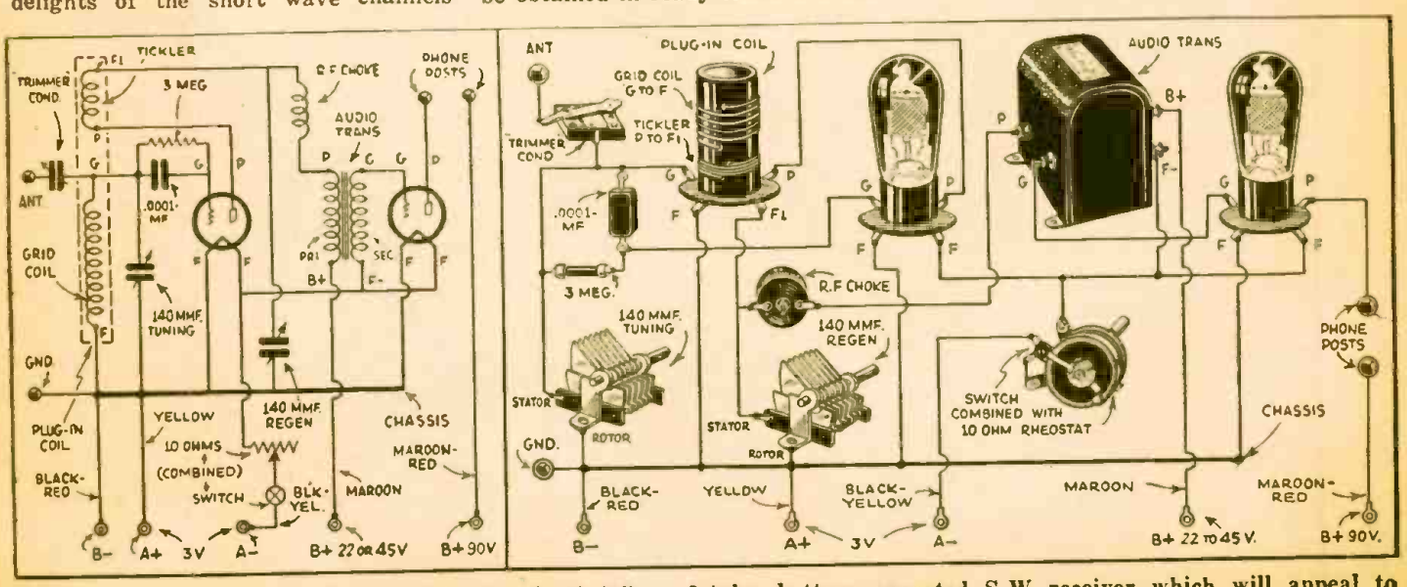
The entire active short wave tuning range from 15 to 200 meters, taking in broadcasting, commercial radiophone, aircraft, ship, amateur and police stations, is covered by a set of four plug-in coils, only one of which is used at a time. Plug-in coils are not nearly as much of a nuisance as most people think; in fact, experienced short wave fans prefer them to any other method of wave changing, and the best sets, whose prices run well into three figures, still use them.

2 Tubes of the 30 Type Used

The two tubes are of the 30 type. Their very low current requirements (only an eighth of an ampere total) make the use of ordinary No. 4 or 6 dry cells entirely satisfactory as the source of filament current. Two small 45-volt "B" batteries are adequate for plate voltage and will last many months. The set will even work very nicely, with slightly reduced volume, on a single 45-volt block.

No apology is offered to more knowing radio men for the use of type 30 tubes instead of 32 or 34 screen grid

(Continued on page 63)



At left: Wiring diagram for the "Beginner's Twin"—a 2-tube, battery operated S-W receiver which will appeal to everyone just starting in the short wave game. Physical diagram is given at the right.

NEW!··Both ENDS of Can Now be Heard

"DUAL WAVE"

By C. E. DENTON

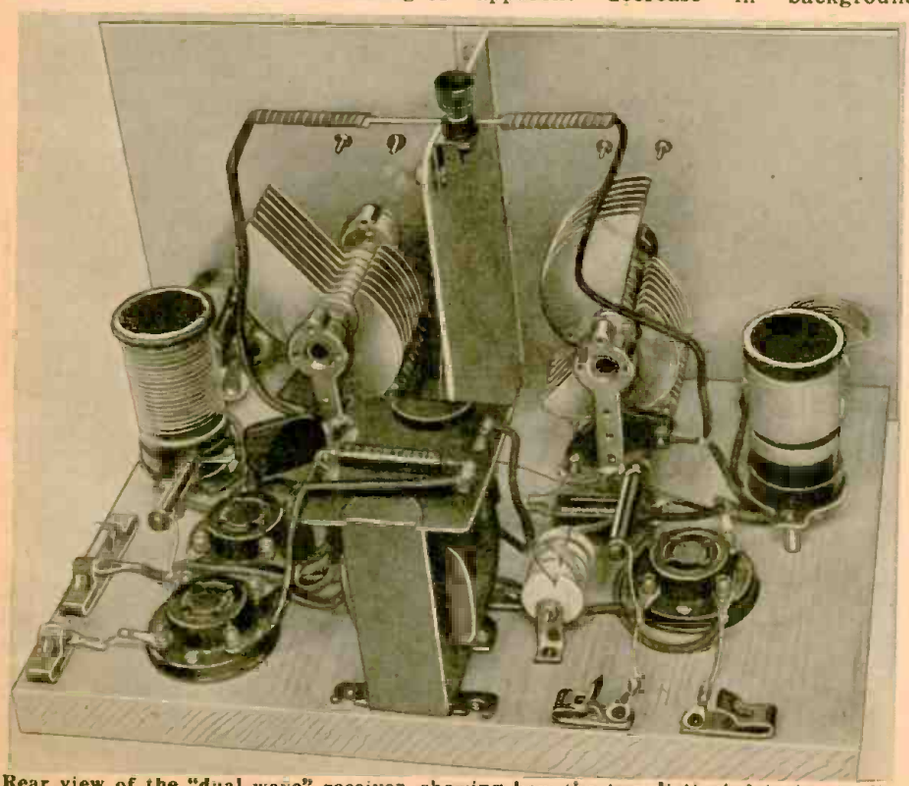
This young lady is enjoying the unusual experience of hearing "both ends" of a short-wave radiophone conversation, with but one receiver and one pair of phones and without "retuning."

● How many times have you listened in on one end of a radio conversation and wished that you could hear what the other fellow had to say? Here is a receiver or—rather two receivers in one—that is the answer to the above question.

While the idea of "two receivers in one" has been written about before, little has been done to develop a simple circuit that can be built reasonably that will do the trick.

Two-way listening-in is a fact with a receiver of the kind here pictured and adds a new "kick" to short-wave reception. In fact, reception from two stations transmitting the same program on two different frequencies sometimes proved more satisfactory than the signal received from only one of the transmitters and received on one receiver. The most marked improvement was noticed in the minimizing of fading, and, strangely enough, in the apparent decrease in background noises. One would think that the background of two receivers would be greater than that of one receiver, but in many instances this is not the case.

● You can now listen to both ends of a phone or code conversation—thanks to the "dual channel" receiver here illustrated and described. In a very interesting test made on the finished receiver by Mr. Denton, who directed its construction, another remarkable stunt was accomplished—that of eliminating the phenomena of fading on trans-Atlantic signals. This effect was accomplished by tuning to two different frequencies which were being broadcast simultaneously at Daventry, England. When fading occurred on one frequency the opposite was the case with the other, and a "mean average" steady strength of signal resulted.



Rear view of the "dual wave" receiver, showing how the two distinct detector tuning circuits are arranged; also the "single" audio channel.

South America and England Come in Fine!

The bands of frequencies to which this receiver will respond is limited only by the coils available. Tests were conducted in the broadcast band and all the way down to 12 meters. The results were always the same—good! *South America and England were tuned in every evening without fail!* The volume was excellent on the phones and most nights the output of the audio stage was fed into a separate power amplifier so that loud speaker reception could be enjoyed.

Essentially the receiver consists of two separate radio sets and a common stage of audio frequency amplification. Simple? Yes, and not much to it at all, but the idea is not only useful in small sets but can be carried out to such a point that short wave superhets can be used with the outputs of the second detectors feeding into a common audio frequency amplifier for a de luxe system of reception.

This receiver has been designed for battery operation, although A. C. operation, or six volt storage battery operation of the filament supply in conjunction with a good "B" eliminator, will work as well. The fundamental circuit will remain the same; all of the changes to be made will be in the filament circuits and the bias circuit of the first audio stage.

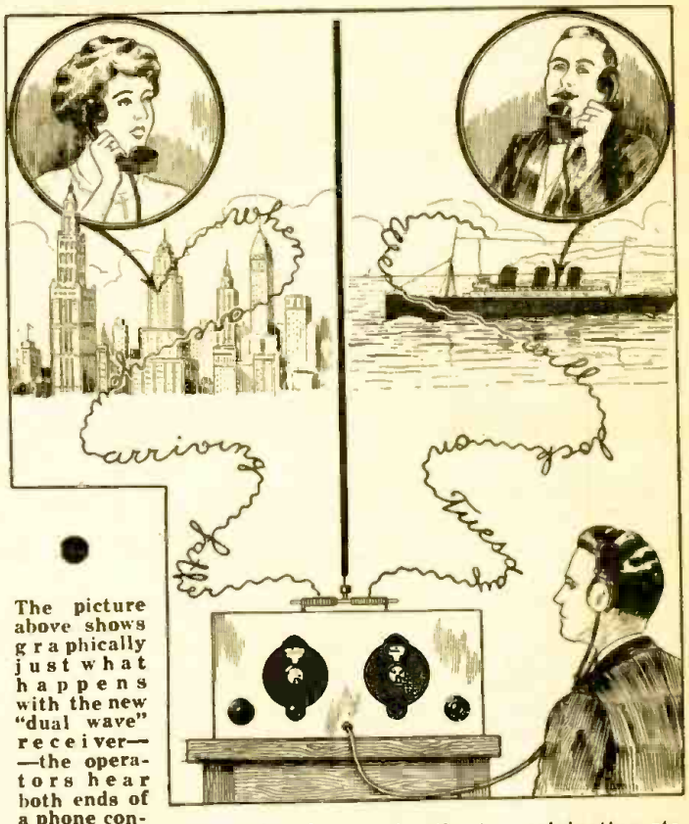
Dual Wave Circuit Described

As mentioned, the receiver consists of two radio sets with suitable plug-in coils for use on short waves. The outputs of the two sets are fed into a common audio frequency transformer so that the mixed signals will be ampli-

Radiophone Talk • • NEW!

On This New S-W RECEIVER

and LESLIE W. ORTON



The picture above shows graphically just what happens with the new "dual wave" receiver—the operators hear both ends of a phone conversation, no matter what frequencies the two originating stations happen to be using.

fied at the same time and passed along to the phones.

A study of the parts making up one of the sets will cover both of the receivers to the point of common connection to the audio frequency amplifier.

Note the method of antenna coupling. The antenna is carried to the set in such a way that the lead is not near any of the parts. The antenna coupling condensers are made by winding hook-up wire on a small piece of bus-bar. Both sets are connected to the same antenna. Both sets work at the same time and work RIGHT.

Shunt feed is used for the regeneration control and the success of this method can be traced to the operation of the short wave chokes used. The set will oscillate on every band and will control smoothly. Note that the grid leaks are returned to the positive side of the filament. Be sure that your set is connected in a like manner, because this will add to the sensitivity of the receiver and help to obtain smooth regeneration control.

Note that the secondary of the audio frequency transformer is shunted by a .0015 mf. tubular condenser. This

The "dual wave" receiver enables you to tune in two widely different frequencies simultaneously on a "single" audio channel. You can now hear both ends of a phone conversation; also eliminate fading effects by tuning to two different frequencies radiated by some of the powerful S-W stations.

lowers the high frequency response of the audio stage and tends to minimize the back ground noises. Be sure and use this condenser, as it helps a lot.

Use tuning dials that are noiseless. When a set is placed in its most sensitive condition, that is the time that noisy dials cause trouble. It is a source of irritation that spoils much short wave reception. Many short wave fans fail to realize that most of the noises that limit their reception from distant stations are created in the receiver proper.

The above chapter goes double for tubes, resistors and condensers. Every part used in the construction of a short wave set should be selected for noiseless operation, for the best results.

Construction Pointers

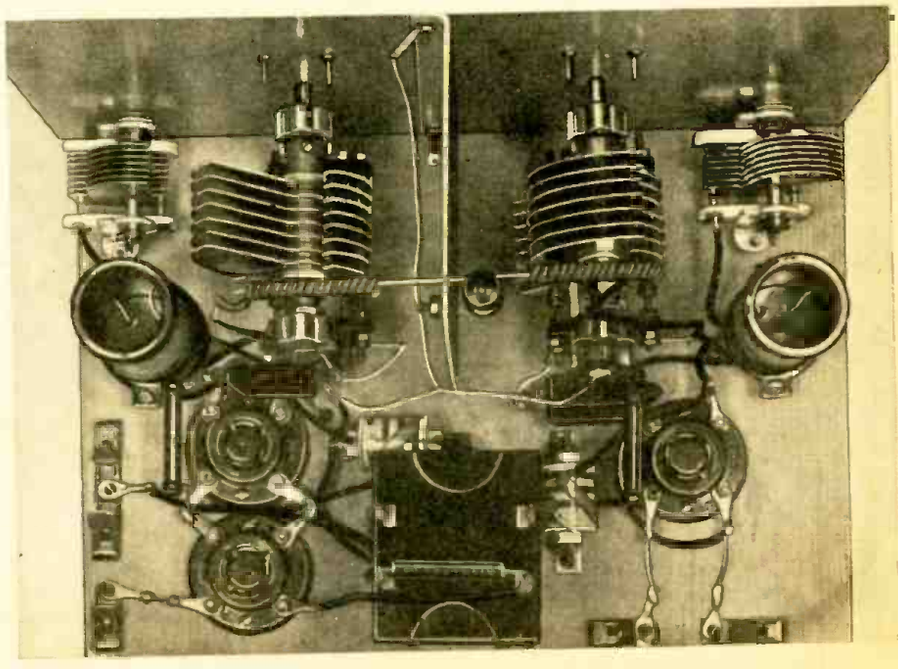
The construction of this receiver will not offer difficulties to even the most inexperienced constructor, as the set is simplicity itself.

Drill the aluminum front panel so that the two tuning dials and the regeneration condensers can be mounted in place as shown in the pictures. Do not place the aluminum shield in place until everything is mounted on the panel and the baseboard.

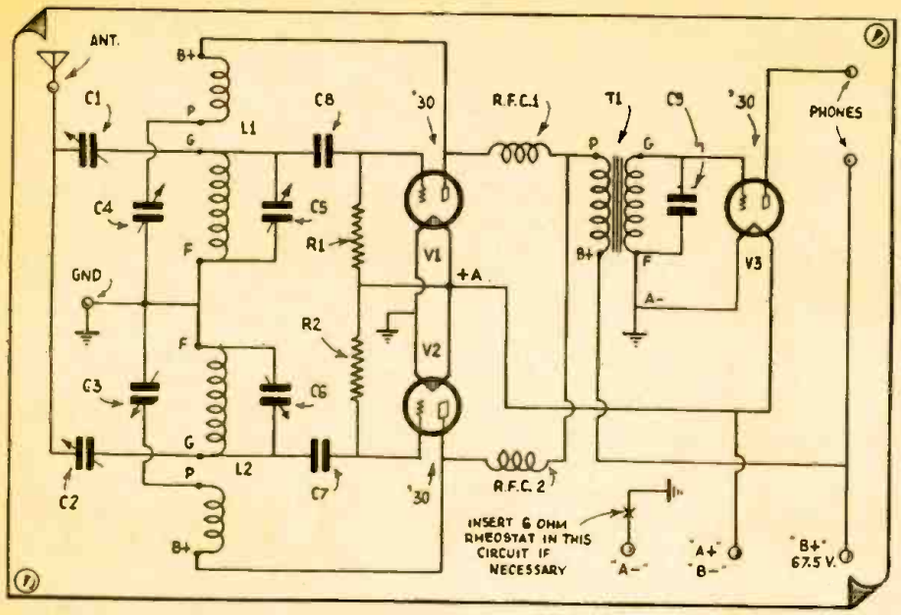
Place all of the parts on the baseboard in their proper positions as shown and fasten down firmly with half-inch wood screws. Be sure that everything is fastened into place and anchored firmly so that the receiver will not be noisy.

Make all soldered connections with a good clean, hot iron. See that all soldered connections are CLEAN and SOLID. Much of the unnecessary noise found in home made short wave sets can be traced to imperfect connections.

Be sure that the hole through which the shaft of the tuning condenser passes (in the panel) is large enough so that the shaft will not rub on the panel. If this precaution is not taken there will be a very annoying series of noises present in the phones when the



Here we have an interesting view looking down on the "dual wave" receiver described by Messrs. Denton and Orton.



Schematic wiring diagram showing the connection of the really few parts necessary to build the "dual wave" S-W receiver.

set is oscillating. Be sure that the aluminum shield partition is firmly fastened to the front panel because if it is not fastened securely, more noise will develop.

When drilling the hole used to mount the antenna binding post be sure that it is drilled over size so that there will be no danger from shorting of the antenna post to the partition. A short at this point will prevent reception. Use the best insulation that you can find at this point. Losses at this point will spoil reception.

The antenna series condenser is made by winding 12 turns of hook-up wire on a piece of busbar, one end going to the stator plates of the tuning condensers and the other end free and not connected to any thing. The capacity of this simple condenser is varied by the movement of the small coil of wire back and forth on the piece of busbar, which, by the way, is two and a half inches long.

Careful attention to detail will enable the constructor to obtain good results as soon as the receiver is placed into operation.

Tuning the Dual Wave Receiver

The method of tuning this receiver is comparable to the operations necessary for tuning any other S. W. receiver, except that there are two receivers to be tuned and it is necessary to know what frequencies are being used for the two-way transmission.

For example, one of the authors listened in on the programs transmitted from GSA and GSC, England. One of the transmitters was in the 48 meter band and the other was in the 30 meter band. Both of the transmissions were identical and the reception was marked by the absence of fading and the high audibility level of the output. Phones were used for all of the tests.

The batteries are connected as shown in the picture diagram. Be sure that theB— connects with the A plus terminal. This is necessary, as it provides a two volt bias for the audio stage. If A— and B— are common then there will be no bias on the grid of the type 30 tube used in the audio amplifier.

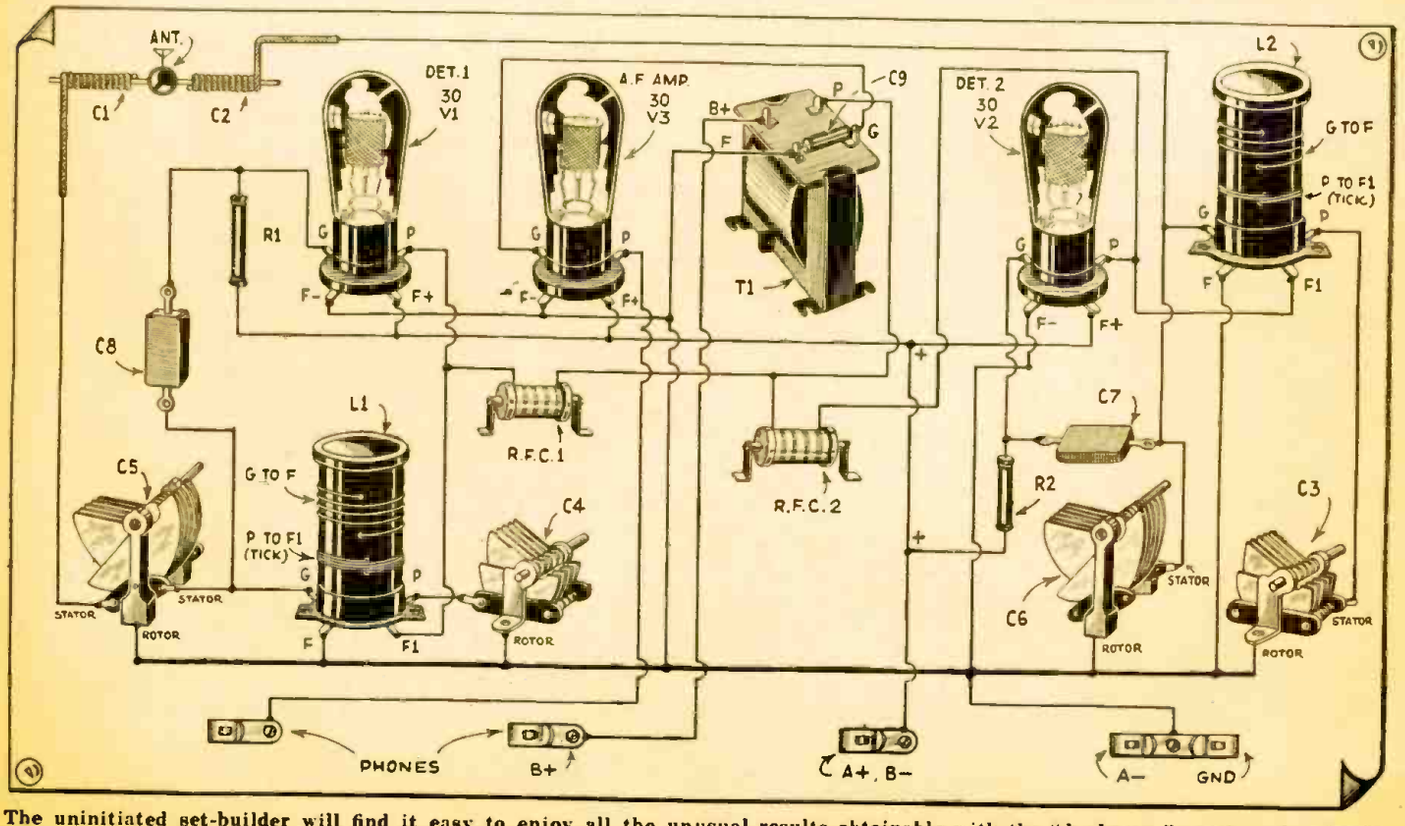
Ground connection is made to the negative filament terminal. A good ground connection is very important, as every short wave fan knows.

Use high impedance phones. The author uses Baldwin Type C phones, which are rather heavy but are really very sensitive. Most of the phones offered at bargain prices are not as sensitive as they should be.

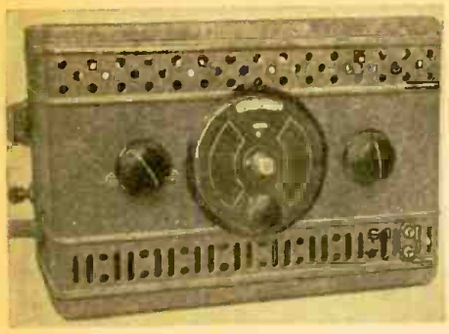
Regeneration is controlled by means of throttle condensers and for smooth operation various plate voltages should be tried until the receiver goes into oscillation smoothly. This combination of coils, tuning condensers, plate chokes and regeneration condensers is hard to beat for real control. If you are not satisfied with the smoothness of the control after the B voltages have been adjusted to the best value, then try various sizes of grid leaks. The receiver as constructed was tested with Eveready Raytheon tubes of the 30 type and 3 megohm resistors seem to work out very well.

If the receivers do not oscillate then

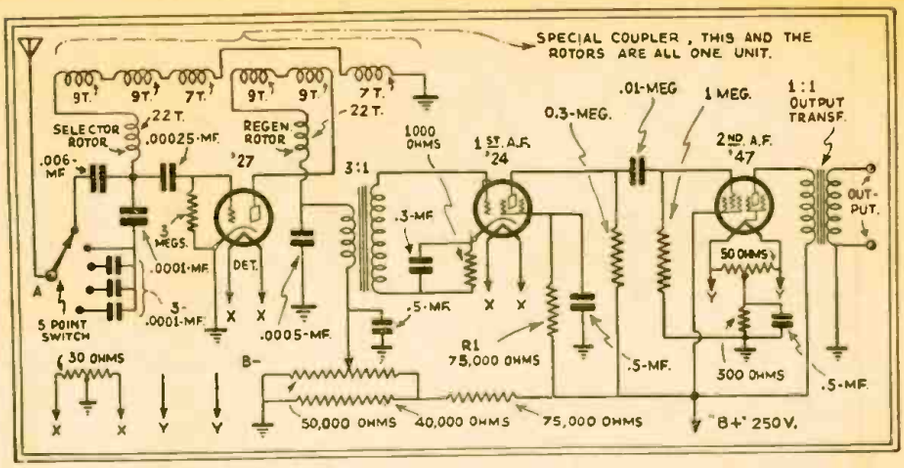
(Continued on page 49)



The uninitiated set-builder will find it easy to enjoy all the unusual results obtainable with the "dual-wave" receiver, by simply following out the wires connecting the terminals of the various apparatus constituting the receiver as here illustrated and described.



Front view of "inductive" S-W tuner, built from parts of a Radiola III, and case from a Philco "B" eliminator. Schematic diagram of the tuner appears at right.



An Inductive S-W Tuner

An A. C. Operated 100 to 350 Meter, Short-Wave Receiver With 2-Stage A. F. Amplifier

By STANLEY E. HOOD

● A NUMBER of years ago one of the most popular broadcast receivers was the "Radiola III" which was of the single-circuit regenerative design; it employed a variable inductance instead of a variable condenser for tuning. The set about to be described is built around one of these easily procurable units, the whole outfit being mounted in a Philco "B" Eliminator case.

Some of the principal characteristics are low cost, fine performance, simplicity of operation and smooth regenerative control.

Three tubes only are used, namely, 27 Detector, 24A first audio, and 47 second audio.

The set has a single dial for tuning, one auxiliary control for regeneration, a potentiometer for varying the detector plate voltage and a special five-point tap switch for adjusting the fixed antenna condensers.

The "inductive tuner" points the way to a new method of tuning and one that we believe will receive considerable attention in the near future. Tuning may be accomplished either by varying the capacity or else the inductance; in this case Mr. Hood elects to vary the inductance. He employs the double-rotor coupler from a Radiola III.

Circuit

By referring to the connection diagram, it will be noted that tuning is accomplished by means of a grid variometer, and volume by means of a plate variometer in conjunction with a 50,000 ohm potentiometer in the detector plate circuit. The tuning range is selected with a five-point switch which connects the proper fixed condenser in series with the aerial and the grid variometer.

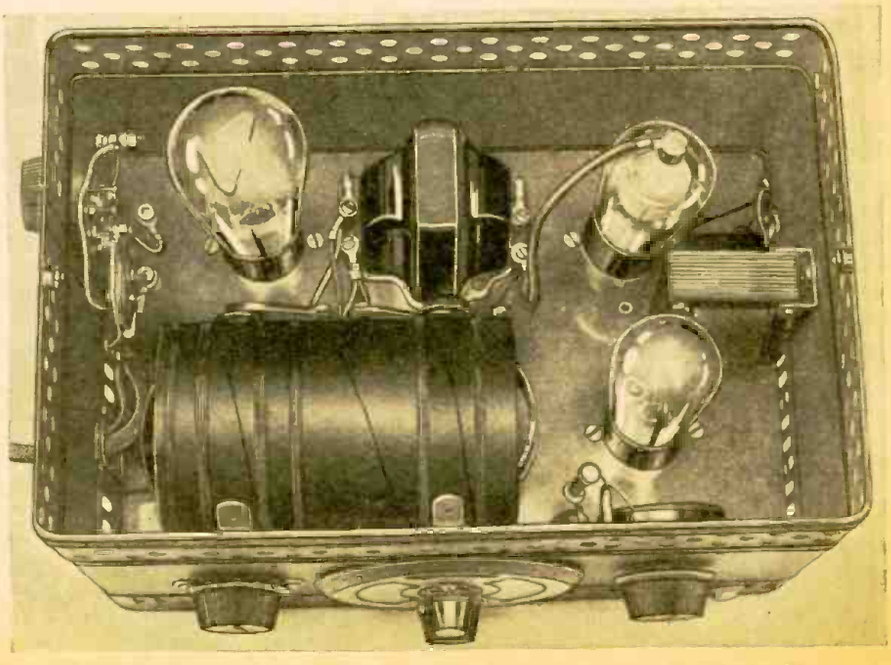
The amplifier part of the circuit consists of a one stage transformer, coupled from the detector to a 24A and one resistance stage coupled from the 24A to a 47. An *output* transformer is used in the plate circuit of the 47 to keep the heavy plate current out of the speaker or earphone windings.

Any power supply, capable of furnishing the necessary filament voltage and 250 volts D.C. for the voltage-divider, which is built in the set, is suitable.

Operation

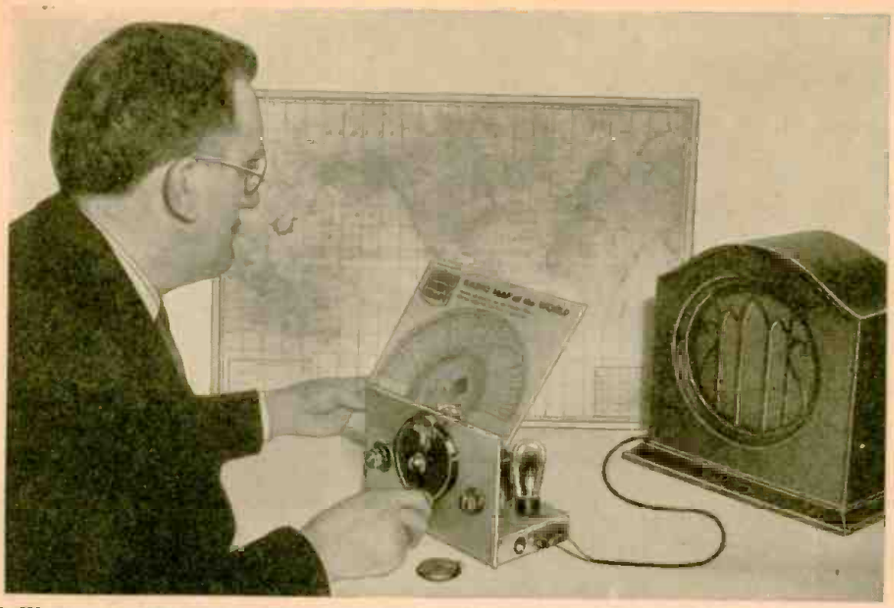
This receiver is very simple to operate. By turning the antenna switch located on the left end of the set counter clock-wise, the lower wave bands are obtained. Each band is then tuned by means of the grid variometer. The proper volume level is obtained by means of the plate variometer. It will be noted that for the longer waves this control, located on the left of the set, will be turned so the arrow points about straight up. This is also true of the detector plate voltage potentiometer, located on the right of the set. Both of these controls turn clockwise for an increase in regeneration and detector plate voltage respectively. As lower bands are tuned in regeneration and detector plate voltage will have to be decreased.

(Continued on page 51)



What the inside of the inductively tuned short-wave receiver looks like.

Building



H. W. Secor using new S. W. League RADIO MAP and TIME CONVERTER in testing set. This set actually "logged" on the loud speaker the new English "Daventry" station GSA; EAQ, Madrid, Spain, and VK3ME, Australia, 12,500 miles away!

In the present article Mr. Worcester tells how to build the really remarkable 2-tube "Oscillodyne" receiver —which the editors had the pleasure and satisfaction of testing on signals picked up from half-way around the world—12,500 miles—and which were reproduced on the loud speaker! This set was tested by the author who also received VK3ME, Melbourne, Australia, on the loud speaker, without interruption and with excellent fidelity. EAQ, Madrid, Spain, and other stations were also received on the loud speaker!

● The set about to be described employs the *Oscillodyne* circuit described last month, but differs from the set therein described mainly in that a tapped inductance coil is employed, and a stage of audio frequency amplification added.

The use of a tapped inductance coil obviates the necessity for using plug-in coils and their accompanying inconveniences, to which many people object.

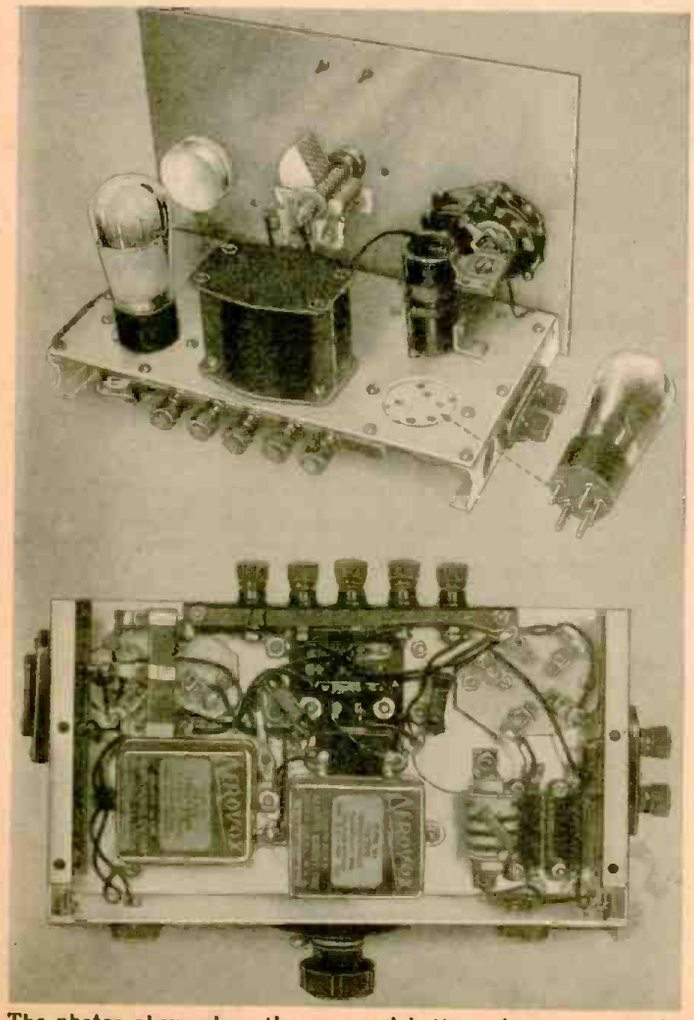
A tapped inductance coil construction has not heretofore proved very popular with Short-Wave constructors when used in conventional circuits; and for this reason, a few words to justify its use in this circuit may not be out of place.

In a non-regenerative circuit a tapped inductance coil is obviously not as efficient as a plug-in coil due to the losses necessarily introduced by the tapped construction and associated apparatus. This will result in an increase in the total circuit resistance and a consequent decrease in the amplification obtainable.

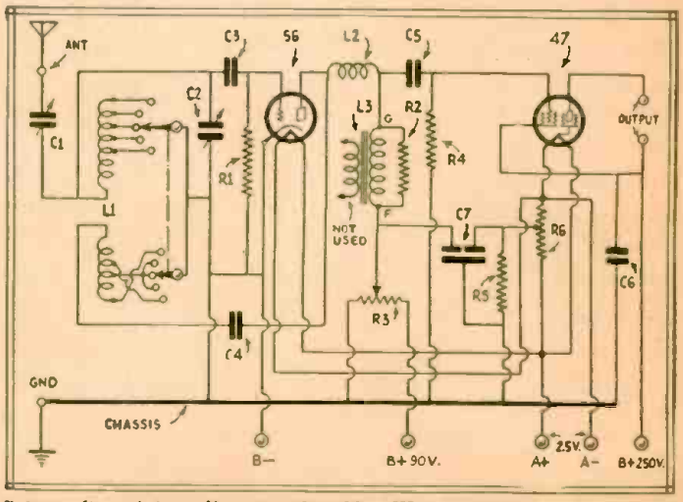
In a regenerative receiver, however, although it is theoretically possible to reduce the circuit resistance to zero by critical adjustment of the feedback, it will be found that there is a practical limit to which the resistance can be reduced and at the same time stable operation retained. The reason for this is that if the feedback is increased too far, minute uncontrollable variations in the plate current will cause the circuit to break into oscillation after a short interval of time.

Now, if the circuit resistance is increased by using a tapped coil construction, for instance, it will be found necessary to increase the coupling between the grid and plate circuits in order to obtain maximum signal strength. Consequently, with this increased coupling, the above minute plate current irregularities will have a correspondingly greater effect, and the practical limit to which the circuit resistance can be reduced is diminished.

The above discussion is, of course, merely a roundabout way of saying that in a high loss circuit the regeneration control is "roughened up" and the circuit goes into oscillation with a "plunk" instead of a gentle hiss as is the case with a low resistance circuit.



The photos above show the rear and bottom views respectively of the 2-tube "Oscillodyne."



Schematic wiring diagram for Mr. Worcester's 2-tube "Oscillodyne," which "pulls in" world-wide short-wave stations on the loud speaker!

A 2-TUBE OSCILLODYNE

By
J. A. WORCESTER, JR.

12,500 Miles on Loud Speaker on 2 Tubes

Verified by the Editors

PART 2.

Second of a series of articles on the "Oscillodyne"—a brand new short-wave receiving circuit. Part one, describing a remarkably sensitive one-tube "Oscillodyne," appeared in the April issue. Complete short-wave coverage without plug-in coils.

Hence, we find that in a regenerative receiver the use of a tapped coil will generally result in a decrease of efficiency.

Resistance "Negative" in Oscillodyne

In the Oscillodyne circuit, however, the resistance is negative at all times during the "building-up" period, and consequently as long as the circuit can be made to oscillate *irregularly*, it makes no difference how large the circuit resistance is.

An inspection of the schematic diagram in Fig. 2 will show that a *shunt-feed* tickler arrangement is employed as an oscillator. This enables both contact arms of the switching mechanism to be at *ground potential*.

An attempt was made to use the Colpitts circuit, shown in Fig 1A, which would simplify the switching problem by requiring the use of only one switch. It was found, however, that although the circuit would oscillate easily, it was not possible to obtain satisfactory *irregular* oscillation at an inaudible frequency.

The circuits shown in Figs. 1B and 1C, which are variations of the Hartley circuit, were also tried, but likewise proved unsatisfactory.

The addition of a stage of audio frequency amplification permits the use of a loud speaker on foreign as well as local stations. This stage is impedance-coupled and employs a pentode type 47 tube. A magnetic type speaker works satisfactorily when connected directly across the output. A dynamic speaker, if used, would of course require an *impedance-matching* transformer.

The use of earphones is not recommended in the output circuit, for two reasons: In the first place, the *background noise* is generally too high for satisfactory earphone operation; and, secondly, the rather considerable plate current that flows in the pentode output may prove damaging to the phones.

If it is desired to use earphones, it is recommended that a jack be provided, enabling the earphones to be plugged into the detector circuit output.

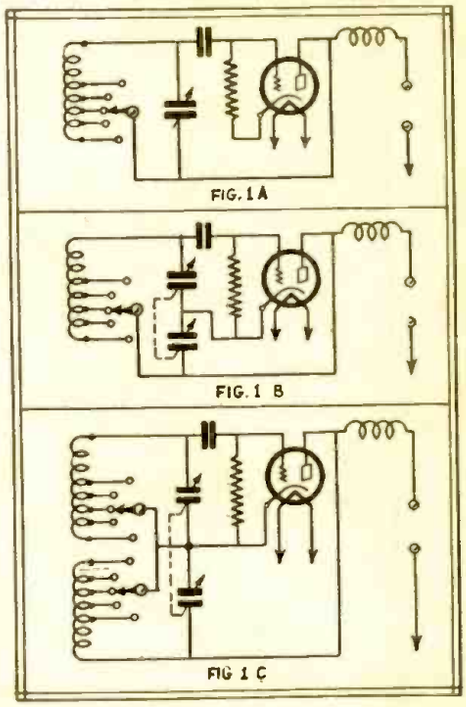
Constructional Details of Oscillodyne

The general layout of the apparatus can be seen from the photographs. The actual dimensions of the mounting holes are not given, as individual constructors may wish to vary this layout slightly or use other parts than those specified.

The aluminum panel measures 6" x 9" and the subpanel, also aluminum, measures 4½" x 8½". These dimensions were chosen so that the whole assembly could be inserted in a 5" x6"-x 9" aluminum shield box if desired. If this is done, one of the 6" x 9" sides of the box will be replaced by the front panel of the chassis. It will also be necessary to cut the other sides so that the various binding posts and the speaker jacks will be accessible.

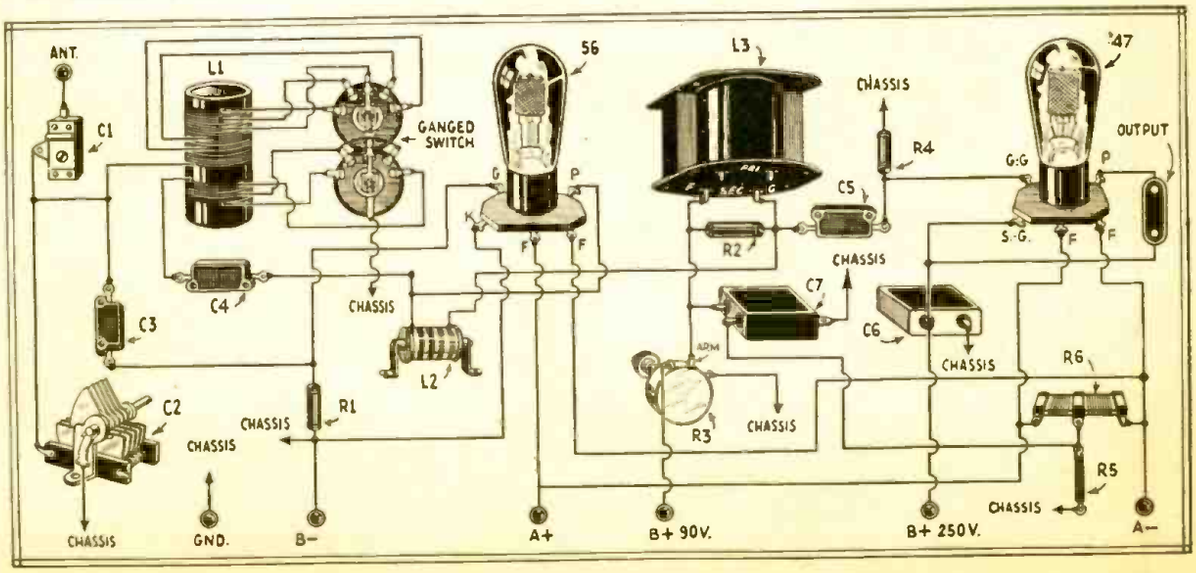
The various parts can be mounted on the subpanel and wired before the front

(Continued on page 54)



Three simplified forms of the Oscillodyne, showing the use of a tap switch. The circuit as Fig. 1A, while simple, did not work out well in practice. The circuits at Figs. 1-B and 1-C were also unsuccessfully tested by the author

A picturized wiring diagram for those uninitiated to the art of reading schematic diagrams and from which all of the simple connections between the parts of the 2-tube "Oscillodyne" can be clearly discerned. It really is quite remarkable that with only 2 tubes such a great "DX" receiving range can be accomplished, with the signals on a loud speaker.



$500.00 Prize Contest

For the Best Title Describing

• This Month's Cover •

● MAYBE you have noticed the slight change of policy inaugurated several months ago, whereby one month we have a strictly *technical* cover followed the next month by a *human-interest* cover.

This month, it was again the turn of the human-interest cover. The idea is really based upon fact because it illustrates in a way an episode from the editor's early days, except that in those days there was no radio, not even *wireless* (code transmission). In those days we had an *electrical laboratory* where we were fond of dabbling with all sorts of electrical "gadgets," from home-made electrical plants to Wimshurst machines and Tesla coils, and believe it or not,—exactly as the short wave enthusiasts do today,—in those bygone years we burned the midnight oil just as is the case today, and we had to contend with an irate mother, just as the budding "hams" have to contend with the same condition these days.

So after we had explained the whole situation to our veteran artist, Howard V. Brown, the cover was delivered in due time and it looked mighty good to us. Next came the usual editorial task of deciding upon a title to use with it that meant something, and if possible draw a smile from the reader. This month, however, there were difficulties in that a goodly number of short-wave sets rained in upon us. Just as we were about to concoct a snappy title, in walks an expressman with Mr. Worcester's two tube "Oscillodyne." We fairly "itched" to get our hands on it and have it hooked up to test out. While we were still itching about it, in walks Mr. Denton with his latest "two-way" radio which got us even more excited, and after we had listened to his enthusiastic discourse extolling its merits, and had hooked up the set and listened to it, it had gotten so late that the idea of a title had entirely vanished from our minds. Besides, we wanted to take those two sets home and test them ourselves, and we figured that this for once was far more important than "fool titles."

