THE RADIO EXPERIMENTER'S MAGAZINE

March

SHORT WAVE CRAFT

Edited by
HUGO GERNSBACK

"Sh-h-h MOSCOW CALLING"

30

SILENCE

25 CANADA 30¢

POWERTONE'S

6 Steps to WORLD-WIDE FAME

1 SCOUT

2

3

4 REGENT

5

6

POWERTONE RADIO CORP. [illegible]

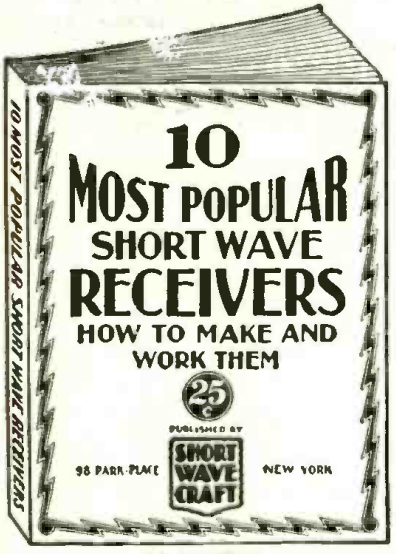
The 4 ESSENTIAL SHORT WAVE BOOKS

'ROUND THE WORLD FANS USE THESE GREAT SHORT WAVE BOOKS

These great books contain everything on short waves that is really worth knowing. They are books which have been most enthusiastically welcomed by short-wave fans. The cost of the books is extremely low in comparison with the valuable material which they contain.

There is not a short-wave fan, experimenter or interested radio-minded reader who will not want these books. Right up-to-the-minute with new material on outstanding developments in the short wave field. The books are authoritative, completely illustrated and not too highly technical.

Ten Most Popular Short Wave Receivers. How to Make and Work Them



This new volume is a revelation to those who wish to build their own short wave receivers. The editors of SHORT WAVE CRAFT have selected ten outstanding short wave receivers and these are described in the new volume. Each receiver is fully illustrated with a complete layout, pictorial representation, photographs of the set complete, hookup and all worthwhile specifications. Everything from the simplest one tube set to a 5-tube T. R. F. receiver is presented. Complete lists of parts are given to make each set complete. You are shown how to operate the receiver to its maximum efficiency.

CONTENTS

The Doerle 2-Tube Receiver That Reaches the 12,500 Mile Mark, by Walter C. Doerle.

2-R.F. Pentode SW Receiver having two stages of Tuned Radio Frequency, by Clifford E. Denton and H. W. Secor.
My de Luxe S-W Receiver, by Edward G. Ingram.
The Binneweg 2-Tube 12,000 Mile DX Receiver, by A. Binneweg, Jr.
Build a Short Wave Receiver in your "Brief-Case," by Hugo Gernsback and Clifford E. Denton.
The Denton 2-Tube All-Wave Receiver, by Clifford E. Denton.
The Denton "Stand-By," by Clifford E. Denton.
The "Stand-By" Electrified.
The Short-Wave MEGADYNE, by Hugo Gernsback.
A COAT-POCKET Short Wave Receiver, by Hugo Gernsback and Clifford E. Denton.
Boy, Do They Roll In on this One Tuber! By C. E. Denton.
The S-W PENTODE-4, by H. G. Clain, M.E.
Louis Martin's Idea of A GOOD S-W RECEIVER, by Louis Martin.

40 PAGES
OVER 75 ILLUSTRATIONS

IMPORTANT

THERE IS NO DUPLICATION 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.

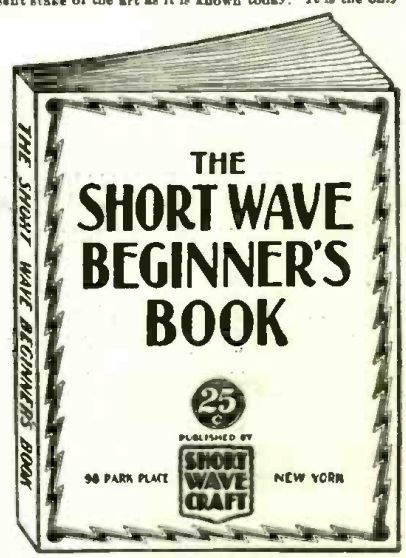
25c

The Short Wave Beginner's Book

Here is a book that will solve your short wave problems—leading you in easy stages from the simplest fundamentals to the present state of the art as it is known today. It is the only low-priced reference book on short waves for the beginner.

The book is profusely illustrated with all sorts of photos, explanations and everything worthwhile knowing about short waves—the book is not "technical." It has no mathematics, no "high-faluting" language and no technical jargon. 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.

It abounds with many illustrations, photographs, simple charts hookups, 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 aerials, noise elimination, how to get verification cards from foreign stations, all about radio tubes, data on coil winding and dozens of other subjects.



Partial List of Contents

Getting Started in Short Waves—the fundamentals of electricity. Symbols the Short Hand of Radio—how to read schematic diagrams. Short Wave Coils—various types and kinks in making them.
Short Wave Aerials—the points that determine a good aerial from an inefficient one.
The Transposed Lead-In for reducing Man Made Static.
The Beginner's Short-Wave Receiver—a simple one tube set that anyone can build.
The Beginner's Set Gets an Amplifier—how the volume may be increased by adding an amplifier.
How to Tune the Short-Wave Set—telling the important points to get good results.
Regeneration Control in Short Wave Receivers.
Audio Amplifiers for S. W. Receivers.
How to Couple the Speaker to the set.
Learning the Code—for Greater enjoyment with the S-W set.
Wave length to Kilocycle Chart.
Wire Chart—to assist in the construction of coils.
Kinks in the construction of S-W Receivers.

40 PAGES
OVER 75 ILLUSTRATIONS

25c

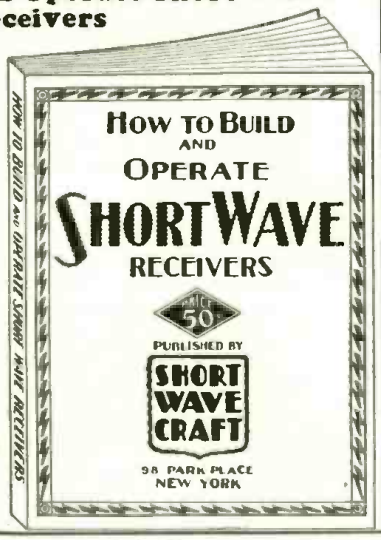
How to Build and Operate Short Wave Receivers

Is the best and most up-to-date book on the subject. It is edited and prepared by the editors of SHORT WAVE CRAFT, and contains a wealth of material on the building and operation, not only of typical short-wave receivers, but short-wave converters as well. Dozens of short-wave sets are found in this book, which contains hundreds of illustrations: actual photographs of sets built, hookups and diagrams galore.

The book comes with a heavy colored cover, and is printed throughout on first-class paper. No expense has been spared to make this the outstanding volume of its kind. The book measures 7½x10 inches.

This book is sold only at such a ridiculously low price because it is our aim to put this valuable work into the hands of every short-wave enthusiast.

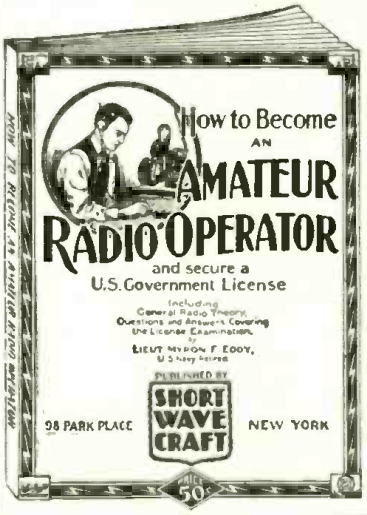
We know that if you are at all interested in short waves you will not wish to do without this book. It is a most important and timely radio publication.



Over 150 Illustrations
72 Pages 7x10 Inches

50c

How to Become an Amateur Radio Operator



We chose Lieut. Myron F. Eddy to write this book because his long years of experience in the amateur field have made him pre-eminent in this line. For many years he was instructor of radio telegraphy at the R.C.A. Institute. He is a member of the I.R.E. (Institute of Radio Engineers), also the Veteran Wireless Operators' Association.

If you intend to become a licensed code operator, if you wish to take up phone work eventually, if you wish to prepare yourself for this important subject—this is the book you must get.

Partial List of Contents

Ways of learning the code. A system of sending and receiving with necessary drill words is supplied so that you may work with approved methods. Concise, authoritative definitions of radio terms, units and laws, brief descriptions of commonly used pieces of radio equipment. This chapter gives the working terminology of the radio operator. Graphic symbols are used to indicate the various parts of radio circuits. General radio theory particularly as it applies to the beginner. The electron theory is briefly given, then waves—their creation, propagation and reception. Fundamental laws of electric circuits, particularly those used in radio are explained next and typical basic circuits are analyzed. Descriptions of modern receivers that are being used with success by amateurs. You are told how to build and operate these sets. Amateur transmitters. Diagrams with specifications are furnished so construction is made easy. Power equipment that may be used with transmitters and receivers, rectifiers, filters, batteries, etc. Regulations that apply to amateur operators. Appendix which contains the International "Q" signals, conversion tables for reference purposes, etc.

Over 150 Illustrations
72 Pages 7x10 Inches

50c

All the books shown on this page are published exclusively by

SHORT WAVE CRAFT

96-98 Park Place, New York, N. Y.

CLIP—MAIL

SHORT WAVE CRAFT SW-3-34
96-98 Park Place, New York, N. Y.

Gentlemen: I enclose herewith my remittance for the amount of $..... for which you are to send me, postpaid, the books checked below.

( ) Ten Most Popular Short Wave Receivers. How to Make and Work Them..25c each
( ) The Short Wave beginner's Book.....25c each
( ) How to Build and Operate Short Wave Receivers.....50c each
( ) How to Become an Amateur Radio Operator.....50c each

Name.....
Address.....
City..... State.....

(Send remittance in form of check or money order. If letter contains cash or unused U. S. Postage Stamps, register it.)

These Books are Authentic For All Short Wave Work and LOW in Price

COUPON TODAY!

IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Worcester . Kahlert . Malsberger . Mitchell . Cisin . Shuart

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

Contents for March, 1934

FEATURES IN APRIL ISSUE

The Tetradyne—4 Receiver-In-One. by Hugo Gernsback.

Transformer Construction Hints.

A New Push-Pull Type of Short-Wave Receiver, by Clifford E. Denton.