So the editor washed his hands of the entire title business, and now throws the entire responsibility into your lap. The editor figures that you have more time to dope out a good title than he has, and as it may take you some time to do a good job, he is willing to pay you for your time. As a matter of fact, arrangements were made with a number of radio concerns who will donate some $500.00 worth of radio apparatus to this contest.

The entire contest has been arranged in such a manner that practically every contestant will get a prize. Anyone who can think up a fair title has an excellent chance to win one of the prizes. There are so many radio items that the judges will not have much trouble in assigning a prize to almost all, always providing that the editors don't become "snowed under" with too many thousands of really good titles, but this, as a rule, is unlikely.

What then, is wanted in this contest is a good title explaining the cover illustration of this issue.

READ CAREFULLY AND DON'T JUMP AT ANY CONCLUSIONS. IN A CONTEST OF THIS KIND READERS USUALLY DO NOT READ INSTRUCTIONS AND CONDITIONS CAREFULLY AND AFTERWARDS ARE DISAPPOINTED WHEN THEY WIN NO PRIZE. READ THE SIMPLE INSTRUCTIONS CAREFULLY TO MAKE SURE THAT YOU FULLY UNDERSTAND WHAT THIS CONTEST IS ALL ABOUT.

Understand, that this is not a "cash" contest. The $500.00 is the actual worth of the radio apparatus which has been donated by radio manufacturers and other radio firms toward this contest.

A good title should have some allusion to radio or short waves, and the higher prizes will go to those who have the best titles. To give you an idea what is meant, a few titles are given at random:

"Mom Rules the Waves"

"Wavering Between Sleep and Science"

"Short Waves vs. Shorter Hours"

These are just a few titles that we thought up in a hurry. We are sure that you will be able to think up a better title than any of these.

Prizes will be awarded for the best titles submitted.

Rules pertaining to this contest:

1.—A suitable title is wanted for the front cover of this month's issue.

2.—The title should be self-explanatory and should have in it some reference to radio, short waves, or both. It should be humorous, if possible.

3.—You may submit as many titles as you wish. There is no limit.

4.—Titles must be submitted on slips of paper size of a postal card, 3¼ x 5½ inches, or you can send your title on a one-cent postal card, if you prefer to do so. Only one title must go on one sheet of paper. Use only one side of the paper. If the paper or postal card is larger than that size the entry will be thrown out automatically.

5.—Write in ink or typewrite the title; no pencilled matter considered.

6.—Name and address must be given on each title, no matter how many you send in.

(Continued on page 56)

Inter-Office Communication on 5 Meters

Experiments in the development of transmission by short waves finds engineering officials of the Columbia Broadcasting System using five-meter transmitters and receivers as a means of inter-office communication. Above (left) E. K. Cohan, Technical Director of CBS, speaks into a portable one-watt transmitter on his desk while Chief Division Engineer Henry Grossman (right), listens-in with a receiver in a broadcasting studio on another floor. The portability and low-power requirements of the five-meter outfits, it is thought, will eventually bring about their general use in the field of remote control broadcasting.

An Improved Super-Regenerator

By J. A. GRATER

Mr. Grater here explains the greatly improved super-regenerative circuit that he has worked out. This receiver has a terrific wallop in it and it provides the maximum strength of signal with the smallest number of tubes.

● AFTER reading Mr. B. F. Locke's article and circuit on a super-regenerative receiver, published in the July issue of SHORT WAVE CRAFT, I decided to send in a circuit that I have experimented on for the past six months, but on second thought I have revised and combined Mr. Locke's circuit with the one I developed and find it by far superior to either circuit.

We will begin by adding an untuned R.F., (radio frequency) inductively coupled, as a booster circuit. This is really essential as it sends a strong signal to be tuned before reaching the detector. Both R.F.'s being inductively coupled means two high-gain R.F.'s that really work. Care should be taken to see that the screen-grid voltages on both R.F. tubes are constant and proper. Excessive voltage on the screen-grids will cause the R.F. tubes to oscillate.

A 35 tube is used as a detector as it proves out to be superior as a regenerative detector, over the more commonly used 24.

The 35's are also used in the R.F. as they are a standard high-gain tube. This tube seems best for all-around A.C. short-wave reception, although everyone has his own pet idea.

A 27 tube is used as an oscillator and proves very satisfactory. A switch in the plate circuit to cut out the oscillator while tuning is preferable over filament control, as the tube is ready to work immediately.

Another fine point is the 50,000 ohm variable resistor in the screen-grid circuit of the detector tube; this acts as a vernier on regeneration.

Motor-boating and fringe-howl are caused mostly by battery coupling. The 25,000 ohm resistor and the 2 mf. by-pass condenser eliminate this completely. This double resistance, by-pass, type of coupling in the detector plate seems to work out as the most efficient.

By using the volume control in the grid circuit of the first audio, you have your R.F.'s and detector working at a maximum, and only work your audio system on an average, below the noise level. This also gives good quality when using phones with the volume turned down.

Changing the 1st audio to a 35 space-charge, resistance coupled to a 47, you get rid of most of the 47's disadvantages and retain the wonderful amplifying quality of this tube. To get a positive bias on the grid of the 1st audio, a small flashlight battery works very good; if you wish you can take it off the voltage divider.

For the volume hound who likes this "ten-room apartment" stuff, he might try 47's in push-pull. Some may prefer a 45 to a 47 in the output.

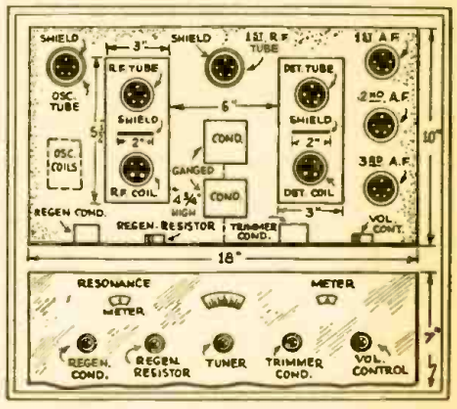
Now we come to the most important factor in A.C. operation, on short waves the *power supply*. The power transformer should be of the electrostatic shielded type. A little money spent on this item is well repaid by the results obtained. Tunable hums are eliminated by the by-passing in the power pack. The filament supply has a 20 ohm C. T. (center top) resistor with the C. T. grounded. One side of the filament is grounded by a .01 mf. condenser. This throws the oscillations set up by the filament circuit outside positive lead and the .1 mf. buffer condensers on the A.C. line help to keep out line noises. The R.F. choke in the positive lead and the .1 mf. buffer condensers in the high-voltage winding keep out the R.F. current sent out by the 80 tube. It must be kept in mind that this R.F. choke must be heavy enough to pass the required milliampere drain of the tubes and also the bleeder draw. An 85 mill (millihenry) choke will do, but it leaves only about 10 mills for the bleeder draw, which is rather small. A 90 mill choke is much better. The power pack cable should be shielded and the shield grounded to the set and also to the power pack chassis.

Both power pack and set are completely shielded.

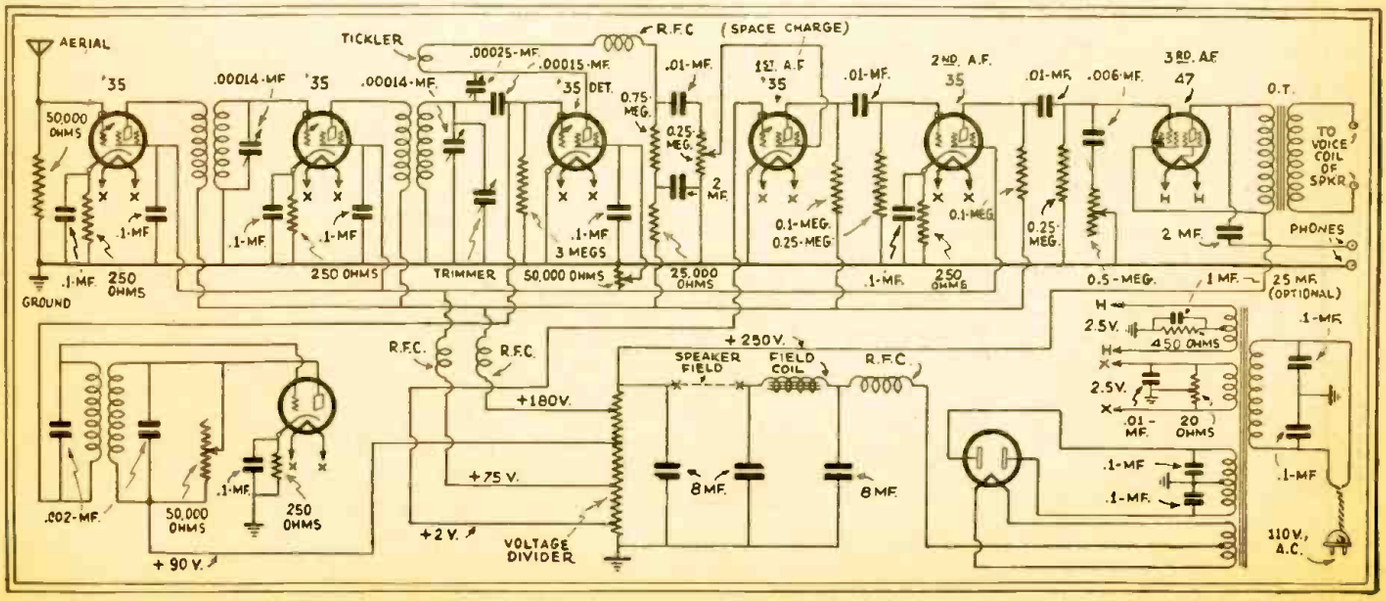
An insulated condenser coupling should be used to eliminate dial scratching coming through the phones, due to a magnetic field set up by the condenser and metal dial.

The suggested arrangement of parts and the shielding arrangement are self-explanatory.

If you want high-class performance use high-class parts. Isolantite coil forms, coil sockets, and tube sockets are the best. Hammarlund condensers are used exclusively. Remember that a set is no better than its poorest part.

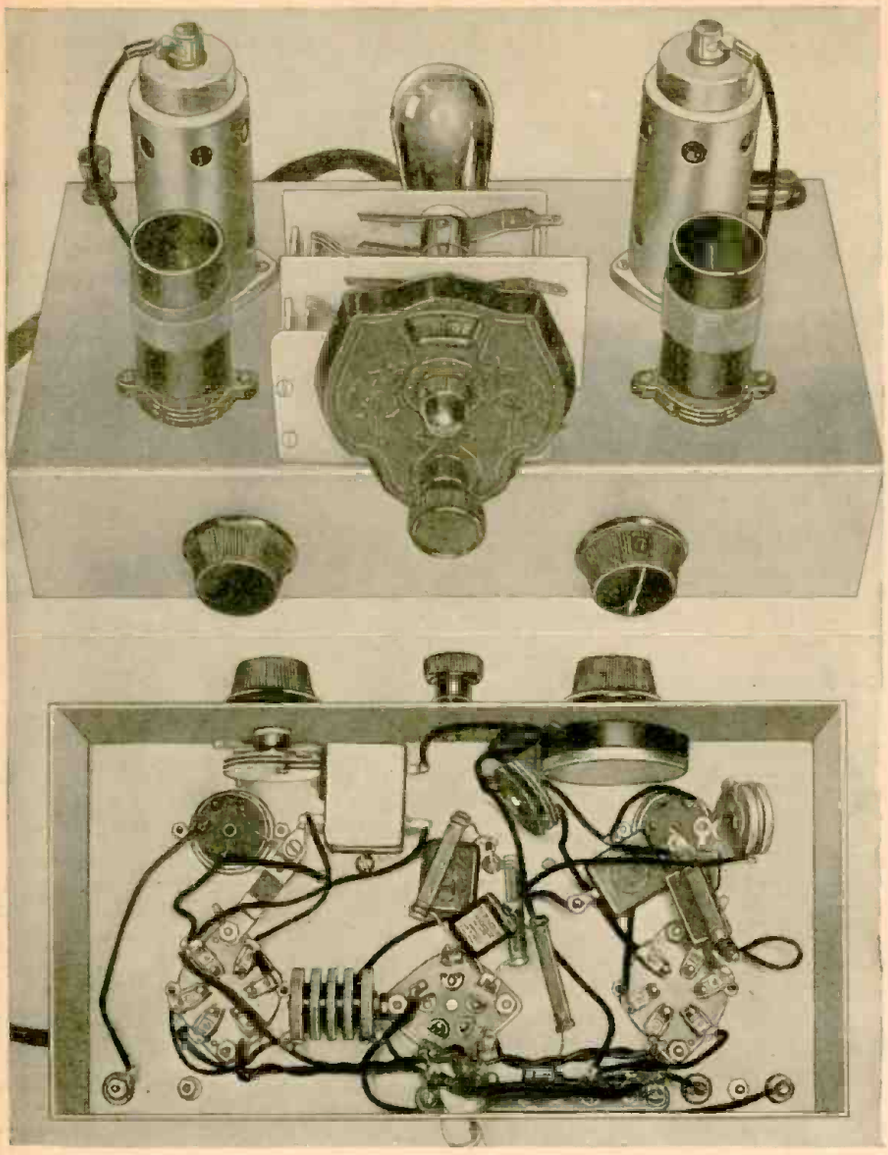


Suggestions for panel and subpanel layout of the "Improved Super-Regenerator" here described by Mr. Grater.

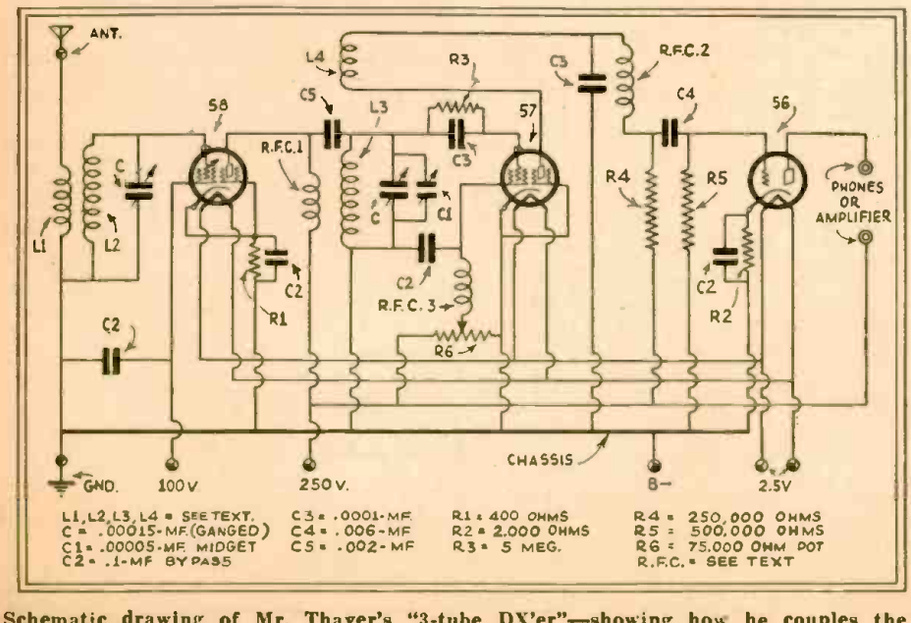


Schematic diagram showing how to wire Mr. Grater's Improved Super-Regenerative Short-Wave Receiver

A 3-Tube



Photos above show the front and bottom views of the "3-tube DX'er" on which the author heard many foreign stations, including HVJ, FYA, GSC, EAQ, et cetera.



Schematic drawing of Mr. Thayer's "3-tube DX'er"—showing how he couples the antenna and ground to the R.F. tube, method of regeneration control by potentiometer and resistance coupling of detector to audio amplifier stage.

● To begin with, three tubes were selected as the maximum number to use in order to keep down size, ease of control, and most important of all cost. In order to get the best results from the minimum amount of tubes used it was necessary to use the latest types, so a 58 was chosen for the R.F. stage, a 57 for the detector stage and a 56 for the audio stage. Many will wonder why I didn't use a pentode there. The reason is the set was to be used mostly with earphones and the volume is there aplenty for phones. Also, a modern pentode amplifier with a dynamic speaker is ready for use any time and when loudspeaker reception that is loudspeaker reception is desired, it is only necessary to turn the amplifier on and plug a lead into the phone jack.

The base is made from 1/16" aluminum 11x16" which, when bent into shape, gives a top of 6x11 with a 2½ deck. The panel should, of course, be measured and drilled before it is bent into shape. The exact place to drill the holes for the coils and center tube will have to be decided on after the size of the two gang condenser is measured off. The coils should be placed half way between the condenser and the ends and back about an inch and three quarters from the front. They are mounted on raised sockets or Na-Ald type sockets so as to keep them away from the panel metal.

The two gang .00015 mf. tuning condenser is one of ordinary design and was cut to size by removing some of the plates. A 5 plate midget vernier is used in place of a fixed balancing condenser because it is very helpful in separating a broadcasting station from the code stations which are nearly always interfering.

Grid leak detection is used in the 57, although the tube is recommended for bias detection. It was found that the grid leak method gave more sensitivity. The grid circuit of the detector is coupled to the plate of the R.F. through a .002 mf. condenser, which gave better results than a larger size. The radio frequency choke (RFC I) is a sectional wound one with 200 turns in each of the four sections. The other two, the one to the detector plate and the detector screen grid, are smaller chokes, of a single winding of 300 turns each.

Regeneration is controlled by a 75,000 ohm potentiometer in the detector screen grid lead and works very smoothly indeed. It will be a fine source of noise, though, unless a smooth acting potentiometer is obtained.

A straight resistance coupled audio stage is used because of the fine quality of output obtained and also because the recommended plate voltage is supposed to be fed to the 57 through exactly 250,000 ohms for best results.

Probably some mention should be made of the front panel or rather the lack of one. In the receiver no hand or body capacity effects were noticeable and for that reason the panel was foregone. A few cents were saved on that score and made mounting in a small mahogany cabinet a simpler process. The plug in coils are then put in place by raising the lid.

A piece of BX cable was obtained and the power supply leads were run

DX'er That Hauls 'em In!

By RAYMOND E. THAYER

This nifty little 3-tube S-W Receiver was designed for the purpose of providing a "Depression" type, low-cost job, which would also make use of the new tubes. It uses a 58 for the R.F., a 57 regenerator detector, and a 56 A.F. stage.

"I believe that in the three-tube short-wave receiver here described that I have combined good looks with the efficiency of the receiver so that it will stand up with many commercial sets of a similar type and also out-perform many of them."—The Author

through it, making a better job mechanically as well as eliminating any chance of stray pickup in the leads.

A power supply similar to that described by Mr. Denton, for the Denton Stand By Receiver, in a back issue, is used and is very compact and light. There is not the least trace of hum even with earphones until down below 15 meters and then the hum is apparent although it isn't so awful bad even down there.

Although nothing but a 10 foot indoor aerial has been used with this set, (inside a tile building) some very fine results have been obtained, and most of the stations come in loud enough to operate a magnetic speaker through the 56 tube. When it is connected to the amplifier it simply makes the dynamic speaker jump off the bench. Some of the stations received regularly are

W8XK	Pittsburgh, Pa.	19.7 Meters
HVJ	Vatican City	19.8 Meters
FYA	Pontoise, France	25.6 Meters
EAQ	Madrid, Spain	30.4 Meters
GSC	Daventry, England	31.3 Meters
GSA		45.5 Meters
VE9DR	Drummondville	25.4 Meters
VE9GW	Bowmanville, Can.	49.1 Meters
VE9CF	Halifax	49.1 Meters
HKD	Barranquilla, Col.	51.4 Meters

also the following S.W. broadcast stations in the United States, besides W8XK mentioned above: W3XAL, W9XF, W2XAD, W3XAU, W1XAL, W1XAZ, W3XL, W8XAL. Also numerous airport and airplanes, Transatlantic telephone, NAA time signals, amateurs from all districts and several in Canada and New Brunswick and Halifax. Police stations have been received from several states, including one police station in Canada.

Have received many other foreign stations but was unable to identify them.

WOO	Ocean Gate, N. J.	72.87 Meters
WOO	Deal, N. J.	63.13 Meters
HKO	Medellin, Colombia, S. A.	50.80 Meters
WENR	Short Wave, Chicago	49. Meters
EAQ	Madrid, Spain	30.4 Meters
YV2BC	Venezuela	49.97 Meters

Amateur calls XIG, XIQ in Mexico City heard on 80 meter phone band. Portable W6GAZ phone in Calif., heard; all "Ham" districts heard on 80 meter phone band in one evening.

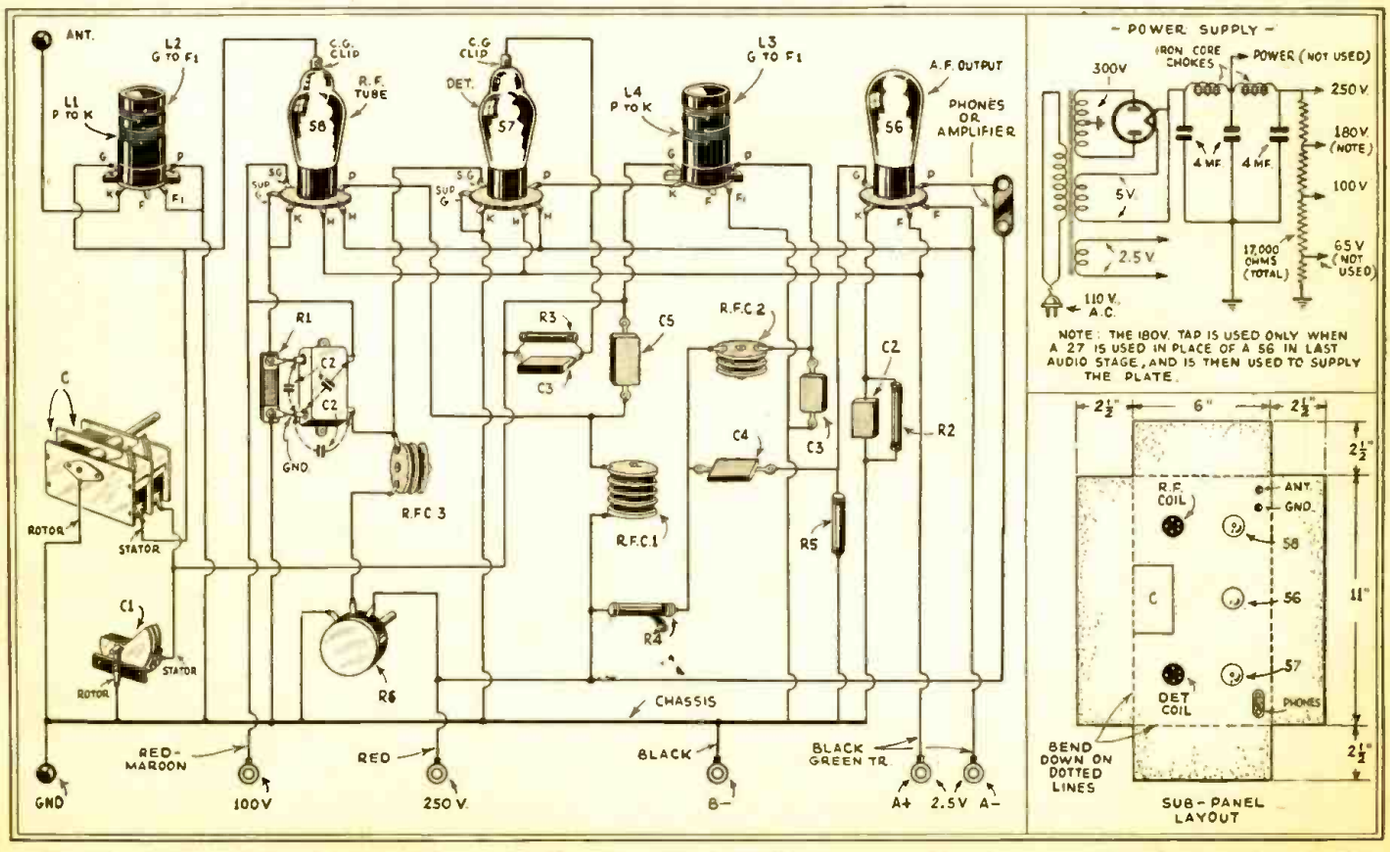
Coil Data

L1	L2	L3	L4	
16	32	32	18	100-200 Meters
10	15	15	8	50-100 Meters
6	7	7	5	28- 60 Meters
5	4	4	5	13- 30 Meters

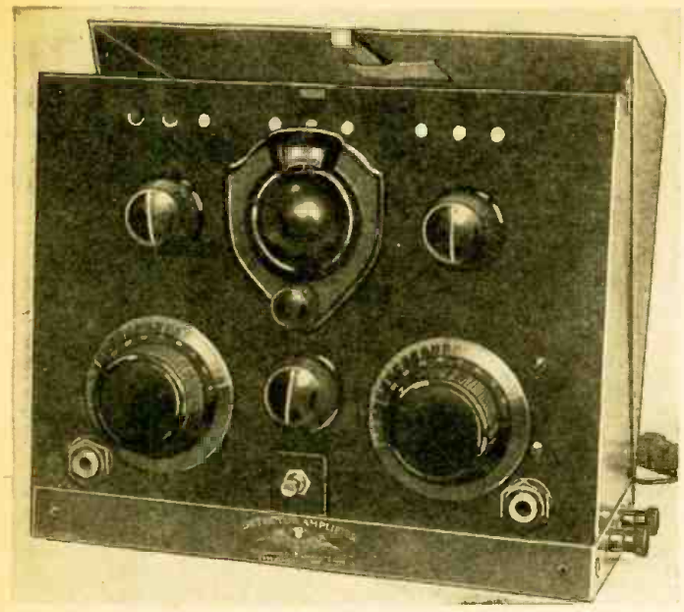
Parts List for 3-Tube DX'er

One aluminum bent and drilled base. (Blan.)
3 Subpanel sockets, (two six, one five prong). (Na-Ald)
2 Na-Ald Universal mount sockets (For raising coils)
1 75,000 Ohm potentiometer, (Centralab) (Clarostat)
1 5 plate vernier midget (Pilot or Hammarlund)

(Continued on page 57)



Picture diagram above shows in simple fashion how anyone can build Mr. Thayer's "3-Tube DX'er"—it uses the latest tubes. The diagrams at the right shows at top—the power supply hook-up and below—the sub-panel layout.



Well-balanced "panel controls" on the 3-tube short-wave "stand-by," as rebuilt from the Radiola V.

A 3-Tube "Stand-by"

One of the best Radiola receivers of the older types, ideally suited for rebuilding in the form of a worthwhile 3-tube S-W receiver, is the Radiola V, model 885A. This receiver was built in a solid brass case; this case opens diagonally with a flip of the wrist, making it easy to change the plug-in coils.

$20.00 February Prize Winner

● THE Radiola V, Model 885-A, was produced in considerable quantity and may be purchased for little if not *nothing flat.* As the following paragraphs will show, it is admirably adapted for short-wave construction, and when completed is all that its name implies. The operator enjoys many mechanical and operating features almost impossible to combine in modern sets of no smarter appearance. A glance at Fig. 1 will recall the set to mind, and may emphasize the rugged and commercial appearance so many "hams" covet.

Salvage

Let's consider the salvage possibilities in detail before we start to build. Dismantle the set completely, leaving only the binding posts on the ends and rear. Doing so will give you a hearty respect for the size and efficiency of the parts. Look 'em over:

(1) *Base board and cover:* of highly polished hard wood, are a standard size, 24"x7"x½" with the moulding removed. Large enough for any table model super-het or just right for a "two-tuber" if cut in one-foot lengths.

(2) *Metal cabinets:* of solid one-sixteenth inch brass, one-eighth inch base, with 22 inches of bakelite binding post strip, an inch wide and a quarter inch thick, at the base of the ends and rear! By setting your cabinet three or four inches from your back wall or batteries the flip of *one hand* will pick up a coil, snap open the cover, remove a coil, insert another, and close the cabinet. No other arrangement can permit it so simply.

The Tuner cabinet I use to house a wave-trap and a long-wave (not broadcast) one tuber with honeycomb coils. And of course it smartly matches the short wave outfit, in the old Detector-Amplifier box.

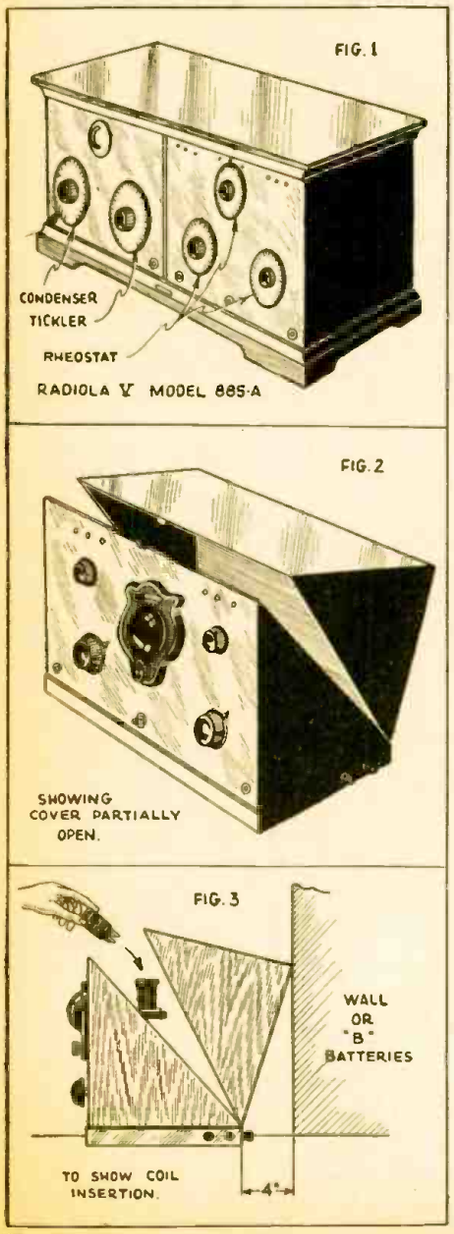
(3) *Phone Jacks:* the left and right hand jacks were mounted in their old positions, right as first stage, left as second for the second is used least, and your cord is out of the way in the position you use it most. The two extra jacks mount readily by holes in their frames to experimental baseboards—and do any of these puny modern jacks? *Also,* when you shift audio stages hurriedly and slam home your phone plug, you can use a healthy sock; the cabinet is *heavy* and won't fly across the room or detune. Neither will the jack "creep" in its hole nor lose its constant biting grip.

(4) *Fixed condensers:* two .001 mf. two .0008 mf. of heavy copper foil and mica, impregnated, and clamped under tremendous pressure in a heavy brass case. Test 'em; if they are still O. K. they are probably as good as new.

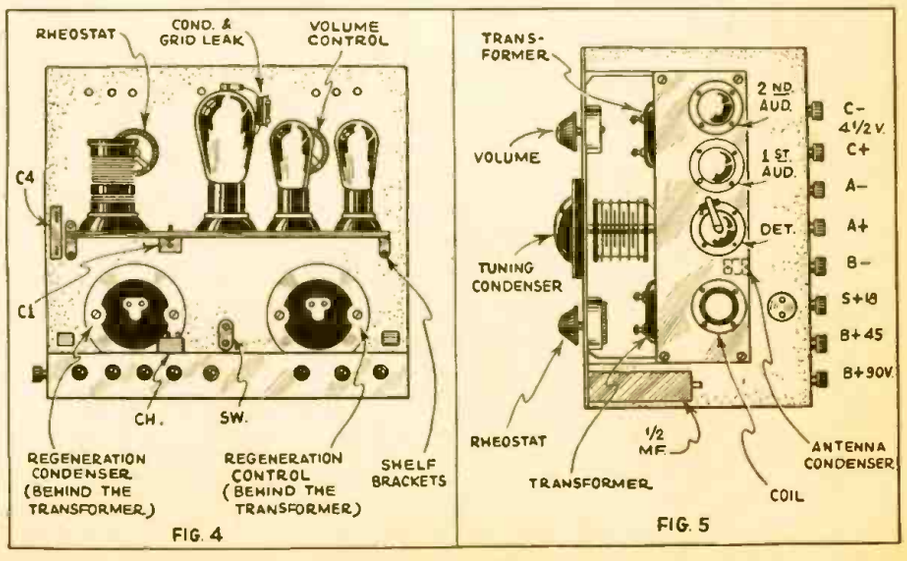
(5) *Grid leaks, and clips:* at least some of these are usable.

(6) *Tube shelf:* went right back in, as is.

(7) *Audio Transformers:* the old RCA U.V.712, 7½ to 1 ratio, shielded, of large wire and low resistance for



The drawings above, with the aid of the text, should make the conversion of the set a relatively simple matter.

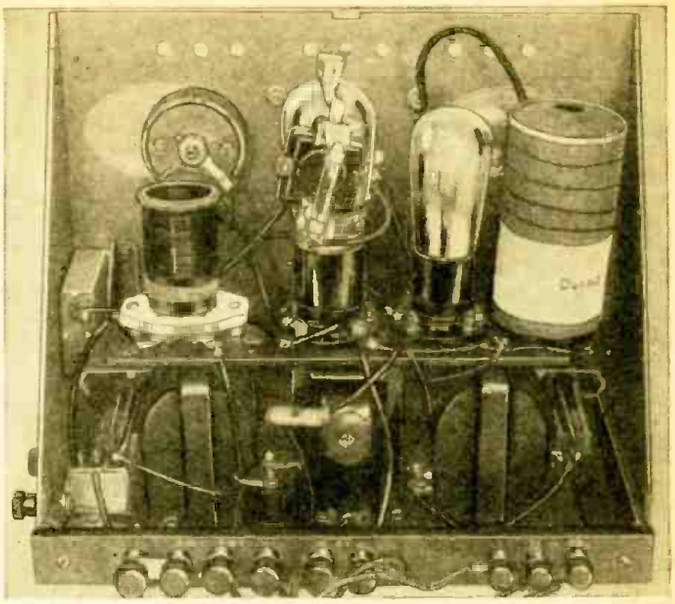


Drawings above show appearance of the Radiola V as converted for short-wave reception.

from a Radiola V

By A. R. APPELMAN

Mr. Appelman is an experienced short-wave fan and a graduate of the Engineering Course of the West Point Military Academy. He here describes how he converted the Radiola V into a dependable 3-tube "stand-by" receiver for short-wave reception. Few extra parts are necessary.



Rear view of the rebuilt Radiola V, which has been very successfully used by Mr. Appelman for DX short-wave reception.

such a ratio, all built on a tremendous circular core of fifty laminations—count 'em. A single stage with one of these has tremendous power and amazingly little distortion. The secondaries are of exactly the right impedance for our two-stage impedance-coupled amplifier. Guess we better put these right back in, and when we hook it up just forget the primaries.

(8) *Tube sockets:* of glazed porcelain, big, strong and heat-resisting. These went into a pal's transmitter in exchange for smaller UX-type sockets, *and* some other equipment, for those porcelain sockets, like the above transformers, are at a premium among hams.

(9) *Rheostats:* these also went into a transmitter, though one went into the short-wave set. These are demountable, may be rewound to any resistance in a few minutes, of good bakelite, are of noiseless operation, and mount readily on a base or panel.

(10) *Variable Condenser:* double and roller-bearinged, no use at short waves, but has rested comfortably in both a transmitter and a long wave set.

(11) *Lugs and Bus Bar Wire:* over two dozen big husky lugs which will drop off the wire all tinned for soldering if held in an alcohol flame a second.

(12) And the crystal detector as your "souvenir."

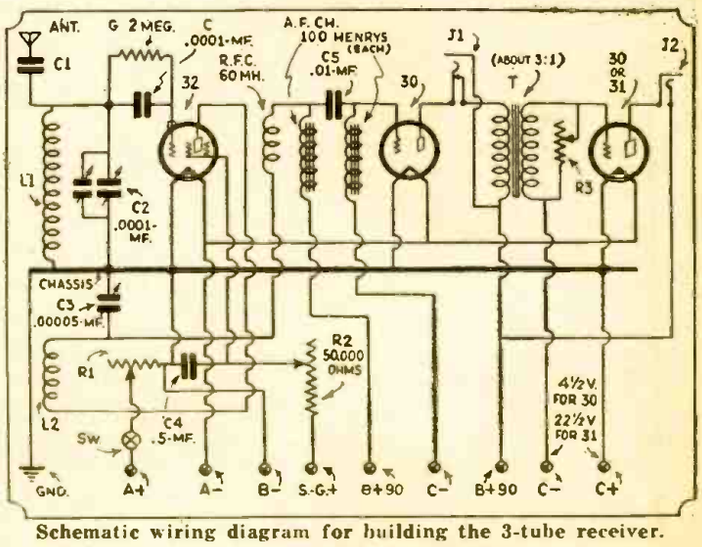
Converting for Short Waves

A glance at the circuit shows the old reliable "stand-by," including both screen grid and capacity control of regeneration, followed by the standard single impedance-coupled two-stage amplifier. The tubes are respectively: a 32 detector, a 30 as first amplifier, and a 31 as second amplifier. The extra cabinet might house the power-pack if A. C. tubes are preferred.

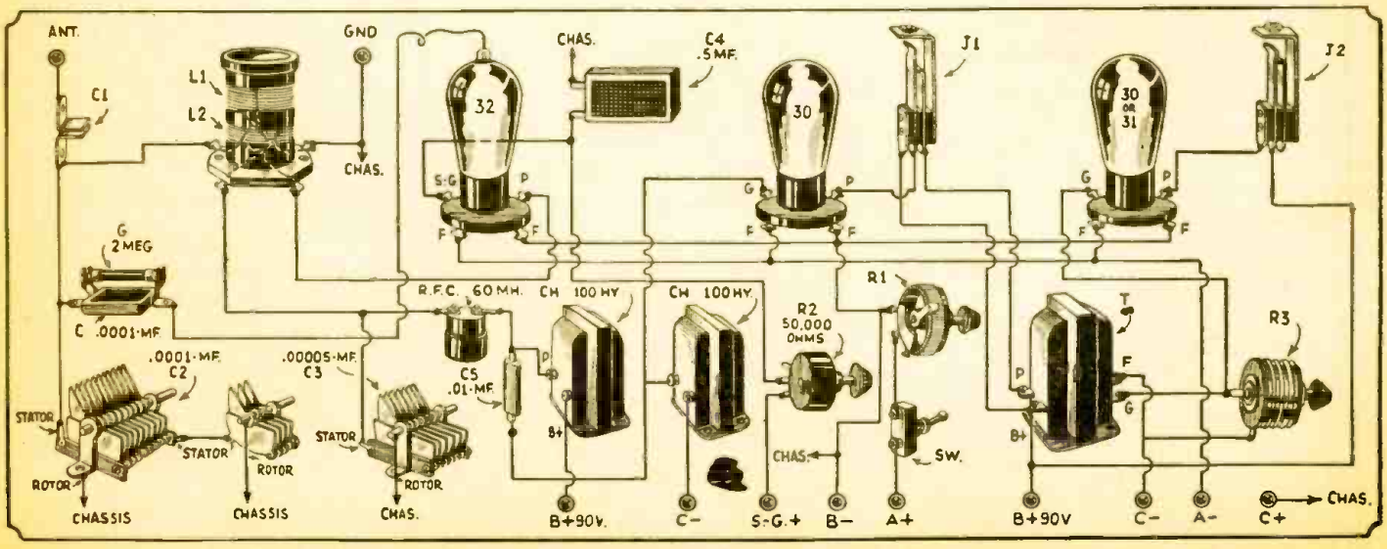
Let's run through the circuit, considering the parts in their order.

Put your antenna and ground binding posts where they are most convenient for those outside leads. Mine are on the right end near the rear. The antenna condenser, C1, is the usual two brass angles with 1½" square faces set an eighth inch apart. The angles are set up at the rear of the tube shelf, *underneath* it, exactly between the coil socket and tube socket. See Fig. 4. If the condenser is above the shelf, pointing up rather than down, you may scratch yourself or bend it while changing coils. The coils may be the standard NA-ALD or wound like those described by Mr. Nelson G.

(Continued on page 52)

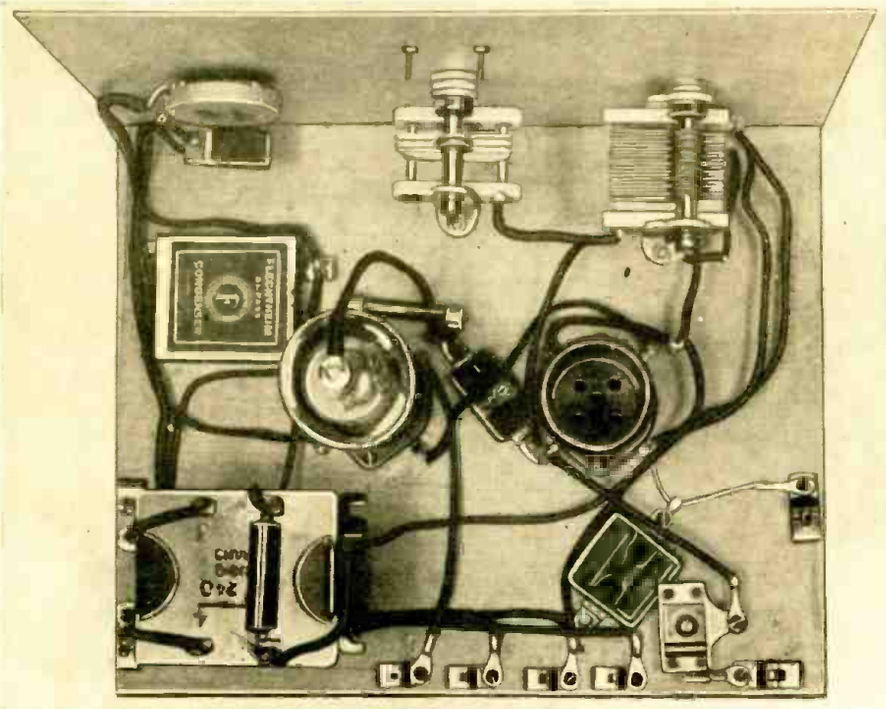


Schematic wiring diagram for building the 3-tube receiver.



Picture diagram, showing in simplified fashion, the connections from one piece of apparatus to another in the 3-tube short-wave "stand-by" receiver here described by Mr. Appelman.

The "EASY-BUILD" S-W Su



Above—looking down on the versatile short-wave receiver here described, which can be converted from regenerative to super-regenerative at the "flip of a switch."

● With the tendency of operators of S.W. transmitters to operate on high frequencies, it becomes necessary for the S.W. fan to have a receiver that will give better results at these frequencies.

While super-regeneration as a principle has been understood for a number of years and has been covered in many texts with all of its variations, it is now receiving the acknowledgment of the S.W. fraternity as the ideal set for use at all wavelengths below 20 meters. Readers interested in the study of super-regenerative receivers and circuits are advised to read SHORT WAVE CRAFT for December, 1932. The author at that time covered the various forms and types of circuits at length.

The receiver described in the present article is novel in several respects. First, it can be used as a straight regenerative receiver, and by the flip of the double throw, single pole toggle switch can be made to "super." When a signal is tuned in simply test for the circuit that will give the greatest output to the amplifier or phones. This is really a radio set with two types of circuits, both of which can be tested on the same signal at practically the same time. The maximum sensitivity will be obtained when used superregeneratively when tuning in "C.W." signals.

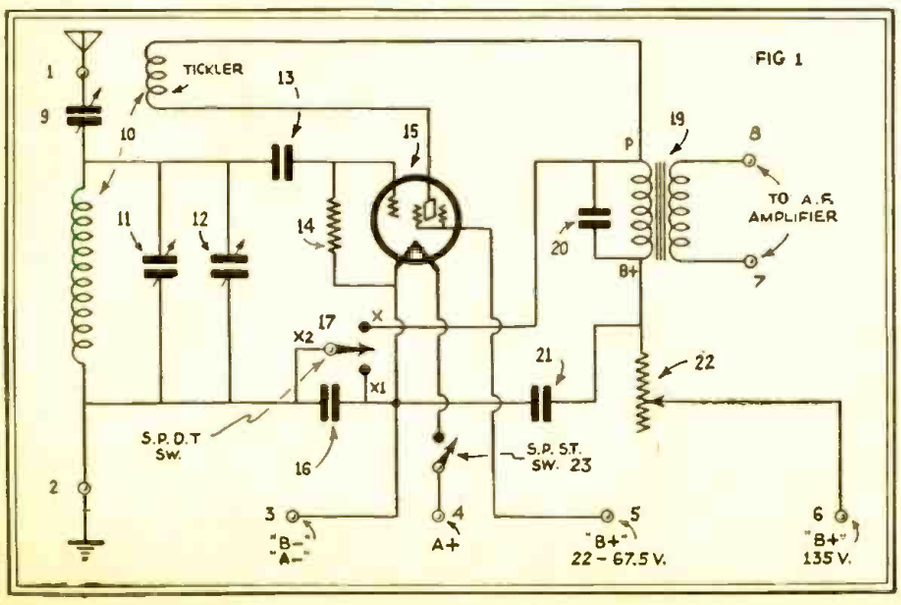
Band-Spread Tuning

The simplified method of band spread tuning as described by the author in several of the S.W. receivers built lately is used. Letters from and talks with set builders indicate that this system is simple and has the advantage of not necessitating special coils. The size of the tuning condenser should be smaller for the real high frequencies and is satisfactory for use above 50 meters. In fact, the size of this condenser as specified is a compromise but it really works quite well.