The "Unitrol" Receiver Simplifies Band-Spread Tuning, by George W. Shuart, W2AMN.

5-Meter Transmitter-Receiver of Superior Excellence, by Marcus L. Potter, W9FQU.

Power Supply Built From Spark Coils.

Certified Circuits

• SHORT WAVE CRAFT goes to a large expense in verifying new circuits published in this magazine. Whenever you see the seal shown here in connection with any of the sets published in this and future issues of SHORT WAVE CRAFT, this will be your guarantee that this set has been tested in our laboratories, as well as privately, in different parts of the country to make sure that the circuit and selected parts are right. Only "Constructional-Experimental" circuits are certified by us.

When you see our certificate seal on any set described you need not hesitate in spending money for parts, because you are assured in advance that the set and circuit are bona fide and that this magazine stands behind it.

SHORT WAVE CRAFT is the only magazine that thus certifies circuits and sets.

OUR COVER

• S-s-s-s-h! MOSCOW CALLING! The young Marconi of the family has Pa and Ma duly impressed, apparently, for they seem quite stunned indeed. This dramatic situation has undoubtedly happened in hundreds of homes, when the thrill of hearing his first DX station electrified the short-wave "fan."

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• • • 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.).

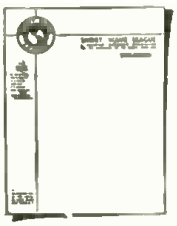
If, therefore, you order any of the short wave essentials without filling out the blank (unless you already enrolled as a LEAGUE member), your money will be returned to you.

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".

C—Radio Map of the World and Station Finder.....Prepaid **25c**

GLOBE OF THE WORLD AND MAGNETIC COMPASS

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.

D—Globe of the World.....Prepaid **$1.25**

SHORT WAVE LEAGUE LAPEL BUTTON

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**

SHORT WAVE LEAGUE SEALS

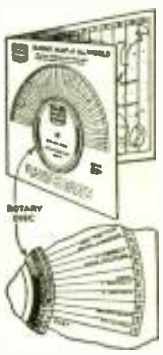
These seals or stickers are executed in three colors and measure 1¼ in. in diameter, and are gummed on one side. They are used by members to affix to stationery, letterheads, envelopes, postal cards and the like. The seal signifies that you are a member of the SHORT WAVE LEAGUE. Sold in 25 lots or multiples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

G—SHORT WAVE LEAGUE seals.....per 25, Prepaid **15c**

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**



C—25c each

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 (3-34)
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:

.....

.....

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.....

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 .....

(3-34) City and State.....

Country .....

I'll Train You Quickly for RADIO'S

LEARN AT HOME

Get into this Field with a Future

My book, "Rich Rewards in Radio," gives you full information on the opportunities in Radio and explains how I train beginners at home to become Radio Experts and how I train experienced servicemen for better Radio jobs—better pay. It's free. Clip and mail the coupon NOW. Radio's amazing growth has made hundreds of fine jobs which pay $40, $60, $75 a week. Many of these jobs lead to higher salaries.

Radio—The Field with a Future

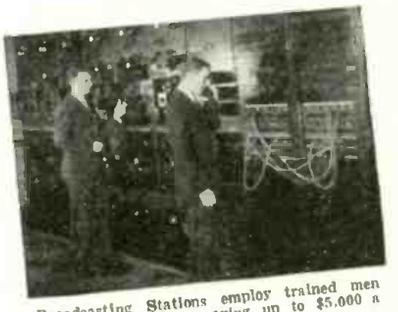
Once or twice in a man's lifetime a new invention starts a new business. You have seen how the men and young men who got into the automobile, motion picture, and other industries when they were started had the first chance at the big jobs — the $5,000, $6,000 and $7,500 a year jobs. Radio offers the same chance that made men rich in those businesses. It has already made many men independent and will make many more wealthy in the future. You will be kicking yourself if you pass up this once-in-a-lifetime opportunity for financial independence.

Many Radio Experts Make $40, $60, $75 a Week

In the short space of a few years, 300,000 Radio jobs have been created, and thousands more will be made by its future development. Men with the right training—the kind of training I will give you in the N. R. I. Course—have stepped into Radio at 2 and 3 times their former salaries. Experienced servicemen as well as beginners praise N. R. I. training for what it has done for them.

Many Make $5, $10, $15 a week extra in spare time almost at once

My Course is world-famous as the one "that pays for itself." The day you enroll I send you material, which you should master quickly, for doing 28 Radio jobs common in most every neighborhood. Throughout your Course I will show you how to do other repair and service jobs on the side for extra money. I will not only show you how to do the jobs, but how to get them. I'll give you the plans and ideas that have made $200 to $1,000 a year for N. R. I. men in their spare time. G. W. Page, 110 Raleigh Apts., Nashville, Tenn., wrote me: "I made $935 in my spare time while taking your Course." My book, "Rich Rewards in Radio," gives many letters from students who earned four, five and six times their tuition fee before they graduated.



Broadcasting Stations employ trained men continually for jobs paying up to $5,000 a year.

Television—the coming field of many great opportunities—is covered by my Course.

HERE'S PROOF

Made $6,000 in Two Years

"Soon after the depression started, I found myself without a job, but I was well protected with N. R. I. training. I swung right to full time Radio servicing and I have made over $6,000 in a little over two years."—Wm. Spartivent, Sparty Radio Service, 93 Broadway, Newark, N. J.

Service Manager Earns $200 a Month

"As Radio Service Manager for Sterchi's four Nashville Stores, my earnings are around $200 a month. My N. R. I. training enables me to keep our customers satisfied."—E. H. Leftwich, Sterchi Bros. Stores, Inc., Nashville, Tenn.

$500 a Year Extra in Spare Time

"Although only doing spare time Radio work, I averaged about $500 extra a year in addition to my regular income. Full time Radio work would net me many times that amount. My example and that of hundreds of other N. R. I. graduates should convince any skeptical person of the superiority of N. R. I. training."—Edward H. Fawcett, Slough Rd., Ladner, B. C., Canada.

$50 to $75 a Week

"The National Radio Institute put me in a position to make more money than I ever made in good times. I am in the Radio service business for myself, where it is possible for me to make from $50 to $75 a week. Service work has increased because people, who in normal times would buy a new Radio, now are contented to have the old one 'pepped up'."—Bernard Costa, 150 Franklin St., Brooklyn, N. Y.

You Get Practical Experience

-- I Will Give You Special Radio Equipment Without Extra Charge

My Course is not all theory. I'll show you how to use my special Radio equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R. C. A., Victor, Majestic and others. You work out with your own hands many of the things you read in our lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical.

With N. R. I. equipment you learn to build and thoroughly understand set testing equipment—you can use N. R. I. equipment in your spare time service work for extra money.

Act! MAIL COUPON Today - - - Get The Facts About

GOOD Spare Time and Full Time Jobs TO MAKE MORE MONEY

Many Make $40, $60, $75 a Week

Free: Radio Servicing Tips

Let me PROVE that my Course is clear, easy to understand, and fascinating to study. Send the coupon for a free lesson, "Trouble Shooting in D.C., A.C. and Battery Sets." This interesting lesson gives 132 ways to correct common Radio troubles. I am willing to send this book to prove that you too can master Radio—just as thousand sof other fellows have done. Many of them, without even a grammar school education, and no Radio or technical experience, have become Radio experts and now earn two or three times their former pay. Mail the coupon now.

Spare time set servicing pays many N.R.I. men $5, $10, $15 a week extra. Full time men make as much as $40, $60, $75 a week.

Loud speaking and public address equipment is another growing Radio field—it offers many money making opportunities to trained men.

Radio Factories employ testers, inspectors, foremen, engineers, servicemen, for jobs paying up to $7,500 a year.

Get ready for jobs like these

Broadcasting stations use engineers, operators, station managers and pay up to $5,000 a year. Radio manufacturers employ testers, inspectors, foremen, engineers, servicemen, buyers and managers for jobs paying up to $6,000 a year. Radio dealers and jobbers (there are over 35,000) employ servicemen, salesmen, buyers, managers and pay up to $100 a week. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. There are hundreds of opportunities for you to have a spare time or full time Radio business of your own—to be your own boss. I'll show you how to start your own business with practically no capital—how to do it on money made in spare time while learning. My book tells you of other opportunities. Be sure to get it at once. Just clip and mail the coupon.

You can learn at home in your spare time to be a Radio Expert

Hold your job. There is no need for you to leave home. I will train you quickly and inexpensively during your spare time. You don't have to be a high school or college graduate. My Course is written in a clear, interesting style that most anyone can grasp. I give you practical experience under my 50-50 method of training—one-half from lesson books and one-half from practical experiments with equipment given without extra charge. This unique and unequalled method has been called one of the greatest developments in correspondence Radio training. N. R. I. pioneered and developed it. It makes learning at home easy, fascinating, practical.

Television, Short Wave, Loud Speaker Systems Included

There's opportunity for you in Radio. Its future is certain. Television, short wave, loud speaker systems, police Radio, automobile Radio, aircraft Radio — in every branch, developments and improvements are taking place. Here is a real future for thousands and thousands of men who really know Radio —men with N. R. I. training. Get the training that opens the road to good pay and success.

Your Money Back if you are Not Satisfied

I will give you an agreement in writing, legal and binding upon this Institute, to refund every penny of your money upon completing my Course if you are not satisfied with my Lessons and Instruction Service. The resources of the National Radio Institute, Pioneer and World's Largest Home-Study Radio School, stand behind this agreement.

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

System In Short-Wave Reception

An Editorial By HUGO GERNSBACK

● THIS is written expressly for *newcomers* to the short wave art, and for those short wave fans who are not *oldtimers*, and who have, as yet, not achieved the success in short waves they hope to obtain.

If you have been used to tune the ordinary broadcast receiver, the first and foremost thing to do is to forget all about what you have known, because knowledge gained in broadcasting is worse than useless when applied to *short waves*.