Additional Amplification

The output of the detector is transformer coupled to the audio stages that should follow, although a transformer with suitable characteristics can be used to couple the output of the detector to a pair of phones. Use an audio frequency transformer with a very high primary impedance. This is very necessary. A high impedance load in the plate circuit will give greater signal output to the phones or the audio amplifier input.

This "dual role" short-wave receiver, which can be changed by the flip of a switch from "regenerative" to "super-regenerative," is particularly efficient for the reception of CW or *code* signals when operating on the super-regenerator principle, particularly on the lower wavelengths, or those below twenty meters. Phone stations may be tuned in by means of super-regeneration and the change-over switch operated to change the circuit to the ordinary "regenerative" type. In other words, at the lower wavelengths and on *code* or CW signals, the super-regenerative circuit shows the most marked gain in efficiency. The cost of this set is very nominal and any wave band can be tuned in by using suitable plug-in coils.



Wiring diagram for the dual-role short-wave receiver here described by Mr. Denton, its constructor.

Panel Layout

The tank tuning condenser is mounted on the left hand side of the front panel and the double throw,

per-Regenerator.

By CLIFFORD E. DENTON

If the signal does not sound so "hot" on the "regen"—flip a switch and then listen to it on the "super-regen" circuit.

Parts List

Two Eby 4 prong sockets (10, 15)
One set Na-ald (or Octocoils) for S.W. Bands. mount in socket 10.
One Hammarlund Equalizing condenser, 100 mmf. (9)
Eight Fahenstock clips, (1, 2, 3, 4, 5, 6, 7, 8)
One Hammarlund MC-140-M condenser, 140 mmf. (11)
One Hammarlund MC-35-S condenser, 35 mmf. (12)
One Illini .000125 mf., mica condenser (13); (Polymet)
One International Resistance 1 watt, 3 megohms, (14); (Lynch)
One Aerovox .006 mf. mica condenser, 16; (Polymet)
One Flechtheim By-pass condenser, 1 mf., 250 volts D.C. (21); (Polymet)
One Flechtheim Tubular condenser .0015 mf., 1000 volts (20); (Polymet)
One Silver Marshall Type 240 audio frequency transformer (19)
One National tuning dial, midget type B
One Acratest S.P.D.T. toggle switch Cat. No. 4104 (17)
One Acratest toggle switch Cat. No. 4010 (23)
One Frost volume control, type 6158 Acratest, 100,000 ohms (22); (Clarostat)
One wooden baseboard 7x10 inches.
One aluminum panel 7x10 inches, Blan-the-Radio-Man
One Eveready-Raytheon type 32 screen-grid tube, (R.C.A.)

single pole switch that throws the circuit over from straight regenerative to super-regenerative action is mounted directly underneath. Tuning is done by means of the dial mounted on the panel in the center.

The regeneration control resistor and the filament switch are mounted on the right hand side of the set within easy reach of the operator.

Chassis Layout

Every other part not mounted on the front panel is fastened down to the wooden baseboard by means of wood screws. The exact location of each part can be seen by reference to the photographs. The small 100 mmf. antenna series condenser should be mounted off the baseboard by means of a small brass collar. The only piece of equipment not held down to the chassis by means of wood screws is the 3 meg. grid leak and that is held in place by the soldered pig-tail leads on the resistor. The photographs should be studied by the constructor so that all of the parts can be placed in the same relative position. No difficulty should be found in laying out the set and mounting the parts.

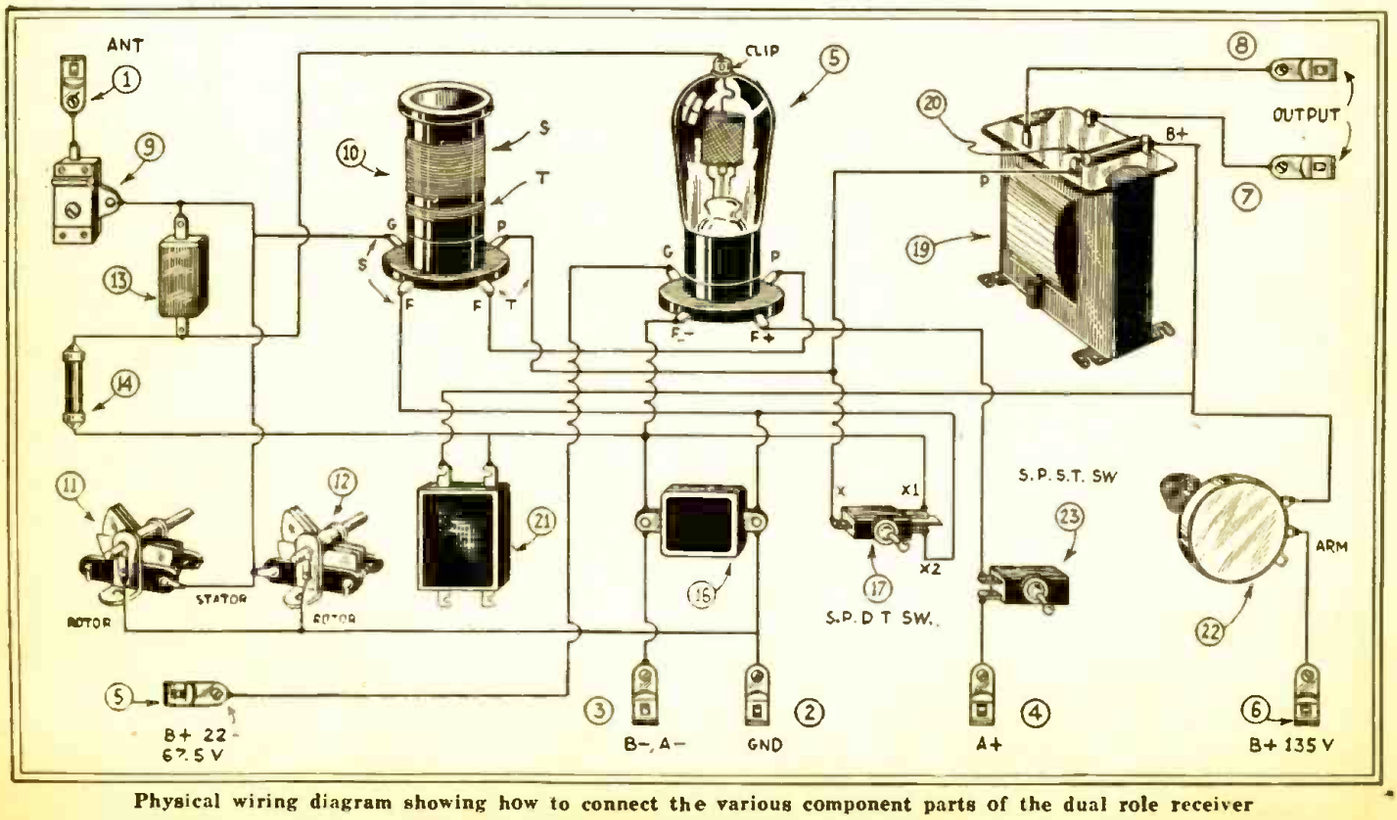
Wiring

There is but little to be said in regards to the wiring of the set. Use a good hot iron, and make sure that all connections are firmly and properly made so that there will be no sacrifice of signal due to poor connections. It is a good idea to wipe all connections with alcohol directly after soldering.

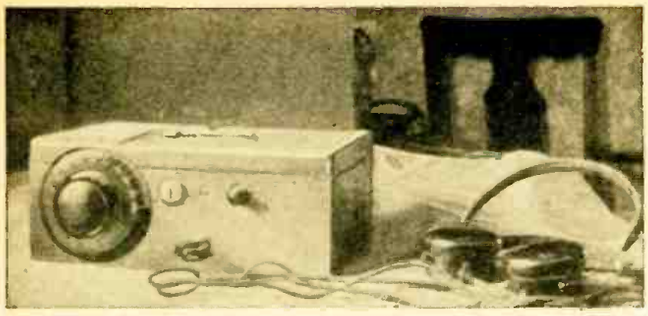
Operation

Anyone familiar with the operation and construction of a simple regenerative receiver will have no difficulty in

(Continued on page 55)

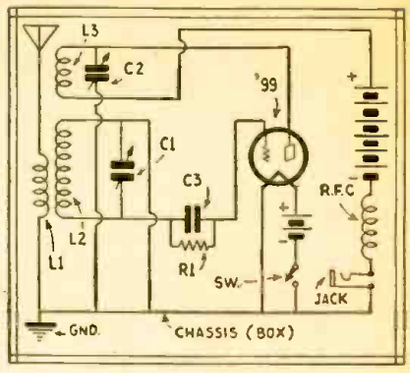


Physical wiring diagram showing how to connect the various component parts of the dual role receiver



Left—The finished receiver.

Right—Diagram of "cash-box" receiver. C1—5 plate triple-spaced or midget tuning condenser; C2—23 plate; C3—100 mmf. R1—2 megohms; R. F. C.—85 mh. choke. SW—switch.



A "Cash-Box" Receiver

By JESS M. REED

● HERE is a receiver that takes an absolute minimum of parts, is extremely compact without being crowded, is fully shielded, and may be accurately calibrated for all frequency bands.

The box is an ordinary all steel cash-box, 7x10x4½", obtainable in most chain stores. The lid fits snugly down to the sides, making the interior completely shielded from extraneous noises. A rebuilt eleven-plate condenser with triple spacing is used for tuning. A five-plate midget condenser will work equally well. The triple spacing or the use of a midget provides the necessary spreading of stations to prevent crowding on the dial.

The coils are wound on tube bases. To remove the solder remaining in the prongs after the glass is broken out, heat the prong until the solder is liquid, then give a sharp flip of the wrist, which throws the solder out, leaving a clear hole for the fastening of the coil ends. A table is given which shows the approximate turns for various frequency bands. A little experimentation is necessary to get the exact number of turns for a given band. Start with two turns more than specified, then remove one at a time until the desired band is fully covered by the dial. A vernier type dial should be used for ease of tuning.

The antenna coupling coil is wound directly around the tube base which holds the plug-in coils. About five turns will provide sufficient coupling without making the set too broad in tuning.

The tube used is a '99 which, because of its low power consumption, enables a set of batteries to last for several months. A small size "B" battery is used for the plate, and a 4½ volt "C" battery furnishes the filament supply. Both batteries fit into the box, so care should be taken to get batteries of a small size.

A chart was made by the writer using standard cross-section paper and pasted on the lid of the box. The various frequencies from standard frequency transmitting stations were plotted against dial settings and a curve drawn. This curve shows at a glance the frequency for each dial setting and makes stations easily located.

The signals from this midget set are amply loud for head-phone reception. The sensitivity of the set is surprising. With this outfit aboard a ship in the Pacific Ocean, and using about twenty feet of antenna, signals were picked up from all parts of the United States as well as from Canada and Mexico. Commercial stations in Japan are easily recognized.

(Continued on page 51)

Improving the Short-Wave Converter

By R. W. TANNER

● IN manufactured and home-constructed converters alike, very little, if any, attention has been centered upon the *mixer* or *first detector*. Certainly the elimination of cross-talk and image interference is as important as in a broadcast receiver. This is particularly true in the case of television reception, where the I.F. amplifier is sufficiently broad.

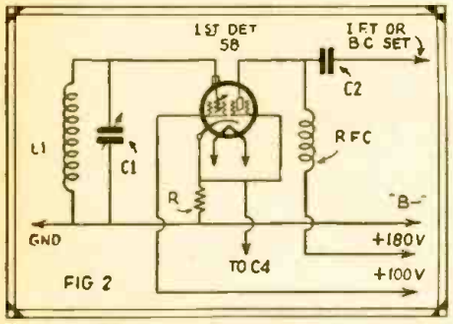


Fig. 1—Diagram for using two-section band-pass filter (BPF) and a vario mu tube as a detector. C—Antenna coupling condenser, midget .000025 mf.; C1—Tuning condenser, 2 gang, .000124 to .00016 mf.; C2—I.F. coupling condenser .00005 to .0001 mf.; C3—Oscillator tuning condenser same capacity as C1; C4—Oscillator feed condenser .002 mf.; C5—.1 mf. bypass condenser; R—1000 ohm bias resistor; R1—2000 ohm bias resistor; L—First BPF section; L1—Second BPF section; L2, L3—Oscillator coils; RFC—Broadcast type R.F. Choke, 20-90 M. H. Fig. 2 shows how to use a 58 tube as a first detector in a short-wave converter.

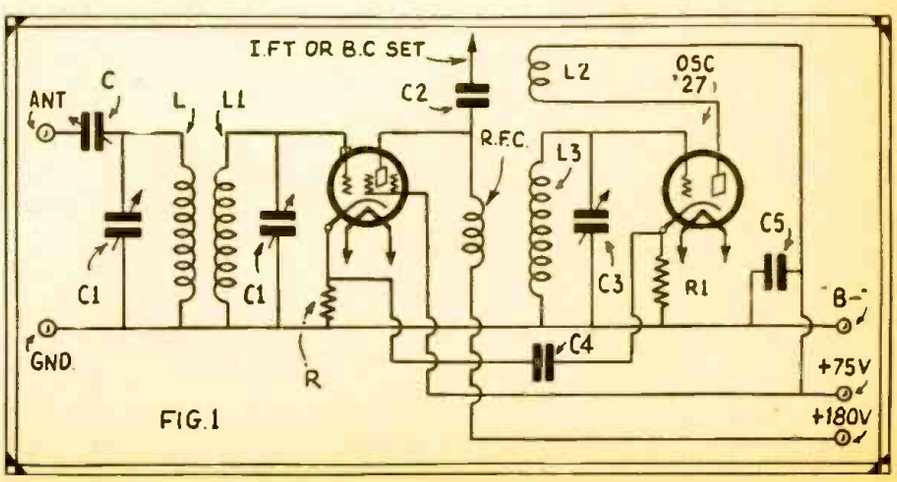
A band-pass filter interposed between the antenna and first detector grid is not an impossibility, even when tapped coils are employed. Image interference would then cause no trouble whatsoever. Furthermore, the operator would pick up fewer code stations; only those operating on their proper frequencies would be heard.

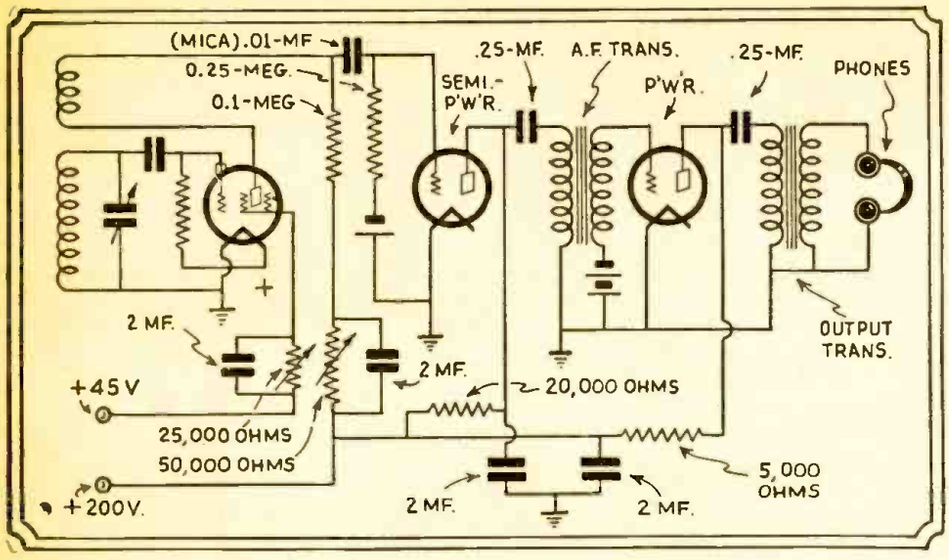
If very loosely coupled, a band-pass filter will also reduce cross-talk to a minimum. However, we do not desire or need very loose coupling at this point, due mainly to the loss in sensitivity if the sections are adjusted to 8 or 10 kc. selectivity. A degree of 25 to 50 kc. selectivity is sufficient to eliminate image interference, but this value would not prevent cross-talk.

A combination of a two-section band-pass filter, with tuning condensers ganged, and a vario-MU tube as a first detector, results in very satisfactory image selectivity and reduction of cross-talk. Tube manufacturers have long recommended this type of tube, but few have taken advantage of it.

A point worth mentioning in regard to the use of a vario-MU tube is the possibility of using the detector as a second harmonic oscillator at the short waves, due to the low grid-bias required. This is a very worth-while idea

(Continued on page 49)





Tying Down the Audio Amplifier

● Very often a most excellent short wave receiver is a misery to handle owing to the audio-end being "up in the air"; so instead of risking such a thing why not build the audio-end along the lines set out in the diagram, wherein it will be observed that everything is tied down to *ground potential*, with the result that no trouble whatsoever will be experienced from such things as body-capacity, hand-capacity, alteration of tuning when a hand is removed from a dial, and so on.—E. T. Somerset, (England).

One of our English short-wave experts suggests the hook-up at the left, whereby everything is tied down to ground potential, thus eliminating hand-capacity effects, etc.

A Coupling Stage for "Plugless" Super

By WILLIAM J. VETTE

● Described herein is a pre-coupler for enabling short wave fans to use a doublet on a receiver using capacity antenna coupling. While primarily designed for use with the 9-tube plugless super appearing in the November 1932 issue of this magazine, it may be used as well with any set which uses a condenser to couple to the antenna.

The manifold superiority of the doublet type of receiving antenna over the other types has been put forth in SHORT WAVE CRAFT in several of the latest issues, so the writer need not dwell on this. It will increase the receiving range of any receiving set, and coupled to the author's super—Mars, maybe!

The *doublet antenna* is highly resonant, and at its point of resonance receiver sensitivity and selectivity rise to a high degree. Using this coupler, the antenna is tuned right in step with the receiver, so that it is always in resonance with the desired wave. This, with the fact that the coupler also amplifies, and with the noise level lowered to the low degree that a doublet brings about, makes steady reception of those foreigns the actual thing.

In procuring parts for the antenna coupler, try to secure a coil and condenser combination identical with the ones in the first detector of the super or converter you are using the coupler with. For instance, in the case of the author's super, National "Equitune"

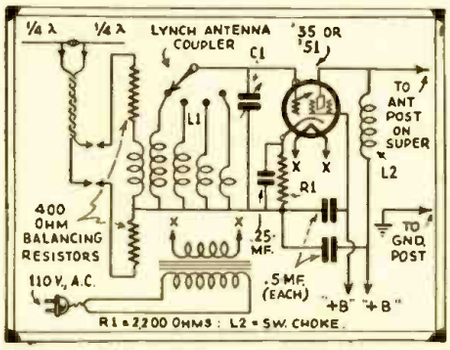


Diagram above shows how to build a pre-coupling stage, so that a doublet antenna can be hooked up to an ordinary receiver.

condensers, .0001 mf. and a Trutest coil assembly, were used. Therefore, in the coupler we shall use a coil and condenser just like the ones named, and wind the coils as near like the first detector coils as possible. These coils are wound as follows:

For the 10-20 meter coil, wind 4 turns No. 16 wire spaced 3/32" on a bakelite tube ⅞" outside diameter. For 20-40 meters, 10 turns No. 16, wound so as to fill ⅞" along a tube of the same size as the 10-20 meter coil. For 40-80 meters, 14 turns number 20 wound the same as the 20-40 coil, on a tube of 1¼" diameter. For 80-200 meters wind 33 turns No. 26 over a length of 1⅛" on a tube of the same size.

You may wind these coils on plug-in forms, of the right diameter, if you wish, or wind them on bakelite tubing and mount them on a switch assembly. If the latter method is used, the centers must be spaced *at least* 2½".

The antenna should be coupled to these coils by means of a small coil, the size of which may be best determined by trial. Personally, I prefer a coupler such as is manufactured by the Lynch company, designed solely for use with doublet antennas.

The construction of the coupling unit is not difficult, neither are there any rigid rules to be observed except that *it must be shielded.* The whole unit

(Continued on page 61)

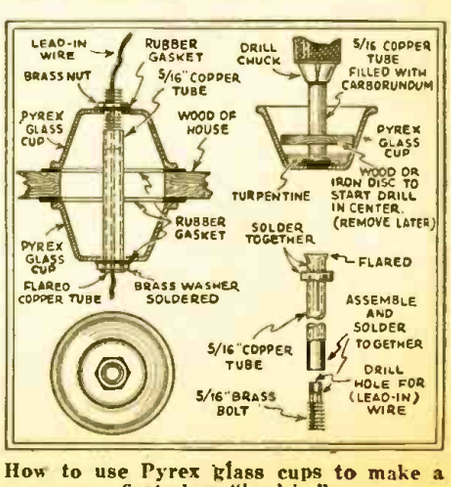
A Pyrex Glass Lead-in for Ten Cents

● Passing a store window advertising Pyrex glass cups, about three and a half inches in diameter, on sale at five cents apiece and noting the resemblance to the regular bowl shaped radio antenna lead-ins sold at quite a high price, two of these were purchased to see if a cheap but good lead-in could not be made from them.

The principal thing to be done was to drill a hole in the bottom of each cup to take the assembly bolt. This was easily accomplished by cutting off a few inches of ⅛" copper tube from an old automobile oil line, straightening and filling with carborundum powder ground from a hand bench grinder and mixed with turpentine, then placed in a drill chuck. Either a power or hand drill can be used as but little pressure is required.

A disc of sheet iron was cut of a diameter to fit near the bottom of the cup, with a five-sixteenths hole drilled in the center, to act as a guide for starting the hole, being removed later. A wood disc would do as well. Place a couple of teaspoonfuls of turpentine in the bottom of the Pyrex cup, set the guide disc in place and start the drill, held vertically of course. An annular groove the size of the copper tube will be formed in the glass due to the abrasive action of the carborundum powder; if the grinding action ceases to be noticed, file off the end of the tube, as this may have been worn round, place more abrasive in the tube and in the bottom of the cup and continue. Do not apply much pressure, especially when almost through the glass. When the drill comes through, reverse the cup and carefully grind through the other

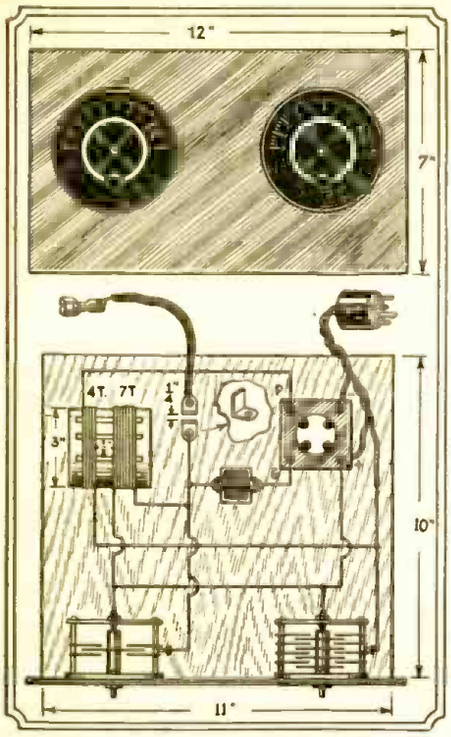
(Continued on page 55)



How to use Pyrex glass cups to make a first-class "lead-in."

A Simple Short-Wave Adapter

By CHAS. SCOTT, JR.



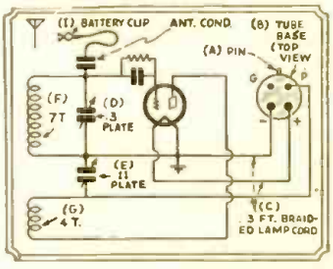
Front and plan views of the easily built short-wave adapter here described by Mr. Scott.

● This efficient short-wave adapter is exceedingly easy to construct, with very little or practically no expense to the builder.

The rig is used in conjunction with any type of tube receiver operated on battery current. Simply remove the tube from the receiver's detector socket, and replace it with the adapter plug-in base. Put the tube in the socket on the adapter. Then, put the battery clip on the antenna lead and you are all set for short-wave reception.

Most amateur radio enthusiasts will, no doubt, have all of the necessary parts for this easily constructed adapter. One can find enough parts in an old dismantled battery receiver to eliminate the necessity of making any expenditures for new equipment.

The list of parts required is as follows:



Wiring diagram for the short-wave adapter, the plug of which fits into the detector tube socket of the "B.C." receiver.

1 Panel, 7x12
1 Baseboard, 10x11
1 Var. cond., 3 plate
1 Var. cond., 11 plate
1 Vernier dial
1 Ordinary dial
1 Tuning coil
1 Grid cond., .00025 mf.
1 Grid leak, 7 megohm
1 Base from burned out tube
8 Ft. single lamp cord
1 Ant. cond.
1 Tube socket

The circuit diagram and the drawings show all the necessary details. The tuning coil consists of seven turns and the tickler coil of four turns of No. 18 bell wire wound on a bakelite or cardboard tube, 3 inches in diameter and 2 inches long. The turns are raised from the surface of the tube by match sticks placed at ¾ inch intervals.

The tuning condenser is made from one of the "One-Buck" low loss condensers cut down to three plates. Take the condenser apart and reassemble, using two stator plates and one rotor plate. The tuning is well spread out over a range of 33 to 45 meters. One meter will occupy a half-inch sector on a 4-inch dial, making it easy to find stations. The 11-plate condenser controls regeneration and has little or no effect on the tuning so that the receiver can be calibrated directly in meters.

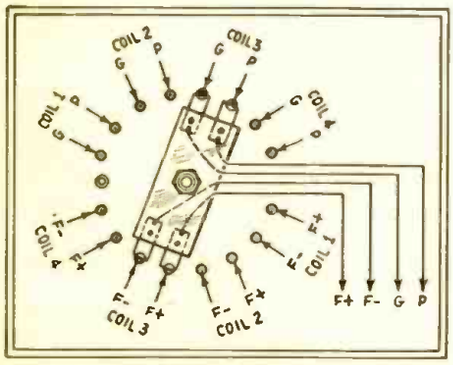
The "A" battery supply is taken from the receiver through the plug-in tube base which also carried the output of the short-wave set into the receiver's amplifier. The rheostat on the receiver controls the short-wave detector voltage.

The regular antenna is used. Size doesn't matter much on these waves and the antenna can be left connected to the receiver while the short waver is in use.

The little antenna condenser consists of two brass or copper angles mounted as shown. A ground can be added to the positive filament lead as shown in dotted lines, but in most cases it will make very little difference in tuning or signal strength and can be left off. There is already a high capacity ground through the filament batteries and wiring in most receiver installations and the addition of a straight ground connection will merely shift the tuning a degree or so on the dial.

The coil data given above is suitable for tuning in waves in the region between 33 to 45 meters. To the readers of this magazine, it will, of course, at once be apparent that any wave band desired may be tuned in by means of this simple adapter, by making use of the well-known "plug-in" coils. Data for winding these coils for the various bands and suitable for a certain specified capacity tuning condenser have been published in practically every issue. It is advisable to employ a small capacity midget condenser, of 25 to 50 mmf. capacity, in series with the antenna in place of the fixed condenser. This antenna variable midget will be found a great help when the set fails to oscillate or when the dead spots occur.

Making a Switch to Change Bands



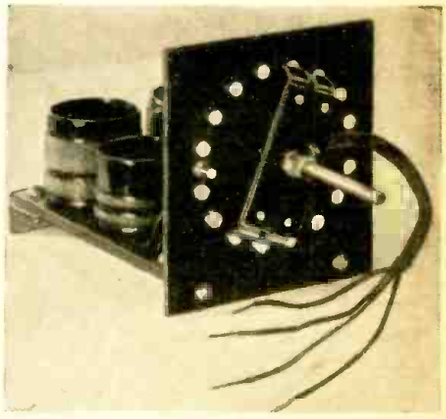
How the band coil selector switch is wired.

● What to do with plug-in coils when building a cabinet set is a question. The photograph and diagram show a satisfactory method of group mounting the coils.

The coils are not connected together, but are selected as originally intended. The four wires (F+, F—, G, P), from switch rotor are connected in the circuit in place of the plug-in socket shown in the circuit diagram you are using.

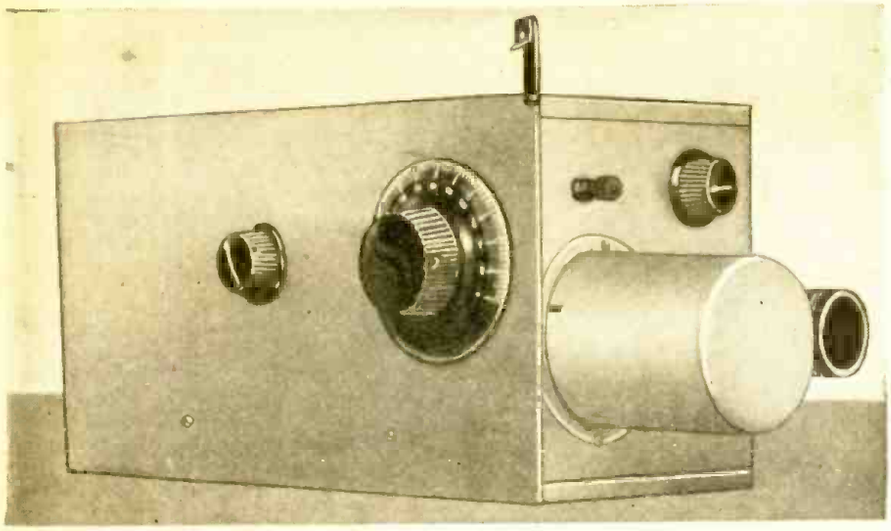
The radio "junk box" should furnish the necessary material. The dimensions of the three pieces of bakelite I used are, coil base 3¼"x4½", switch panel 3¼"x3½", switch rotor 1"x2", all cut from an old set panel. Switch contacts, rotor bushing, rod and knob from a vario-coupler. The switch blades are from a tube socket. Four wafer sockets for coils which in my case are wound on tube bases. Two pieces of ½" angle brass each 3¼" long for holding base and panel together and to prevent coil prongs from striking set base. Six small bolts and nuts, a switch stop and some flexible rubber covered wire obtained from old lamp cord will complete the parts list.

By compact mounting, well soldered connections and wires crossing at right-angles for minimum inductance when possible, the length of wire in the circuit hook-up is increased very little over a single socket.



Photo, above, shows how the author built his band change switch, with the four coils grouped behind the switch.

A similar switching idea is easily worked out for five and six prong coils. —S. M. Cook, Jr.



Exterior view of the well-shielded 2-Volt, 3-Tube "Ham" Receiver, here described by Mr. Ewing.

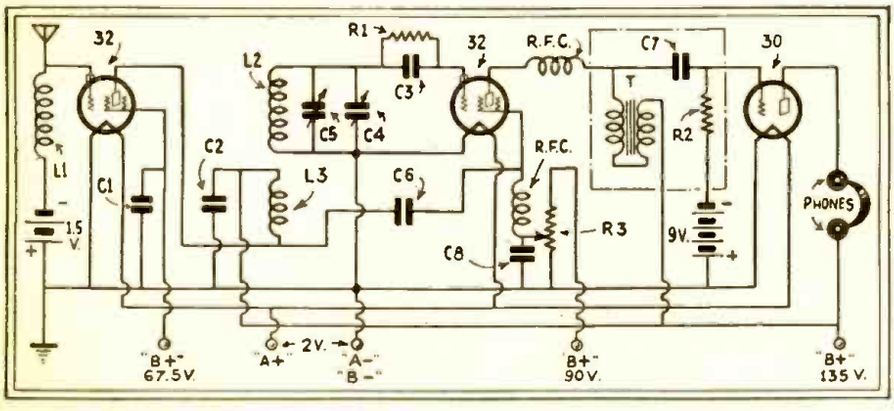
A 2-Volt 3-Tube "HAM" Receiver

By LEWIS M. EWING
W8ECH

The editors have received many requests from readers asking for a 2-volt, short-wave receiver design, using preferably no more than three tubes. Here's just such a set; it was built and tested very successfully by Mr. Ewing, a licensed S-W operator. The author explains how to provide a "smooth-as-silk" regeneration control, the "Waterloo" of many short wave sets.

● A screen-grid short-wave receiver has many advantages over the usual detector and two-step audio type that many amateurs and short-wave listeners possess. The old receiver in use at this station was a good one in its day, but the very low prices prevalent in these times and the extraordinary success some of the local fellows were having with screen-grid receivers induced us to build a new set using screen-grid tubes.

After considerable poring over the characteristics of the various tubes, the two-volt D.C. tubes were selected. They are cheap to install and operate and are ideal for portable receivers.



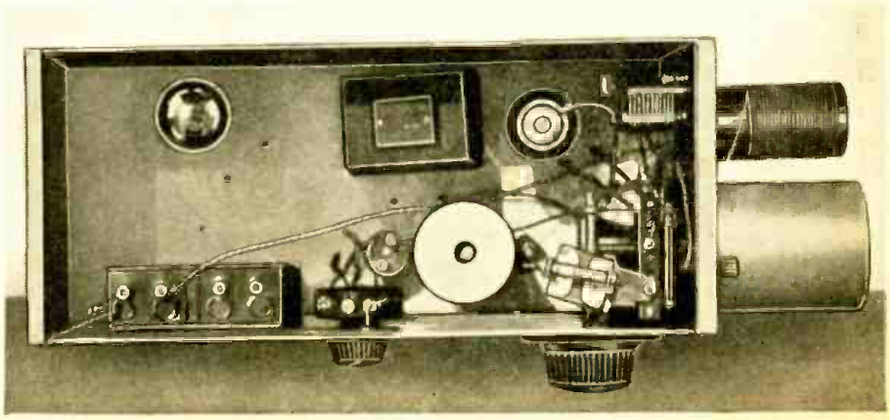
Wiring diagram for the 2-Volt Receiver, which employs three tubes; it possesses very smooth regeneration control.

The only major disadvantage found was the high plate resistance of the type 32 tubes. For this reason impedance-matching to secure maximum efficiency and tone quality was out of the question. However this mattered but little as this station is interested mainly in C.W. (code) work.

On first consideration a screen-grid detector stage using the type 32 and one stage of audio was thought sufficient for our needs. But one of the above mentioned amateurs called our attention to a receiver described in the December, 1931, issue of *QST* and to the circuit of the *Pilot Universal Super-Wasp*, which was explained in SHORT-WAVE CRAFT some months ago. Briefly, the circuit utilizes a stage of screen-grid radio frequency amplification, which is coupled to a screen-grid detector by means of a combined primary and tickler coil. In addition to this novel feature the tickler or feedback coil is removed from its usual position in the detector plate lead and placed in the screen-grid circuit. This is clearly shown in the diagram of the receiver.

The number of parts required for the screen-grid R.F. stage was so small, and the advantages of such a stage were so obvious, that the use of this amplifier was felt necessary, especially since the novel method of coupling eliminated any difficulties in getting this stage to work properly. In order to get maximum amplification from the R.F. stage though, the impedance of the combined primary-tickler coil should be made as large as possible. The number of turns is limited, however, by the ease with which the detector oscillates. In addition the ratio of the primary to the grid coil should allow some voltage step-up in the R.F. transformer that these coils form. With the purpose of increasing the impedance of the primary-tickler coil, a larger than usual number of turns was put on "space wound," and the spacing between the two coils was increased to at least three-eighths of an inch. This spacing must be determined by experiment. This increase in spacing allows several more turns than usual to be used on

(Continued on page 45)



Interior view of Mr. Ewing's 2-Volt Receiver which employs two 32 type and one 30 type tubes.

How to Get LICENSES for Amateur Radio Stations

By BOB HERTZBERG

Arthur Batcheller, radio inspector of the 2nd district, at his desk in the Sub-Treasury Building, New York. As holder of this office for many years, Mr. Batcheller, himself a pioneer radio amateur, has licensed probably more "Ham" operators than any other man in the world.

A hitherto unpublished view of the examination room of the 2nd radio district, located on the third floor of the Sub-Treasury Building, Pine and Nassau Streets, New York, N. Y. The applicants sit at small but comfortable tables, and take the code test with single head phones.

● Numerous letters received from members of the SHORT WAVE LEAGUE indicate that many prospective amateurs are not familiar with the proper method of obtaining government licenses for amateur short wave transmitting stations. Much confusing information is evidently being circulated —not intentionally, of course—by "old-time" amateurs who do not know that the government machinery for radio administration is altogether different from what it was only a couple of years ago.

First let's get the matter of *operator* and *station* licenses straightened out. If you, as an individual "ham", want to go on the air, you need an operator's license, which involves a code test and a simple technical examination, and a station license, which requires nothing more than an application blank. Full details of the operator's license requirements were published on page 346 of the October, 1932 issue of SHORT WAVE CRAFT, so need not be repeated here. PLEASE REFER TO THIS ISSUE AND READ THE REGULATIONS VERY CAREFULLY AND THOROUGHLY.

A few additional notes in this regard are pertinent. There are no restrictions as to age, sex or color, as long as the applicant is an American citizen. Boys of 10 and bearded men of 80, and a goodly sprinkling of girls, are numbered among the amateur fraternity. Please note from the article in the October number that if you live within 100 miles of an examining office, you MUST take the operator's test in person, unless you are physically disabled. At any event, write to the nearest Radio Inspector and find out when examinations are held. If you are in the disabled class, explain your situation thoroughly.

There are now twenty inspection offices; previously there were only nine. A complete list is attached to the end of this article. Make sure of your county and state before writing. This sounds like needless advice, but it is quite necessary, as some people don't seem to know where they live!

The first part of the operator's license examination is the code test. Here's a tip: do your practicing at home with only ONE phone, as the phones at the inspector's offices are single units. If you do all your practicing with regular double phones, and then take the exam with a single phone, you're quite likely to become horribly confused. The code sending of the test message is done by machine, is precise and accurate and lasts only a few minutes. If you pass this test, you are given the theoretical part, which will take possibly 1½ to 2 hours. If you fail the code test, or fail to get a passing mark for the entire examination, you must wait three months for a second chance, so bone up in advance!

If you pass the whole test, you are given your operator's license *immediately*. You then ask the inspector for a station application blank, which you

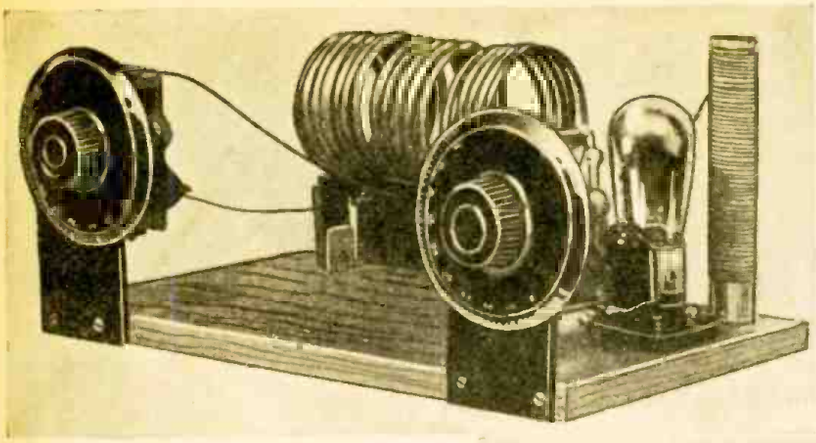
(Continued on page 48)

Here is the answer to hundreds of inquiries received by the editors and the answer to hundreds more, which you will not need to write, after studying the information given in the accompanying article by Bob Hertzberg. Just how to go about obtaining an amateur radio operator's license, as well as a station license, is clearly explained. The nearest U. S. Inspection District to your location can also be found from the appended list.

The reward of success: amateurs receiving their operator's licenses from Charles Mencher, in the office of the 2nd district radio inspector, immediately after passing the examination.

Building a Depression Transmitter

By JOHN T. FRYE, W9EGV



Above—Mr. Frye's transmitter which has accomplished some wonderful "DX" results at his station. Left, antenna tuning condenser, also antenna, plate and grid coils; tank condenser on right. Grid-condenser and grid-leak appear in front of the tube; plate choke at rear to right of tube.

Mr. Frye here regales us with a very appetizing tale—"How To Build An Amateur Transmitter At Depression Prices!" Mr. Frye built his transmitter with parts obtained from an old radio receiving set, which cost fifty cents. The market is full of such sets at bargain prices—so hop to it!

● Is this depression keeping you from building a transmitter? It need not any longer, for I can tell you how to build a transmitter and power supply that will actually "get out," that is the acme of simplicity to construct and operate, and best of all, that costs less than the average "junk-box" receiver.

Probable Cost 50 Cents!

The first thing on the program is a pilgrimage to some radio mart where old battery sets are taken in for new receivers. Now these sets are a drug on the market, and many dealers do not even attempt to resell them; therefore you should be able to secure for about fifty cents an old set that contains the following parts:

Two .0005 mf. tuning condensers of sturdy construction and good insulation, A .00025 mf. grid condenser, Two dials, and One UV or UX socket.

In addition to these parts, you will need three .006 mf. fixed condensers, one 60 ohm center-tapped resistor, one 25,000 ohm grid resistor, and about fifteen feet of No. 10 copper wire or larger. (Copper tubing is preferable if it can be secured.)

We are ready to start building the transmitter. First, secure a board 8"x12" and give it two or three coats of clear shellac. Next, saw two 4"x7" strips from the panel of the old receiver and mount the condensers upon them. These pieces, bearing the condensers, are mounted at opposite ends of the front edge of the base-board. The socket is mounted directly behind the right-hand, or tank condenser.

Winding the Coils

The next task is the winding of the coils. These coils are three inches in diameter and the turns are spaced about a quarter of an inch apart. For eighty meters, the grid and plate coils have five turns each, and the antenna coil has seven turns. They are mounted on a strip of bakelite and are spaced one-half inch apart. This mounting is accomplished by drilling holes through the flattened ends of the wire and running brass bolts through these and corresponding holes in the bakelite strip. These coils should be set up from the strip with small washers.

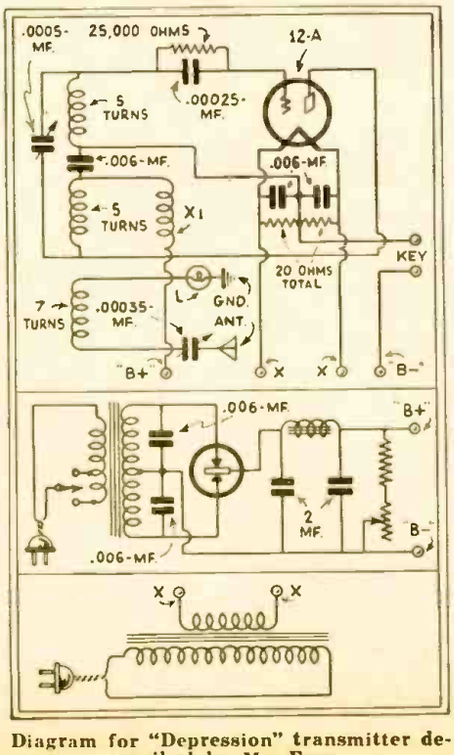


Diagram for "Depression" transmitter described by Mr. Frye.