If you have a short-wave receiver—and it makes no difference whether it is a home-made one or a factory-built short wave set, or an "all wave" receiver for that matter—the principle of getting the best results from your set remain the same for all three. There is no sense in tuning haphazardly, just plugging in a coil, or if you have a switching arrangement that uses no plug-in coils, switching from one coil to another. *Try at the outset to be methodical.* Remember always, that there is such a thing as *time difference*, and that certain overseas stations come in best only at certain times. Thus, for instance in the eastern United States, the best time to receive the English, French and German stations is in the afternoon, say from 5:00 to 7:00 P. M. This time corresponds from about 10:00 P. M. until Midnight in Europe. Nor are all wave-lengths suitable in the afternoon. All short-wave magazines give you the best listening times and what bands come in best at certain times. Always bear this in mind, because it is most important. It is the exception when different bands are heard than those prescribed. This might be called "freak" reception. Usually, it is not worthwhile to search a different band in a different time allotment. Thus, for instance, from daybreak to midafternoon, and particularly during bright daylight, it is best to listen between 13 and 22 meters (21,504 to 13,000 kilocycles). Then to the east of the listener—and this holds good whether you live in the United States or in Japan—from about Noon to 10.00 P. M., the 20 to 35 meter band will be found best. To the west of the listener, the same band is best from about Midnight until shortly after daybreak, etc. The mere fact that "foreign" stations do not always transmit as per schedule makes listening a great sport. You can only find this out by diligently searching every band *very, very slowly*, from time to time. Unless you are out to hear the entire talk or music of each station, it is best to find out what station is sending, and enter it into your "log" book. Then you are through with that station for the time being. You next hunt for another one, and so on. It is best to stick to one band during the time which you know best reception is had for that particular band. Don't search another band at the wrong time, because usually it is a waste of time. It has often been stated that when you tune for short waves, you must have an exceedingly fine hand. Sometimes as many as five stations are cluttered together in a space about the thickness of a coarse hair! The slightest movement of your tuning knob will throw out one station and bring in another. This is particularly true of such stations as GSC, Daventry, England (9585 kilocycles); W1XAZ, Westinghouse Electric and Mfg. Co., Springfield (9570); and DJA, German Post Office Station, Berlin (9560); and, unless you have a *band-spreader*, stations such as these will come together uncomfortably close, and it needs precise tuning to bring them in. Once the trick has been learned, it is never forgotten. It takes care and patience. The band-spreading condenser, if your set has one, will, of course, help things along, and will give you a better control, but it is not absolutely necessary, and may prove bewildering to the beginner.

In large cities, there is such a thing as the nuisance of receiving certain powerful locals which break through on the short wave band, by what is technically called *harmonics*. Certain stations, if you are not too far removed from them, will come in at half a dozen points on the several bands. The trained short-wave "fan" soon picks out these harmonics, and disregards them quickly. He soon finds out that a station that tunes broadly on a short-wave set is, as a rule, not a "foreigner" but is a harmonic or a station not many hundred miles removed from the "fan's" locality. A station that does not tune with razor-blade sharpness is, as a rule, not worthwhile going after. Always bear this in mind.

After awhile, you become used to certain characteristics of "foreign" stations. First and foremost there is, of course, the foreign language. If no one is speaking at the time, and there is music, it is usually not of the jazz variety and seldom of the popular variety such as we know it here. Also the foreign stations "sound" quite different from American stations. They have a different tone to them, to which you soon become "ear-minded," once you have heard a number of them.

Listening for the Carrier Wave. This is something that the beginner, as a rule, does not understand. Always remember, that foreign stations do not run on a split-second schedule like American stations. Time, to foreign stations, means nothing! A station may be on the air and yet not be audible, because no one is either singing or talking, in which case you hear the characteristic sound of the *carrier*. You will note this as soon as you tune across it; it is a hissing sound, like escaping steam. When you tune in on this, and it is very sharp and difficult to get, you may be quite sure that it is a carrier of a foreign station. It is worthwhile to spend five or ten minutes to listen for announcements, and frequently you are thrilled and rewarded by the announcement of the foreign station.

When I said before that you should DILIGENTLY search the band on which you are working, I mean just that! The reason for this is not easily perceived by the beginner. You may tune back and forward, even very slowly, and not hear a thing. This is particularly true if your set is not very powerful, because here is what happens.

A lot of the foreign stations. at certain times of the day, have a *fading characteristic*. That (*Continued on page* 684)

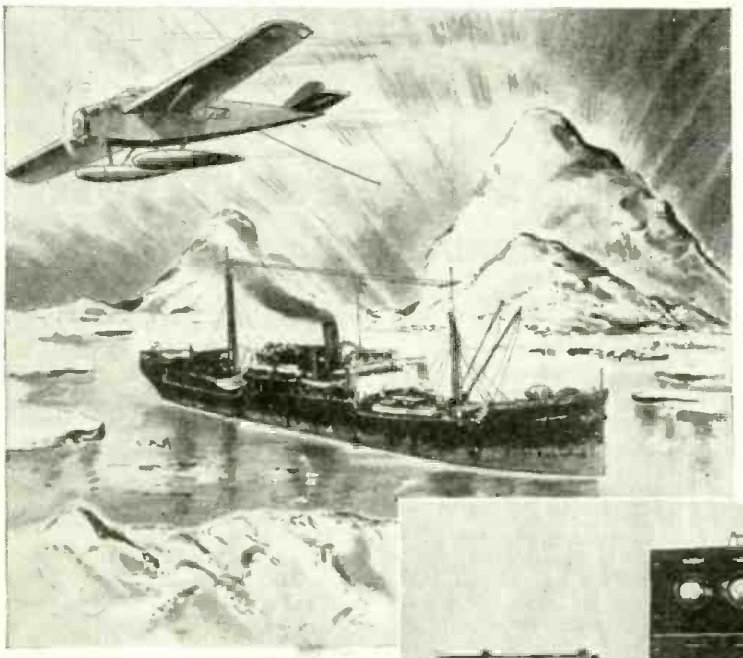
SHORT WAVE CRAFT IS PUBLISHED ON THE 5th OF EVERY MONTH

This is the March, 1934, Issue—Vol. IV, No. 11. The next Issue Comes out March 5th

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

SHORT-WAVING with BYRD in the Antarctic

By H. WINFIELD SECOR



In this picture one of the large airplanes carried by Admiral Byrd is seen in flight, together with the flagship, the "Jacob Ruppert", wending its way among the icebergs to Little America.

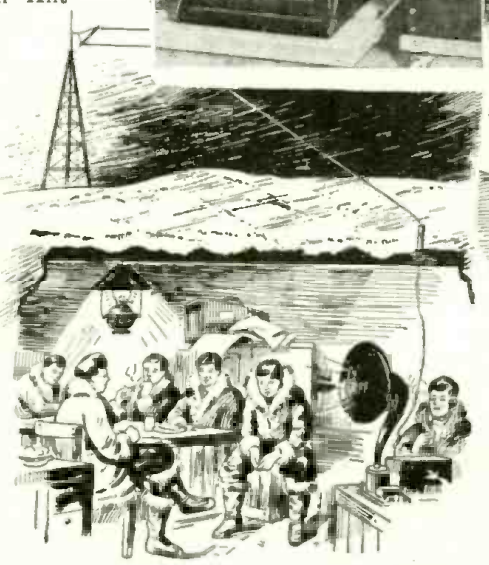
● SHORT waves are almost synonymous with the name of Byrd when we come to consider the elaborate communication arrangements which link Admiral Richard E. Byrd and his men with the rest of the world.

Thousands of broadcast listeners have heard the *re-broadcast* from Admiral Byrd's flagship, the *Jacob Ruppert*, as the sturdy vessel fought its way through iceberg-infested waters on its journey through Antarctic seas to the Bay of Wales and "Little America."

Our artist, George Wall, has in a very masterly fashion portrayed in the accompanying illustrations something of the spirit of this great scientific expedition to the South Pole.

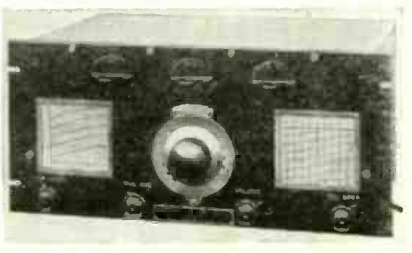
Without a doubt this second Byrd expedition to the south polar regions is the best equipped, scientifically, of any that have ever attempted explorations in either of the polar zones. The short-wave angle of the expedition is particularly interesting and on this trip small, yet highly efficient 5-meter (56 megacycle) *trans-ceivers*, built by a Brookline, Mass., radio engineering concern, will be carried for use on the *dog-sleds*. In many of these polar expeditions, it will happen now and then that a dog-sled team and its personnel become estranged from the main base or the nearest station, due to sudden blizzards and wind-storms which spring up with amazing

The central photo in the group (left) shows the 1 kw. transmitter carried aboard the "Jacob Ruppert" and to be transferred to the main base at Little America. This transmitter is the one that sends the weekly radio programs.

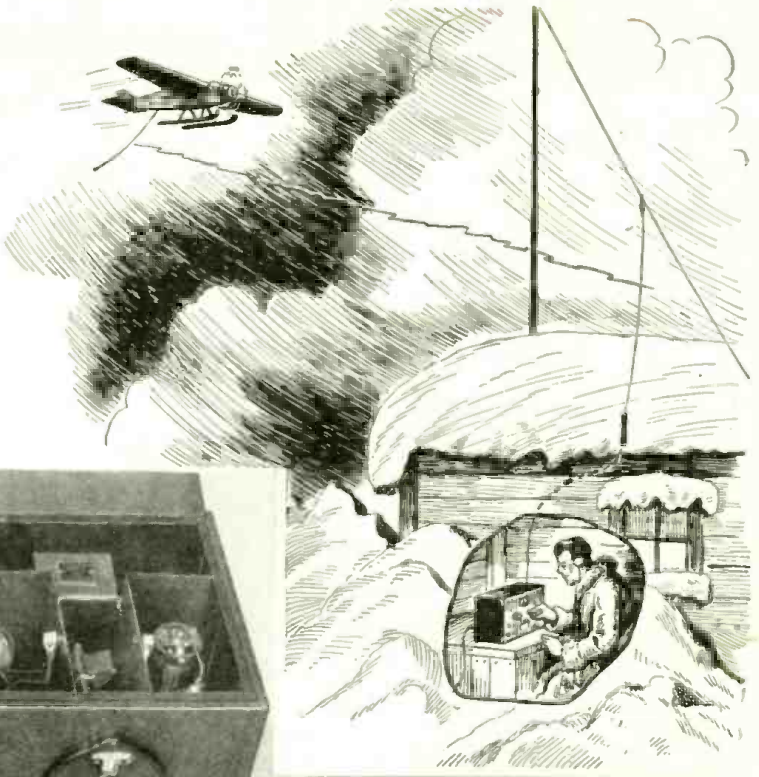


Above—Admiral Byrd broadcasting from "Jacob Ruppert".