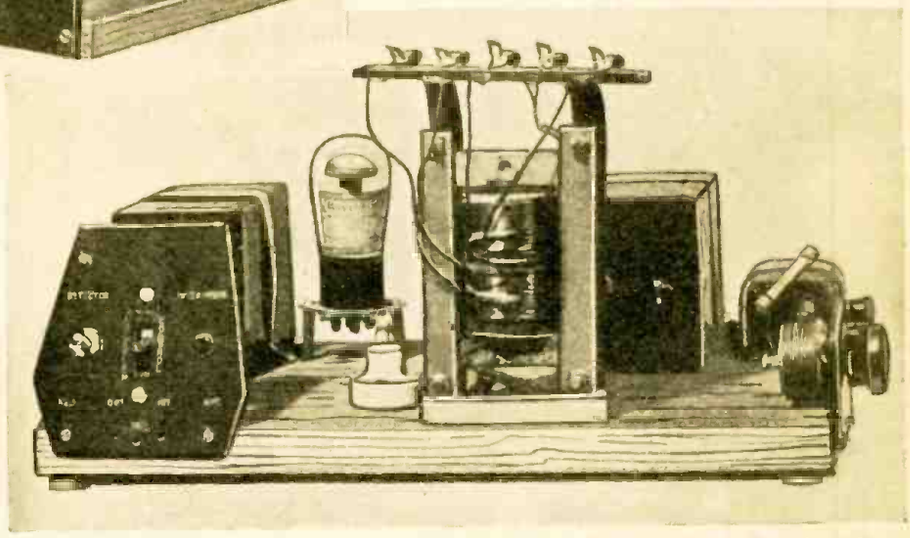


Plate Supply. Front of Board, left to right: Switchboard, including line switch and primary tap switch; socket and flash-light bulb used as fuse. Filament transformer with center-tapped 5 volt winding and 2.5 volt winding. Output binding posts with bleeder assembly, including fixed and variable resistors. Back row, left to right: Plate transformer; socket and BH tube; first filter condenser (behind filament transformer); choke; second filter condenser.

Small brass angles are used to raise the coils about two inches from the base-board. This entire assembly is mounted with the antenna coil at the left at the rear of the board. Next, comes the construction of the choke. It consists of simply 200 turns of No. 28 or No. 30 wire wound upon a suitable length of shellacked broom-handle. The choke is mounted by running a brass screw up through the baseboard into the broom-handle in the right rear corner of the board.

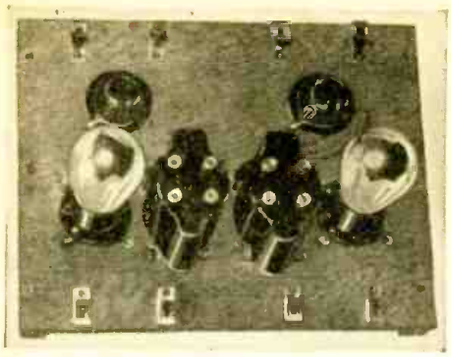
Eight binding posts should be mounted along the rear edge of the board.

By following the diagram closely, you should encounter no difficulty in the actual wiring of the transmitter. Care should be taken, however, to keep all leads as short as possible, and the tank leads should be of the same material as the inductances. The .006 mf. coupling condenser should be mounted directly across the adjacent ends of the plate and grid coils.

Power Supply

Now that the transmitter is completed we may turn our attention to the construction of the power supply. To secure the necessary parts, another trip to the radio shop must be made.

(Continued on page 50)



How the code teaching apparatus here described by Mr. Doerle looks, when neatly assembled on a base-board.

Come and Enlist in the Short-Wave "Code" Army

By WALTER C. DOERLE

A number of practical hints on how to learn the code are here given by Mr. Doerle, already well-known to our readers. Mr. Doerle describes a tube-type code teaching instrument, which you can easily construct from odd parts in your work-shop.

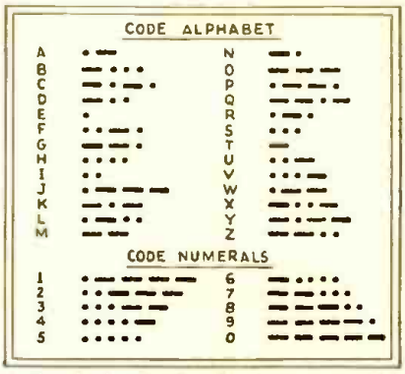
● YOU fellows recall the time when broadcasting was in its infancy and you stayed up late to catch the last call on the air, just for the sport of breaking another DX record and finding another thrill from your receiver. And perhaps with much regret, just as the station announcer gave the call letters, you would also hear the clarion call of your better half, partially asleep in bed, saying with disgust, "John, it's 2 a. m. and you've got to be up at six."

With "equal rights" being breathed into your lungs, and many women's voices expressing their sentiment via radio even in the political conventions, it's time you fellows got your family into the short-wave game and this includes your wife. You've got all to gain—even "Home Sweet Home"—and surely nothing to lose.

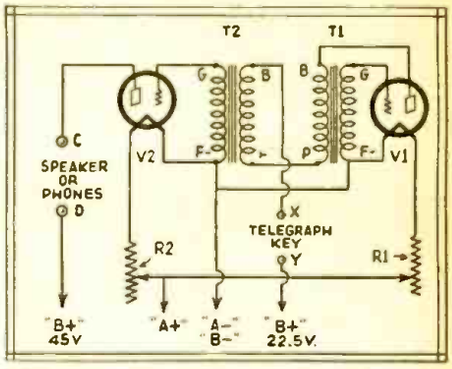
A Few Facts

Furthermore, another great fact is brought to your attention. While the broadcast field has developed by great strides, things are happening in short-waves at so high an exponential power of growth that the pile of accumulated facts is dazzling. Surely with this kind of progress, you don't want to miss the thrills of short-waves, and you too want to share these thrills with the family.

The ether is teeming with short-wave vibrations, to wit, 5 meter code, 10 meter code, 20 meter code and 'phone, 40 meter code, 80 meter 'phone and 160 meter 'phone, and this is only an introductory list of the short-wave signals. Perhaps you are still up in the air as to "how" to get in on the ground floor of transmitted code signals. As for 'phone signals of course no special training is necessary.



The simplest set of code characters which everyone should learn—the alphabet and numerals from one to zero.



Wiring diagram of the code teaching instrument made from a couple of A.F. transformers and two tubes.

How To Do It

The accompanying photograph shows the arrangement of the few radio parts required to make a good code-learning set. The hook-up shows its principle of operation—just the old style regenerative hook-up, with one stage of audio amplification adapted to a new use. It generates an audio frequency signal, by which the customary "dots" and "dashes" of telegraph code may be imitated.

In the diagram, tube VI is the audio frequency oscillator and by "making" and "breaking" its plate current with a regular telegraph key at points X and Y, the amplified audio frequency sound from the loud speaker at points C and D is automatically turned "on" and "off." Thus if a "dot" is made with the depressed key at points X and Y, the "dot" sound comes from the phones or speaker at points C and D; and if the key is held down long enough for the "dash," the "dash" sound is heard.

Comparing this code-learning set to that of a short-wave regenerative receiver: it generates its own audio frequency note, while the beat-note for reception is made by the difference in frequency of the transmitted signal and that generated by the regenerative set. Because of the large values of inductance and capacitance of the windings of transformer T1, the frequency generated comes at the low-note end of the audible range.

For fear of overlooking a fact upon which the operation of this code-learning set depends, your attention is called to the importance of connecting the plate terminal of tube V1 to the "B" terminal of the transformer T1, so that you get the "tickler" action of the transformer winding. In other words, connections to the primary winding of T1 are reversed.

Hints On Construction

Since the photograph clearly shows the arrangement of the parts on the plywood baseboard and the hook-up diagram indicates the few simple but marked connections, it seems quite unnecessary to list a long column of constructional details, so a few words will suffice. As the baseboard is nailed or screwed onto end cleats of sufficient height to permit the filament rheostats to be mounted under it, it would be very tiresome to "work" the key for any length of time and that is the reason for mounting the key on a piece of wood separate from that of the baseboard of the set.

Let the key-knob serve as one

(Continued on page 51)

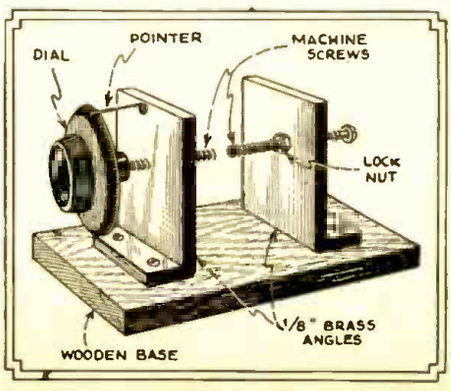
A Home-Made Micrometer

● A GOOD micrometer is much too expensive for the average radio builder to buy when he gets the urge to try his hand at grinding crystals. Some means of measuring the thickness of the quartz plate is essential in order to keep track of the hills and valleys which develop in spite of efforts to keep them out.

Fig. 1 shows a device which can be utilized as a substitute for a micrometer. The action, or principle, is similar to the more expensive ones and, for the purpose, is quite satisfactory.

The readings obtained are comparative, that is, the total thickness of the crystal cannot be obtained, but the thickness of one part compared to another is easily observed. The dial may be any spare dial; preferably one with divisions marked all the way around the edge. An ordinary six or eight thirty-two machine screw is prepared by sawing off the head and filing the ends flat. Fill the shaft hole in the dial with hot sealing-wax, then, before it hardens, place the machine screw in position.

This device will admirably serve the purpose for amateur crystal grinding. —By Jess M. Reed.

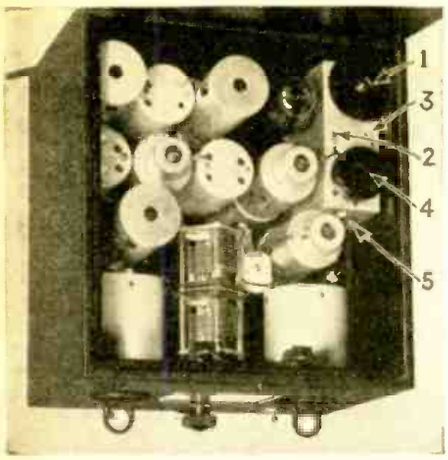


A micrometer which can be made from a couple of machine screws and a radio dial.

The FBX "Single Signal" S-W Receiver

Created by National

How the FB7 Superheterodyne Receiver is converted for "Single Signal" Work



1—Selectivity control; 2—Phasing condenser; 3—I.F. "peaking"; 4—Crystal in plug-in mount; 5—"Series"-"Parallel"-"Off" switch.

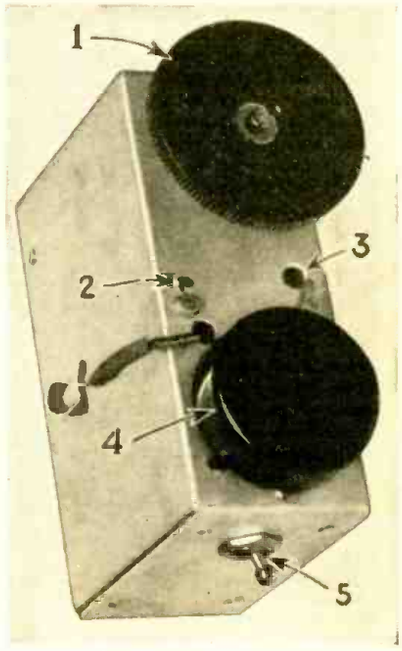
● In the April issue, the new National FB7 superheterodyne was described, together with photos and wiring diagram of the complete 7-tube set. For many amateur requirements it is desirable to have a set respond with extreme selectivity to a *single* signal frequency, particularly in C.W. work. The accompanying photos show a crystal filter circuit attachment which can be fitted as shown to the FB7 receiver, so as to make it a *single signal* receiver, which is then known as the FBX model receiver.

The use of a crystal filter connected in the I.F. amplifier in order to obtain an exceptionally high order of selectivity is desirable under certain circumstances. The idea is by no means new, having been incorporated in the Stenode receivers for several years; but its application to high frequency C.W. reception is comparatively recent.

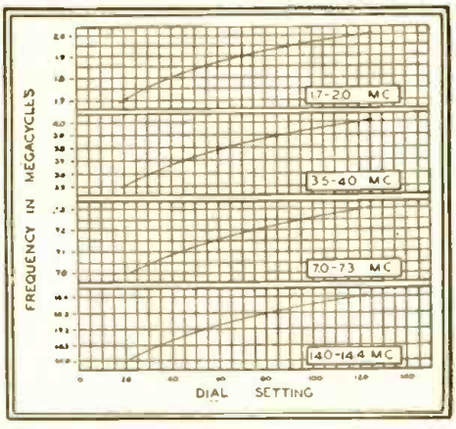
Briefly, a properly designed and adjusted filter connected in series with the input of the I.F. amplifier, will pass only a very narrow band; the width being measured in cycles rather than kilocycles. The fundamental circuit, as shown in the accompanying diagram, is seen to be in the form of a capacity bridge, the function of C_N being to balance (or neutralize) the capacity of the crystal holder, and that of C_T being to tune and center tap the secondary circuit. In addition, the adjustment of C_T has a marked effect upon the width of the response characteristic, enabling the operator to vary it at will from a few cycles to several hundred.

It is evident, from the foregoing discussion of selectivity, that such an extremely narrow I.F. response characteristic will allow the complete separation of stations differing in frequency by only a small fraction of a kilocycle, provided the beat oscillator is correctly adjusted. To carry the discussion further, suppose the beat oscillator is tuned to 502 kc.; that is, 2 kc. from the I.F. (crystal); the 10,500 kc. signal will be tuned in as before, but now should the signal circuits be changed only a few cycles, say 50, the signal will be completely detuned. The beat note resulting when the signal circuits are tuned to 10,504 kc. will now be so weak as to be negligible. In other words, any given signal may be tuned in at only one definite adjustment of the signal oscillator, and the audio response will depend solely upon the detuning of the beat oscillator from the I.F. In the above case, all signals will peak very sharply at 2000 cycles. While the receiver sounds to the ear similar to the older regenerative detectors with a sharply peaked audio amplifier, the principles involved are quite different,

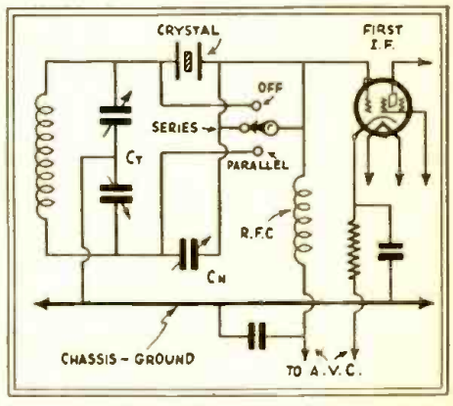
(Continued on page 59)



Close-up of "single signal" attachment.



"Band-spread" coil tuning curves.



Connections of the quartz crystal filter used for "single signal" operation.

$20.00 Prize Monthly For Best Set

● THE editors offer a $20.00 monthly prize for the best short-wave receiver submitted.

If your set does not receive the monthly prize you still have a chance to win cash money, as the editors will be glad to pay space rates for any articles accepted and published in SHORT WAVE CRAFT.

You had better write the "S-W Contest Editor," giving him a short description of the set and a diagram, BEFORE SHIPPING THE ACTUAL SET, as it will save time and expense all around. A $20.00 prize will be paid each month for an article describing the best short-wave receiver, converter, or adapter. Sets should not have more than five tubes and those adapted to the wants of the average beginner are much in demand.

Sets must be sent PREPAID and should be CAREFULLY PACKED in a WOODEN box!

The closing date for each contest is sixty days preceding date of issue (May 1 for the July issue, etc.).

The judges will be the editors of SHORT WAVE CRAFT, and Robert Hertzberg and Clifford E. Denton, who will also serve on the examining board. Their findings will be final.

Articles with complete coil, resistor and condenser values, together with diagram, must accompany each entry. All sets will be returned prepaid after publication.

REQUIREMENTS: Good workmanship always commands prize-winning attention on the part of the judges; neat wiring is practically imperative. Other important features the judges will note are: COMPACTNESS, NEW CIRCUIT FEATURES, and PORTABILITY. The sets may be A.C. or battery-operated. Straight Short-Wave Receivers, Short-Wave Converters, or Short-Wave Adapters. No manufactured sets will be considered; EVERY SET MUST BE BUILT BY THE ENTRANT. Tubes, batteries, etc., may be submitted with the set if desired, but this is not essential. NO THEORETICAL DESIGNS WILL BE CONSIDERED! The set must be actually built and in working order. Employees and their families of SHORT WAVE CRAFT are excluded. Address letters and packages to the SHORT WAVE CONTEST EDITOR, care of SHORT WAVE CRAFT Magazine, 96-98 Park Place, New York, N. Y.

Short-Wave Beginner

How to Build a Simple 3-Tube Receiver, Which Uses a Switch Instead of Plug-in Coils to Change the Wave Bands it Tunes to.

No. 11 of a Series

By C. W. PALMER

● IN PAST issues we have described the construction of a complete short-wave receiver, beginning with one tube and gradually building it up to three tubes, adapted for operation on batteries or with a power unit. In making this receiver, we accumulated a working knowledge of short waves, and learned how to follow wiring diagrams, etc. We also learned, in a general way, the purpose of each part in the set.

We are now ready for a more ambitious job—the construction of a neat three-tube receiver using the most up-to-date tubes, parts and ideas. This set will do away with the annoyance of having to plug-in a new coil every time we desire to change from one wave-band to another. By simply turning a switch on the panel, this shifting is accomplished.

In appearance, too, the set is a distinct improvement over the other we built. It is made on an aluminum base, with an aluminum panel, and practically all the wiring is "below board" where it does not show. Because of the switch feature, it may be mounted in a neat little cabinet and be an asset rather than a liability to the appearance of the room in which it is used.

The Tubes

In selecting the tubes, from the large number of new ones available, a group was chosen that may be used with either alternating current or batteries on the filament. In this way, it may be completely "power-operated" with a suitable "B" power unit, such as the one described in the January 1933 *Short Wave Beginner* article, and a filament transformer supplying 6.3 volts. It may also be operated from dry "B" batteries for the plate supply and a "6 volt" storage battery for the filaments.

The set uses a pentode tube as a radio frequency amplifier; a screen-grid detector and a pentode audio frequency tube. The combination of these three supplies sufficient volume to operate a loudspeaker on all but the most distant stations. Due to the pentode radio frequency amplifier, it is very sensitive to weak stations—and best of all, it is quite simple to tune, as it has only one tuning knob and the regeneration control.

The Coils for 14 to 195 Meter Coverage

The coils used in the original model shown in the photographs are home-made, but commercial coils such as the "Octo" coils may be employed by removing the primary winding and connecting the *secondary* and *tickler* coils as shown in the diagrams.

Four coils are used to cover the wavelengths from 14 to 195 meters. They are all wound on forms three inches long and 1⅜ inches in diameter. The first coil covers the wavelengths from 14 to 30 meters and contains a grid coil of 5 turns of number 14 enamelled wire space wound to cover one inch of the form. The tickler or plate coil contains 6 turns of number 28 enamelled wire, close wound. The latter coil is wound below the secondary with 1/16th inch spacing between.

The second coupler has a secondary of 12 turns of number 14 enamelled wire, spaced to cover 1½ inches and a tickler of 8 turns of 28 enamelled wire close wound. The third has a secondary of 26 turns of number 14 enamelled wire, spaced over 2⅛th inches and a tickler of 12 turns of number 28 enamelled wire, close wound. The largest coil contains 45 turns of number 24 enamelled wire spaced over 1½ inches of the form, with a tickler of 20 turns of number 28 enamelled wire, close wound. The four coils are shown in one of the diagrams.

Building the Set

The first thing to do in building any receiver is to collect all the parts. The parts listed below were used in the original model of the set.

3—R.F. Chokes—National type 100—L1, L2, L3. (2.5 millihenries each.)

1—Set of four coils—described in the text—L4, L5.

1—Tuning condenser—National SE100—C1. (Cap. 100 mmf.)

3—.0001 mf. fixed condensers—Polymet C2, C3, C7.

4—.01 mf. by-pass condensers—Polymet C4, C5, C6, C8.

1—.5 mf. by-pass condenser—Polymet C9.

1—500 ohm (10 watt size) Lynch resistor—R1.

1—5 megohm grid leak—Lynch—R2

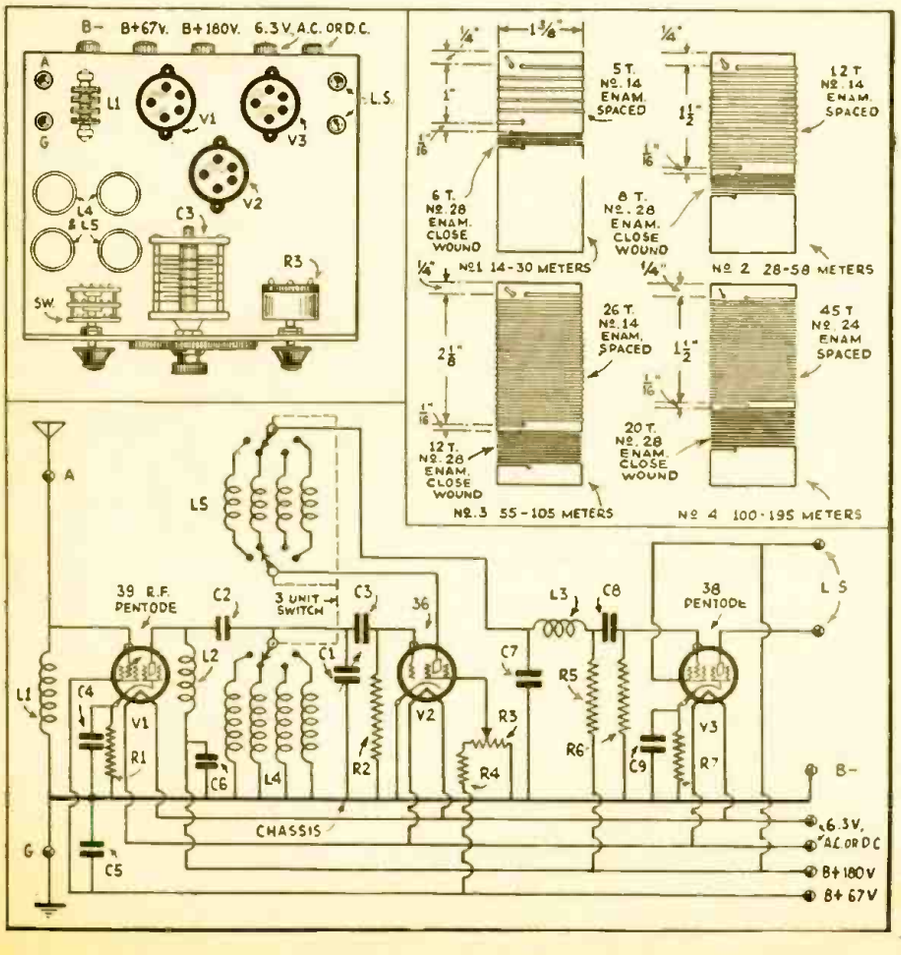
1—50,000 ohm wire wound potentiometer—Clarostat—R3.

1—20,000 ohm resistor (1 watt size) Lynch—R4.

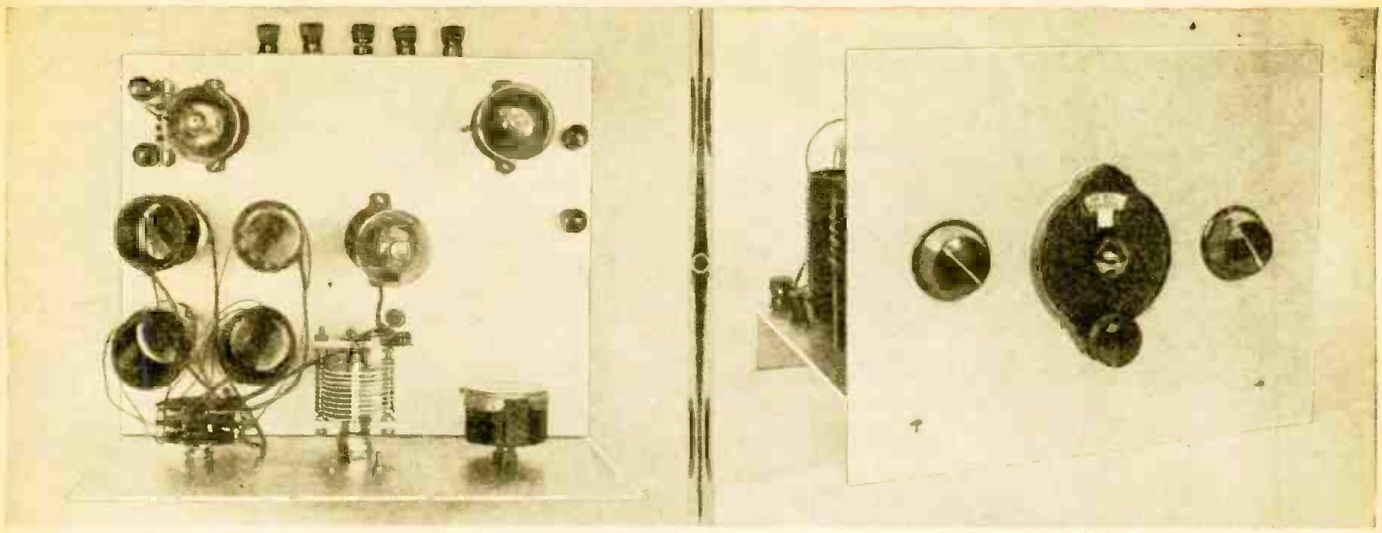
1—250,000 ohm resistor (1 watt size) Lynch—R5.

1—1 megohm grid leak Lynch—R6.

1—2,000 ohm resistor (10 watt size) Lynch—R7.



The line drawing above shows, in the upper left-hand view—a top plan view of the receiver; in the upper right-hand corner—details of the coils used; the lower diagram shows schematically the connections of all the parts in the 3-tube receiver.



The photos above illustrate the neat and well arranged 3-tube beginner's receiver here described by Mr. Palmer, and which employs a switch to change the wavebands instead of "plug-in" coils.

3—5-prong Tube sockets—Eby.
9—binding-posts—Eby Jr.
1—Band Selector Switch—"Best" type (or Eby). (3 sections—4 contacts each.)
1—39 Tube—Triad—V1.
1—36 Tube—Triad—V2.
1—38 Tube—Triad—V3.
1—Aluminum chassis 8 by 10 inches by 1½ inches high—Blan.
1—Aluminum panel 8 by 10 inches—Blan.
4—pieces of bakelite tubing—1⅜ by 3 inches—Blan.
1—Dial—3 inch diameter—National type BM-3.
¼ lb. No. 14 enamelled wire.
¼ lb. No. 24 enamelled wire.
¼ lb. No. 28 enamelled wire.
1—roll of hook-up wire.
As required—angles, screws, soldering lugs, etc.

After the parts have been collected, lay them on the aluminum chassis in the positions shown in the photographs and diagrams. Mark the holes with a center punch or a scribe and drill them. As the positions for the holes vary with each make of parts used, it is useless to show exact positions for them. We have had sufficient experience, after building the other receiver, to layout the holes without any difficulty.

The drilling of the holes, especially the ones for the tube sockets, will be more difficult than with our previous sets, because of having to drill through aluminum. For this reason, if possible, you should have the socket holes drilled by the store or supply company where the chassis and panel are purchased. However, for those who are ambitious, it can be done without the use of special tools, by first marking the circle of the required size with a compass or dividers and then drilling a number of small holes around the circumference of the circle. The center piece can then be knocked out and a file used to clean up the rough edges.

It is important to place the parts in the positions shown, to keep the leads short and to prevent body-capacity or other defects in the operation.

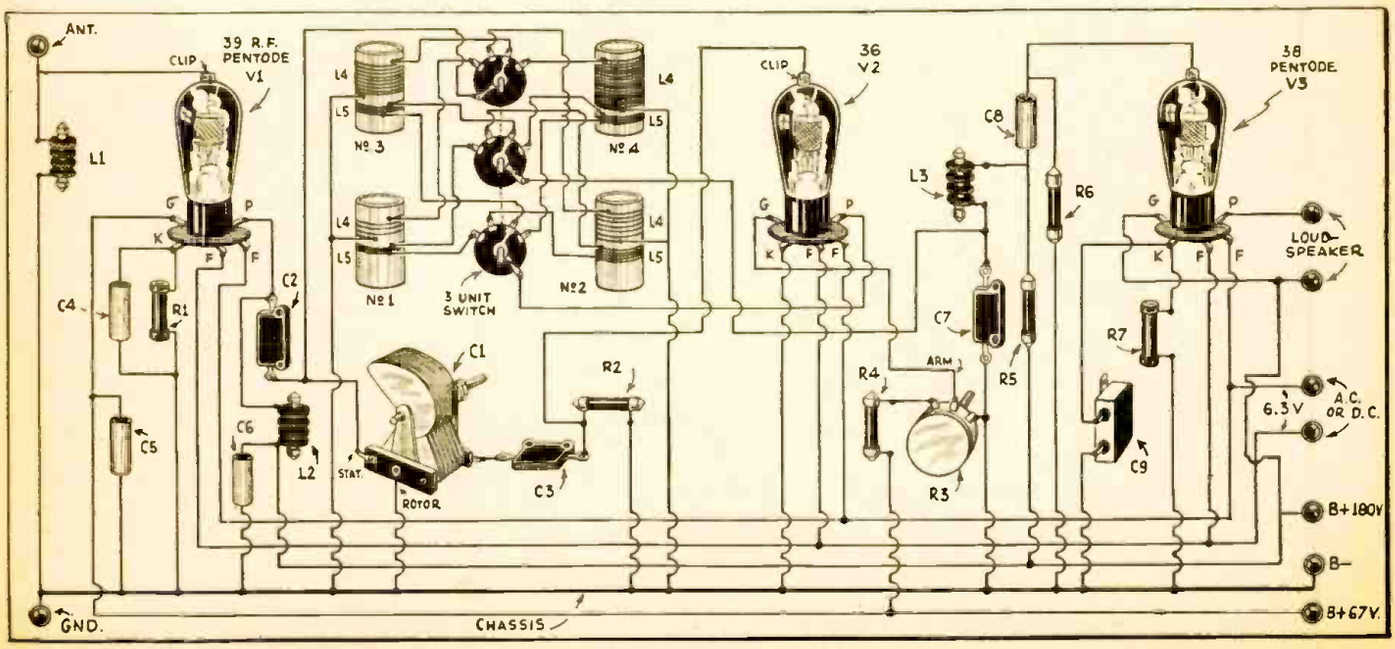
After all the parts have been mounted in the positions shown, the set is ready to be wired. Most of the wiring is quite easy to follow, so we will not describe how to connect each wire. Either the picture or the schematic diagram may be used. The wiring to the band selector switch, however, is a little difficult; so we will explain it in detail.

The Band-Selector Switch

This switch really consists of three separate switches mounted on one shaft, so that they can all be turned at one time. The first section switches one side of the secondary coils (grid coils) from one band to another. As one side of each of these grid coils is connected to the chassis, it is not necessary to switch this side of the coils. They are connected permanently to the chassis as shown in the diagrams.

The second section of the switch changes one side of the tickler or plate coils from one to another at the same time that the secondaries are being changed, and the third section shifts

(Continued on page 59)



Picturized wiring diagram for the newcomer in the short-wave game, illustrating how the various apparatus comprising Mr. Palmer's 3-Tube "Plug-less" Receiver are connected.

LETTERS FROM S-W FANS

IMPROVES THE DOERLE

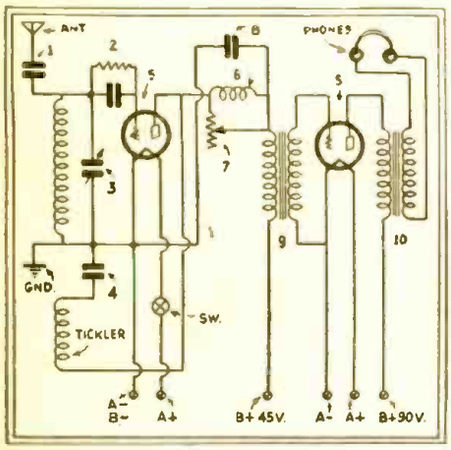
Editor, SHORT WAVE CRAFT:

In the August issue of SHORT WAVE CRAFT you were kind enough to publish a letter of mine about my success with the *Doerle* receiver. Since then I have made changes that have greatly improved the set, both in efficiency and ease of operation.

I would like to tell you the results I have had with this set, from March 1 to Sept. 15. I have heard Australia, Japan, Indo-China, Philippine Islands, Russia, Brazil, Argentina, Colombia, Ecuador, Mexico, Canada, Hawaii, France and Spain. And Amateurs! My oh my! I have heard them from New Jersey to Los Angeles and from Calgary to Texas. I have received KKP in Hawaii and W3XAL, W1XAZ, W2XAF, many times on the loud speaker. W3XAL, W1XAZ, W2XAF, I can receive them on the earphones almost every day, without any aerial at all. No wonder I feel a little proud, thrilled, and highly excited, to hear programs from halfway around the world, through the small 2-tube set that I built. Such is the magic of short wave radio! And what I knew about radio could be written on a postage stamp; (to illustrate) it took me two hours to connect a filament voltmeter to the set. In closing, I would like to say that SHORT WAVE CRAFT magazine should be on every short-wave fan's desk.

A. P. VENTURA,
637 Porter St.,
Vallejo, Calif.

(Thanks very much, A.P.V. for your informative letter and diagram which we are publishing herewith, for the benefit of other short wave fans. We are pleased to hear of the vast array of short wave stations you have heard on your improved Doerle receiver. Again, thanks for your good wishes and we trust you will hear "plenty" more DX stations and get oodles of thrills with the "Doerle" 2 tuber.—Editor.)



Mr. Ventura's hook-up for improved "Doerle" receiver.

WHOLE WORLD ON "1-TUBE MEGADYNE!

Editor, SHORT WAVE CRAFT:

Recently I had the pleasure of seeing my letter published in your magazine. I am writing you this letter to let you know about other stations the Megadyne has pulled in since then. Stations. W8XK, Pittsburgh; W1XAZ, Springfield; W2XAF, Schenectady; W3XL, Boundbrook; W8XK, Pittsburgh; W3XAL, Boundbrook; W9XF, Chicago; W8XAL, Cincinnati; W3XAU, Philadelphia; W4XB, Miami; W1XAL, Boston.

In Canada: VE9GW, Bowmanville and VE9JR, Winnipeg. In Colombia, S. A.: HJ3ABF, Bogota, HKD, Barranquilla. In Venezuela: YV1BC, Caracas. In Brazil: PSH, Rio de Janiero and PRBA, Rio de Janiero. In Argentina: LSX, LSN, and LZA, all in Buenos Aires. In England: two new stations of the BBC. I have not heard their call letters. They are on 31.3 and 49.6 meters. In Rome: I2RO. In France: FYA. Pontoise. In Germany: DJC, Berlin. In Switzerland: HBP, Geneva, League of Nations. In Spain: EAQ, Madrid. In Australia, VK2ME, Sydney. The telephone stations in the U. S. A. are WMF, WAJ, WEF, WKJ, WOO, WNB, WND, WOK, WNA, WOA, WEJ. WOB. WOO, WAD, WEM, and WQN. The telephone station in Canada is CGA in Drummondville. The telephone stations in England I have heard are GCB and GBB. The telephone stations in the Bermudas I have heard are ZFA and ZFB. The telephone station in Venezuela I have heard is YVR in Maracay. A new station in the Bahamas is VPN who telephones Miami. It is on about 70 meters. In Ecuador, PRADO, in Diobamba.

CURRIE'S 5-TUBE SET MARVELOUS!

Editor, SHORT WAVE CRAFT:

About five days ago I completed Mr. Burton Currie's 5-tube De-Luxe Radio Frequency Short-Wave receiver, described in the January issue of SHORT WAVE CRAFT. I want to congratulate you and Mr. Currie for giving the short-wave fans this excellent receiver. It certainly is a winner!

I have built quite a few short-wave receivers such as: Stand-By Receiver, Superregnode, Copper Clad Special, Mr. Bryan's Automobile Short-Wave Receiver, Megadyne, and others, but none can be compared with this job.

Foreign stations coming in just like "local" ones, with the volume control barely turned on! This is just like tuning a regular broadcast receiver. I have received the following stations with plenty of volume to spare: British Empire Stations, GSA, GSD, and GSC; French Stations FYA on 19 meters and FYA on 25 meters; YV2BC. Carracas, Venezuela; I2RO, Rome; EAQ, Madrid; VK3ME. Melbourne; VK2ME, Sidney; and Berlin on 25 meters. I listen to these stations regularly and have been since I built the set.

On Sunday, February 19, between 5 and 6 a. m., I was listening to VK2ME. Sidney, on 31.28 meters, while GSC, London, was on the air on 31.29 meters. Both stations were coming in fine and clear!

I have been a reader of SHORT WAVE CRAFT since 1930, and I can hardly wait until it appears on the newsstand for the next issue.

At the present time I am building the Cage Aerial (space limited) with transposed lead-in wires, and with Mr. Currie's set and this aerial, I am sure I will enjoy "real" short-wave reception.

Anyone who wants to build a real short-wave should build Mr. Currie's 5-tube, tuned radio frequency receiver.

I wish SHORT WAVE CRAFT every success.

Very truly yours
MARTIN MULLER,
213 S. Metropolitan Avenue,
Atlantic City, N. J.

(Mighty glad to receive such a glowing tribute to the ingenuity of Mr. Currie. That set looked pretty good to us and after reading of the wonderful results you had with it, we are still more impressed with the argument now going on in one of the English radio publications, that the T.R.F. sets always give a good account of themselves when tested side by side with the super-hets. Let's hear from some more builders of the Currie T.R.F. 5-Tube Receiver.—Editor.)

Mr. Whitmer's efficient looking station.

Just to let you know how the "one tuber" is coming along and wishing good luck to your magazine.

JACK JONES, JR.
Tupelo, Miss.

(Marvelous work with the short wave Megadyne, Jack! We were certainly surprised at the very fine DX results you obtained with this set. Apparently, you must have used parts of the best quality and also the crystal detector must be a "cuckoo." Let's hear from you again, especially if you should make any new changes in the Megadyne circuit.—Editor.)

SEND US MORE "STATION" PHOTOS!

Editor SHORT WAVE CRAFT:

Received my March issue of SHORT WAVE CRAFT yesterday and noted with interest that you ask for pictures of S. W. Listening stations, so I am enclosing a photo of my station. I will describe it: the receiver is a converter-broadcast receiver combination, composed of a Stewart-Warner model 301-A converter, used in connection with an Atwater Kent model 55 broadcast receiver. In the corner in back of "yours truly" is the speaker of the A. K. 55 mounted on a 30 inch square baffle so as to reproduce the bass notes better, since I have added tone control to the A. K. Verification cards of my best catches are posted at random on baffle and walls.

It might be of interest to say that this picture was taken by myself, of myself. Being an amateur photographer I also developed and printed it. I am making this letter serve a dual purpose in that I am going to ask you to assist me in becoming a member of the SHORT WAVE LEAGUE.

I am a student in the R. C. A. Institutes, Inc., of New York and am an experimenter with short-wave receivers. I am also a broadcast service man and am secretary and treasurer of the Radio Service Men's Association of this city.

I think that your magazine SHORT WAVE CRAFT is without a doubt the best one in its field. It fills a great need in that it contains information that we short-wave experimenters would be at a loss to know where to find, if it were not for SHORT WAVE CRAFT. I especially appreciated the short-wave tuning charts (wave-length, inductance and capacity charts giving coil and wire sizes, etc.) in the March issue.

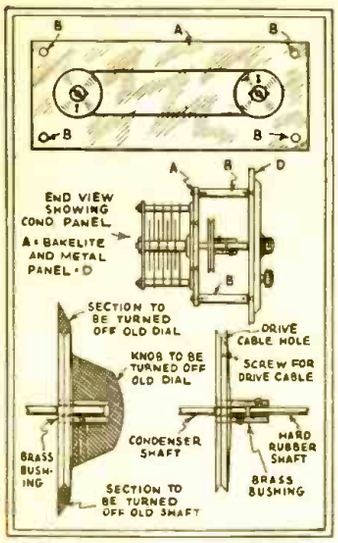
Assuring you of my cooperation, I remain,

Respectfully yours,
E. LLOYD WHITMER,
121B S. E. 4th St.,
Evansville, Ind.

("Fine business"—O. M. Let's have some more photos of those short wave listening stations and "ham" (transmitting and receiving) stations also. We will endeavor to use all of these we can. Your SHORT WAVE LEAGUE application has been attended to and your certificate sent.—Editor.)

$5.00 For Best Short Wave Kink

The Editor will award a five dollar prize each month for the best short-wave kink submitted by our readers. All other kinks accepted and published will be paid for at regular space rates. Look over these "kinks" and they will give you some idea of what the editors are looking for. Send a typewritten or ink description, with sketch, of your favorite short-wave kink to the "Kink" Editor, SHORT WAVE CRAFT.



$5.00 Prize
CONDENSER GANGING

The method used in ganging two condensers as shown in this drawing is nothing new. After many an attempt and equally as many failures, at cutting a bakelite disc for this purpose, I conceived this idea of using some of the odd dozen old dials in my junk-box. There are quite a few of the old dials (three- and four-inch) hard rubber or bakelite, which have a brass shaft bushing (note drawing).

I find it easy to make this disc or drum, as you might call it, by filing the knob off level with the end of this bushing. Then place each on a ¼ inch shaft; with the aid of a hand- or power-drill and a large file, we now proceed to turn down the knob until only the brass bushing remains. Then by placing both dials on one shaft, flat sides together, we are now ready to turn down the outer edges to the size disc we want, about 2¼"; by holding the file against both edges, presto, we find when done both disc are the same size! Now with a small three-cornered file, we cut the groove to accommodate the cord used to drive the condensers, both disc to have the same depth groove. Next, we drill the drive cable hole, and drill and tape hole for drive cable screw (note drawing). Then on only one of the brass bushings, we drill another set-screw hole near the outer edge, and tap for second set-screw; this we find serves nicely for a shaft coupling.—C. J. Fink.

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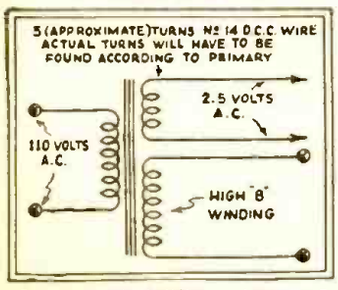
HEATER SUPPLY



I was recently building a 4-tube A.C. receiver, but I lacked a filament transformer. I solved my problem by removing the power transformer from my power supply and winding five turns of No. 12 D.C.C. copper wire over the high voltage "B" winding. This gave me enough amperage to supply four 2½ volt tubes. This method can be utilized for different voltages by varying the number of turns—Renaldo Karas.

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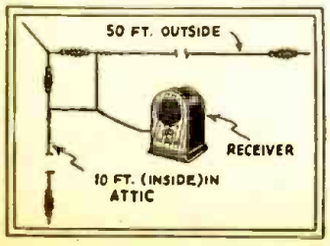
HOW TO USE TWO AERIALS

I have here two aerials. One is about ten feet long and the other about fifty feet long. When using the short one I have very good regeneration, but the signal strength is not as great as with the long aerial; with the long aerial the signal strength is appreciably greater but the regeneration is poor. By merely connecting both aerials to the set at one time, I obtained excellent results—a gain in signal strength and also better regeneration.—Allen D. Rickert, Jr.



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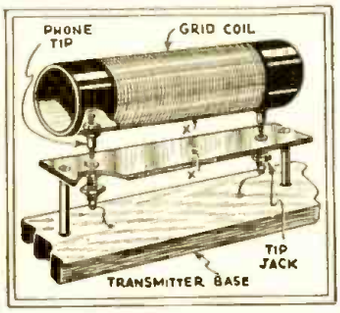
PLUG-IN XMITTER COIL

Here is a sketch and description of a plug-in grid coil for transmitters of the push-pull and single-control type. Procure a machine screw large enough to fit the phone tips and solder within. Fit these into each end of the grid coil and solder the loose ends of wire of the coil



on to it, after fitting nuts into the machine screw. Then, as illustrated, these should fit into tip jacks. For push-pull an additional tip and tip jack is needed at the point marked "X".—James L. Paul.