Left—Inside the main hut at Little America. Right—The National AGS receiver used at main and forward bases.



Short Waves form the back-bone of the whole communication system linking Admiral Byrd's Antarctic Expedition II with civilization. Over thousands of miles of space, short waves will not only carry official radio messages, but also the phone broadcast programs transmitted weekly from *Little America*. The type of equipment carried on the Expedition is here discussed.



suddenness in these extremely cold polar zones.

These dog-sled trans-ceivers, illustrated in one of the accompanying illustrations, utilize but two 2-volt tubes, one 30 and one 33 type, to be exact. The small power consumption required by these two high-efficiency battery tubes permits a minimum of battery weight, the plate voltage being 90 and the plate current 20 milliamperes. A small 7½ volt C-battery is also required. These dog-sled *trans-ceivers* are built into a strong aluminum case measuring only 4½" x 5½" x 6". When the set is operated as a receiver the 30 tube becomes a super-regenerative detector, while the 33 tube serves as an audio amplifier. In other words the performance of the little dog-sled set, as a receiver, is similar in all respects to that of the customary 3-tube super-regenerative receiver, using a separate tube to supply the interruption frequency.

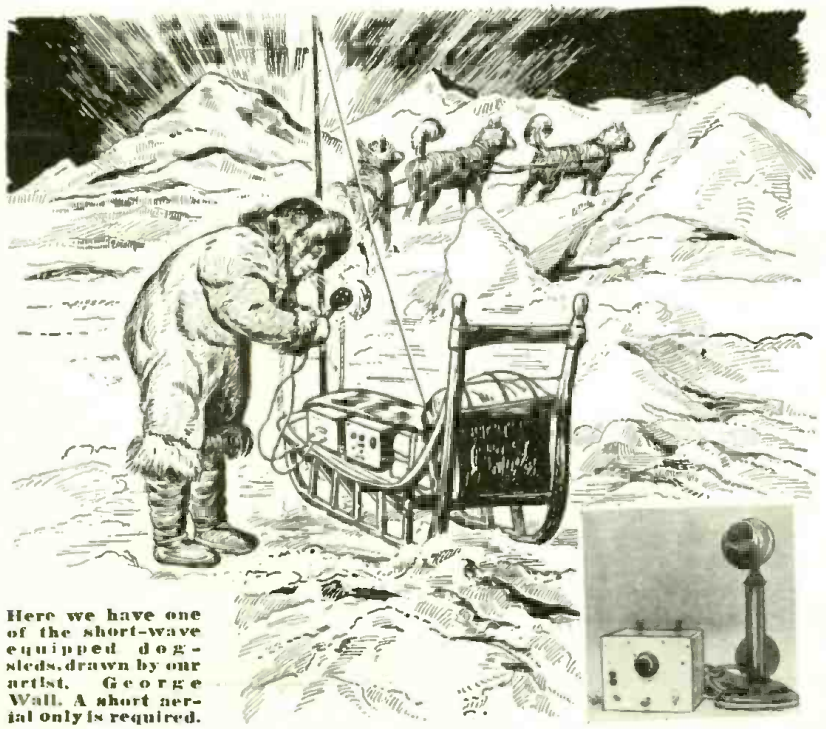
When used as a transmitter, the 30 tube becomes the oscillator and the 33 tube the modulator. The transmitting range, as with the usual 5-meter equipment, is greatly dependent, of course, on

(*Continued on page* 691)

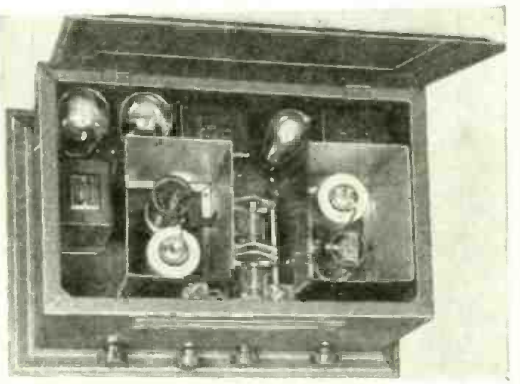
Scene above—a glimpse of the forward station located at the base of the Queen Maude mountain range, where an FB-7, as well as an AGS and an SW-58 National receiver will be on duty for intercepting Admiral Byrd's airplane radio signals, etc.

Photo directly above shows the National SW-3 type receiver, four of which are assigned for use on Byrd's planes.

One type of receiver to be used at the main and forward bases—the National FB-7.



Here we have one of the short-wave equipped dog-sleds, drawn by our artist, George Wall. A short aerial only is required.



At both the main base and at the forward base at the Queen Maude range there will be on duty a National SW-58 receiver, a close-up of which is shown above.

Left—A close up of one of the 5-meter "Trans-Ceivers", which will permit 2-way communication between the dog-sled crew and one of the base stations.

At the first trial of the "19" Twinplex, a battery-operated one-tube receiver, foreign, as well as American stations, rolled in with amazing smoothness.

The "19" TWINPLEX Makes 1-Tube Perform as 2

By J. A. WORCESTER, Jr.

A Low-Cost, Easy-to-Build, Short-Wave Receiver of positive interest to "Beginners" and "Old-Timers" alike.