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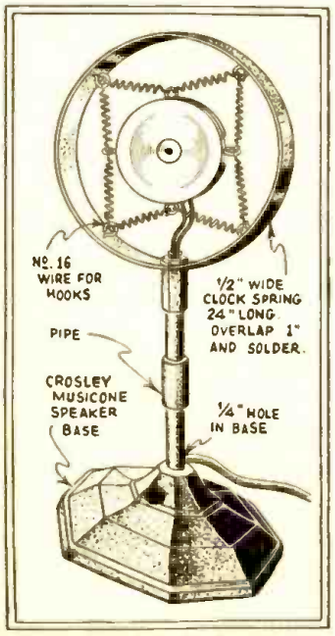
"MIKE" STAND

This "mike" stand may be made of scrap material that is usually found in any "workshop." The base of the stand pictured was taken from a "Crosley Musicone" speaker, but any sort of a base may be used. The arm supporting the cone was sawed off leaving a "stub" about one inch high. This was drilled with an 11/32 drill, and threaded for the 12" length of ⅜ pipe on which the ring is mounted. The ring is made of a 24" length of ½" clock spring. Brass will be better, if available. The ends should be lapped 1", clamped together firmly, and

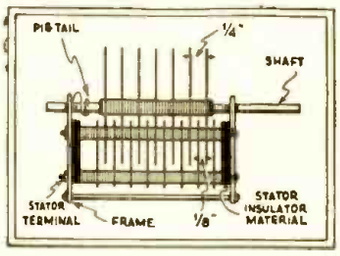


soldered. The rings for the microphone springs are made of No. 16 wire formed around a lead pencil. They should be attached to the large ring through small holes, drilled 5½" apart, soldered firmly on both sides, and smoothed down with a file. The overlapped portion is drilled with a ⅜" hole and the ring attached to the standard with two hexagon nuts. The cord is brought out through a ¼" hole in the pipe near the base. After assembling the stand, give it a coat of shellac or varnish. Before this finish dries, brush on bronze powder, covering thoroughly. After this dries hard, cover with brown paint (enamel or oil paint of any kind) and wipe off immediately with a cloth saturated in turpentine. This will give an antique bronze finish.—W. E. Carson.

▼ ▼ ▼

CUTTING DOWN A CONDENSER

Although midget condensers are relatively inexpensive, many experimenters still prefer to "cut down" standard receiving condensers when building S-W receivers. After much experimenting with all manner of variable condensers, using the Doerle "rig," it was found that as much as 25 per cent increase in volume could be obtained by copying transmitter variable condenser design and spacing the plates. Instead of cutting the rotor or stator plates to fit the capacity. The condenser to be altered should have washer spacers on both the stator and rotor mount-



ings. Space the stator plates about ¼" apart, by the simple procedure of putting in twice the number of washers between plates. The same should apply to the rotor plates. The number of plates needed with the new spacing may be readily determined by experiment or formula. This method has another advantage in that the original frame retains its balance, and that scraping plates may be more easily avoided.—Carroll Moon.

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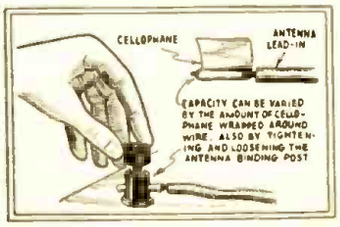
CELLOPHANE CONDENSER

Have you ever built a short-wave receiver and then have it not work? All because you did not have a midget condenser handy to tune the aerial. Or perhaps in making a very compact model, there was no place to mount one, without making it a cumbersome job. Try this method, which I have used successfully and see how it works.

Secure a piece of Cellophane off a cigarette package or a cigar and wrap it around the bare wire on the end of the aerial lead-in and then insert it in the antenna binding post. You will find that this method will save you lots of trouble, espe-

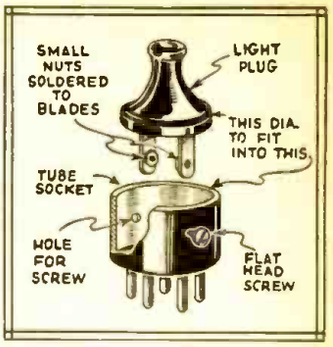


cially in experimental hook-ups. Capacity can be varied by the amount of Cellophane wrapped on the wire and also by tightening or loosening of the antenna binding post screw.—R. E. Thayer.

▼ ▼ ▼

ADAPTER PLUG

Here is how I make my adapter plugs: I got an A.C. plug at the Nickel & Dime store, and, as the blades of the plugs have holes in them, I soldered a small nut on the inside of each blade and opposite the hole. Then, I drilled the tube-base for the bolts to go through the sides to the blades of the A.C. plug. The A.C. plug is slightly smaller than the tube-base, but if it is filed down close, this makes a very neat "adapter" plug.—Charles Cassell.



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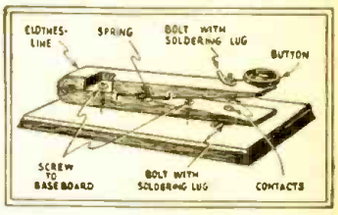
KEY FROM CLOTHES-PIN

Here's one for you fellows who want an extra key to practice on or perhaps to take the place of a regular key until the pocket-book gets a little fatter. Secure a clothes-pin from your mother's clothes line; one of the clip variety with a spring.

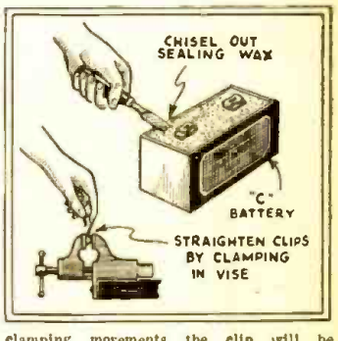


Mount the pin on a suitable base, put a button on top for the fingers to grip and insert a couple of screws for contacts; a very serviceable key results. This method can also be used for making push-buttons where appearances won't count against it.—R. E. Thayer.

▼ ▼ ▼

CHEAP SPRING CLIPS

On small 4½ v. "C" batteries there are usually two Fahnestock clips. Take a small wood chisel and knock the red substance from around the clip. With a little patience the clip can be removed. The clip will be bent as it was on the real battery. Put this bent part in a vise and clamp the vise together. With one or two



clamping movements the clip will be straightened. Old, dead "C" batteries and 45 v. "B" batteries will be given to you by radio shops, etc. In the long run this saves money, especially if Fahnestock clips are going to be used in a multi-stage transmitter. A drill will put a hole in the clip for fastening.—H. S. Harrison.

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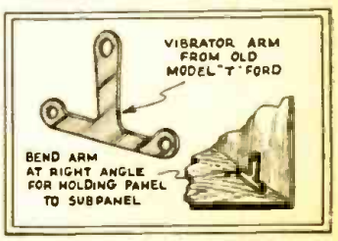
USE OF VIBRATOR ARMS



Vibrator arms from old Model T Ford coils make good mountings for "one-hole" mounted radio apparatus. This is useful in dealing with experimental radio apparatus. This also may be used for holding panels to subpanels. If the hole is too small a reamer will help.—H. S. Harrison.

SHORT WAVE STATIONS OF THE WORLD

SECTION TWO

Section One of this list of the Short Wave Stations of the World appeared in the April, 1933, number, and contained extremely valuable data on 170 stations of the broadcasting, experimental and commercial classifications. Preserve all your copies carefully, as they will form a continuous, up-to-the-minute station directory of unequalled accuracy and completeness. If you do not have the April issue on hand, you can obtain a copy directly from us. (Mailed on receipt of 25c.)

Section One of this list (in the April number) contained the short wave broadcasting, experimental and commercial stations. *Section Two* contains the police, airport and television stations. *Section One* will reappear in the June issue and will feature a revised "grand" list of broadcasting, commercial and experimental stations. Keep these lists; they are valuable!

This month we are running the American police radio alarm stations, both numerically according to frequency and wavelength, and alphabetically according to call letters. This arrangement permits a double check on your reception of these highly interesting and active stations. The list is corrected against daily reports received by us from the Federal Radio Commission. No operating hours are given, of course, as practically all police stations are maintained on a 24 hour basis.

Airport and television stations are also included this month, as are the experimental and commercial stations that were crowded out of the April issue. Please write to us about any new stations, changes in schedules, or other important data that you learn through announcements over the air or correspondence with the stations themselves. A post card will be sufficient.

Around-the-Clock Listening Guide

Although short wave reception is notorious for its irregularity and seeming inconsistency (wherein lies its greatest appeal to the sporting listener), it is a good idea to follow a general schedule as far as wavelength in relation to the time of the day is concerned. The observance of a few simple rules will save the short wave fan a lot of otherwise wasted time.

From daybreak to mid-afternoon, and particularly during bright daylight, listen between 13 and 22 meters (21540 to 13000 kc.).

To the east of the listener, from about noon to 10:00 p. m., the 20-35 meter will be found very productive. To the west of the listener this same band is best from about midnight until shortly after daybreak. After dark, results above 35 meters are usually much better than during daylight. These general rules hold good whether you live in the United States or in China.

POLICE RADIO ALARM STATIONS

By Frequency and Wavelength

2506 kc.-120 m.

KGZE	San Antonio, Tex.

2470 kc.-121.5 m.

KGOZ	Cedar Rapids, Ia.
KGPN	Davenport, Ia.
WPDZ	Fort Wayne, Ind.
WPDT	Kokomo, Ind.
WPEC	Memphis, Tenn.
KGPI	Omaha, Neb.
WPDP	Philadelphia, Pa.
KGPD	San Francisco, Cal.
KGPM	San Jose, Cal.
KGPW	Salt Lake City, U.
WRDQ	Toledo, Ohio
.....	Gary, Ind.

2458 kc.-122.0 m.

WPDO	Akron, Ohio
WPDN	Auburn, N. Y.
WPDV	Charlotte, N. C.
WRDH	Cleveland, Ohio
WPDR	Rochester, N. Y.
WPEA	Syracuse, N. Y.

2450 kc.-122.4 m.

WPDK	Milwaukee, Wis.
WPEE	New York, N. Y.
WPEF	New York, N. Y.
WPEG	New York, N. Y.
KGPH	Okla. City, Okla.
KGPO	Tulsa, Okla.
KGPZ	Wichita, Kans.
KGZF	Chanute, Kans.
.....	Coffeyville, Kans.

2442 kc.-122.8 m.

KGPX	Denver, Col.
WPDF	Flint, Mich.
WPEB	Grd. Rapids, Mich.
WMDZ	Indianapolis, Ind.
WPDL	Lansing, Mich.
WPDE	Louisville, Ky.
KGPP	Portland, Ore.
WPDH	Richmond, Ind.
KGZH	Klamath Falls, Ore.
WPFC	Muskegon, Mich.
.....	Reading, Pa.

2430 kc.-123.4 m.

WPDI	Columbus, Ohio
KGPP	Portland, Ore.
WPDM	Dayton, Ohio
KGZD	San Diego, Cal.
WPFD	Highland Park, Ill.
WPFF	Toms River, N. J.
.....	Hackensack, N. J.

2422 kc.-123.8 m.

KSW	Berkeley, Cal.
WMJ	Buffalo, N. Y.
KGPE	Kansas City, Mo.
KGPG	Vallejo, Cal.
WPEK	New Orleans, La.
WPDW	Washington, D. C.
.....	Jacksonville, Fla.

2416 kc.-124.1 m.

KGPB	Minneapolis, Minn.
WPDS	St. Paul, Minn.

2414 kc.-124.2 m.

WPDY	Atlanta, Ga.
KGPS	Bakersfield, Cal.
WCK	Belle Island, Mich.
WPDX	Detroit, Mich.
WRDR	Grosse Pt. Vil. Mich.
WMO	Highland Pk., Mich.
KGPA	Seattle, Wash.
WPDA	Tulare, Cal.
KGZM	El Paso, Tex.
WPFH	Baltimore, Md.
.....	Tacoma, Wash.
.....	Columbus, Ga.
.....	Birmingham, Ala.

1712 kc.-175.15 m.

KGPJ	Beaumont, Tex.
WPDB	Chicago, Ill.
WPDC	Chicago, Ill.
WPDD	Chicago, Ill.
WKDU	Cincinnati, Ohio
KVP	Dallas, Tex.
KGPL	Los Angeles, Cal.
KGJX	Pasadena, Cal.
WPDU	Pittsburgh, Pa.
KGPC	St. Louis, Mo.
KGZI	Wichita Falls, Tex.
.....	Newton, Mass.
.....	Shreveport, La.
WPEH	Somerville, Mass.
WPEP	Arlington, Mass.
KGZB	Houston, Tex.
.....	Hammond, Ind.
.....	Fairhaven, Mass.
.....	Waco, Tex.

1574 kc.-189.5 m.

WRDS	E. Lansing, Mich.
WMP	Fram'gham, Mass.
WPEW	North'pton, Mass.
KGPY	Shreveport, La.

1534 kc.-196.1 m.

KGHO	Des Moines, Ia.

1430 kc.-209.8 m.

.....	Harrisburg, Pa.

257 kc.-1123 m.

WBR	Butler, Pa.
WJL	Greensburg, Pa.
WBA	Harrisburg, Pa.
WMB	W. Reading, Pa.
WDX	Wyoming, Pa.

POLICE RADIO ALARM STATIONS

Alphabetically By Call Letters

KGHO	Des Moines, Iowa	1534 kc.
KGJX	Pasadena, Cal.	1712 kc.
KGOZ	Cedar Rapids, Iowa	2470 kc.
KGPA	Seattle, Wash.	2414 kc.
KGPB	Minneapolis, Minn.	2416 kc.
KGPC	St. Louis, Mo.	1712 kc.
KGPD	San Francisco, Cal.	2470 kc.
KGPE	Kansas City, Mo.	2422 kc.
KGPG	Vallejo, Cal.	2422 kc.
KGPH	Oklahoma City, Okla.	2450 kc.
KGPI	Omaha, Neb.	2470 kc.
KGPJ	Beaumont, Tex.	1712 kc.
KGPL	Los Angeles, Cal.	1712 kc.
KGPM	San Jose, Cal.	2470 kc.
KGPN	Davenport, Iowa	2470 kc.
KGPO	Tulsa, Okla.	2450 kc.
KGPP	Portland, Ore.	2442 kc.
KGPS	Bakersfield, Cal.	2414 kc.
KGPW	Salt Lake City, Utah	2470 kc.
KGPX	Denver, Colo.	2442 kc.
KGPY	Shreveport, La.	1574 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZB	Houston, Tex.	1712 kc.
KGZD	San Diego, Cal.	2430 kc.
KGZE	San Antonio, Tex	2506 kc.
KGZF	Chanute, Kans.	2450 kc.
KGZH	Klamath Falls, Ore.	2442 kc.
KGZI	Wichita Falls, Tex.	1712 kc.
KGZM	El Paso, Tex.	2414 kc.
KVP	Dallas, Tex.	1712 kc.
KSW	Berkeley, Cal.	2422 kc.
WBA	Harrisburg, Pa.	257 kc.
WBR	Butler, Pa.	257 kc.
WCK	Belle Island, Mich.	2414 kc.
WDX	Wyoming, Pa.	257 kc.
WPDA	Tulare, Cal.	2414 kc.
WPDB	Chicago, Ill.	1712 kc.
WPDC	Chicago, Ill.	1712 kc.
WPDD	Chicago, Ill.	1712 kc.
WPDE	Louisville, Ky.	2442 kc.
WPDF	Flint, Mich.	2442 kc.
WPDH	Richmond, Ind.	2442 kc.
WPDI	Columbus, Ohio	2430 kc.
WPDS	St. Paul, Minn.	2416 kc.
WPDW	Washington, D. C.	2422 kc.
WPDX	Detroit, Mich.	2414 kc.
WPDY	Atlanta, Ga.	2414 kc.
WPEA	Syracuse, N. Y.	2458 kc.
WPEB	Grand Rapids, Mich.	2442 kc.
WPEC	Memphis, Tenn.	2470 kc.
WPEE	New York, N. Y	2450 kc.
WPEF	New York, N. Y.	2450 kc.
WPEG	New York, N. Y.	2450 kc.
WPEH	Somerville, Mass.	1712 kc.
WPEK	New Orleans, La.	2422 kc.
WPEP	Arlington, Mass.	1712 kc.
WPFC	Muskegon, Mich.	2442 kc.
WPFD	Highland Park, Ill.	2430 kc.
WPFF	Toms River, N. J.	2430 kc.
WPFH	Baltimore, Md.	2414 kc.
WJL	Greensburg, Pa.	257 kc.
WKDU	Cincinnati, Ohio	1712 kc.
WMB	W. Reading, Pa.	257 kc.
WMDZ	Indianapolis, Ind.	2442 kc.
WMJ	Buffalo, N. Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1574 kc.
WPDK	Milwaukee, Wis.	2450 kc.
WPDL	Lansing, Mich.	2442 kc.
WPDM	Dayton, Ohio	2430 kc.
WPDN	Auburn, N. Y.	2458 kc.
WPDO	Akron, Ohio	2458 kc.
WPDP	Philadelphia, Pa.	2470 kc.
WPDR	Rochester, N. Y.	2458 kc.
WPDT	Kokomo, Ind.	2470 kc.
WPDU	Pittsburgh, Pa.	1712 kc.
WPDV	Charlotte, N. C.	2458 kc.
WPDZ	Fort Wayne, Ind.	2470 kc.
WRDH	Cleveland, Ohio	2458 kc.
WRDR	Grosse Pt. Village, Mich.	2414 kc.
WRDQ	Toledo, Ohio	2470 kc.

AIRPORT RADIO STATIONS

The airport stations do not follow any fixed schedules, and are likely to be heard anytime of the day or night. They operate very "snappily," and engage only in quick, brief conversations with pilots aloft. The airplane transmitters are usually heard on the same wavelengths. The stations are listed alphabetically according to cities within ten groups of wavelength ranges. The stations in each group are likely to be heard on any of the waves listed.

Group One

94.86 m.–3160 kc. 53.83 m.–5570 kc.
94.56 m.–3170 kc. 53.74 m.–5580 kc.
93.29 m.–3215 kc. 53.64 m.–5590 kc.
52.98 m.–5660 kc.

Bakersfield, Calif.	KQK
Bellefonte, Pa.	WNAM
Boise, Idaho	KRA
Brooksville, Pa.	WNAL
Burbank, Calif.	KEU
Cheyenne, Wyo.	KOE
Chicago, Ill.	WUCG
Cleveland, Ohio	WNAK
Dallas, Tex.	KNAT
Des Moines, Iowa	KQM
Elko, Nevada	KKO
Fort Worth, Tex.	KGUC
Fresno, Calif.	KGT
Iowa City, Iowa	KQQ
Kansas City, Mo.	KNAS
Lincoln, Neb.	KRF
Medford, Ore.	KGE
Moline, Ill.	WNAU
Newark, N. J.	WNAO
North Platte, Nebr.	KMR
Oakland, Calif.	KFO
Okla. City, Okla.	KNAV
Omaha, Nebr.	KMP
Orlando Twsp., Ill.	WNAT
Pasco, Wash.	KRD
Ponca City, Okla.	KGUZ
Portland, Ore.	KVO
Redding, Calif.	KUT
Rock Springs, Wyo.	KQC
Sacramento, Calif.	KFM
Salt Lake City, Utah	KQD
San Diego, Calif.	KGQZ
Seattle, Wash.	KZJ
Spokane, Wash.	KGTZ
Tulsa, Okla.	KNAU
Wichita, Kans.	KGTE

Group Two

103.23 m.–2905 kc. 60.15 m.–4990 kc.
97.63 m.–3070 kc. 54.45 m.–5510 kc.
97.15 m.–3090 kc. 52.88 m.–5680 kc.
60.39 m.–4970 kc. 52.7 m.–5690 kc.
52.45 m.–5720 kc.

Alameda, Calif.	KGSB
Albuquerque, N. M.	KSX
Burbank, Calif.	KSI
Butte, Mont.	KBTY
Camden, N. J.	WAEE
Columbus, Ohio	WHG
Cresson, Pa.	WAEG
Harrisburg, Pa.	WAED
Indianapolis, Ind.	WHM
Kansas City, Mo.	KST
Kingman, Ariz.	KGTL
Las Vegas, Nev.	KGTN
Newark, N. J.	WAEF
Pittsburgh, Pa.	WAEC
Pocatello, Idaho	KGTX
Robertson, Mo.	KGTR
Springfield, Mo.	KGTQ
Tulsa, Okla.	KSY
Wichita, Kans.	KGTD
Winslow, Ariz.	KGTA

Group Three

103.23 m.–2905 kc. 60.15 m.–4990 kc.
97.63 m.–3075 kc. 54.45 m.–5510 kc.
97.15 m.–3090 kc. 53.83 m.–5570 kc.
94.86 m.–3160 kc. 53.74 m.–5580 kc.
94.56 m.–3170 kc. 53.64 m.–5590 kc.
94.26 m.–3180 kc. 52.98 m.–5660 kc.
93.29 m.–3215 kc. 52.88 m.–5670 kc.
60.39 m.–4970 kc. 52.7 m.–5690 kc

Denver, Colo.	KGSP
Las Vegas, Nev.	KGTJ
Pueblo, Colo.	KGSR
Salt Lake City, Utah	KGTH

Group Four

93.09 m.–3220 kc. 86.52 m.–3470 kc.
92.8 m.–3230 kc. 86.08 m.–3490 kc.
92.52 m.–3240 kc. 61.00 m.–4920 kc.
92.09 m.–3250 kc. 53.55 m.–5600 kc.
87.02 m.–3450 kc. 53.45 m.–5610 kc.
86.77 m.–3460 kc. 53.26 m.–5630 kc.

Abilene, Tex.	KGUL
Beaumont, Tex.	KGTV
Birmingham, Ala.	WSDE
Boston, Mass.	WSDD
Mobile, Ala.	WAEK
Newark, N. J.	WSDC
Tuscon, Ariz.	KGUO

Group Five

129.63 m.–2315 kc. 86.08 m.–3490 kc.
127.33 m.–2355 kc. 63.29 m.–4740 kc.
93.09 m.–3220 kc. 61.00 m.–4920 kc.
92.8 m.–3230 kc. 53.55 m.–5600 kc.
92.52 m.–3240 kc. 53.45 m.–5610 kc.
92.09 m.–3260 kc. 53.26 m.–5630 kc.
87.02 m.–3450 kc. 45.87 m.–6540 kc.
86.77 m.–3460 kc. 45.8 m.–6550 kc.
86.52 m.–3470 kc. 37.43 m.–8015 kc.

Albany, N. Y.	WSDM
Atlanta, Ga.	WQPD
Bera, Ohio	WSDQ
Big Spring, Tex.	KGUG
Brownsville, Tex.	KGUE
Burbank, Calif.	KGUR
Chicago, Ill.	WSDG
Cincinnati, Ohio	WSID
Columbus, Ohio	WSDP
Dallas, Tex.	KGUF
Douglas, Ariz.	KGUN
El Paso, Tex.	KGUA
Frijole, Tex.	KGUM
Indianapolis, Ind.	WSDZ
Indio, Calif.	KGUQ
Jackson, Miss.	KSDB
Little Rock, Ark.	KQUU
Louisville, Ky.	WSDF
Memphis, Tenn.	WSDK
Nashville, Tenn.	WSDT
New Orleans, La.	WQDQ
Omaha, Nebr.	KGTS
Phoenix, Ariz.	KGUP
Robertson, Mo.	KGUT
San Antonio, Tex.	KGUD
Shreveport, La.	KGUK
Springfield, Ill.	WAEJ
Waco, Tex.	KGUH

Group Six

112.44 m.–2670 kc. 98.83 m.–3040 kc.
112.27 m.–2675 kc. 55.79 m.–5380 kc.
105.11 m.–2850 kc.

Chicago, Ill.	WSDS
Duluth, Minn.	WSDL
Fargo, N. D.	KNWB
Madison, Wis.	WSDR
Milwaukee, Wis.	WAEH
Pembia, N. D.	KNWC
St. Paul, Minn.	KNWA

Group Seven

111.19 m.–2680 kc. 51.5 m.–5820 kc.
102.1 m.–2935 kc.

Detroit, Mich.	WAEI

Group Eight

129.63 m.–2310 kc. 45.87 m.–6540 kc.
127.33 m.–2355 kc. 45.8 m.–6550 kc.
86.52 m.–3470 kc. 45.73 m.–6560 kc.
63.29 m.–4740 kc. 37.45 m.–8010 kc.

Blythe, Calif.	KGUS
Buffalo, N. Y.	WSDO
Houston, Tex.	KGUB

Group Nine

126.1 m.–2380 kc. 63.22 m.–4740 kc.
101.83 m.–2950 kc. 53.07 m.–5650 kc.
100.46 m.–2990 kc. 45.52 m.–6590 kc.
72.11 m.–4160 kc. 45.45 m.–6600 kc.

Atlantic City, N. J.	WEEQ
Baltimore, Md.	WEEB
Charleston, S. Car.	WEEC
Greensboro, N. Car.	WEEG
Jacksonville, Fla.	WEEJ
Linden, N. J.	WEEN
McRae, Ga.	WEEH
Miami, Fla.	WEEM
Orlando, Fla.	WEEO
Richmond, Va.	WEER
Spartanburg, S. Car.	WEEF

Group Ten

113.29 m.–2650 kc. 45.59 m.–6580 kc.
104.53 m.–2870 kc. 37.43 m.–8010 kc.
97.32 m.–3080 kc. 36.5 m.–8220 kc.
55.5 m.–5400 kc. 24.33 m.–12,330 kc
53.64 m.–5700 kc. 18.47 m.–16,240 kc
45.66 m.–6570 kc. 18.24 m.–16,450 kc

Brownsville, Tex.	KGJW
Miami, Fla.	WKDL
San Juan, P. R.	WMDV

AIRPORT RADIO STATIONS

Alphabetically by Call Letters

The number in parenthesis following the location indicates the frequency group in which the station operates. See preceding page for these figures.

KBTY	Butte, Mont. (2)	KGUB	Houston, Tex. (8)	KNWC	Pembina, N. D. (6)	WMDV	San Juan, P. R. (10)
KEU	Burbank, Calif. (1)	KGUD	San Antonio, Tex. (5)	KOE	Cheyenne, Wyo. (1)	WNAO	Newark, N. J. (1)
KFM	Sacramento, Calif. (1)	KGUE	Brownsville, Tex. (5)	WAEC	Pittsburgh, Pa. (2)	WNAK	Cleveland, Ohio (1)
KFO	Oakland, Calif. (1)	KGUF	Dallas, Tex. (5)	WAED	Harrisburg, Pa. (2)	WNAL	Brookville, Pa. (1)
KGE	Medford, Ore. (1)	KGUG	Big Spring, Tex. (5)	WAEE	Camden, N. J. (2)	WNAM	Bellefont, Pa. (1)
KGGUC	Ft. Worth, Tex. (1)	KGUH	Waco, Tex. (5)	WAEF	Newark, N. J. (2)	WNAT	Orlando Twnshp., Ill. (1)
KGJW	Brownsville, Tex. (10)	KGUK	Shreveport, La. (5)	WAEG	Cresson, Pa. (2)	WNAU	Moline, Ill. (1)
KGQZ	San Diego, Calif.	KGUL	Abilene, Tex. (4)	WAEH	Milwaukee, Wis. (6)	WQDQ	New Orleans, La. (5)
KGSB	Alameda, Calif, (2)	KGUM	Frijole, Tex. (5)	WAEI	Detroit, Mich. (7)	WQPD	Atlanta, Ga. (5)
KGSP	Denver, Colo. (3)	KGUN	Douglas, Ariz. (5)	WAEJ	Springfield, Ill. (5)	WSDC	Newark, N. J. (4)
KGSR	Pueblo, Colo. (3)	KGUO	Tuscon, Ariz. (4)	WAEK	Mobile, Ala. (4)	WSDD	Boston, Mass. (4)
KGT	Fresno, Calif, (1)	KGUP	Phoenix, Ariz. (5)	WEEB	Baltimore, Md. (9)	WSDE	Birmingham, Ala. (4)
KGTA	Winslow, Ariz. (2)	KGUQ	Indio, Calif. (5)	WEEC	Charleston, S. C. (9)	WSPF	Louisville, Ky. (5)
KGTD	Wichita, Kans. (2)	KGUR	Burbank, Calif. (5)	WEEF	Spartanburg, S.C. (9)	WSDG	Chicago, Ill. (5)
KGTE	Wichita, Kans. (1)	KGUS	Blythe, Calif. (8)	WEEG	Greensboro, N.C. (9)	WSDK	Memphis, Tenn. (5)
KGTH	Salt Lake City, U. (3)	KGUT	Robertson, Mo. (5)	WEEH	McRae. Ga. (9)	WSDL	Duluth, Minn. (6)
KGTJ	Las Vegas, Nev. (3)	KGUZ	Ponca City, Okla. (1)	WEEJ	Jacksonville, Fla. (9)	WSDM	Albany, N. Y. (5)
KGTL	Kingman, Ariz. (2)	KKO	Elko, Neva. (1)	WEEM	Miami, Fla. (9)	WSDO	Buffalo, N. Y. (8)
KGTN	Las Vegas, Nev. (2)	KMP	Omaha, Neb. (1)	WEEN	Linden, N. J. (9)	WSDP	Columbus, Ohio (5)
KGTQ	Springfield, Mo. (2)	KMR	No. Platte, Nebr. (1)	WEEO	Orlando, Fla. (9)	WSDQ	Berea, Ohio (5)
KGTR	Robertson, Mo. (2)	KNAS	Kansas City, Mo. (1)	WEEQ	Atlantic City, N. J. (9)	WSDS	Chicago, Ill. (6)
KGTS	Omaha, Neb. (5)	KNAT	Dallas, Tex. (1)	WEER	Richmond, Va. (9)	WSDT	Nashville, Tenn. (5)
KGTV,	Beaumont, Tex. (4)	KNAU	Tulsa, Okla. (1)	WHG	Columbus, Ohio (2)	WSDZ	Indianapolis, Ind. (5)
KGTX	Pocatella, Idaho (2)	KNAV	Okla. City, Okla. (1)	WHM	Indianapolis, Ind. (2)	WSID	Cincinnati, Ohio (5)
KGTZ	Spokane, Wash. (1)	KNWA	St. Paul, Minn. (6)	WKDL	Miami, Fla. (10)	WUCG	Chicago, Ill. (1)
KGUA	El Paso, Tex. (5)	KNWB	Fargo, N. D. (6)				

TELEVISION STATIONS

Television transmission at the present time is highly experimental in nature, and for this reason it is difficult to give operating hours, scanning speeds, lines per second, etc., with any degree of accuracy.

According to frequency and wavelength

1600-1700 kc. 176.5-187.5 m.

W2XR—Radio Pictures, Inc.
Long Island City, N. Y.
500 watts. 60 lines

W1XAV—Short Wave & Television Co.
Boston, Mass.
1000 watts. 60 lines

200-2100 kc. 142.9-150 m.

W3XK—Jenkins Laboratories
Wheaton, Md.
5000 watts. 60 lines

W9XAO—Western Television Corp.
Chicago, Ill.
500 watts. 45 lines

W6XAH—Pioneer Mercantile Co.
Bakersfield, Cal.
1000 watts. 60 lines

W9XK—Iowa State University
Iowa City, Iowa
100 watts. 60 lines

W8XAM—Sparks-Withington, Inc.
Jackson, Mich.
1000 watts

2100-2200 kc. 136.4-142.9 m.

W3XAK—National Broadcasting Co.
Portable

W2XBS—National Broadcasting Co.
New York, N. Y.
5000 watts

W3XAD—RCA-Victor Co.
Camden, N. J.
500 watts

W8XAN—Sparks-Withington, Inc.
Jackson, Miss.
1000 watts.

W2XCW—General Electric Co.
Schenectady, N. Y.
20,000 watts

W8XAV—Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.
20,000 watts

W6XS—Don Lee Broadcasting Corp.
Gardena, Calif.
500 watts

W9XAB—National Broadcasting Co.
Chicago, Ill.
2,500 watts

W9XO—Kansas State Agriculture College
Manhattan, Kans.
100 watts

2200-2300 kc. 130.4-1364 m.

W9XAL—First National Television Corp.
Kansas City, Mo.

2750-2850 kc. 105.3-109.1 m.

W9XG—Purdue University
W. Lafayette, Ind.
1500 watts. 60 lines

W3XE—Philadelphia Storage Battery Co.
Philadelphia, Pa.
1500 watts. 120 lines

W9XAA—Chicago Federation of Labor
Chicago, Ill.
500 watts. 60 lines

43,000-46,000 kc. 6.52-6.98 m.
48,500-50,300 kc. 6.00-6.20 m.
60,000-80,000 kc. 3.75-5.00 m.

W9XD—The Journal Co.
Milwaukee, Wis.
500 watts

W3XAD—RCA-Victor Co.,
Camden, N. J.
2000 watts

W2XBT—National Broadcasting Co.
Portable
750 watts

W1XG—Short Wave & Television Co.
Boston, Mass.
30 watts

W2XR—Radio Pictures, Inc.
Long Island City, N. Y.
1000 watts

W2XF—National Broadcasting Co.
New York, N. Y
5000 watts

W6XAO—Don Lee Broadcasting System
Los Angeles, Calif.
150 watts

W3XE—Philadelphia Storage Battery Co.
Philadelphia, Pa.
1500 watts

Alphabetically by Call Letters

W1XAV	Boston, Mass.
W1XG	Boston, Mass.
W2XBS	New York, N. Y.
W2XBT	Portable
W2XCW	Schenectady, N. Y.
W2XF	New York, N. Y.
W2XR	Long Island City, N. Y.
W3XAD	Camden, N. J.
W3XAK	Portable
W3XE	Philadelphia, Pa.
W3XK	Wheaton, Md.
W6XAH	Bakersfield, Calif.
W6XAO	Los Angeles, Calif.
W6XS	Gardena, Calif.
W8XAM	Jackson, Mich.
W8XAN	Jackson, Mich.
W8XAV	Pittsburgh, Pa.
W9XAA	Chicago, Ill.
W9XAB	Chicago, Ill.
W9XAO	Chicago, Ill.
W9XD	Milwaukee, Wis.
W9XG	W. Lafayette, Ind.
W9XK	Iowa City, Iowa
W9XO	Manhattan, Kans.

EXPERIMENTAL AND COMMERCIAL STATIONS

Continued from April issue.

15950 kc. PLG
18.80 meters
BANDOENG, JAVA
Afternoons.

15860 kc. FTK
18.90 meters
ST. ASSISE, FRANCE
Telephony

15760 kc. JIAA
18.93 meters
TOKIO, JAPAN
Up to 10 a. m. Beam transmitter.

15300 kc. OXY
19.60 meters
Lyngby, Denmark. Experimental

14530 kc. LSA
20.65 meters
BUENOS AIRES, ARGENTINA

14480 kc. GGBW
20.70 meters
RADIO SECTION
General Post Office, London E. C. 1. Rugby, England

14480 kc. WNC
20.70 meters
DEAL, N. J.

14420 kc. VPD
20.80 meters
SUVA, FIJI ISLANDS

14150 kc. KKZ
21.17 meters
BOLINAS, CALIF.

13400 kc. WND
22.38 meters
DEAL BEACH, N. J.
Transatlantic telephony

12780 kc. GBC
23.46 meters
RUGBY, ENGLAND

12290 kc. GBU
24.41 meters
RUGBY, ENGLAND

12250 kc. FTN
24.46 meters
STE. ASSISE (PARIS), FRANCE
Works Buenos Aires, Indo-China and Java. On 9 a. m. to 1 p. m. and other hours

12250 kc. GBS
24.46 meters
RUGBY, ENGLAND

12250 kc. PLM
24.46 meters
BANDOENG, JAVA
7.45 a. m.

12150 kc. GBS
24.68 meters
RUGBY, ENGLAND
Transatlantic phone to Deal, N. J. (New York)

12150 kc. FQO,FQE
24.68 meters
STE. ASSISE, FRANCE

12045 kc. NAA
24.89 meters
ARLINGTON, VA.
Time signals, 11:57 to noon.

12045 kc. NSS
24.89 meters
ANNAPOLIS, MD.
Time signals, 9:57-10 p. m.

12000 kc. FZG
24.98 meters
SAIGON, INDO-CHINA
Time signals, 2-2:05 p. m.

11945 kc. KKQ
25.10 meters
BOLINAS, CALIF.

11690 kc. YVQ
25.65 meters
MARACAY, VENEZUELA
(Also broadcasts occasionally)

11670 kc. KIO
25.68 meters
KAHUHU, HAWAII

11530 kc. CGA
26.00 meters
DRUMMONDVILLE, CANADA

11490 kc. GBK
26.10 meters
BODMIN, ENGLAND

11470 kc. IBDK
26.15 meters
S.S. "ELETTRA"
Marconi's yacht

11435 kc. DHC
26.22 meters
NAUEN, GERMANY

11340 kc. DAN
26.44 meters
NORDEICH, GERMANY
Time signals, 7 a. m., 7 p. m.
Deutsche Seewarte, Hamburg

10980 kc. ZLW
27.30 meters
WELLINGTON, N. Z.
Tests 3-8 a. m.

10630 kc. PLR
28.20 meters
BANDOENG, JAVA
Works with Holland and France weekdays from 7 a. m.; sometimes after 9:30

10540 kc. WLO
28.44 meters
LAWRENCE, N. J.

10540 kc. VLK
28.44 meters
SYDNEY, AUSTRALIA
1-7 a. m.

10410 kc. PDK
28.80 meters
KOOTWIJK, HOLLAND

10410 kc. KEZ
28.80 meters
BOLINAS, CALIF.

10410 kc. LSY
28.80 meters
BUENOS AIRES, ARGENTINA

10390 kc. GBX
28.86 meters
RUGBY, ENGLAND

10150 kc. DIS
29.54 meters
NAUEN, GERMANY
Press (code) daily; 6 p. m., Spanish; 7 p. m., English; 7:50 p. m., German; 2:30 p. m., English; 5 p. m., German. Sundays: 6 p. m., Spanish; 7:50 p. m., German; 9:30 p. m., Spanish

9950 kc. GBU
30.15 meters
RUGBY, ENGLAND

9890 kc. LSN
30.30 meters
BUENOS AIRES
Phone to Europe

9890 kc. LSA
30.30 meters
BUENOS AIRES

9790 kc. GBW
30.64 meters
RUGBY, ENGLAND

9750 kc.
30.75 meters
AGEN, FRANCE
Tues. and Fri., 3 to 4:15 p. m.

9750 kc. WNC
30.75 meters
DEAL, N. J.

9700 kc. WMI
30.90 meters
DEAL, N. J.

9600 kc. LQA
30.93 meters
BUENOS AIRES

9600 kc. LGN
31.23 meters
BERGEN, NORWAY

9330 kc. CGA
32.13 meters
DRUMMONDVILLE, CANADA

9310 kc. GBC
32.21 meters
RUGBY, ENGLAND
Sundays, 2:30-5 p. m.

9250 kc. GBK
32.40 meters
BODMIN, ENGLAND

9230 kc. FL
32.50 meters
PARIS, FRANCE
(Eiffel Tower). Time signals 4:56 a. m. and 4:56 p. m.

9200 kc. GBS
32.59 meters
RUGBY, ENGLAND
Transatlantic phone

9010 kc. GBS
33.26 meters
RUGBY, ENGLAND

8872 kc. NPO
33.81 meters
CAVITE (MANILA)
Philippine Islands
Time signals 9:55-10 p. m.

8872 kc. NAA
33.81 meters
ARLINGTON, VA.
Time signals 9:57-10 p. m., 2:57-3 p. m.

8810 kc. WSBN
33.98 meters
S.S. "LEVIATHAN"

EXPERIMENTAL AND COMMERCIAL STATIONS

8690 kc. W2XAC
34.50 meters
SCHENECTADY, NEW YORK

8650 kc. W2XCU
34.68 meters
AMPERE, N. J.

8650 kc. W3XE
34.68 meters
BALTIMORE, MD.
12:15-1:15 p. m., 10:15-11:15 p. m.

8650 kc. W2XV
34.68 meters
RADIO ENGINEERING LAB.
Long Island City, N. Y.

8650 kc. W8XAG
34.68 meters
DAYTON, OHIO

8650 kc. W4XG
34.68 meters
MIAMI, FLA.

8650 kc. W3XX
34.68 meters
WASHINGTON, D. C.
And other experimental stations

8630 kc. WOO
34.74 meters
DEAL, N. J.

8630 kc. W2XDO
34.74 meters
OCEAN GATE, N. J.

8550 kc. WOO
35.02 meters
OCEAN GATE, N. J.

8450 kc. PRAG
35.50 meters
PORTO ALEGRE, BRAZIL
8:30-9:00 a. m.

8120 kc. PLW
36.92 meters
BANDOENG, JAVA

8100 kc. EATH
37.02 meters
VIENNA, AUSTRIA
Mon. and Thurs., 5:30 to 7 p. m.

8100 kc. JIAA
37.02 meters
TOKYO, JAPAN
Tests 5-8 a. m.

7930 kc. DOA
37.80 meters
DOEBERITZ, GERMANY
1 to 3 p. m. Reichpostzentralamt, Berlin

7890 kc. VPD
38.00 meters
SUVA, FIJI ISLANDS

7890 kc. JIAA
38.00 meters
TOKIO, JAPAN
(Testing)

7830 kc. PDV
38.30 meters
KOOTWIJK, HOLLAND
After 9 a. m.

7770 kc. FTF
38.60 meters
STE. ASSISE, FRANCE

7770 kc. PCK
38.60 meters
KOOTWIJK, HOLLAND
9 a. m. to 7 p. m.

7660 kc. FTL
39.15 meters
STE. ASSISE, FRANCE

7610 kc. HKF
39.40 meters
BOGOTA, COLOMBIA
8-10 p. m.

7520 kc. CGE
39.74 meters
CALGARY, CANADA
Testing, Tues., Thurs.

6860 kc. KEL
43.70 meters
BOLINAS, CALIF.

6860 kc Radio Vitus
43.70 meters
PARIS, FRANCE
4-11 a. m. 3 p. m.

6840 kc. CFA
43.80 meters
DRUMMONDVILLE, CANADA

6753 kc. WND
44.40 meters
DEAL, N. J.

6660 kc. F8KR
44.99 meters
CONSTANTINE, ALGERIA
Mon., Fri., 5 p. m.

6660 kc. HKM
44.99 meters
BOGOTA, COLOMBIA
9-11 p. m.

6560 kc. RFN
45.50 meters
MOSCOW, U. S. S. R. (Russia)
2 a. m.-4 p. m.

6515 kc. WOO
46.05 meters
DEAL, N. J.

4770 kc. ZL2XX
62.80 meters
WELLINGTON, NEW ZEALAND

4760 kc. Radio LL
63.00 meters
PARIS, FRANCE

4750 kc. WOO
63.13 meters
OCEAN GATE, N. J.

4700 kc. WIXAB
63.79 meters
PORTLAND, ME.

4116 kc. WOO
72.87 meters
DEAL, N. J.

4105 kc. NAA
74.72 meters
ARLINGTON, VA.
Time signals, 9:57-10 p. m., 11:57 a. m. to noon

3256 kc. W9XL
92.50 meters
CHICAGO, ILL.

3156 kc. PK2AG
95.00 meters
SAMARANG, JAVA

3124 kc. WOO
96.03 meters
DEAL, N. J.

3076 kc. W9XL
97.53 meters
CHICAGO, ILL.

3076 kc. W9XL
97.53 meters
MOTALA, SWEDEN
11:30 a. m.-noon, 4-10 p. m.

1560 kc. WIXAU
199.35 meters
BOSTON, MASS.

1550 kc. W2XCE
193.5 meters
PASSAIC, N. J.

A Word of Explanation About S. W. Schedules

This list is compiled from many sources, all of which are not in agreement. In fact, conflicting data are received sometimes from the stations themselves. We are constantly writing to stations all over the world and reading reports from hundreds of correspondents. We invite individual listeners to inform us of any stations not listed herewith, or operating on frequencies of hours different from those indicated. All times given are Eastern Standard.

Listeners living in zones operating on daylight saving time must make their own corrections.

Special note: please do not ask us to identify unknown stations from snatches of voice or music. This is utterly impossible. Make a notation of the dial setting and try for the station again until you get an understandable announcement. This list will appear with last minute corrections in the June issue.

SHORT WAVE LEAGUE

HONORARY MEMBERS

Dr. Lee de Forest
John L. Reinartz
D. E. Replogle
Hollis Baird
E. T. Somerset
Baron Manfred von Ardenne
Hugo Gernsback

Executive Secretary

Special S-W Programs for "League" Members

As one of the first steps in our campaign to make the SHORT WAVE LEAGUE a truly international organization, we are now busily engaged in arranging with various foreign short-wave broadcasting stations for special test programs for the benefit of LEAGUE members.

While the number of foreign stations that transmit during periods convenient to American listeners has increased during the past year, many "fans" complain that some of the better stations are still operating on limited schedules that preclude any possibility of successful reception during early evening or even late afternoon hours. Although we don't expect every station to put on special programs, many stations are anxious to co-operate with short-wave listeners because of the value of the latters' reports.

Dat ol' debbil "time difference" is what makes things so difficult. In spite of all our efforts to educate LEAGUE members to the essential facts of time practices, many of them want distant stations handed to them on a gold platter, so as to speak. They complain that they have to get up too early for some of the choice prizes like VK2ME (Sydney, Australia), or let supper get cold while they "fish" for EAQ (Madrid, Spain). They seem to forget that when it is seven p.m. Eastern Standard Time it is already midnight in Madrid and London, and most self-respecting radio announcers and station engineers are yawningly preparing for bed, if they aren't already there.

We are trying to arrange for a number of transmission periods. The first is set tentatively for 7:00 to 8:30 or perhaps 9:00 a.m. E.S.T., the wavelengths to be in the neighborhood of 20 meters or lower. This will give most people a chance to do some serious "daylight listening," either before or after breakfast, or even during breakfast! This morning session should prove very productive, as many noise-making machines are not yet in operation, the air is quiet, and, more important, the listener is fully rested from a night's sleep and is not likely to be as impatient as he is late at night. Then again, this period corresponds to early afternoon in Europe and Africa, when many stations are on the air anyway and they won't mind making special announcements in English—get that, in *English*, so that we'll understand them. We've all had the aggravating experience of holding short-wave signals loud and clear for hours, without once hearing announcements in other than a strange foreign language. If we do nothing else, we think we will have accomplished something if we can get foreign announcers to give their call letters in English, however horrible the accent is.

The second suggested period is around noon E.S.T., corresponding to late afternoon in Europe. While people who go to school or to work may not be able to take advantage of this session, many night workers, who sleep during the morning, will find it very convenient.

The third and last period, which will undoubtedly be the most popular, will take in our own evening hours. The British Empire stations at Daventry have shown that early evening transmissions can be very successful, and perhaps we can inveigle some of the other stations into keeping an engineer awake at the transmitter, with plenty of black coffee, and phonograph records—and also a "self-pronouncing" English dictionary.

At this early stage we are unable to make any definite announcements of the special programs. It takes time for letters to get across oceans, and we want to be darn sure of the arrangements before we say "Go!" to League members anxious to fill up their log books. Watch the next issue for further details.

* * *

Several years ago PCJ, the famous short wave station of Philips Radio in Holland, rewarded listeners for their reception reports not only by sending them acknowledgement cards, but also by mentioning their names over the air! Outside of hearing an SOS or working your "first" station with an amateur transmitter, this is Thrill No. 1 for the short-wave listener. Maybe we can get Mr. Edward Startz, Philips Radio's multilingual announcer, to revive this most delightful practice.

What Some of the Boys Think

A "Hot" Code Argument

Editor, SHORT WAVE CRAFT:

I bought your December issue recently and soon turned to the SHORT WAVE LEAGUE page. I always make it a point to read the letters which are published there. However, I can not keep the lid on any longer after reading some of that batch of letters. Every one of the letters proposes to open some band of frequencies to practically unrestricted radio telephone operation. Code requirements are to be abolished in a part of the radio spectrum if these proposals are to be accepted. Only one letter, that from the Hollywood Chapter of the SHORT WAVE LEAGUE, makes any mention of the rigid technical examinations which would have to be instituted to take care of the situation. And these gentlemen are playing the game by having code classes and preparing to operate according to the regulations.

Perhaps I should make my own position clear. I am a licensed operator, holding an amateur first-class license, and also a radio-telephone first-class license. I have held these licenses or their equivalent since 1930. I am a member of the *American Radio Relay League*, the organization which fights the battles for the amateur having any transmitting privileges today.

Is it fair to the more than 30,000 licensed amateurs in this country to throw open a part of their hard won territory for the use of a class of people who are unwilling to spend a few minutes a day for a month or two to learn the code? Would they be any more willing to take the time and trouble to learn to operate their stations legally and effectively? The amateur has to walk the "straight and narrow" path or he will lose all his rights. Learning the code and passing the prescribed examinations impresses upon him that he is being granted a valuable privilege, when he is granted the use of the air.

Let us get together and keep the privileges we have by playing the game.

Yours truly,

ROGER WILSON, W6EGI,
Box 245,
Flagstaff, Ariz.

(Continued on page 56)

Get Your Button!

The illustration herewith shows the beautiful design of the "Official" Short Wave League button, which is available to everyone who becomes a member of the Short Wave League.

The requirements for joining the League are explained in a booklet, copies of which will be mailed upon request. The button measures ¾ inch in diameter and is inlaid in enamel—3 colors—red, white, and blue.

Please note that you can order your button AT ONCE—SHORT WAVE LEAGUE supplies it at cost, the price, including the mailing, being 35 cents. A solid gold button is furnished for $2.00 prepaid. Address all communications to SHORT WAVE LEAGUE, 96-98 Park Place, New York.

SHORT WAVE QUESTION BOX

Edited by R. WILLIAM TANNER

Questions, ordinary ones, will only be answered by mail when a fee of 25 cents accompanies them. Special queries involving considerable research will be quoted upon by the editor of this department.

NOISE IN ONE-TUBE SUPER

Fred Hoffman, Rutland, Vt., wants to know:

(Q) How to eliminate rushing noises in a one-tube super-regenerative set which employs a 12A tube?

(A) Such noises may sometimes be eliminated or reduced to a minimum by employing a variable grid leak and possibly a variable grid condenser. The feed-back or plate coil in the variation frequency circuits may also require an adjustment. If resistance control of regeneration in the short wave circuits is used, the plate voltage may be too high for the low frequency oscillator circuits. In any super-regenerator, it is preferable to apply constant plate (and screen grid with screen grid tube) voltage and control regeneration in some other way.

(Q) Would an untuned screen grid R.F. stage increase volume enough to warrant its use?

(A) No.

(Q) On my 20 meter coil, the set works only on the low half of the dial. The grid coil has 5 turns (spaced) and the tickler has 3 turns wound close. Would it be OK to increase the tickler turns?

(A) It will be necessary to change the turns to about 5 or 6 since, in a super-regenerative circuit the tickler must be somewhat larger than with the usual regenerator.

ADDING T.R.F. STAGES

Howard Hogan, Milwaukee, Wis.

(Q) I am using a 24 T.R.F., a 24 regenerative detector and a 27 A.F. Would it be advisable to add two more T.R.F. stages for greater sensitivity?

(A) Such an arrangement would be too unstable even though all coils and tubes were shielded.

(Q) Could a Stenode crystal be added to a T.R.F. set to increase selectivity?

(A) The Stenode can be applied only to a superhet circuit.

ELECTROSTATIC SHIELD IN TRANSFORMERS

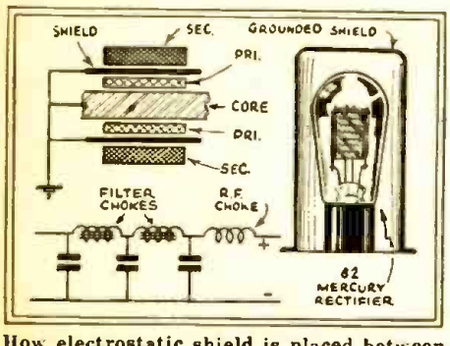
Stanley Grossmann, Grand Rapids, Mich.

(Q) Why is an electro-static shield used in some makes of power transformers?

(A) This shield is a copper strip placed between the primary and secondaries to prevent R.F. noises from motors, etc., reaching the set.

(Q) I understand that the new 82 rectifier causes noise in the receiver. What is the reason for this?

(A) The noise is due to the normal arcing in the tube. The cure is generally a shield on the tube and a radio frequency choke in the positive lead preceding the filter chokes.



How electrostatic shield is placed between windings on some power transformers; also use of R.F. choke in plate supply circuit.

TELEVISION R.F. COIL DATA

M. E. Hall, Des Moines, Iowa.

(Q) How many turns would be needed on a 1½" form for the television band? An .0001 mf. tuning condenser will be used.

(A) Approximately 40 turns of 26 D.C.C. wire "close wound."

(Q) Could eastern television stations be picked up at this location?

(A) With a suitable receiver you would probably be able to pick them up but the set would require considerable R.F. gain.

4 VERSUS 1 WIRE ANTENNAS

Edwin Woodard, Baltimore, Md.

(Q) Would a 4 wire antenna, 100 feet long, be better for reception than a single wire?

(A) It is doubtful if any great difference would be noted.

(Q) What would be the simplest R.F. chokes to wind for 20-200 meters and also for 465 kc.?

(A) Many radio dealers sell a winding form made with fibre ends 1¼" diameter. These are ideal. For short waves, 300 turns of 36 to 32 wire will be needed. For 465 kc 1,500 turns same size wire.

(Q) Is it necessary to shield audio tubes in a 7 tube set?

(A) If the first A.F. is a screen grid or pentode, shielding would probably be necessary to eliminate howling.

VALUE OF BIAS RESISTOR

James Murphy, Long Beach, Calif.

(Q) What size bias resistor is needed for the triode of the 55 tube?

(A) 2500 ohms, 2 watt.

(Q) My short-wave superhet uses a 55 second detector, the triode of which is resistance-coupled to a 47 A.F. Volume is rather poor. Would another A.F. tube be needed to increase volume?

(A) You could save the extra tube by transformer coupling the 55 triode to the 47 A.F. grid. A 2 to 1 up to 4 to 1 ratio transformer would result in greater volume.

EFFICACY OF TUBE BASES FOR COILS

A. I. Petain, Fall River, Mass.

(Q) Is the bakelite used in tube bases good enough for coils?

(A) Some manufacturers use a high grade of material and others use a poor grade; therefore all tube bases will not be equally good.

(Q) If I use large wire for coils will the losses be lower?

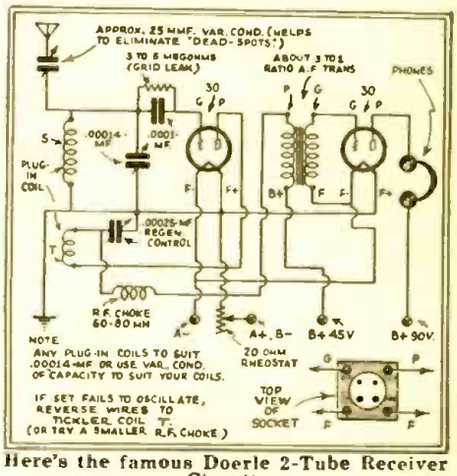
(A) Large wire usually requires large forms and greater spacing of turns to keep distributed capacity to a minimum. Small wire on small forms is as efficient as large wire on large forms, generally speaking.

CAN'T TUNE BELOW 31 METERS

H. C. Chesnut, 88 Bailey Avenue, Plattsburg, N. Y.

(Q) No matter what coils I use I cannot tune below 31.3 meters; why?

(A) We do not quite understand why you cannot tune in signals below 31.3 meters, especially when you use coils with a small number of turns, such as specified in the various articles of SHORT WAVE CRAFT. The principal reason offhand would be that the variable tuning condenser that you are using across the grid coil in any case, has too high a minimum capacity. This is rather unusual today as most of the short-wave type midget condensers have a fairly low minimum capacity, i.e., the capacity of the variable condenser, when the rotary plates are turned entirely out of the stationary plates. One other cause of such a performance comes to mind; it might be possible that you are using too large an aerial. It has occurred that with a large aerial of possibly 150 feet or 250 feet of wire connected to the SW receiver, such a large antenna resonated at harmonics and fundamentals such that you might not be able to tune much lower than 31 meters. The remedy is to use a short antenna of about 40 feet.



Here's the famous Doerle 2-Tube Receiver Circuit.

THE DOERLE 2-TUBE RECEIVER

H. W. Sinclair, Paterson, New Jersey.

(Q) Having read so many glowing letters on your "fan mail" page each month, regarding the reception of world-wide signals on the Doerle 2-tube receiver, will you please repeat this circuit so that we can all have a look at it?

(A) Here is the Doerle 2-tube receiver circuit. As you will see it represents nothing radical; the principal reason for its remarkable success logically lies in the use of the highest quality parts, good tubes, and a well-insulated aerial, which may comprise a single wire forty to sixty feet long.

NECESSITY FOR R.F. CHOKES

Ezra Parker, Rutland, Vt.

(Q) Are R.F. chokes necessary in the plate and screen grid leads of the 35 R.F. amplifier in my set?

(A) R. F. chokes are used to keep the R.F. currents in their proper path. Whether one or more R.F. stages are used, chokes should be used.

(Q) What value bias resistor is needed for a 58 R.F. tube?

(A) 300 ohms is the minimum but it is well to use 450 or 500 ohms.

(Q) Could I obtain greater sensitivity by changing from a 35 to a 58 tube?

(A) Due to the circuit connections with the 58 pentode, somewhat greater gain can be realized, particularly below about 50 meters.

Curing Interference

Wm. Whitlock, Tulsa, Okla., wants to know:

(Q) How to cure or help reduce interference from a *power leak?*

(A) The simplest method is to employ a counterpoise in conjunction with the antenna both of which are not more than 50 feet long. The coupling coil (antenna) should then be connected, one side to antenna and the other to the counterpoise. No ground should be used anywhere in the antenna system. The "B"-negative and chassis in the receiver should be connected to a *good* ground. This method does not entirely eliminate the noise, but it does peak the interference at one or more points on the dial, allowing good reception in between.

. . . . SHORT WAVE ESSENTIALS

FOR MEMBERS OF THE SHORT WAVE LEAGUE . . . .

THE following list of short wave essentials has been prepared from the suggestions to the LEAGUE by its members. A number of months were consumed in creating these short wave essentials for members of the SHORT WAVE LEAGUE. All essentials listed are approved by headquarters of the LEAGUE.

A FEW WORDS AS TO THE PURPOSE OF THE LEAGUE

The SHORT WAVE LEAGUE was founded in 1930. Honorary Directors are as follows:

Dr. Lee de Forest, John L. Reinartz, D. E. Replogle, Hollis Baird, E. T. Somerset, Baron Manfred von Ardenne, Hugo Gernsback, Executive Secretary.

The SHORT WAVE LEAGUE is a scientific membership organization for the promotion of the short wave art. There are no dues, no fees, no initiations, in connection with the LEAGUE. No one makes any money from it; no one derives any salary. The only income which the LEAGUE has is from its short wave essentials. **A pamphlet setting forth the LEAGUE'S numerous aspirations and purposes will be sent to anyone on receipt of a 3c stamp to cover postage.**

One of the aspirations of the SHORT WAVE LEAGUE is to enhance the standing of those engaged in short waves. To this end, the SHORT WAVE LEAGUE supplies members with membership letterheads and other essentials. As soon as you are enrolled as a member, a beautiful certificate with the LEAGUE'S seal will be sent to you, providing 10c in stamps or coin is sent for mailing and handling charges.

Another consideration which greatly benefits members is that they are entitled to preferential discounts when buying radio merchandise from numerous firms who have agreed to allow lower prices to all SHORT WAVE LEAGUE members. The radio industry realizes that, the more earnest workers there are who boost short waves, the more radio business will result therefrom; and a goodly portion of the radio industry is willing, for this reason, to assist SHORT WAVE LEAGUE members by placing them on a professional basis.

SHORT WAVE ESSENTIALS LISTED HERE SOLD ONLY TO SHORT WAVE LEAGUE MEMBERS

All the essentials listed on this page are never sold to outsiders. They cannot be bought by anyone unless he has already enrolled as one of the members of the SHORT WAVE LEAGUE or signs the blank on this page (which automatically enrolls him as a member, always provided that he is a short wave experimenter, a short wave fan, radio engineer, radio student, etc.).

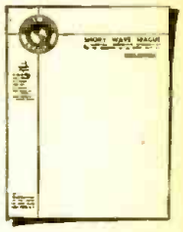
If, therefore, you order any of the short wave essentials without filling out the blank (unless you already enrolled as a LEAGUE member), your money will be returned to you.

Inasmuch as the LEAGUE is international, it makes no difference whether you are a citizen of the United States or any other country. The LEAGUE is open to all.

SHORT WAVE LEAGUE LETTERHEADS

A beautiful letterhead has been designed for members' correspondence. It is the official letterhead for all members. The letterhead is invaluable when it becomes necessary to deal with the radio industry, mail order houses, radio manufacturers, and the like; as many houses have offered to give members who write on the LEAGUE'S letterhead a preferential discount. The letterhead is also absolutely essential when writing for verification to radio stations either here or abroad. It automatically gives you a professional standing.

A—SHORT WAVE LEAGUE letterheads, per 100..... **50c**



A—50c per 100

OFFICIAL SHORT WAVE LEAGUE LOG AND CALL BOOK

Here is the finest book of its kind ever published. It contains the largest listing of short wave stations in the world, much larger in fact than the list published in SHORT WAVE CRAFT and other magazines. All experimental stations, no matter where located, are listed. A large section is provided where calls can be listed in a proper manner. This log section gives dial settings, time, date, call letters, location, and other information. Another section has squared-paper pages on which you can fill in your own frequency curve for your particular receiver. It helps you to find stations which otherwise you could never log. It is the only book of its kind published.

B—Official Log and Call Book..... Prepaid **25c**

B—25c per copy

RADIO MAP OF THE WORLD AND STATION FINDER

The finest device of its kind published. The world's map on heavy board is divided into 23 sections, while the rotary disc shows you immediately the exact time in any foreign country. Invaluable in logging foreign stations. Also gives call letters assigned to all nations. Size 11"x22".

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This highly important essential is an ornament for every den or study. It is a globe, 6 in. in diameter, printed in fifteen colors, glazed in such a way that it can be washed. This globe helps you to intelligently log your foreign stations. Frame is of metal. Entire device substantially made, and will give an attractive appearance to every station, emphasizing the long-distance work of the operator.

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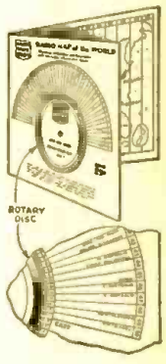
This beautiful button is made in hard enamel in four colors, red, white, blue and gold. It measures three quarters of an inch in diameter. By wearing this button, other members will recognize you and it will give you a professional air. Made in bronze, gold filled, *not plated*. Must be seen to be appreciated.

E—SHORT WAVE LEAGUE lapel button..... Prepaid **35c**

EE—SHORT WAVE LEAGUE lapel button, like the one described above but in solid gold..... Prepaid **$2.00**



C—25c each

SHORT WAVE LEAGUE SEALS

These seals or stickers are executed in three colors and measure 1¼ in. in diameter, and are gummed on one side. They are used by members to affix to stationery, letterheads, envelopes, postal cards and the like. The seal signifies that you are a member of the SHORT WAVE LEAGUE. Sold in 25 lots or multiples only.

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SHORT WAVE MAP OF THE WORLD

This beautiful map, measuring 18x26 in. and printed in 18 colors is indispensable when hung in sight or placed "under the glass" on the table or wall of the short wave enthusiast. It contains a wealth of information such as distances to all parts of the world, political nature of the country in which a broadcast station is located, etc., and from the manner in which the map is blocked off gives the time in different parts of the world at a glance.

F—SHORT WAVE Map of the World..... Prepaid **25c**

PLEASE NOTE THAT ABOVE ESSENTIALS ARE SOLD ONLY TO MEMBERS OF THE LEAGUE—NOT TO NON-MEMBERS.

Send all orders for short wave essentials to SHORT WAVE LEAGUE, 98 Park Place, New York City.

If you do not wish to mutilate the magazine, you may copy either or both coupons on a sheet of paper.

SHORT WAVE LEAGUE. 98 Park Place, New York, N. Y.

D—$1.25 each

G—15c for 25

F—25c each

E—35c each

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE (5-33)
98 Park Place, New York, N. Y.

I, the undersigned, herewith desire to apply for membership in the SHORT WAVE LEAGUE. In joining the LEAGUE I understand that I am not assessed for membership and that there are no dues and no fees of any kind. I pledge myself to abide by all the rules and regulations of the SHORT WAVE LEAGUE, which rules you are to send to me on receipt of this application.

I consider myself belonging to the following class (put an X in correct space): Short Wave Experimenter ☐ Short Wave Fan ☐ Radio Engineer ☐ Student ☐

I own the following radio equipment:

Transmitting .....

Call Letters.....

Receiving .....

Name .....

Address .....

City and State.....

Country .....

I enclose 10c for postage and handling for my Membership Certificate.

SHORT WAVE LEAGUE, 98 Park Place, New York, N. Y.
Gentlemen:
I am already an enrolled member in the SHORT WAVE LEAGUE ☐
I am a new member and attach my application to this coupon ☐
Please send me the following short wave essentials as listed in this advertisement:

.....

.....

.....

.....

.....

.....

for which I enclose $..... herewith.
(The LEAGUE accepts money order, cash or new U. S. Stamps in any denomination. Register cash and stamps.)

Name.....
Address.....
City and State.....
Country.....

(5-33)

"Short Waves in England"

(Continued from page 7)

come up to W2XAD for sheer "punch." The writer has been able to follow his 19.56-meter transmission from night to night for a fortnight or more, using a simple two-tube receiver, with just as much ease as if he were tuned to London Regional, putting out 70 kw. or so at a distance of fifteen miles.

Strangely enough the Australian stations seem to be just as easily received here as the Americans, although they are not so consistent. VK2ME, when he *does* come over, rattles the 'phones in no mean manner.

Judging from what we read in the American periodicals, we score over the listeners in the States (as yet) concerning "man-made static." Electrically-operated domestic appliances are not very common in England at present—certainly not outside the big cities—and, although there are no "silencing regulations" (again *as yet*) we are not much troubled by the sounds of dirty brushes and sparking commutators.

Broadcast stations, too, worry the English short-wave listener very little. This is thanks to the Regional scheme, whereby a small number of high-powered broadcasting stations serve this country. All the stations are run by one concern—the B. B. C.—and we, therefore, do know just how we stand. Harmonics of broadcasting stations are practically unknown on short waves.

The British Ham

British "hams" do not have such an easy time of it as do the short-wave B.C.L.'s. To obtain a license for transmission one has to persuade the General Post Office that one "knows something" about the subject. This, together with good reasons why one *should* be allowed to add another signal to the existing crowd, and the passing of a Morse test, completes the first ordeal of the "ham." But at this stage he is licensed for 10 watts only; this refers, too, to the *input*, not to the type of tube he is allowed to use! Further, it is pretty rigidly enforced.

It is this regulation, in the writer's opinion, that has kept amateur radio alive in this country. Hams starting up for the first time are not allowed to degenerate into mere QSL-collectors; they have to go ahead and make their 10 watts do something first, and that is a fine encouragement for some real experimental work. (Right! says we. If a regulation like this were imposed on U. S. "hams" perhaps we'd have less QRM and more "real fun." —Editor.)

When they have had their "ten-watters" for some time—assuming that they have not been reported as being "off-wave" or anything equally objectionable—the hams apply for a "50-watt" permit. This is generally granted on the recommendation of the Radio Society of Great Britain (to which the vast majority of hams belong) and is issued only on condition that some form of frequency-stabilization is installed.

This is responsible for the fact that nearly 90 per cent of the British "hams" are using crystal-controlled "gear." Though the writer is one of them, he is sufficiently proud of the British "ham" fraternity to state, here and now, that you will very seldom here a rotten note coming from a "G" station. Equally he realizes that you will never hear one coming from a good "W" station, but unfortunately there are still some bad ones left on the air!

Time Difference Unfortunate

The time-difference makes the Britisher unfortunate in one respect. During the period between 7 p. m. and 10 p. m., when listeners in the States are receiving Europeans, we over here have a very "dull time" of it. It is not until 10 or 11 p. m. that we can do much in the way of DX, except on the rare occasions when the South Africans are coming over. This applies particularly to the Summer and Fall! Generally, in the Winter and Spring, the "W's" start coming over quite early in the evening. But even that has a snag, for there are very few of them on the air between lunch and tea-time—the hours which, being translated into G.M.T., are roughly 6 p. m. till 10:30 p. m.

The English ham works under another big disadvantage. When general conditions or time of day are such that only signals up to about 1,500 miles are good, the "W's" can work each other to their heart's content. Not so over here; other G's are often quite inaudible and the only stations on the air are Hungarians, Finns, Swedes, Danes and Germans! Excellent stations, too, most of them, but there are so very *few* of them compared with the hundreds of W's that are on the air.

This has the result that conditions appear to be extremely poor over here, when the only real reason for the absence of signals is the small number of active stations within workable distance.

When conditions are good, however, as in the British Empire Radio Union tests this year, it is possible to keep up non-stop DX practically right through the twenty-four hours. The writer's own station, on one Sunday during the tests, established contact with Iraq at 1030, Egypt at 1130, Hong Kong at 1200, Barbadoes at 1230, Canada from 1330-1500, Ceylon and India at 1600, South Africa at 1700 and Australia right up till 2100. The 20 and 40-meter bands were both used for this work, and, as the tests were of an "Empire" nature, the many "W's" on the air had to be disregarded!

The only peculiarities of conditions that seem to be at all regular here are these: East Coast Americans are nearly always best in February and March; and West Coast stations are very rarely heard at all, except during the early mornings in May and June, when they fill the entire band. We often hear fifty or sixty W6's and W7's without finding another signal of any kind; but only in May and June.

A 2-Volt, 3-Tube "Ham" Receiver

(Continued from page 27)

the primary-tickler coil, and yet *the regeneration is as smooth as silk*. The coil values are given in a separate coil table.

The set is built into an electralloy shield can, 14"x7"x6". The subpanel is a piece of heavy galvanized iron of the kind used for roofing, and its use makes the whole receiver very rigid. On the front panel are mounted only the band-spreading condenser C4 and the variable resistor R3 used as the regeneration control. Incidently, the negative B battery lead must be broken when the set is turned off or this resistor will draw current all the time. At the left end the phone jack and Yaxley cable plug are placed. The jack is a combination jack and switch. The phone leads were brought out at this end in order to have the cord out of the way. A left-handed operator should build his receiver in the opposite direction. At the right end are the two coils, the antenna binding post, and the main tank tuning condenser C5. The R.F. coil is unshielded, but the detector coil is shielded by a National type B-30 coil shield with removable base. The R.F. coil L is always the detector coil next in size above the one used in the detector socket for the particular part of the short wave spectrum in which operation is desired. For example when the twenty meter coil is in the detector socket, the forty meter coil is placed in the R.F. coil socket. In this set five prong coil sockets are used but only four of these are necessary, although the fifth one is handy for experimenting with inductive coupling to the R.F. stage. This is frequently advised for best results in bringing in phone stations. None of the values for the fixed condensers seem to be at all critical, but they should all be high-quality *mica* condensers except the 1 mf. condenser C8. Both R.F. chokes are Pilot short-wave chokes.

Impedance coupling from the detector to the audio stage is used because the relatively large plate impedance of the screen-grid detector will not allow the use of an audio transformer method of coupling, and, while resistance coupling would give better quality, there would be too much voltage drop through the plate resistor. The impedance used here is a Pilot audio transformer with the primary and secondary connected in series, but any other audio transformer connected this way or a regular coupling impedance will serve very nicely.

The National Company makes a coupler especially for screen-grid detectors, which probably would help results both in amplification and quality. This coupler contains the impedance, coupling condenser and grid resistor. The coupling condenser C4 used in this particular set is not critical in value, but better bass response could probably be secured by using one with a capacity of .01 mf. The grid resistor R2 value may vary from 50,000 ohms to five megohms with little change in results. Any handy resistor between these values will work, depending, of course, on the C bias. From six to nine volts of bias battery seems about right with a plate voltage of 135 on the type 30.

Really this set was easier to get working well than the old 01A receiver. None of the usual troubles often encountered with screen-grid tubes was found here. This circuit should work even better with the six volt "auto" tubes because of the relatively low plate impedance of the type 36. Perhaps some of the readers of SHORT WAVE CRAFT will do some experimenting with this circuit. They should find it worthwhile, if one is to judge by the excellent results secured with this receiver.

This station is interested in operation only in the 7 and 14 megacycle bands, so the receiver was designed and built with the hope of securing the best operation in these bands. That hope panned out fine. On 7 mc. satisfactory operation is secured with the speaker any time in the day. Naturally there are always plenty of loud signals when one is using the earphones. The volume falls off a little on the 14 mc. band, but there is plenty of "sock" left to bring in DX (distance) easily. The 14 mc. phone stations are usually loud enough to use the speaker in the evenings from four to eight p. m. in anything like favorable weather. All in all, no better receiver is desired at this station, and that is saying plenty.

Coil Table for Ewing Receiver

	Grid coil L-2	Wire	Primary-tickler coil	Wire	Spacing
20 meter	5	No. 30 DSC	L-3	No. 30 DSC	3/8"
40 meter	12	No. 26 DCC	11	No. 30 DSC	9/16"
80 meter	26	No. 30 DCC	21	No. 30 Enamel	9/16"

For antenna coil L1 for use on the 80 meter band, wind a special coil containing 55 turns of wire.

(Note) All coils are close-wound except the twenty meter one, on which the spacing must be found by experiment. The forty meter primary-tickler coil spacing should also be varied some in order to find the best value.

Condenser and Resistor Values

C1—.006 mf.
C2—.006 mf.
C3—.0001 mf.
C7—.005 mf.
C6—.00004 mf.
C8—1 mf.
R1—2 megohm
R2—2 megohm
R3—50,000 ohm Potentiometer
T—Pilot Audio Transformer
RFC—Pilot Short Wave Choke
C4—.0001 mf. Pilot Midget
C5—.0001 Pilot midget, cut down to four plates.

S-W Record Set by League Report

(Continued from page 8)

telephone "tone line" direct to the radio room of The Times Annex Building on Forty-third Street.

Inked Tape Record Made

An operator wearing ear-phones copied the words on a typewriter. At the same time a tiny inked needle recorded the electric impulses on an automatic receiver.

This system served as a double check on accuracy.

The report was broadcast from the League of Nations' powerful short wave transmitting station at Geneva, Switzerland. It was originally intended, according to various reports from the Geneva station, to transmit the report at fairly high speed, but when the transmission actually started the speed was found to be approximately thirty words per minute. Even though higher speeds were asked for by Japanese receiving stations in Tokyo, and the Chinese station at Shanghai pleaded with Geneva for an increased speed of 100 words a minute, the sunlight zone on the earth began to change and the transmission characteristics likewise changed. The League consulted other stations at various points, such as Rio de Janeiro and Buenos Aires, and found the latter could not receive more than thirty-five words a minute, so the transmission ended at that speed. The League of Nations' station was handled by its regular personnel, numbering ten people.

When it was all over Washington commented, "We get you fine and solid. Do not need any repetitions." The same was true at THE NEW YORK TIMES receiving station.

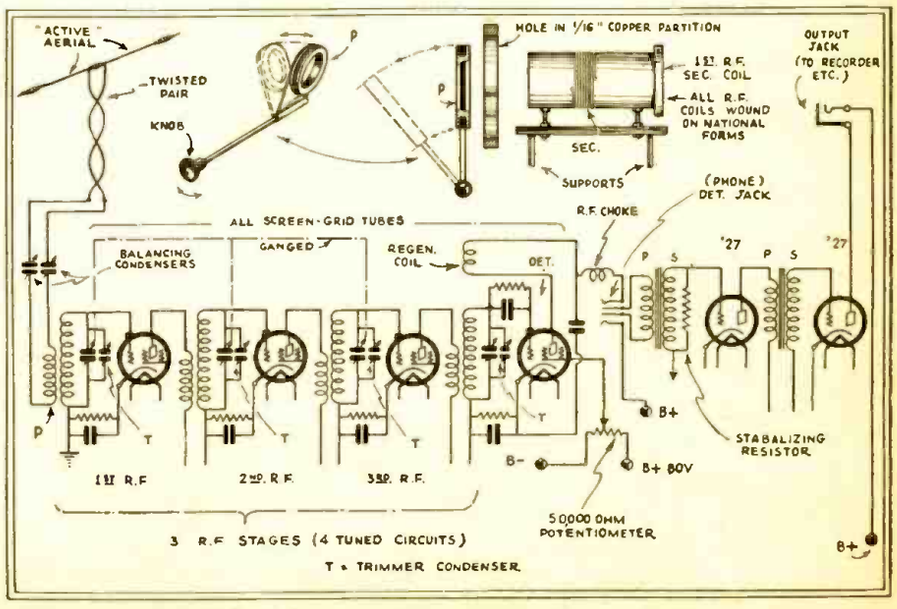
Shanghai said, "Fine tape; pity you could not increase speed." The operators at Nagoya reported receiving conditions good to fair, but they asked for repetition of 200 words. Buenos Aires was bothered by static and needed 1,000 words repeated. Rio de Janeiro requested repetition of 200 words. Australia missed considerable portions of the broadcast because of fading.

Description of Receiver

A few words regarding the remarkably efficient short wave receiver employed by the NEW YORK TIMES radio station in picking up the message for the ten hour period in Geneva will undoubtedly prove of interest to our readers. Mr. F. E. Meinholtz, who is in charge of the radio and telegraph service operated by the NEW YORK TIMES, kindly permitted the writer to inspect the receiver, designed and built by R. J. Iversen of the NEW YORK TIMES, which was used for the remarkable short wave achievement. As the diagrams and photos show, the receiver, which was installed in an apartment house in Astoria, Long Island, utilized four stages of tuned radio frequency amplification employing vario-mu screen grid tubes, which yielded very high gain or amplification and extreme selectivity. A screen grid tube was likewise used in the detector stage, which was provided with sufficient regeneration through a feed back coil to permit the reception of uninterrupted C.W. signals. Some of the transatlantic short wave transmissions take place with interrupted C.W. signals and, in that event, no regeneration or separate oscillator is required for their reception. Phone reception requires no regeneration or separate oscillator.

Two ordinary stages of transformer-coupled audio frequency amplification are built into the special receiver, which the engineers on the NEW YORK TIMES staff built at a cost of approximately $300.00. All of the stages are carefully shielded and all of the shielding, including the external cabinet, is made of ⅛" copper, the inside of the shield compartments being painted a light color while the outside is treated with a black crystalline finish.

In the A.F. stages a couple of type 27 tubes are used, but of course the experimenter could place a 47 pentode or other heavy duty output tube in the second A.F. stage if he wished to. The reason why the A.F. output stage is not designed particularly for heavy duty is due to the fact, as happened in the present instance, that the signal picked up by the receiver was passed through a power amplifier, the signal then being transmitted over a two wire telephone circuit as shown in the diagram, and again amplified by passing it through a recorder amplifier in the NEW YORK TIMES Building in New York City. The highly amplified signal as it emerged from the amplifier is then connected to the headphones worn by the operator who was copying the message on a typewriter; at the same time the signal current was connected to a siphon type tape recorder, and the dots and dashes comprising the signals were permanently recorded on the moving paper tape, a specimen of which



Typical 3-Stage T.R.F. Receiver of the type used in N. Y. Times pick-up of "League of Nations" Report

is reproduced as a border for this article.

In Astoria two short wave doublet antennas had been erected, one for 21 meter reception and the other for 38 meter reception. The aerial currents were lead down through twisted feeders to the receiving room. At this point, an operator sat before the receiver shown in the photos and whenever the signal fell below a certain level or vice versa, it was brought back to the proper level.

The operator in Astoria monitored the reception continuously by means of a pair of phones and "current level" indicator. Referring once more to the receiver, those interested in building up such a receiver should refer to page 525 of the January, 1933, issue of SHORT WAVE CRAFT, where they will find an article by Mr. Burton Currie entitled, "A DeLuxe T.R.F. Receiver." Mr. Currie's receiver shows wiring diagrams, etc., for two tuned R.F. stages and the NEW YORK TIMES receiver which received the Geneva ten hour message has two more stages of T.R.F., (i.e. four tuned circuits—Editor) which is practically a duplicate of those shown in Mr. Currie's article. In Mr. Currie's description all details are given for coils, tuning condensers, cathode bias resistors, by-pass condensers, etc.

It is interesting to note that the NEW YORK TIMES receiver here illustrated utilized National R.F. coil forms, which are made of low loss composition R-39. Note particularly that a distance of two inches and more in most cases is left between the R.F. coils and the copper shielding in any direction to minimize losses by induction in the shielding metal. The method of coupling the antenna to the tuned secondary of the first R.F. coupler is novel and is worth the attention of anyone attempting to build a set of this type. The coupling coil, which may comprise from six to ten turns of No. 18 silk covered or enameled wire, is wound in a slot in pancake form on a bakelite disc of about the same diameter as the secondary coil form; this disc, containing the primary or antenna coil, is mounted on a rod fitted with a knob mounted on the front panel so that the degree of coupling can be varied. The three main tuning condensers of the three R.F. stages are ganged, but of course if you wish they may be tuned separately with the separate dials. The fourth tuned circuit or detector stage has a drum dial of its own in the NEW YORK TIMES receiver. Small trimming condensers are connected across all of the tuning condensers and the small knobs controlling these trimming condensers are mounted along the bottom on the front panel of the set.

The regeneration control in the detector circuit may very well be of the screen-grid potential regulation type as indicated in the diagram, the voltage supply of the screen grid to the detector tube being varied by means of a 50,000 ohm potentiometer connected between "B" minus or ground and "B" plus 80 volts or higher.

Where the two lead-in wires from the transposition lead-in of the aerial doublet are connected to the coupling coil as shown in the diagram, two small variable condensers of about 50 mmf. may be connected in series with the two lead-in wires, these being used to balance up the antenna system to perfect resonance.

For plate supply well filtered D.C. is obtained for the amplifier stages from a National plate supply unit in the NEW YORK TIMES radio receiving laboratory, and "B" batteries may supply the plate voltage for the detector unit if power line fluctuations make the high voltage unstable.

How to Get Licenses for Amateur Radio Stations

(Continued from page 28)

take home, fill out, have notarized, and send to the Federal Radio Commission, Washington, D. C. Get all this straight: all matters concerning operator's licenses are handled by the local office; all matters concerning station licenses are handled directly by the Commission in Washington. DO NOT SEND the station application to the local office.

Formerly two station application blanks, in duplicate, were required. Now you need only one. Be sure to answer all questions that apply to you, and don't forget the notarization, or your application will come back.

Because of the steadily increasing number of amateur station license requests that are pouring into the office of the Federal Radio Commission, there is some delay in the issuance of the actual licenses. Be patient and don't bother the Commission with letters after you have sent in your blank. Figure on a wait of at least three weeks and as much as six. If you have your operator's license, and have filled out the form properly, the station "ticket" will come through automatically.

Both operator's and station licenses now run for three years. These licenses represent a very valuable privilege, granted by the government at no cost to you; take care of them and obey the law and you will be proud of your standing as a "ham."

U. S. INSPECTION DISTRICTS

Address	Radio Inspector
District No. 1 States of Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island.	Customhouse, Boston, Mass.
District No. 2 City of Greater New York and the Counties of Suffolk, Nassau, Westchester, Rockland, Putnam, Orange, Dutchess, Ulster, Sullivan, Delaware, Greene, Columbia, Albany and Rensselaer of the State of New York, and the Counties of Bergen, Hudson, Passaic, Sussex, Warren, Morris, Essex, Union, Somerset, Middlesex, Monmouth, Mercer, Hunterdon of the State of New Jersey.	U. S. Subtreasury Building, New York, N. Y.
District No. 3 City of Philadelphia and the Counties of Bucks, Montgomery, Philadelphia, Delaware, Chester, Lancaster, York, Adams, Cumberland, Perry, Dauphin, Lebanon, Berks, Schuylkill, Lehigh, Northampton, Carbon and Monroe of the State of Pennsylvania, and the Counties of Ocean, Burlington, Atlantic, Cape May, Cumberland, Salem, Gloucester and Camden of the State of New Jersey; State of Delaware.	Gimbel Building, 32 South Ninth St., Philadelphia, Pa.
District No. 4 State of Maryland, the District of Columbia, and the Counties of Arlington, Loudoun, Fairfax, Prince William, Fauquier, Rappahannock, Page, Warren, Shenandoah, Frederick and Clark, of the State of Virginia.	Fort McHenry, Baltimore, Md.
District No. 5 State of Virginia, except the Counties of Arlington, Loudoun, Fairfax, Prince William, Fauquier, Rappahannock, Page, Warren, Shenandoah, Frederick and Clark, and the State of North Carolina, except the Counties of Ashe, Watauga, Caldwell, Avery, Burke, McDowell, Yancey, Mitchell, Madison, Buncombe, Haywood, Swain, Graham, Cherokee, Clay, Macon, Jackson, Transylvania, Henderson, Polk, Rutherford and Cleveland.	Customhouse Norfolk, Va.
District No. 6 States of Alabama, Georgia, South Carolina, Tennessee, and the Counties of Ashe, Wataga, Caldwell, Avery, Burke, McDowell, Yancey, Mitchell, Madison, Buncombe, Haywood, Swain, Graham, Cherokee, Clay, Macon, Jackson, Transylvania, Henderson, Polk, Rutherford, and Cleveland of the State of North Carolina.	528 Postoffice Building, Atlanta, Ga.
District No. 7 The State of Florida.	1424 Dade County Building, Miami, Fla.
District No. 8 The States of Louisiana, Mississippi and Arkansas.	Customhouse. New Orleans, La.
District No. 9 Counties of Jefferson, Chambers, Harris, Galveston, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, Goliad, Refugio, Aransas, San Patricio, Mueces, Jim Wells, Kleberg, Brooks, Kenedy, Willacy, Hidalgo, and Cameron of the State of Texas.	209 Prudential Bldg., Galveston, Texas
District No. 10 State of Texas, except the Counties of Jefferson, Chambers, Harris, Galveston, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, Goliad, Refugio, Aransas, San Patricio, Mueces, Jim Wells, Kleberg, Brooks, Kenedy, Willacy, Hidalgo and Cameron, and the States of Oklahoma and New Mexico.	464 Federal Building, Dallas, Texas
District No. 11 Counties of Monterey, Kings, Tulare, San Luis Obispo, Kern, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, and San Bernardino of the State of California; the County of Clarke of the State of Nevada, and the State of Arizona.	1105 Rives-Strong Building, Los Angeles, Calif.
District No. 12 State of California, except the Counties of Monterey, Kings, Tulare, San Luis Obispo, Kern, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside and San Bernardino, and the State of Nevada, except the County of Clark.	Customhouse, San Francisco, Calif.
District No. 13 State of Oregon and the State of Idaho, except the Counties of Boundary, Bonner, Kootenai, Shoshone, Benewah, Latah, Clearwater, Nez Perce, Lewis and Idaho.	227 Postoffice Building, Portland, Ore.
District No. 14 State of Washington, the Counties of Boundary, Bonner, Kootenai, Shoshone, Benewah, Latch, Clearwater, Nez Perce, Lewis and Idaho of the State of Idaho; and the Counties of Lincoln, Flathead, Glacier, Toole, Pondera, Teton, Lake, Sanders, Mineral, Missoula, Powell, Lewis and Clarke, Cascade, Meagher, Broadwater, Jefferson, Granite, Ravalli, Deerlodge, Silver Bow, Beaverhead, Madison, Gallatin of the State of Montana, and Territory of Alaska.	1012 Exchange Building, Seattle, Wash.
District No. 15 States of Colorado, Utah, Wyoming, and Montana except the Counties of Lincoln, Flathead, Glacier, Toole, Pondera, Teton, Lake, Sanders, Mineral, Missoula, Powell, Lewis and Clarke, Cascade, Meagher, Broadwater, Jefferson, Granite, Ravalli, Deerlodge, Silver Bow, Beaverhead, Madison and Gallatin.	538 Customhouse, Denver, Colo.
District No. 16 States of South Dakota, North Dakota, Minnesota, the northern peninsula of Michigan, and the State of Wisconsin, except the Counties of Crawford, Richland, Sauk, Columbia, Dodge, Washington, Ozaukee, Milwaukee, Waukesha, Jefferson, Dane, Iowa, Grant, Lafayette, Green Rock, Walworth, Racine and Kenosha.	413 Federal Building, St. Paul, Minn.
District No. 17 States of Nebraska, Kansas, Missouri and Iowa, except the Counties of Winneshiek, Allamakee, Fayette, Clayton, Buchanan, Delaware, Dubuque, Linn, Jones, Jackson, Clinton, Cedar, Johnson, Washington, Muscatine, Scott, Louisa, Des Moines, Henry and Lee.	231 Federal Building, Kansas City, Mo.
District No. 18 States of Indiana, Illinois and the Counties of Winneshiek, Allamakee, Fayette, Clayton, Buchanan, Delaware, Duhuque, Linn, Jones, Jackson, Clinton, Cedar, Johnson, Washington, Muscatine, Scott, Louisa, Des Moines, Henry and Lee of the State of Iowa; and the Counties of Crawford, Richland, Sauk, Columbia, Dodge, Washington, Ozaukee, Milwaukee, Waukesha, Jefferson, Dane, Iowa, Grant, Lafayette, Green Rock, Walworth, Racine and Kenosha of the State of Wisconsin.	2022 Engineering Building, Chicago, Ill.
District No. 19 State of Michigan, except the northern peninsula and the States of Ohio, Kentucky and West Virginia.	2909 David Stott Building, Detroit, Mich.
District No. 20 State of New York, except the City of Greater New York and the Counties of Suffolk, Nassau, Westchester, Rockland, Putnam, Orange, Dutchess, Ulster, Sullivan, Delaware, Greene, Columbia, Albany, and Rensselaer; the State of Pennsylvania, except the City of Philadelphia, and the Counties of Bucks, Montgomery, Philadelphia, Chester, Delaware, Lancaster, York, Adams, Cumberland, Perry, Dauphin, Lebanon, Berks, Schuylkill, Lehigh, Northampton, Carbon and Monroe.	514 Federal Building, Buffalo, N. Y.

Hawaii is attached to District No. 12.

Porto Rico and the Virgin Ids., are attached to District No. 7.

Both Ends of Phone Talk Now Heard

(Continued from page 12)

check over all connections and make sure that the leads running to the plate coil are connected properly. The circuit diagram has the socket terminal markings for the various coil terminals and should be followed carefully.

Parts List

One Silver Marshall A.F. transformer, type 240 (T1)
Two Hammarlund S.W. R.F. chokes type CH8 (R.F.C.1 and R.F.C.2)
Two Hammarlund .0001 mf. tuning condensers, type MC100M (C3, C4)
Two Antenna series condensers; see text for construction. (C1, C2)
Two National S.W. receiving condensers, .00015 mf. (C5, C6)
One set Alden S.W. coils. (L1, L2). See page 55.
Two Eby sockets, 4-prong type, for L1 and L2
Three Alden four-prong sockets for tubes. (V1, V2, V3)
Two Illini .000125 mf. mica condensers. (C7, C8) (Polymet)
One Flechtheim tubular condenser, .0015 mf. (C9) (Polymet)
Two International Resistance Co. resistors, 3 meg., 1 watt. (R1, R2) (Lynch)
One Blan-the-Radio-Man 7 by 12 aluminum panel.
One wooden baseboard, 8 by 11 inches.
One Aluminum Company of America aluminum partition.
Wire, wood screws, Fahnestock clips, etc.

Some "Dual Wave" Reception Pointers by Leslie W. Orton of England

Mr. Orton is Hon. President, Anglo-American Radio & Television Society; Hon. President, International Radio Society; Editor, "Radio," etc, (all of England).

● It is a frequent experience among short-wave listeners to tune in a station carrying out tests with another station. With the normal short-wave receiver only half the conversation can be heard unless, as occasionally occurs, the station received has a loud speaker connected up near the microphone so that both ends of the conversation are audible to the listener.

It was with a view of overcoming the annoyance of being restricted to hearing only one side of test conversations that I set about designing a receiver capable of receiving two stations at once.

Figure 1 (diagram is practically like one shown—Editor.) is the outcome. It will be clear to any technical minded listener that the arrangement comprises two detector stages, followed by an audio-frequency stage. Now if one detector is tuned to one station and the other to the other, it is possible to hear *two stations at the same time.* Besides making the reception of two stations possible, this arrangement has also another advantage. Let me explain: If we tune one detector to one of the Daventry Empire stations and the other to another of the Empire stations, broadcasting the same program, it will be found that almost "fadeless" reception is experienced. This is due to the fact that when one station fades the other does not necessarily do so.

The design of the arrangement should be carefully arranged and the coils and tuning condensers should be kept well apart. On the other hand *grid* leads should be as short as possible, while they should also be kept well away from the plate leads.

A loose-coupled aerial may be employed but in my experiments I found that the insertion of a .00005 mf. condenser in each aerial circuit was a better method of coupling the aerial.

If the listener so desires he may construct the arrangement to operate from the electric-light lines and although more care has to be taken with the wiring and placing of components the final results are generally better than if a battery set of this type is employed. Of course, in the A.C. model, indirectly-heated tubes should be employed throughout and the filament current should be regulated to be exact. If this is not done hum may result.

Although the circuit of this set may lead the reader to conclude that it is a "stunt" receiver I assure them that although it may be "stuntish" in appearance, it *does* give results, which prove that it is well worth constructing.

Improving the S-W Converter

(Continued from page 24)

as it saves one tube, an important consideration in these days.

In Fig. 1 is a circuit of a short wave converter which will greatly improve operation over that obtained from the use of a single tuned circuit preceding the detector grid.

The coils L1, L2 and L3 are those used regularly and will not require any changes. Coil L must have the same number of turns of the same size wire as L1, also the form should be of the same diameter. The spacing between L and L1 will be between the limits of 1" and 1-½".

The method of feeding energy from the oscillator has been used by a prominent set manufacturer and many experimenters; it has proven very satisfactory.

Figure 2 shows the detector circuit using a 58 R.F. pentode instead of a '35. This tube results in greatly increased sensitivity. The bias resistor has a value of 1000 ohms.

Building a Depression Transmitter

(Continued from page 29)

You should be able to secure an old "B" eliminator with a blown filter condenser for not more than One Dollar, and this price should include a serviceable Raytheon rectifier tube. The next purchase should be a battery-charger, less rectifier, which can be had for around fifty cents. Care should be taken that the transformer is not of the auto-former type with the secondary and primary being one continuous coil. The transformer should be of the two-coil variety.

The first step is to entirely dismantle the eliminator. I mean to remove the transformer, chokes, resistors, socket, and switches, and to remove the condensers from their casing of pitch. Next separate the sheep from the goats in these condensers by testing each of them in series with a lamp across the lighting voltage. I need scarcely say that if the lamp burns, the condenser should be discarded.

Now I have not mentioned it before, but if it is at all possible, I suggest that you try and secure an old Majestic.

Assuming that you *do* have a Majestic, pick up the transformer and look at it. You will see that there are two sets of three soldering lugs running across the open face. One set of three represents the secondary winding together with the center-tap, and the other set is the tapped primary. A pair of earphones in series with a battery will serve the purpose of determining which is which; for when the current is passed through the primary, the click is much louder than when it is sent through the high-resistance secondary. Now place the transformer on the table before you with secondary terminals on your right. The top of the left hand terminals is now one end of the primary, the bottom one is the other end, and the middle terminal is a tap that is taken off a few turns from the end represented by the bottom terminal.

Mount this transformer at the rear left hand corner of a 10"x14" board by means of a tin strap going over the top. Mount one of the chokes in the center rear section of the board. Put the tube socket next to the transformer. Put one of the variable resistors and two binding posts on a piece of bakelite at the right end of the board, and mount the single pole switch that is marked "High" and "Low" on a piece of bakelite on the front edge. A simple toggle switch should be mounted on this same piece of bakelite.

Condenser Details

Now, by placing two of the 1 mf. condensers in parallel, make up two condenser-sections of 2 mf. each. One of these should be mounted on each side of the choke. A glance at the diagram should now enable you to wire up the entire power-supply. The high voltage leads on the transformer go to the filament connections on the socket, and the positive high voltage lead comes from the plate prong. The bleeder consists of the fixed bleeder that was in the eliminator together with one of the variable resistors in series. The bleeder current should be about one-fifth or one-fourth of the plate current drawn by the tube.

I suggest that a Flashlight bulb be placed in the negative lead between the center tap of the transformer and the first condenser. In the event that a condenser goes out, this protects the transformer and the rectifier from overloading. In wiring up the tap switch, it should be remembered that the greater the number of turns that there are on the primary, the lower will be the output voltage. The two small condensers that are found in the condenser-section are *buffer* condensers, and they should be placed from the center-tap to each high-voltage end of the transformer.

Checking Transformer

Before you remove the secondary winding from the charger transformer, have the voltage tested. Very probably the man from whom you purchase it will perform this service for you. As you remove the turns of the secondary, count them; and then divide the number of turns by the voltage that was across the output. This will give you the turns-per-volt ratio of the transformer. Multiply this number by five, and you will have the number of turns that are necessary on the new winding. It is a good idea to add a couple of turns to take care of the drop that will occur when a load is placed on the transformer. If the winding cannot all be made in one layer, a layer of oiled paper may be placed between the first and second layers. After the secondary has been wound and tested under a quarter-ampere load, the entire winding should be taped.

Now you have the three essential parts of your transmitter, and you are almost ready to go on the air. For an antenna, a wire about 66 feet long including the lead-in should be used. Care should be taken that a very good ground is used. The transmitter is tuned to the band, and then the antenna is tuned to resonance. This resonance is indicated by the flashlight bulb in the antenna circuit. If the antenna cannot be brought into resonance when the transmitter is in the band, different lengths should be tried. I may say, however, that the exact length is not critical.

Remarkable Range of This Transmitter

Now a word as to the results that may be expected from this "rig." Using a 112A tube and permitting it to draw 35 ma. at 170 volts, I have worked all of the United States districts except W6 and W7. I have received R7 reports from all of these except the fifth and the report from that was R6. QSA 4-5 reports have been received from all of these, and I have just received a QSL from Rainy River, Ontario, Canada, in which my PDC sigs were QSA5 R8 through the heavy Saturday evening QRM. I work the East Coast almost nightly, so I know that these performances are not of the kind that are known as "freak." Although I have not had my transmitting license for a year, I have 560 QSO's to my credit and have run regular traffic schedules with hams in adjoining states. I have received many compliments regarding my signals, and receive XTAL PDC reports about 50% of the time. I do not mean to boast about the performance of this transmitter, for I can take no share of the credit for its work. The circuit is an old one, but I believe that it is the best of all for "low-power."

An Inductive S-W Tuner

(Continued from page 13)

Parts

All parts are shown on the diagram with their respective values. The coil unit is the same as that used in the Radiola III, except for turns as noted. This is also true of the .006 and .0001 mf. antenna condenser, which is a standard part of the aforementioned set.

The antenna switch may be of any reliable make, but should be so constructed that there will be no open circuit when changing from one tap to another. Otherwise, when earphones are used a violent click, which is hard on the ears, will result.

List of Parts for the 100 to 300 Meter Inductively Tuned Hood Receiver

3—tubes, 27, 24, and 47.
3—wafer sockets, two 5-prong and one 6-prong for 47 pentode; 1 output transformer 1:1 ratio, with high impedance primary to match pentode; Thordarson.
1—5-point switch, Eby (Best).
1—Vario-Coupler with two rotors of the type used in the Radiola III.
1—3:1 ratio A.F. transformer.
1—Grid leak, 3 megohms (Lynch).
1—Grid Condenser .00025 mf.
1—Fixed condenser .0006 mf.
3—.0001 mf. fixed condensers.
1—.01 mf. fixed condenser.
1—.0005 mf. condenser.
3—.5 mf. by-pass condensers.
1—.3 mf. by-pass condenser.
1—1000 ohm resistor, 1 watt (providing cathode bias on 24 tube). Lynch.
1—300,000 ohm resistor. Lynch.
1—megohm resistor. Lynch.
1—300 ohm resistor (grid bias for 47 tube).
1—75,000 ohm resistor, R1 (in series with 5 G. of 1st A.F. tube).
1—Center tap resistor, 50 ohms.
1—Center tap resistor, 30 ohms.
1—50,000 ohm potentiometer, Frost (Clarostat).
1—40,000 ohm resistor.
1—75,000 ohm resistor (forming voltage-divider supplying 250 v. "B" plus, feed, for three tubes.

Come and Enlist in the S-W "Code" Army

(Continued from page 30)

pivot, upon which rests the fore and index fingertips, while the thumb lightly grips the under edge of the knob but also slightly to one side. Your elbow on the table serves as the other pivot for arm movement. With these two ideas clearly in mind, bend your arm at the wrist so that it is raised about two inches from the table, then let your arm "fall" to the table, thus executing the "make" movement so that you will hear the audio note from the speaker. With the arm raised at the wrist, this is the "break" position and no sound comes from the speaker. Also adjust the contact-gap of the key so that when your hand does not rest on it, the compression spring of the key will keep the contact points slightly separated. This will eliminate hearing the key contact.

Many operators would have better records, there would be less disturbance, and their signals could be "read" at greater distances if their method of *keying* were better. Hence you are admonished to develop the outstanding ethical habit which distinguishes the good operator—"*a good fist on the air.*"

Uses

This code-learning set is useful for the whole family to learn the short-wave language, to teach each other the code, to try their hand at "transmitting," and to help each other, by constructive criticism, make more rapid progress, for it is a well-known fact that people improve only when under a system of observation. Furthermore, the partially deaf can enjoy short-wave reception because by means of the amplifier, the audio signal, if fed into headphones, gives entirely adequate volume.

While the photograph shows the set using '01A's, '99's or '30's may be used with equally good results and with about the same degree of economy, for in actual operation, the filament of the oscillator tube V1 is turned very low, as this gives a good musical code-tone. If the filament is burned at rated voltage, the tone is "mushy" and if burned very, very low, the audio note generated goes beyond hearing. Thus the tone can be adjusted to the best reception frequency of the hearers.

In conclusion, it may be said that such a set will be found useful in teaching code to school classes and for recruiting the whole family into short-wave service.

A "Cash-Box" Receiver

(Continued from page 24)

Another good feature of the set is that in case one builds a transmitter or a larger receiver, the cash-box set can be used as an ideal monitor or frequency meter.

Frequency	Coil Data L2	L3
3,500 KC	35	14
7,000 KC	16	11
14,000 KC	6	7
28,000 KC	3	5

L1—5 turns around coil socket.

A 3-Tube "Stand-by" From a Radiola V

(Continued from page 21)

Haas on page 497 of the December, 1932, issue of SHORT WAVE CRAFT. The tuning condenser is a standard .0001 mf. of Hammarlund's make. A regular quarter inch steel lock washer on its shaft prevents the condenser from "creeping" when turned quickly against its stops. I use a Kurz Kasch 3" vernier on this condenser, and by offsetting the dial slightly from the panel, by means of washers on the mounting screws, prevented any tendency to back-lash.

This condenser was mounted in the old upper rheostat hole, thus placing the vernier knob at the exact center of the panel. See Figs. 1, 2, 3.

Grid Condenser and Leak

The grid condenser and leak, respectively .0001 mf. and 2 megohms, are soldered directly to a small battery clip, and thus attached to the grid cap of the detector tube. The .00005 mf. regeneration condenser was mounted directly in the hole of the old right hand rheostat. It carries one of those old large knob and pointers which were so common, and are very well adapted for minute but comfortable tuning. The regeneration control, a 50,000 ohm Clarostat, with a similar knob, is mounted in the left hand rheostat hole. The .5 mf. suppressing condenser fits snugly between the coil end of the tube shelf and the side of the cabinet, with the mounting lugs slipped around the screws supporting the tube shelf brackets. The upper left hand knob is for the 50,000 ohm volume control, while the corresponding right hand knob is on the detector rheostat. Both of the latter are luxuries, of course, and are unessential. However, the volume control permits adjustment of the third tube for ear-phone reception when desired, while the single rheostat permits adjustment to the source of current, both desirable. Should a *band-spreading* condenser be desired it may be mounted in place of the volume control, and the volume control placed where the rheostat now is. If none of the last three instruments is used, *no drilling of the panel is necessary.*

The 60 henry radio frequency choke, a Pilot, is mounted one inch behind the binding post strip and four inches from the coil end of the set, i. e., the left end, viewed from the rear. The writer drilled one hole here in the soft zinc base, but it is not absolutely necessary. The battery switch mounts readily with a large metal or bakelite washer in the center hole near the base, from which the center jack was removed. Hook-up the set as far as possible before inserting the tube shelf. Neither is this absolutely necessary, but it will simplify that work somewhat. The writer used No. 18 bell wire, covered with black spaghetti. Now mount your coil and tube sockets on the tube shelf, all at its rear edge to place them on the center line of the set. The detector socket is placed at the center of the shelf (the long way), the second amplifier socket is placed at the extreme right end of the shelf, and the first amplifier socket exactly between its mates. The coil socket is placed exactly in the middle of the space between the detector and the left end of the cabinet as viewed from the rear. Note that for all your resulting compactness, no metal lies in the field of the coil! Finish your wiring and hook on your batteries. Now let's review the physical and operating characteristics of our "Luxuriant Mongrel":

Features

1. A set weighing 15½ lbs. that will take punishment.

2. A properly designed 3-tuber with a base only 5½"x11".

3. A genuine commercial appearance, with an extra matching cabinet for supplementary use, all heavily shielded.

4. A consistent "DX" logger, and loud speaker operation.

5. A 2-control tuner, with supplementary controls to "squeeze the utmost" from a signal.

6. A set with "one-hand," split-second, coil-changing facilities.

The following parts were necessary:

C—1—.0001 mf. grid condenser.

C1—2—1½" square brass angles.

C2—1—.0001 mf. Hammarlund variable condenser.

C3—1—.00005 or .0001 mf. Hammarlund variable condenser.

C4—1—½ to 2 mf. fixed condenser, one from a Ford spark coil will do—but test it.

C5—2—.01 mf. condensers.

G—3—2 megohm grid leaks.

L1 & L2—Na-ald coil kit.

CH—1—60 henry pilot R.F. choke.

R2—1—50,000 ohm Clarostat.

1—3" Kurz Kasch vernier dial, matching knobs, etc.

The following are desirable:

R1—1—20 ohm rheostat.

R3—1—Clarostat volume control.

Sw—1—filament switch.

If preferred, the first audio stage may readily be changed to the regular transformer coupling, or the insertion of a third transformer will permit a stage of transformer-coupled, followed by a stage of double impedance coupling. In the last case the secondary of the third transformer is substituted for the third grid leak. Obviously the set is as elastic in design and construction as it is in operation.

Refinements and Coil Data

COILS: Forms, standard 1¼", Na-ald, Genwin, etc.

	Meters	Turns	Spacing	Antenna Tickler Separation	Tickler, close wound
Blue	10-30	7 @	7 turns/inch	1/8"	• 8 turns
Yellow	20-50	15 @	15 turns/inch	1/8	• 7 turns
Green	40-90	30 @	24 turns/inch	1/8"	•11 turns
Red	80-180	60	close wound	†1/16"	‡15 turns

•All No. 22 enamel covered wire. †No. 22 ‡No. 28

VOLUME CONTROL: A standard universal Clarostat or Pilot Resistograd on the upper left is shunted across the last transformer.

RHEOSTAT: A six to twenty ohm rheostat on the upper right handles the filament supply.

BAND SPREADER: A pilot .00001 mf. variable condenser shunted across the main tuning condenser is on the lower left. Broadcasting stations are logged directly on the main condenser with the band spreader kept at 50. In the "ham" bands C.W. signals are logged on the band spreader with the main condenser set in the middle of the band.

REGENERATION: The 50,000 ohm Clarostat in the control grid lead is moved over directly under the vernier dial of the main condenser.

AMPLIFIER: The first stage has been converted to double impedance, the last stage to low ratio straight transformer coupling. Two Kelford 100 henry chokes have been substituted for the R.C.A. U.V. 712 audios, and a General Radio 2.7 to 1 transformer inserted for the last stage. These happened to be handy and the RCA's brought a good supply of other parts in a swap! Of course the two RCA secondaries work as well in the double impedance arrangement. Incidentally the latter arrangement gives somewhat more power and clarity than the two-stage single impedance.

TUBES: A 32 detector, next to coil; a 30 first stage in the middle; and a 231 for output, over which I found a *shield-can* worthwhile.

Building a 2-Tube Oscillodyne

(Continued from page 15)

panel is attached. The subpanel is attached to the front panel by a pair of 1" x 4¾" brackets, which are cut to the latter dimension from a stock length of 8½".

The 50,000 ohm Electrad potentiometer is used to vary the voltage applied to the plate of the type 56 tube, used as a detector. If a potentiometer of another make is used, make sure that the shaft and the bearing are insulated from the slider; otherwise the part must first be mounted to a strip of bakelite which in turn is mounted to the panel.

The antenna and ground connections are made at one side by means of Eby Twin binding posts. The loud speaker connections are made on the other side by means of an Eby Twin jack assembly. The battery connections are made by a binding post strip at the rear.

The Hammerlund antenna compensating condenser is mounted to the top of the inductance coil and bent horizontal to facilitate adjustment, as shown in the photographs.

The Aerovox by-pass and fixed condensers are mounted to the bottom of the subpanel, as is also the Hammarlund choke.

Coil Construction

The tapped inductance coil is wound on a bakelite form 1" in diameter and 2" long. No. 35 D. S. C. wire is employed and there is no spacing between turns. The windings are separated by one-eighth of an inch.

The winding procedure is as follows: Start the grid winding from the inside and wind outward, tapping the coil at 5, 8, 12, and 20 turns while winding. This winding should have a total of 33 turns.

A convenient method of making the taps is to wind about one-quarter of a turn less wire than required and make about a four inch loop which is knotted so that the knot appears in the proper place when wound on the form. One wire of the loop is then cut about one-half inch from the knot leaving one long lead and one short lead. The long lead is used to make connections to the inductance switch; while the short lead is scraped bare and wrapped around the base of the long lead, which is bared for this purpose. The joint, thus made, is soldered and covered with a 1½" length of "spaghetti" tubing.

When the first winding is finished, the tickler winding is started from the inside and wound in the same direction as the preceding. This means that the two windings would appear like a continuous winding if joined in the center. This winding is tapped at 8 and 11 turns and has a total of 15 turns.

The finished coil may be given a light coat of clear Duco or airplane dope, if desired. The coil is now mounted to the top of the subpanel and wired to the Yaxley inductance switch, as shown in Fig. 2.

Operating Notes

The operation of this set is practically the same as the one described last month except that a loud speaker is now used in place of earphones.

One difficulty encountered in getting the set described to function properly was faulty switch contacts. This was presumably caused by rosin flowing down during the soldering operation. After cleaning the switch points this trouble disappeared.

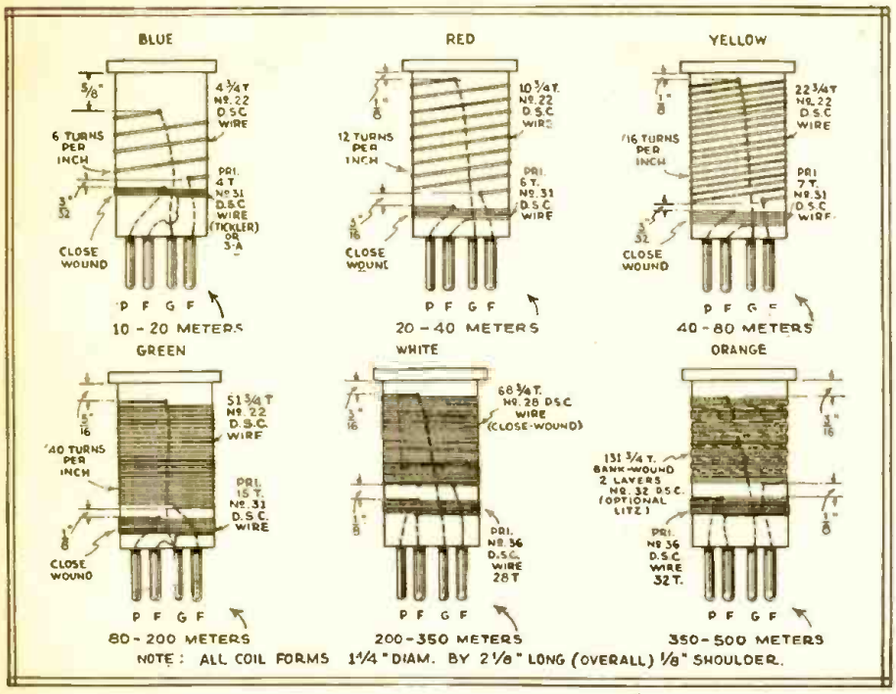
If the set does not operate correctly the trouble, in all probability, can be located by the "trouble-shooting" instructions given last month.

The writer would be pleased to hear from constructors who have built this or the preceding set, in regard to results obtained or difficulties encountered, and will endeavor to answer all letters providing

(Continued on page 56)

The "Easy-Build" S-W Super-Regenerator

(Continued from page 23)



Details for Making Coils to Be Used in Super-Regenerator. (Alden type)

tuning in signals with this set. Try the circuit as a straight regenerative receiver and then as a "super." Note that certain stations will come in with greater volume on the super circuit and that other stations will give better signals on the straight regenerative hook-up. In general the super-regenerative circuit will give better results on the very high frequencies and the straight regenerative circuit will be more satisfactory on the lower frequency bands. C. W. signals and super-regeneration go well together and very high values of amplification can be built up. This great "build-up" of signal will result in the distortion of the original pitch of the signal, but this will not be objectionable.

For 2-volt battery operation use the 32 type tube, for 6 volt operation use the 36 type tube and the 24 or 57 for operation on A.C. If a satisfactory filament transformer with a secondary voltage of 6 volts is available, then the 36 type tube can be used if desired. *Be sure that the tubes are in good condition. Poor tubes will ruin any short wave receiver.*

When using tubes of the 32 class do not place more than two volts across the filament or the life of the tube will be materially decreased. Keep the voltage at exactly TWO volts for maximum life. The plate voltage should be 135 and the screen voltage should be varied until the most sensitive and smoothest operating point is found. This voltage will vary with different types of tubes and tests should be conducted when tuning to a weak station to determine the proper operating screen voltage.

This receiver offers the S.W. set builder his chance to test and compare the difference between the efficiency of regeneration and super-regeneration for short wave reception. It is necessary to keep in mind that there are several improvements that can be made in the circuit for more refined operation as a super-regenerative circuit. Many of these possible improvements can be found in the article on super-regeneration as mentioned in the second paragraph of this article.

Set builders who have looked at the many super circuits that have appeared in SHORT WAVE CRAFT in the past, and have hesitated to build them because they were doubtful as to the results, should try this one and then they will go after the more complicated and smoother operating jobs. There is a great deal of fun in trying to make one tube do the work of two and some times more.

A Pyrex Glass Lead-in for Ten Cents

(Continued from page 25)

way until the tube will easily slide through the glass. Repeat for the second cup.

Cut two rubber gaskets from an old inner tube to fit under the cup edges, between cups and wall, also two smaller ones to go between cups and bolt heads. Cut a hole in the wall as large as possible, or a little less than the inside diameter of the cups. If the antenna is not to be carried through in one length, it is only necessary to obtain a long brass bolt, or threaded rod with nut at each end, or make up one by soldering a brass screw into each end of a five-sixteenth copper tube. To make a hollow bolt, so that the antenna wire or lead-in may be carried right through without joints, take a five-sixteenth brass screw, file threads from one end so that it will fit into a copper tube, drill the screw through, using drill a little larger than the lead-in wire used, then solder into end of tube. Cut the tube proper length, determined by the thickness of wall through which wire is run, flange the end over a heavy brass washer and solder. This saves the use of two threaded ends.

When assembling, a few brads will hold the cups and gaskets in place until the bolt is dawn up. Should a larger insulating surface be desired, larger Pyrex bowls may be used, drilled in the same way, or holes for larger diameter bolts may be drilled about as easily as the smaller ones. —H. H. Parker.

Building a 2-Tube Oscillodyne

(Continued from page 54)

a self-addressed and stamped envelope is enclosed.

(Part III of "Oscillodyne" series to appear in June issue.)

List of Parts Required for Two Tube Oscillodyne

C1—Hammarlund equalizing condenser, EC-35. (3-35 mmf.)
C2—Hammarlund midget condenser, midline plates, 80 mmf. capacity, type MC-75-M. (Cardwell Midway, 100 mmf. type C, plates, 404-C.)
C3—Aerovox Type 1460, .00015 mf. mica condenser.
C4—Aerovox Type 1460, .002 mf. mica condenser.
C5—Aerovox Type 1460, .004 mf. mica condenser.
C6—Aerovox Type 261 filter condenser—single section 1. mf. 300 volt D.C. working voltage.
C7—Aerovox Type 261 Filter Condenser—double section .5-.5 mf., 200 volt D.C. working voltage.
L1—Bakelite Tubing 1" diameter x 2" long (Wholesale Radio Service Co., Inc.). See text for winding details.
L2—Hammarlund Isolantite R.F. choke-type CH-8, 8 millihenrys.
L3—Stromberg-Carlson A.F. transformer, No. 3-A (secondary winding only used).
R1—Aerovox Type 1095 Resistor, 2 megohms.
R2—Aerovox Type 1095 Resistor, 100,000 ohms.
R3—Electrad Type RI-205, 50,000 ohm volume control (potentiometer).
R4—Aerovox Type 1095 Resistor, .5 megohms.
R5—Electrad Type GB Flexible Resistor 500 ohms, 2 watt rating.
R6—Yaxley center-tapped resistor, 20 ohms.
1—Yaxley No. 1625 two gang-5 point tap switch.
1—Eby Twin binding post assembly.
1—Eby Twin jack assembly.
5—Eby binding post.
2—Hammarlund Isolantite 5 prong sockets, Type S-5.
1—Vernier Dial (National) 5", with variable ratio.
2—1"x8½" brackets.
1—Aluminum panel 6"x9".
1—Aluminum panel 4½"x8½".
Miscellaneous nuts, bolts, wire, etc.

Short Wave League

(Continued from page 41)

Yes! Yes! The Code!

Editor, SHORT WAVE CRAFT:

I would like to clout the guy who says code is useless to the "ham." How did radio begin? With a five meter fone set? I guess not! In the old days they experimented with code and code alone and still some bright "lid" claims code is useless! Those are the birds that should not be given a license at all even after they see that it is useless to try to engineer one without passing a code test.

I am for the SHORT WAVE LEAGUE and all "hams" who use code or a combination of code and fone. Bar the codeless "would-be-hams" from the air; send 'em to China or some place where they can talk through a "mike."

Respectfully,
S. M. WILSON, W5BSC,
Pascagoula, Miss.

What! No Code?

Editor, SHORT WAVE CRAFT:

Just what is all this "ballyhoo" regarding a "codeless phone license"? Personally, I don't believe the F. R. C. will ever consent to such a change in their already ridiculously simple amateur requirements.

Learning the code is such an insignificant thing. In fact, without a code test, the "exam" would be a joke. The average intelligent person can, with a few hours of serious study, learn all the theory necessary for a license.

If these "would be hams" had spent their spare time with the code, instead of trying to devise ways of beating the "exam," they would be on the air now. However, if they intend sitting around, waiting for this absurd change to take place, they will all have long flowing white beards before they "crash the gate."

In your SHORT WAVE LEAGUE department, I noticed a letter written by Richard Colwell, a few lines of which I will quote:

"Most people in our town don't give a whoop about code. Phone transmission gives everybody listening in a thrill, but who cares for dots and dashes? I want to have a station, but I don't want to send code."

Mr. Colwell's letter, in substance, is like all the rest written by those whom I assume are unaware of the true purpose of amateur radio transmission. He wants to have a station, but doesn't want to send code.—Why? To call up his friends? To give everybody listening in a thrill? Surely it will be a great day for radio when those of Mr. Colwell's high ambition are on the air. I might suggest the telephone as a means of calling his friends. (Cheaper too.)

The gist of all letters of this type indicates that the writer's desire is a new "toy." Amateur radio communication is not a plaything, but a serious endeavor towards the betterment of radio in general through intelligent experimentation.

These squawkers vow they will experiment, and try to improve DX—ROT! A person who has such a lack of mental capacity or mental discipline, that he can't or won't learn the code, certainly will never put forth the effort needed to improve upon the present inability of 5 meters to be received beyond the horizon. Fellows of this sort are not interested in better results; they are satisfied with any results at all.

To me, it seems that those who say they don't want to learn the code are on a par with one who might say he didn't want to learn to read and write, because he could hear and talk. I am not as yet the holder of an amateur license, but I soon will be, and I'll go first class, code and all.

Yours very truly,
FRANCIS ROSE,
742 Regents Drive,
Portland, Ore.

$500.00 Prize Contest

(Continued from page 16)

7.—This contest is open to everyone, whether you are a newsstand reader or subscriber.

8.—From the contest are excluded employees of SHORT WAVE CRAFT magazine and their families.

9.—This contest closes on May 30, at which time all entries must have been received.

10.—The editors of SHORT WAVE CRAFT will be the judges of this contest, and their findings will be final.

11.—No correspondence can be engaged in on this contest, nor letters answered, nor the entries returned.

12.—In the event of "ties" the prizes tied for will be awarded to the contestants so tying.

In the next issue a full list of prizes will be given.

The prizes will be sent from the radio manufacturers and radio firms to the winners at the end of the contest, and the results giving the winners' names will be published in our August issue.

Address all entries to Title Contest Editor, SHORT WAVE CRAFT, 98 Park Place, New York City.

C.B.S. Uses S-W's in Inaugural Broadcast

(Continued from page 6)

Technical Supervisor of Columbia's station WJSV, in Washington, and Henry Grossman, Eastern Division Chief, in the field. Assisting Husing at various points of activity there was a staff of veteran commentators, including Frederic William Wile, Edwin C. Hill and H. V. Kaltenborn, plus a number of men from the regular announcing staff, including Robert Trout, Washington Presidential announcer, and John Mayo, Harry von Zell and Don Ball of the New York key station, and Ted Church of the Washington office.

The entire presentation was divided into seven sections. First the "preview"; second, the journey to the Capitol; third, the Vice-Presidential Inauguration; fourth, the Presidential Inauguration; fifth, a musical interlude by the United States Service Bands; sixth, the parade, and seventh, the Inaugural Ball.

Each section, with the exception of the parade, was approximately one hour in length. The parade description consumed about two hours. The broadcast began at 9:00 A. M., EST., and lasted until 4:00 P. M., EST. The Inaugural Ball was heard from 10:00 to 11:00 P. M., EST. The parade coverage brought into play a United States Army blimp for an "air description" of the City of Washington as it appears on Inauguration Day. A *short wave* pick-up point was used for this part of the broadcast, as well as a pick-up point for a *short wave* set installed in an automobile which traversed the city. In addition, a *portable transmitter* was used for interviewing visitors from neighboring states, as they poured into the Capital at Union Station, the airport and on the highways.

24 Pick-up Points

Twenty-four pick-up points, including two mobile units, were brought into play when the C. B. S. system devoted the entire day of Saturday, March 4 to an aerial presentation of the ceremonies attendant to the inauguration of Franklin D. Roosevelt as President of the United States. The "coast-to-coast" network covered the proceedings from 9:00 A. M. to 4:00 P. M., EST, without intermission.

Microphones dotted the streets of Washington from Union Station to the White House and up Pennsylvania Avenue to the Capitol. A mobile transmitter in a motor truck cruised about the city picking up the day's events. Another mobile transmitter in an army blimp provided a bird's-eye view of the city.

There was a pre-Inaugural Day broadcast on Friday, March 3, when the arrival of President-Elect Roosevelt in the Capital was described from Union Station. The motor truck transmitter carried on the broadcast with a running description of Mr. Roosevelt's trip to the Townsend home, where he spent the night.

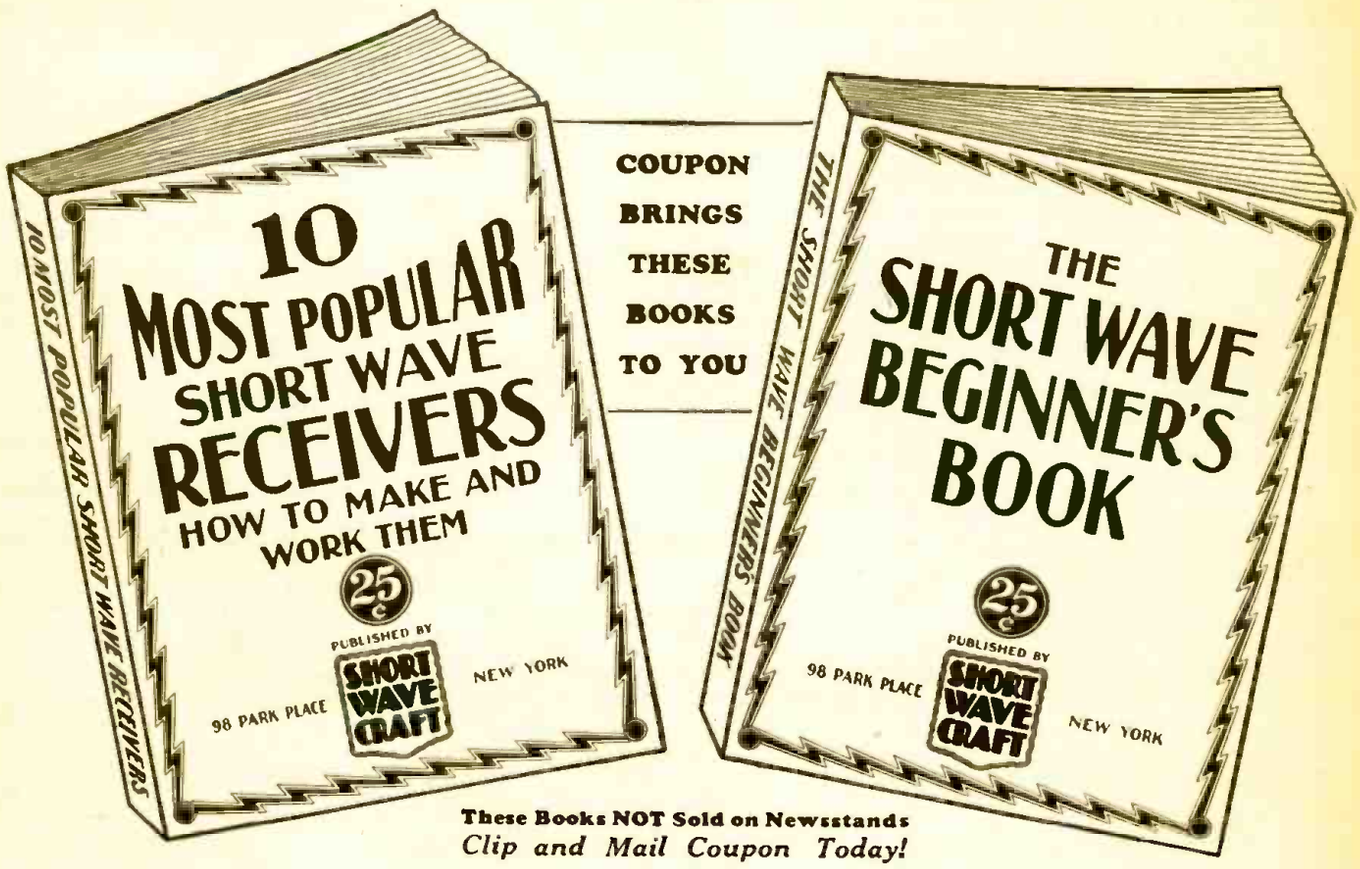
A 3-Tube "DX-er" That Hauls 'em In

(Continued from page 19)

1 Two gang .00015 mf. tuning condenser.
4 .1 mf. bypassing condensers (Aerovox)
3 Radio Frequency chokes (Home-made or bought)
1 400 Ohm bias resistor (Lynch)
1 2000 Ohm bias resistor (Lynch)
1 .0001 mf. Grid condenser (Aerovox) (Polymet)
1 .0001 mf. Regeneration condenser (Hammarlund)
1 .002 mf. coupling condenser (Micamold) (Polymet)
1 .006 mf. coupling condenser (Sprague) (Polymet)
1 250,000 Ohm det. plate resistor (Lynch)
1 500,000 Ohm grid resistor (Lynch)
1 phone plug
1 ant.-gnd. post
1-58, 1-57, 1-56 tube.
Two Trutest (or other) tube shields
1 vernier dial (preferably Pilot "Art")
Volume control and vernier knobs.

New! New!! New!!!

TWO NEW 25c SHORT WAVE BOOKS



These Books NOT Sold on Newsstands

Clip and Mail Coupon Today!

HERE IS GREAT NEWS

PURSUANT to many requests from our readers, we have decided to publish two new popular short wave books, for which there is a persistent demand at this time.

These new books contain everything on the subjects worth knowing and both books will be welcomed by all short wave experimenters, short wave fans and short wave enthusiasts, the same as our former two books HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS, and HOW TO BECOME AN AMATEUR RADIO OPERATOR were welcomed by thousands of our short wave friends.

In conformity with the times these books have been priced at 25c instead of 50c, which is the price of our other books. Yet the two new 25c volumes that we are offering now contain a tremendous amount of information and the type and illustrations have been chosen in such a manner as to give you almost as much for your 25c as you received for your 50c before. Only by increasing the press run enormously and making other printing economies has it been possible to price these books at such a low, popular price.

You will make no mistake in getting either or both of these new and popular books and we know in advance from our many years of experience with short wave enthusiasts that you will thank us for having made these books possible.

Ten Most Popular Short Wave Receivers. How to Make and Work Them

This new volume will be a revelation to all those who wish to build their own short wave receivers. The editors of SHORT WAVE CRAFT over a period of years have learned to know exactly what short wave experimenters and short wave set builders want to get. For that reason they have selected ten outstanding short wave receivers and these are described in the new volume. Everything worthwhile about every one of the ten receivers is described in the text. Each receiver is fully illustrated and each receiver has a complete layout, pictorial representation, photographs of the set complete, hookup and all worthwhile specifications, so there is *nothing left to your imagination* when it comes to building any one of these ten popular receivers. Everything from the simplest one tube set to a six tube superheterodyne is presented. Complete lists of parts are given to make each set as complete as it is humanly possible to do. You can select any or all receivers and know beforehand that you will be able to successfully build and operate such a receiver and not waste your money in building some theorist's dream-child. You will also be shown how to operate the receiver to its maximum efficiency.

IMPORTANT

THERE IS NO DUPLICATION WHATSOEVER BETWEEN THIS BOOK AND OUR OTHER VOLUME —"HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS." ALL THE MATERIAL PUBLISHED IN THE NEW BOOK HAS NEVER APPEARED IN ANY BOOK BEFORE.

This book has been edited by the editors of SHORT WAVE CRAFT, which alone is a guarantee that you will get satisfaction and that nothing has been left undone to give you between two covers the greatest selection of short wave receivers ever published.

PRICE 25c PREPAID 40 PAGES
OVER 75 ILLUSTRATIONS

A Short Wave Beginners Book

Here is a book that will solve your problems if you are new to the short wave game. It contains positively everything that you would wish to know in connection with short waves, leading you in easy stages from the simplest fundamentals to the present stage of the art in short waves as it is known today. It is the only low-priced reference book on short waves for the beginner, whether he be a short wave enthusiast, short wave listener or short wave amateur.

The book is profusely illustrated with all sorts of illustrations, explanations and everything worthwhile knowing about short waves in this interesting and growing field. Yet withal, the book is not "technical." It has no mathematics, no "high-faluting" language and no technical jargon which would only serve to frighten you away. *The entire book is kept in popular language throughout.* Wherever technical words are used, explanations are given, leaving nothing to the imagination. You are shown how to interpret a diagram and a few simple sets are also given to show you how to go about it in making them. Yet everything has been done to make it possible to give you a complete understanding of short waves from the ground up.

After reading this book, you will never be at a loss for short wave terms and you will not have to consult other text-books or dictionaries. The editors of SHORT WAVE CRAFT who have edited this book have seen to it that everything has been done to make this volume an important one that will be used as reference for years to come by all those who wish to break into the short wave art. The book covers everything, "from soup to nuts" and will be of tremendous importance to everyone.

It abounds with many illustrations, photographs, simple charts, hook-ups, etc., all in simple language. It also gives you a tremendous amount of very important information which you usually do not find in other books, such as time conversion tables, all about serials, noise eliminations, how to get verification cards from foreign stations, all about radio tubes, data on coil winding and dozens of other subjects.

The book is just chock full of information and you will never regret having gotten this important volume. You will keep referring to it every day in your work.

PRICE 25c PREPAID 40 PAGES
OVER 75 ILLUSTRATIONS

SHORT WAVE CRAFT SW-5-33
96-98 Park Place, New York City.
Gentlemen:

☐ I enclose herewith 25c, for which please send me as soon as published, prepaid, a copy of your new book **"Ten Most Popular Short Wave Receivers. How to Make and Work Them."** The book to be sent to me immediately upon publication.

☐ I enclose herewith 25c for which please send mo as soon as published, prepaid, a copy of your new book **"The Short Wave Beginners Book."** The book to be sent to me immediately upon publication.

☐ I enclose 50c for which please send me, prepaid, as soon as published, your two books, **"Ten Most Popular Short Wave Receivers. How to Make and Work Them,"** and **"The Short Wave Beginner's Book."** The books to be sent to me immediately upon publication.

(Send money order, check, cash or new U. S. stamps. Register letter if it contains currency or stamps).

Name .....
Address .....
City ..... State .....

The FBX "Single Signal" S-W Receiver

(Continued from page 31)

as witnessed by the fact that there is no "other side of zero beat."

The selector switch, referring to the diagram, is used to connect the crystal in series for true *single signal* reception, remove it from the circuit entirely, or connect it in parallel. The parallel connection is useful, particularly in phone reception, since the crystal will now reject a narrow group of frequencies and may, in consequence, be employed to eliminate heterodyne interference by adjusting the high frequency circuits so that the unwanted signal sets up an I.F. equal to that of the crystal.

The single signal receiver is said to represent the finest "C.W." (code) receiver yet developed and it has in addition numerous advantages for *phone* reception. Further details on the single signal receiver are to be found in Q.S.T. (Aug. and Sept. 1932). This type receiver is marked by its extensive selectivity and also by the fact that the annoying *double beat* characteristic of autodyne detectors is eliminated.

Some additional data on the FB7 receiver is here presented: The capacity of the main tuning condensers, both 1st detector and oscillator circuits, is 105 mmf. each. The trimmer condensers have a maximum capacity of approximately 40 mmf.

The beat oscillator coil consists of a winding of about 1 millihenry inductance, tapped ⅛ of the way from the grounded end. (The ⅛ referring to turns and not inductance.) The two standard 70 mmf. I.F. tuning condensers are connected in parallel to obtain a high-"C" circuit.

The inductance of the I.F. coils is approximately 3½ millihenries and the tuning condensers are 70 mmf. maximum. The intermediate frequency is about 480 kc. This data was kindly furnished by James Millen, of the National Company.

Coil Data: National FB-7
General Coverage Coils

DETECTOR

Secondary Turns	Secondary Wire Size No.	Primary Turns	Primary Wire Size No.	Detector Form grooved per in.	Range KC
6 1/3	16EN	3	24EN	5 th'rds	19,500-11,400
11 5/6	18EN	3 1/2	24EN	8 th'rds	11,700-7000
21 5/6	18EN	5 1/6	34DS	14 th'rds	7300-4000
34 5/6	24EN	7 5/6	34DC	24 th'rds	4200-2400
58 5/6	28EN	8 5/6	32DS	40 th'rds	2500-1500

OSCILLATOR

A	B	C	Total No. of turns	Wire Size No.	Form Grooved per in.
2 1/6	——	4 1/6	6 1/6	16EN	5 thr'ds
2 1/6	——	9	11 1/6	18EN	8 thr'ds
4 1/6	——	14 1/3	18 1/2	20EN	14 thr'ds
7 1/6	20	5 2/3	32 5/6	24EN	24 thr'ds
11 1/6	27 1/2	17 1/6	55 5/6	28EN	40 thr'ds

A—from bottom end to 1st tap.
B—from 1st tap to 2nd tap.
C—from last tap to top end coil.

GLOBE TROTTER "TROTS 'EM IN"!

Editor, SHORT WAVE CRAFT:

I have just built the "Globe Trotter" and want you to know that *it sure trots them in!* I think you have the finest magazine in existence, but I would like to see more "one" and "two tube" sets. I am not an amateur, but I soon hope to become one. I wish you would publish the letter in your "ham" section and I would like to hear from fellows in all stages of this great radio game. I promise to answer all letters. Yours with 73.

FRANCIS MacARTHUR,
527 South Avenue,
Rochester, N. Y.

(Pleased to know, Francis, that the "Globe Trotter" trots in the short wave stations. We have had several thousand letters complimenting us on the "Globe Trotter" receiver described by Bob Hertzberg in the November issue. Thanks very much for your kind words and as you will note from recent number of SHORT WAVE CRAFT, *we are endeavoring to publish plenty of one, two, and three tube sets.—Editor.)*

The S-W Beginner

(Continued from page 33)

the remaining side of the tickler coils; so that we shift the connections from the coils to the grid and plate circuits all at the same time, by turning the knob on the panel.

On the switch, you will find five soldering lugs on each of the bakelite discs. Four of these are arranged with an equal spacing between them, while the fifth is spaced further apart than the others. The latter lug is the common connection that is made to the plate or grid circuits (shown as the knob of the switch in the schematic).

You will also notice that on the three discs, the four contacts on each disc are opposite each other. Connect the grid end (top end) of each of the secondary coils to the four lugs on the disc furthest from the panel; starting with the smallest coil on the left lug (looking from the panel) and progressing toward the right with the largest coil. Then connect the common connection of the next switch section to choke coil L3 and condenser C7. Connect the ends of the tickler coils nearest to the secondard (the top ends) to the four switch lugs for the second section—making sure that you start with the smallest coil on the left hand lug (looking from the panel) and progressing toward the right. Finally connect the common terminal for the section nearest to the panel to the plate terminal on V2 and repeat the connections for the lower ends of the four tickler coils (with the smallest coil on the left contact).

As mentioned before, the remainder of the wiring in the set is not difficult and the wiring diagrams will not be difficult to follow.

Operating the Set

When all the wiring is complete, connect up the batteries or power units. As the tubes in the set are of the "cathode" type in which the filament is used simply to heat the cathode, it does not matter which filament binding post is connected to the positive or negative side of the storage battery, if batteries are used. If a "B" power unit is used, the connection to "B" plus 67 volts should be made to the output tap which supplies the voltage nearest to this value; then connect a variable resistor in the lead, to adjust it to the correct value. If the output voltages are adjustable on the power unit, the latter expedient is unnecessary, of course.

After the batteries or power unit have been connected, the tubes should be placed in the correct sockets (they cannot be shifted around) and the power turned on.

Turn the band selector switch to the extreme right and the volume control all the way to the right. The set should be oscillating and when a station is passed on the tuning dial, a whistle will be heard. The volume control should then be turned to the left until the whistle stops.

If the set does not oscillate with one or more of the coils, you may have to connect a small aerial condenser between the aerial wire and the aerial binding post. This condenser consists of two small brass angles fastened on a wooden or bakelite base with two ends parallel similar to the one we used in the first Beginner's set described in the August, 1932 issue. By varying the distance between the plates, the "dead spots," as they are called, can be eliminated.

In wiring the receiver it is important to keep all wires as short as possible especially the connections between the coils, switch and detector tube socket.

WORLD'S BEST RADIO BOOKS

IT IS always the well-trained man who wins out over the horde of thousands of superficially trained and incompetent men. You are reading this magazine because you are interested in radio. Sooner or later, the time will come when you will wish to cash in on your knowledge. Your chance may come over night, and then the big and vital question will be, "How well equipped am I to fill the job?" You are in radio because you like it. You also realize that, at the present time, there are many branches of the radio art which you do not know as thoroughly as you should. Knowledge, these days, can be gotten cheaper than ever before. It isn't necessary for you to go to college to become proficient in radio. Start today, to build a REAL radio library and become acquainted with all branches of this great and growing art. In this page are listed the world's best radio books. We have combed the market for the really important books in radio; so that, no matter what branch you are interested in, you can pick out the best books that are now printed. Start, now, to build a complete radio library. You do not have to get all the books at once, but make up your mind to get one book a month; so that, when your chance comes, you will be fully equipped to win out over the others not so well equipped.

IMPORTANT.—This list is changed every month to include the latest books. Note also new low prices.

THE RADIO HANDBOOK, by James A. Moyer and John F. Wostrel. Flexible covers, size 5½x8", 886 pages, 650 illustrations. Price **$5.00**

Comprehensive data on short-wave apparatus, vacuum tubes, modern radio receivers and transmitters, photoelectric cells, television, sound motion pictures, tables, graphs, diagrams, etc. No radio man should miss it.

RADIO FREQUENCY ELECTRICAL REQUIREMENTS. by Hugh A. Brown. Cloth covers, size 6x9", 386 pages, 235 illustrations. Price **$4.00**

One of the few great books on this important subject. Everything from thermionic-tube coefficients to piezo-electric measurements.

PRACTICAL TELEVISION, by E. T. Larner. Cloth covers, size 5½x8¾", 223 pages, 127 illustrations. Price **$3.75**

This book explains television in full, including elementary principles, photo-electric cells, and all important types of television sets as well as basic principles of optics, images, mirrors, lenses, etc.

MAGNETIC PHENOMENA, by Samuel Robinson Williams. Cloth covers, size 6x9", 230 pages, 150 illustrations, and numerous tables. Price **$3.00**

All electric motors, coupling coils, magnetic and dynamic loud speakers, transformers, choke coils, etc., are dependent on magnetic phenomena. This fine book is complete on the subject.

CINEMATOGRAPHY, by James R. Cameron. Stiff covers, size 7¾x5", 240 pages, 150 illustrations. Price..... **$4.00**

Everything on the subject from "silent" and "talkie" 16 mm. film to its manufacture and to the final projection is in this marvelous volume.

AUDELS RADIOMAN'S GUIDE, by Frank D. Graham. Cloth covers (flexible), size 5x6¾", 220 pages, 300 illustrations. Price **$1.00**

A practical, concise book presenting the theoretical and practical information for the proper operation, maintenance and service as applied to modern radio practice.

THE RADIO AMATEUR'S HANDBOOK, (New Revised Edition), by A. Frederick Collins. Cloth covers, size 5¾x7¾", 394 pages, 116 illustrations. Price **$2.00**

If you wish to become a radio amateur (radio ham) this book tells you how. Everything in receiving and transmitter sets and how to build them.

EXPERIMENTAL RADIO, by R. R. Ramsey, Prof. of Physics, Indiana University. Cloth covers, size 7½x5½", 256 pages, 168 illustrations. Price, Postpaid **$2.75**

A marvelous book for the experimenter. Experiments galore in easy comprehensible language.

RADIO THEORY AND OPERATING, by M. T. Loomis. 5th revised Edition. Cloth-bound; size 5½x8x1½" thick; 1,000 pages; over 800 illus.; 450 review questions and answers. Price **$4.50**

Written in textbook style, a tremendous amount of useful information has been crammed into this thin-paper, compact reference work. Radio transmission and reception have been covered, "from soup to nuts." A truly great book.

9. GERNSBACK'S RADIO ENCYCLOPEDIA (Second Edition). Red Morocco Flexible Binder, 352 pages, 2201 radio definitions, 1253 illustrations, 34 tables. Price **$3.25**

The most comprehensive encyclopedia of its kind in print. Remarkably up-to-date in every way, with marvelous illustrations.

DRAKE'S CYCLOPEDIA OF RADIO AND ELECTRONICS, by H. P. Manly. Cloth covers, size 6x9", 1050 pages, 1080 illustrations. New 1932 Edition. Price **$5.00**

The largest work of its kind ever put between two covers. New and up-to-date; a standby for every radio man.

FUNDAMENTALS OF RADIO, by R. R. Ramsey, Professor of Physics, Indiana University. Cloth covers, size 9½x6", 372 pages, illustrated. Price prepaid..... **$3.50**

The backbone of the radio art. This book gives you the foundation on radio from A to Z.

RADIO OPERATING QUESTIONS AND ANSWERS, by Nilson and Hornung. Fourth Edition. Cloth covers, size 5½x8", 350 pages, 131 illustrations. Price..... **$2.50**

Contains over 600 questions and answers covering all phases of licensed radio operation. Revised to contain much new material. Nothing better in print for the transmitting and receiving amateur.

OFFICIAL RADIO SERVICE MANUAL, Volume 1, by Hugo Gernsback and Clyde Fitch. Flexible loose-leaf binder, size 9x12", over 2,000 illustrations, 650 pages. **COMPLETE WITH SIX SUPPLEMENTS.** Price prepaid..... **$4.50**

The Service Man's Bible. Greatest book ever published on the subject. Contains all old circuits of every imaginable commercial radio set up to 1931.

THE RADIO MANUAL, by George E. Sterling and Rob't S. Kruse, E.E. 2nd enlarged edition. Flexible fabrikoid covers. Size 5¾x8". 805 pages, 348 illustrations. Price **$6.00**

A complete Radio Course for the operator, the technician, the amateur, the student and experimenter. Everything imaginable in the whole radio art is covered in this great book—the "radio Bible" of the amateur. **DON'T MISS THIS.**

PRACTICAL RADIO CONSTRUCTION AND REPAIRING, by J. A. Moyer, S.B., A.M. and J. F. Wostrel. Cloth covers, size 8x5", 354 pages, 163 illustrations. Price **$2.50**

A handbook that every radio set tester and general student must have. The diagrams alone are worth the price of the book.

A POPULAR GUIDE TO RADIO, by B. Francis Dashiell. Cloth covers, size 5½x8¼", 286 pages, profusely illustrated. Price prepaid..... **$3.50**

The fundamental principles of radio. From crystal rectifiers to the latest electron tube amplification, etc.

PRINCIPLES OF RADIO COMMUNICATION, by J. H. Morecroft, Prof. of Electrical Engineering, Columbia University. Cloth covers, size 9½x6", 988 pages, profusely illustrated. Price **$7.50**

THE radio classic, by the dean of radio. Covers entire radio art as does no other book.

ELEMENTS OF RADIO COMMUNICATION, by Professor John H. Morecroft. Cloth covers, size 9x6", 270 pages, 170 illustrations. Price..... **$3.00**

An authoritative volume embracing every imaginable phase in radio communication.

RADIO SERVICE MAN'S HANDY-BOOK WITH ADDENDA DATA SHEETS. Flexible covers, size 9x12", 200 pages, 400 illustrations. Price prepaid..... **$1.49**

The Service Man's standby. Contains the latest practical information on radio servicing.

HOW TO PASS U. S. GOVERNMENT RADIO LICENSE EXAMINATIONS, by R. L. Duncan and C. E. Drew. Flexible covers, size 9½x7", 170 pages, 92 illustrations, appendix. Price..... **$2.00**

The most important book on the subject ever published. Gives every conceivable angle which will help you to pass a radio license examination successfully.

RADIO MOVIES AND TELEVISION, by C. Francis Jenkins. Cloth covers, size 9½x6", 144 pages, profusely illustrated. Price..... **$1.00**

A complete volume by the master of television, giving everything in television, including constructional details for building your own television sets.

RADIO PHYSICS COURSE (2nd enlarged edition), by Alfred A. Ghirardi. Cloth covers, size 7¾x9¾", 992 pages, 510 illustrations, numerous tables. Price..... **$3.50**

The finest and most popular book on electricity and radio. Each subject is clearly discussed, with the aid of dozens of excellent drawings. Chapters on talkies, television, electronics and service work, etc. Biggest buy in radio books.

RADIO VISION, by C. Francis Jenkins. Cloth covers, size 9½x6", 144 pages, profusely illustrated. Price prepaid..... **90c**

An excellent book. The Jenkins television system, as well as many other modern television systems fully described.

We herewith present the most complete collection of recent important radio books. We have, after an exhaustive study, selected these volumes because they represent the foremost radio books of their kind in print today. There is such a great variety that we are sure it will satisfy any taste as well as any requirement that the student of radio might have.

We publish no catalog and ask you to be kind enough to order direct from this page. Prompt shipments will be made to you direct from the publishers. We merely act as a clearing house for a number of radio publishers and OUR PRICES ARE AS LOW OR LOWER THAN WILL BE FOUND ANYWHERE. Remit by money order or certified check. If you send cash, be sure to register it.

SHORT WAVES, by C. R. Leutz and R. B. Gable. Stiff Covers. Size 6x9", 384 pages, 258 illustrations. Price, prepaid **$3.00**

The biggest and most complete book on short waves. Covers every imaginable phase, including S. W. Superheterodynes. The authors are famous S. W. authorities.

SOUND PICTURES AND TROUBLE SHOOTERS MANUAL, by Cameron and Rider. Cloth cover, size 8x5½", 1120 pages, profusely illustrated. Price **$7.50**

The standby of every operator. It is the most thorough book on the subject.

ELECTRICITY AT HIGH PRESSURES AND FREQUENCIES, by Henry L. Transtrom. Cloth covers, size 7½x5¼", 248 pages. 141 illustrations. Price Prepaid..... **$2.35**

A marvelous book for the student in electricity and radio. General fundamentals lead up to a complete discussion of every type of Tesla and Oudin high-frequency coils, Geissler tubes, etc.; construction details of Tesla coils are given in great profusion. THE ONLY BOOK OF ITS KIND.

OFFICIAL RADIO SERVICE MANUAL, Volume II, by Hugo Gernsback, C. E. Denton and C. H. W. Nason, with 1932 Free Supplements, 1000 pages, 2000 illustrations. Flexible Loose-leaf Binder, size 9x12". Price prepaid..... **$4.00**

The talk of the radio industry. This marvelous volume contains every thing in radio, circuits and radio developments, for 1932. Not a line of duplication between 1931 and 1932 volumes. (Vol. I and Vol. 2.)

RADIO RECEIVING TUBES, by Moyer and Wostrel. Cloth covers, size 7½x5½", 298 pages, 181 illustrations. Price..... **$2.50**

One of the finest books on vacuum tubes. Everything worthwhile on the subject treated in a masterful manner.

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A student's book; devoted to the principles of radio apparatus; intended to accompany a course in electricity. The best of its kind.

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RADIO PUBLICATIONS 245-S GREENWICH STREET NEW YORK, N. Y.

Amateurs who made good

Clifford E. Denton

Clifford E. Denton

● CLIFFORD E. DENTON, engineer and designer of numerous short wave receivers, sound equipment, etc., and author of many technical articles appearing in this and various other radio magazines, has recently been appointed engineer-in-chief of the manufacturing division of Federated Purchaser, Inc., of New York City. Mr. Denton is a recognized authority on radio servicing. The "OFFICIAL RADIO SERVICE MANUAL" for 1932 was edited by Mr. Denton. Mr. Denton was formerly connected in the capacity of Chief Engineer with Farranti, Inc., during which time he designed the first commercial amplifier using type 250 tubes in push-pull, besides a number of high-quality talking picture outfits.

Mr. Denton is very well known to all SHORT WAVE CRAFT readers as the designer and constructor of many fine sets described in this magazine during the past two years. Mr. Denton received an excellent academic education in engineering and through his close association with the manufacturing field, the designs that he has originated incorporate ideal combinations of theory and practice. SHORT WAVE CRAFT readers may indeed count themselves extremely fortunate in having had presented to them the many fine articles by Mr. Denton. (Old "2AUW")

●

A Coupling Stage for "Plugless" Super

(Continued from page 25)

may be built in a shield can, or you may shield just the coils and tube. It is best to incorporate a separate filament supply in with the unit, as shown in the diagram.

For an antenna, the author uses a doublet tuned, fundamentally, to the frequency of VK3ME. This frequency is 9510 kilocycles. Each half of the antenna is 24.5 feet in length, determined by the formula

$$\frac{468{,}000}{\text{Frequency}} = \text{Length in feet.}$$

Your antenna, however, may be tuned to any frequency you wish, by following the above formula. If you care to read more about the theory of the doublet, read the article by Mr. Dillard, in the November issue of SHORT WAVE CRAFT.

To produce the transposition effect, which cancels out the noise, I use a *shielded* lead-in, twisting the two wires together. Thus, besides getting the effect of transposition, with its attendant noise elimination, the grounded shield also eliminates pickup in the lead-in. And, as the lead-in can do no more than carry the signal energy to the receiver, the length of the leads is not important.

The writer would like to hear from builders of this unit, as well as from anyone who has built a super, and an answer is guaranteed to all who inclose postage.

BOOK REVIEW

Experimental Radio Engineering, by John H. Morecroft, E.E., D.Sc. Cloth covers; Size, 6"x9"; 346 pages; 250 illustrations; published by John Wiley & Sons, Inc., New York, N. Y.; price $3.50.

Professor Morecroft, who teaches electrical engineering at Columbia University, and who is past president of the Institute of Radio Engineers, is one of the foremost radio experts and his books on radio and electrical subjects are always welcomed by students of these subjects. Probably it is safe to say that the foremost text-books on radio engineering studied privately by students, and also for classroom use in schools and universities, are those of Professor Morecroft. This book, while having a rather ambitious title, is so clearly written that every student of radio will be able to understand the subjects presented. The first chapters are devoted to "introduction" and such interesting and fundamental topics as the kind of meters to use in radio laboratory measurements; rectifier-type meters; hot-wire meters; thermo-couples; wavemeters, etc. Later chapters deal with the laboratory measurement of mutual inductance of air-core coils; measurement of insulation resistance, capacity and power-factor of condensers; parallel resonance and the effect of circuit changes on it; use of special bridge for measuring capacity at audio frequencies; measuring the phase angle of a condenser; calibration of a variable condenser; how to measure the natural frequency of an antenna—also its capacity and self-inductance; a study of the triode as a power converter; measuring the amplification factor and plate resistance of the triode; study of the characteristic curves of tetrodes and pentodes; study of superheterodyne detector; study of the cathode ray oscillograph and how to use it in making radio and audio frequency measurements.

Photocells and Their Application, by V. K. Zworykin, E.E., Ph.D., and E. D. Wilson, Ph.D.; cloth covers; size, 5¾"x8"; 332 pages; 180 illustrations; published by John Wiley & Sons, New York, N. Y.; price $3.00.

Photocells represent one of the latest devices discovered by modern science and the practical application of which is increasing daily by leaps and bounds, especially in the industrial field, where these small light-controlled devices are finding many hundreds of new uses in sorting various products, etc. Very little worthwhile information has been published on these magic "wonder-workers" and it is fortunate that we have this very fine textbook so clearly written and illustrated by two scientists who are outstanding in their profession—Doctors Zworykin and Wilson. The authors explain the fundamental phenomena occurring in photo-electric cells and the characteristics of the various suitable chemicals and metals utilized in constructing these devices. Selenium cells are discussed, as well as the new photo-electric cells with their vastly improved speed in response to a beam of light. Among many other topics discussed are photo-voltaic cells; color response; dynamic characteristics; optimum pressures; the gas-filled photocell; secondary emission; cells sensitive to ultra-violet rays; the photocell in photometry and colorimetry; color-analysis and color-matching by photocells with diagrams and photos of the apparatus; the R. C. A. photophone and how it works; the photocell in television—with diagrams of amplifiers, etc.; the control of artificial illumination by photocells, including traffic controls, counting, automatic inspection of factory products; bean-sorting; photocells in the future and probable application, including infra-red detection or the possibility of seeing at night (nocturnal vision) by means of cells sensitive to infra-red rays. A valuable bibliography, a list of technical periodicals, and also appendix and index are given.

Read Page 43

When to Listen In

By Robert Hertzberg

● Our remarks in the March issue of SHORT WAVE CRAFT about our inability to pick up the new British Empire short-wave stations at Daventry (described in detail on page 714 of the April number) have brought forth a veritable avalanche of letters from readers all over the country.

In explanation—not defense—we might remark that the "When to Listen In" department of the March issue was written during the middle of January, when the Daventry stations were just getting started. Only a few days after the magazine went to press the Empire stations started coming through with terrific strength—enough in fact, to completely overload a National SW-58 receiver.

During the last week of February Daventry "went off the air"—without warning—but they reappeared just as abruptly! As we have warned several times, the S-W wavelengths and schedules are subject to change without notice.

Listeners everywhere report the best reception of many months. Not only has Daventry been a consistent visitor, but Madrid, Rome, Pontoise, Moscow, Caracas and a whole mess of Central and South American stations have also contributed to many "log" books. After twilight, the police channels are simply "teeming with activity," while the amateur bands continue to acquire more and more occupants. We are building a portable five-meter phone outfit to carry in the back seat of the family flivver, and expect shortly to agitate the ether around New York City under the call letters W2EXX.

PCJ

Short wave fans all over the world have been wondering what happened to PCJ, probably the most famous short wave broadcasting station on the air. This was the first important short-wave broadcaster, and achieved the most widespread international audience of any radio station in the world. In an effort to learn the fate of PCJ, we wrote to Philips Radio, Eindhoven, Holland, and received the following reply:

Eindhoven, 24th January 1933

Dear Mr. Hertzberg:

In reply to your letter please note that all reports regarding PCJ transmissions and reception of this station are without foundation. PCJ was closed in October 1931 and has not as yet resumed activities. Although there is a chance of re-opening the station this year, no definite information about the date can be given just now. However, it will interest you to know that our station PHI on 16.88 meters has been on the air again for a month or so for experiments. Transmissions have now ceased, as alterations are being made with a view of changing the wavelength. The new wavelength will be 25.53 meters while the 16.88 meter wave will be used in the summer time. It is expected that within five or six weeks PHI will be on the air on the new wavelength.

As you probably know, station PHI is principally meant to entertain our countrymen in the colonies (Dutch East and West Indies). Of course it is heard around the world and only last week we communicated successfully with the Dutch scientific expedition for polar research on Greenland. PHI's frequency is 17,778 kilocycles, crystal controlled. Input 130 kilowatts, 50 kilowatts in the antenna. The location is Huizen, near Hilversum, Holland. Huizen is on the shores of the Zuider Sea.

The undersigned, formerly of PCJ, is now announcer and studio manager of PHI and will make announcements in various languages as on PCJ. First experiments on 25.53 meters will take place around the end of February. (Ed. Note: Just before this issue appears.)

Very truly yours,

E. Startz.

Mr. Startz is one of the most versatile announcers on the air. He speaks Dutch, English, German, Italian, French, Spanish and Portuguese, and announces fluently in all these languages! Listen for him.

The "Beginners Twin"

(Continued from page 9)

tubes. The latter are unquestionably more sensitive, but they also cost more and require higher plate voltages, which means more "B" batteries. The "Beginner's Twin" as it stands is probably the best kind of introductory set for the beginner, who can readily make changes and improvements in it as he becames more familiar with short wave technique.

Detector and 1 Stage of A.F.

The circuit, as shown in the accompanying diagram, is of the series-tickler type, with one stage of audio frequency amplification. This is a "sure fire" arrangement, absolutely devoid of trickiness as far as regeneration and oscillation are concerned. Two midget variable condensers are employed. One, controlled by the vernier drum dial, is the tuning condenser; the other, mounted directly on the front panel, is the regeneration control. The third knob on the front panel represents a combined on-off switch and filament rheostat. Since the tubes work on two volts, and a pair of dry cells in series develops three volts, the rheostat is turned up only part of the way. As the batteries wear out, the rheostat must be advanced further and further, until the batteries are entirely exhausted.

Aerial Condenser Used

The last adjustable unit is a tiny two-leaf trimmer condenser of the screw type, mounted on insulating studs next to the variable condensers. This is connected in the aerial circuit and must be adjusted for each plug-in coil to eliminate "dead spots" in the regenerative action. Different aerials will make the set behave differently in this regard, although dead spots under any conditions can always be overcome by opening the plates wide enough.

The simple mechanical arrangement of the "Beginner's Twin" is made clear in the illustrations. Both front panel and sub-panel are stamped of strong steel, the latter being formed into a shallow box to accommodate the wiring and to form a solid foundation for the entire receiver. The variable condensers, plug-in coil socket and radio frequency choke form a little cluster at the left, while the tubes and the audio transformer are balanced neatly along the back. The wiring is short and follows the logical circuit positions.

Double binding post strips are mounted on the rear side of the chassis for aerial, ground and earphone connections. The battery connections are made by wires in a heavy braided cable, which is equipped with a special fuse block for the protection of both the filament and plate circuits. The Try-Mo panel and subpanel, which are available separately, are already drilled with all necessary holes, so no tedious preparation work is involved.

Batteries and Phones Needed

The photograph showing the author testing the "Beginner's Twin" also shows all the required accessories. These include a pair of high resistance earphones, two type 30 tubes, two No. 6 dry cells, and two 45-volt "B" batteries. For an aerial, an extra wire may simply be run to the same aerial already used with the family broadcast receiver. This seems to work quite well in most cases. An independent aerial, totalling 100 to 100 feet in length, is of course more desirable. The usual cold water pipe "ground" is employed.

A natural question to ask about this simple receiver is, "What results can be expected?"

Provided the builder has patience, the set will provide many hours of interesting reception, not from foreign stations alone, but from hundreds of other stations of the classifications previously mentioned. Too many people have the idea that foreign stations will drop right in the first time a short wave set is turned on, and their enthusiasm suffers an undeserved setback when they fail to log London or Madrid immediately. Extravagant advertising to the contrary, the short waves are still tricky, and therein lies their greatest charm. Stations that are thunderously loud one week may be completely absent the next!

At any event, the builder must not expect to master the fine points of short wave tuning in a few hours. First he will probably log the police stations around 122 meters, as these are easy to catch. Then there are the hundreds of amateurs on 160 and 80 meters, the airplane stations on approximately 53 and 95 meters, and finally the relay broadcasters on 49, 31 and 25 meters. Short wave broadcasting schedules are irregular and subject to quick changes, but there is always something doing below 200 meters and the careful listener is never without signals.

Following is a complete list of the parts used in the "Beginner's Twin":

List of Parts

1—Try-Mo foundation kit, consisting of 10¾x8 inch panel and subpanel of same dimensions.
2—Hammarlund 150 mmf. midget variable condensers.
1—Hammarlund vernier drum dial.
1—Trimmer condenser for antenna circuit.
1—10 ohm rheostat with built in switch.
1—100 mmf. grid condenser, with 3 meg. leak.
1—Audio transformer (any ratio between 3:1 and 6:1).
1—Set of Powertest plug-in coils.
3—Four-prong sockets (two for tubes, one for coil).
1—Fused battery cable.
2—Twin binding post strips.
1—Short wave R.F. choke, about 60 mh.
Assorted hardware.

Required Accessories:

2—Type 30 tubes.
2—No. 4 or No. 6 dry cells (preferably the latter).
2—"General" 45-volt "B" batteries.
1—Pair earphones, 2000 ohms.

Coil Data

Although factory-wound coils are available at low prices, some constructors of the "Beginner's Twin" may want to wind their own. The winding data follow:

Four prong forms, 1½ inches in diameter. No. 22 or 24 D.C.C. wire for grid coils, No. 26 or 28 S.C.C. wire for ticklers. Tickler at top of form, separated ¼ inch from grid winding. Start of tickler goes to right F pin; finish to P. Start of grid coil to G, finish to left F pin. Both coils wound in same direction.

Wavelength range (approximate)	Grid Turns	Tickler Turns
16- 30	6	6
29- 58	13	13
54-110	21	15
103-200	54	27

Free Booklet

THE NATIONAL AGS SHORT WAVE SUPERHETERODYNE
By JAMES MILLEN, M. E.

A fine 18-page booklet describing, with diagrams and photos, the new "communications type" National AGS Short Wave Superheterodyne Receiver. Some of the subjects discussed by Mr. Millen are "The Valueof an R. F. Pre-selector Stage Ahead of the First Detector—Selectivity and How It Is Achieved in a Superheterodyne—"Single Signal" Reception, with a Diagram and Discussion showing how to attain it—Improved Automatic Volume Control—Shielding of Various Stages—Using a Transposed Lead-in Aerial System to Reduce Noise. Also notes on servicing the I. F. amplifier, Beat Frequency Oscillator, R. F. First Detector and Oscillator. This valuable booklet will be sent to you free upon receipt of a postal card or letter addressed to the editor of SHORT WAVE CRAFT. Just state that you wish the booklet—"The National AGS Short Wave Superheterodyne." Send all requests to Short Wave Craft, Box 41, 98 Park Place, New York, N. Y.

Just the Books You Need, See Page 58

OFFICIAL DOERLE WORLD-WIDE Receivers

Improved Doerle Receivers—Absolutely Fool Proof

15 TO 200 METERS

THERE have never been produced short-wave receivers which have taken the whole country by storm as much as the now famous DOERLE Receivers. Mr. Doerle described his first receiver, the now famous TWO TUBE 12,500 MILE RECEIVER in the December-January issue of SHORT WAVE CRAFT. You have seen the many letters published in SHORT WAVE CRAFT lauding this receiver to the skies, and for a good reason. It is a low-priced receiver, yet, pulls in short-wave stations from all over the world, REGULARLY, in practically any location, not only in this country, but anywhere. Thousands of experimenters have built their own, and have obtained miraculous results, as hundreds of glowing testimonial letters from radio fans testify.

Recently, Mr. Doerle brought out another receiver, the THREE TUBE SIGNAL GRIPPER, which already has started to make history. There is no question that the three tube job will also make its triumphant tour all over the world.

Despite the remarkable performance of these two receivers, our technical staff felt that they could obtain even better results with slight modifications of the circuit. This is especially true of the Three-Tube Signal Gripper. The first type 30 R. F. tube was replaced with a type 34 which is a high gain Screen-grid R. F. amplifier. This has increased the sensitivity and selectivity of these receivers considerably. Yet despite these changes, we have not raised the prices of these instruments to you.

In the course of the year, we have received many requests for these receivers, and we have sold a great many parts for both receivers, but not until recently have we concluded our tests which now places us in a position to supply the two complete receivers so that you can either buy them completely wired or in kit form.

By special arrangement with the publishers of SHORT WAVE CRAFT, we are now in a position to sell you these official receivers so that all short wave enthusiasts who ever wished to own either of these fine sets can now be sure to buy them without a question in their minds that they will perform 100%.

It took a lot of labor, and much ingenuity to collect the correct parts to make sure that each receiver would work under all circumstances. This means that all the usual "bugs" have been ironed out by us in such a way that you may order every receiver with full confidence, that in practically every location, anywhere, "they will do their stuff."

ONLY FIRST CLASS PARTS USED

It may be possible to buy the parts of the completed sets at a lower price. We admit this at once. But if you will look over our parts list, you will find that *only first class material is used.* We have done away with all losses. There is no "*hand capacity.*" IN THESE TWO SETS ONLY THE BEST CONDENSERS—AND THAT MEANS HAMMARLUND—ARE USED. The sets could be produced for a considerable less amount if we used cheaper condensers. We have refrained from doing so because we wanted a first class product. And this goes for everything else in the sets. They are low in price, yet the quality is excellent considering the low price. Thus, for instance, we are using Kurtz-Kasch dials because we found them excellent for their purpose, and as everyone knows, they are really first class verniers. The aluminum chassis is completely drilled, ready for mounting parts. Panels are polished aluminum, on which the condensers and other parts are mounted. These panels do away with hand capacity. The plug-in coils are of Bakelite, wound with enamel wire for low losses. In short, despite the exceedingly low price of these sets, we give you quality. Bakelite sockets only are used. Even the aerial condensers are of the Micamold Equalizing type. We have even included pin-tip jacks, rheostats with "off" positions and binding post strips of Bakelite to keep down losses.

In short, you will be pleased not only with the business-like appearance, but with the performance as well.

Only by making these sets in quantities can we afford to sell them at the extremely low prices quoted.

Note the testimonials printed on this page. They will give you an idea what can be expected from these great sets.

HOW DO THE TWO SETS DIFFER?

The TWO TUBE 12,500 MILE SHORT-WAVE SET is intended to be used with headphones, although it is bringing in right along, stations on the loudspeaker. We, however, do not make such a claim. For instance, stations 5,000 and 10,000 miles away come in only on headphones. This set uses two 230 two-volt battery type tubes.

The Improved THREE TUBE SIGNAL GRIPPER, as its name indicates, is a three tube set. It uses a type 34 screen grid R. F. amplifier followed by a Type 30 regenerative detector and finally a type 30 A. F. Amplifier. It is a great deal more powerful than the smaller set and will bring in stations from great distances on the loudspeaker. A good magnetic loudspeaker should be used. Thus, for instance, stations from all over the country come in on the loudspeaker, but, of course, stations 12,000 miles distant require the use of earphones.

The price of the two sets include a set of plug-in coils. Both sets are operated from ordinary dry cells. The "B" battery supply can be either 90 volts or 135 volts for the THREE TUBE SIGNAL GRIPPER. For the TWO TUBE SET, 90 volts is sufficient.

Both sets tune exceedingly easy, and the oscillation control is always under full control of the operator. The vernier dials are accurate so that stations can be logged and found in their allotted positions every time you use the set.

OUR OWN TESTS

Both sets have been tested by us, and we found that they do all and more claimed by Mr. Doerle, and other enthusiasts who built the sets, especially since they have been improved. We refrain from giving you the astonishing list of stations which we ourselves have logged because we do not wish to let our enthusiasm run away with us, and because you might not believe the actual results accomplished with this set. We much rather have others talk about the results.

Incidentally, we have, as yet, to receive a single complaint on these sets, although we sold a large quantity of parts for both of them.

WHAT THEY SAY!

"Does All You Say"

I have built the *Doerle* short wave receiver and I want to say it does all you say it will.
J. Joseph Whalley, 401 Springdale Street, Cumberland, Md.

Some List!

Have just completed your *Doerle* two-tuber. I received the following on the loudspeaker: XDA, LQA, GMB, VE9DR, VE9GW, KKQ, W1XAZ, W2XAF, W3XAL, W3XAU, W2XAB, W8XK, W8XAL, W9XF, W9XAA, Bermuda, Honolulu, Budapest, Hungary, and "hams" in 38 states
Maurice Kraay, R. F. D. 1, Hammond, Ind.

This Is Going Some!

Today is my third day for working the *Doerle* set, and to date I have received over fifty stations. Some of the more distant ones I shall list. From my home in Maplewood, N. J., I received the following: WVR, Atlanta, Ga.; WGK, Ohio; W9BHM, Ft. Wayne, Ind.; W9AYR, Elgin, Ill.; W8ERK, Girard, Ohio; and, best of all, XDA, Mexico; PZA, Surinam, South America; TIR, Cartago, Costa Rica; G2WM, Leicester, England. I have also received stations WDC and PJQ, which I have not found listed in the call book.
That's not a bad record for three days on a two-tube job, is it? I will answer any questions concerning the *Doerle* set.
Jack Prior, 9 Mosswood Terrace, Maplewood, N. J.

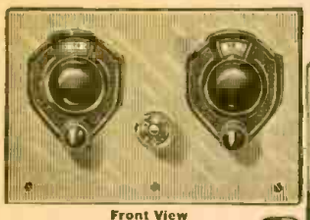
A Good Word for the Doerle

I would like to put a word in for the *Doerle* 12,500 mile receiver. I recommend this set to all "set wreckers" in a big way! Hoping that this set "perks" for all "hams" in a big way.
H. J. Keilholtz, 1508 Belt Street, Baltimore, Md.

A Doerle Enthusiast

I have just completed my two-tube *Doerle*, and it surely is a great receiver! It works fine on all the wavebands. Nobody could wish for any better job than this one. I can get W8XK and W9XAA to work on the loudspeaker at night, and the code stations come in with a wallop behind them.
Samuel E. Smith, Lock Box 241, Grayling, Mich.

Two Tube 12,500 Mile Doerle Receiver



Front View

Rear View

$8.90

This receiver is exactly as illustrated in our photographs. Size of aluminum panel is 9x6¼ inches; base 9x6 1/8 inches. List of material used: 2 Hammarlund .00014 Condensers; 1 Carter 20 ohm Rheostat and Switch; 1 Peerless Audio Transformer; 2 Kurtz-Kasch Vernier Dials; 3 Bakelite Low Loss Sockets; 1 Micamold Equalizer Antenna Condenser; 1-.0001 Aerovox Fixed Condenser; 1-5 megohm Carborundum Grid Leak; 2 Telephone Pin Jacks; 1 Aluminum Panel; 1 Aluminum Base; 1 Bakelite Rheostat Knob; 1 Bakelite Binding Post Strip; 1 set of 4 Bakelite Short Wave Plug-in Coils; Instructions for Operation; 1 Set of Hardware, Wire, etc. Complete shipping weight 5 lbs.

No. 2140. TWO TUBE 12,500 MILE DOERLE SHORT WAVE RECEIVER, completely wired and tested as per above specifications. YOUR PRICE **$8.90**

No. 2141. TWO TUBE 12,500 MILE DOERLE SHORT WAVE RECEIVER KIT, with all parts as specified above, but not wired, with blueprint connections and instructions for operation. Complete shipping weight 5 lbs. YOUR PRICE **$7.70**

No. 2142. COMPLETE ACCESSORIES, including the following: 2 six months guaranteed Neontron type No. 230 tubes; one set of No. 1078 Brandes Matched Headphones; 2 No. 6 standard dry cells; 2 standard 45-volt "B" batteries, complete, shipping weight 22 lbs. YOUR PRICE **$5.40**

Improved 3-Tube Doerle Signal Gripper

Front View

Rear View

$11.85

This receiver also, is exactly as shown in our photograph. The aluminum panel measures 10½x7¾; baseboard 10½x8 inches. It comprises the following parts: 3 Hammarlund .00014 Tuning Condensers; 1 Carter 20 ohm Rheostat and Switch; 1 Peerless Audio Transformer; 2 Kurtz-Kasch Vernier Dials; 2 Sets of Short Wave Coils; 1-5 Megohm Carborundum Grid Leak; 2 RTC r.f. Chokes; 5 Bakelite Low Loss Sockets; 2 Micamold Equalizer Aerial Condensers; 1 Bakelite Binding Post Strip; 2 Telephone Pin Jacks; 2 Bakelite Knobs, 1 Aluminum Panel; 1 Aluminum Base; One Set of Directions and Instructions for Operation; 1 Set of Hardware, Wire, etc. Shipping weight 7 lbs.

No. 2143. Improved THREE TUBE DOERLE SET, completely wired, ready to use. YOUR PRICE **$11.85**

No. 2144. Improved THREE TUBE DOERLE SET-IN KIT FORM with all parts as specified above, but not wired with blueprint connections and instructions for operation, complete. Shipping weight 7 lbs. YOUR PRICE **$10.50**

No. 2145. COMPLETE ACCESSORIES, including the following; 2 six months guaranteed Neontron type No. 230 tubes; and one type 34 one set of Brandes Matched Headphones; 2 No. 6 standard dry cells; 3 standard 45-volt "B" batteries. 1 B.B.L. 9 inch Cone Magnetic Loudspeaker, complete. Shipping weight 32 lbs. **$11.00**

GUARANTEE

We guarantee and warrant that all material furnished in the two sets described in this advertisement, whether in the completed set or in the kit form, is first class, in every respect; that the complete sets have been tested before shipping, and that we will stand back of these sets and kits in every way. We will replace any parts, with the exception of accidentally blown out vacuum tubes within three months, if parts are returned to us within that time.

PLEASE NOTE

We are short wave specialists. Please understand that the two sets here described are not the only ones which we produce. We can furnish parts, in kit form of practically any short wave receiver described in SHORT WAVE CRAFT or other radio magazines. Get our prices first. We will save you money.

ORDER FROM THIS PAGE — Send money order or certified check. C.O.D. only if 20% remittance accompanies all orders. Order NOW—TODAY

FREE 104-page Radio and Short Wave Treatise; 100 hook-ups, 1,000 Illustrations. Enclose 4c for postage. Treatise sent by return mail.

RADIO TRADING COMPANY, 100A Park Place, New York City

They Have Copied Everything—

Except TRIAD *Quality*

IT IS WRITTEN—

"Imitation is the sincerest form of flattery"

TRIAD Appreciates the compliment it receives each month from other tube manufacturers who have copied our sales plan—our method of advertising—our discount schedules

TRIAD Was first to recognize the Service Man

TRIAD Was first to make double-tested tubes

TRIAD Was first to offer a plan which really makes money for the dealer and Service Man

OTHERS have made every effort to do the same thing

BUT

THEY HAVE NOT BEEN ABLE TO DUPLICATE

TRIAD→Quality

TUBES

A NEW DEAL

Some of our Service Men and Dealers have wanted to buy regular Triad Tubes to meet ordinary competition—

We have worked out a special proposition with most attractive discounts, and will be glad to supply the details upon request.

With regular Triads you can beat any kind of competition.

Triad Dealers and Service Men everywhere have sold many thousands of these tubes,—they are making money—there hasn't been a single complaint. Mail the coupon today and learn how you can sell these super-grade tubes at a real profit. We protect you in your territory and you are sure of all of the inducements offered by other manufacturers, plus quality which is in a class by itself. GET THE FACTS!

TRIAD Manufacturing Co.
Pawtucket, R. I.

Gentlemen:

Please send me the outline of the TRIAD Sales Plan for Dealers and Service Men.

Name.....

Address.....

City.....State.....

My letterhead or business card is attached

Announcing the New Idea in DX

LINCOLN R-9

9-200 METERS

The new R-9 has what one might say—a dual personality. In the hands of an expert commercial operator, the high sensitivity brings in CW and voice signals, impossible to hear on many receivers, with any volume you want. It has been a sensation to every "Ham" who worked it on the air.

In the hands of the "dyed in the wool" DXer it has filled the bill 100%. He can be the proud possessor of the most powerful strictly short wave receiver which he can demonstrate to his friends without interrupting the family broadcast receiver.

If you could bring in just half of the stations we bring in daily, regular as clock work, you would be just as enthusiastic as we are.

Don't forget you have the choice of the famous DeLuxe SW-33 all wave, if you prefer, which radio engineers, Army officers, and millionaires claim the greatest receiver they ever operated. The new super powered DeLuxe SW-33 cuts like a knife, absolutely 10KC from the powerful locals. Sensitivity beyond practical measurement and a new fidelity hard to equal in the finest amplifiers.

Just drop me a line and tell me what you want. If you are a licensed operator, please give call letters. I will send complete information on your request.

Cordially yours,

W. H. Hollister, President.

LINCOLN RADIO CORPORATION, 333 S. Wood St., Chicago

LINCOLN RADIO CORPORATION
Dept. E, 333 S. Wood St., Chicago U. S. A.
Please send me Free Technical description of the
☐ R-9 ☐ SW-33
Name .....
Street .....
City ..... State .....

LINCOLN
DeLuxe Receivers