The "19" Twinplex, here described by our well-known contributor, Mr. Worcester, provides one of the *smoothest-working* short-wave receivers it has been our good fortune to try. This ambitious baby-sized set uses but one tube, a type 19, 2 volt, battery type; as this is a twin amplifier, the one tube performs the functions of two stages—detector and audio amplifier. This set is extremely easy, as well as economical, to build and is a dandy for those just breaking into the short-wave game.

● THE short-wave receiver described in this article follows in general principle the "53" Twinplex receiver described in the October issue of this magazine, but requires a less pretentious power supply in that the dry cell type 19 tube is used. This tube consumes .26 ampere at 2 volts and hence requires only two dry cells in a series connection for satisfactory results. The 53 tube previously employed, required 2.0 amperes at 2½ volts, thus making the use of dry cells uneconomical. The plate voltage for the 19 tube can vary between 90 and 135 volts and may be supplied by dry batteries or a well-filtered "B" eliminator.

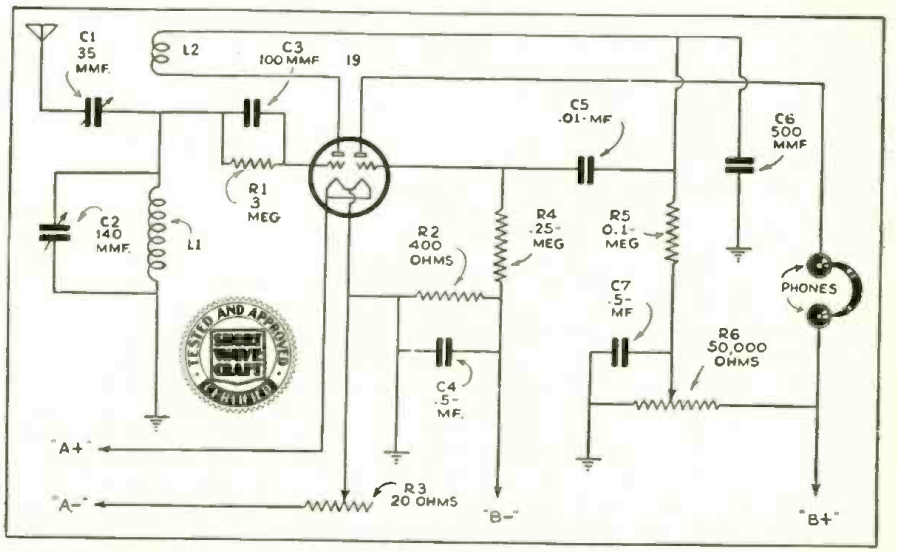
As is well known, this tube was designed as a class "B" twin amplifier and when used in this manner is capable of supplying approximately 2 watts of audio power. Due to the rather large static plate current drawn by this tube, however, it is entirely feasible to employ it for detection and class "A" amplification. The mechanical construction of this tube is similar to that of the 53, in that it effectively comprises two triodes enclosed within a single envelope; only the filament circuit being common.

Diagram Easy to Follow

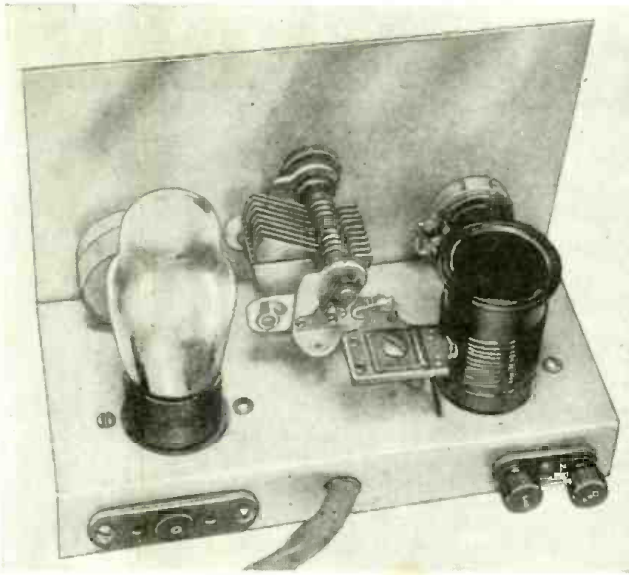
An inspection of the circuit diagram will reveal the simplicity of the layout and the small number of parts required. It will also be noted that the input circuit is entirely conventional. The antenna is coupled to the tuned circuit by means of the small equalizing condenser, C1. Detection is produced by virtue of the grid condenser, C3, and grid-leak, R1. These components have the proper values to automatically bias the tube sufficiently for proper detecting action. The plug-in tuning coils, L1, L2, are of the conventional manufactured variety although data are furnished for constructing same, if the reader wishes to "roll his own." The winding, L2, is employed to feed a portion of the radio frequency current flowing in the plate circuit back to the grid circuit; thus making it possible by suitable adjustment of the feed-back to largely compensate for losses in the tuned circuit. The feed-back is controlled by varying the plate voltage applied to the detector tube by means of the potentiometer, R6. Decreasing the plate voltage increases the internal plate resistance of the tube, causing a corresponding decrease in mutual conductance with a consequent reduction in feed-back. The radio frequency currents flowing in the plate circuit are by-passed to ground by the small capacity condenser, C6. This condenser is too small to allow the audio frequency currents produced by the detecting action of the tube to pass through and they consequently take the alternative path through the plate coupling resistor, R5, and the large capacity condenser, C7.

Audio Frequency Function

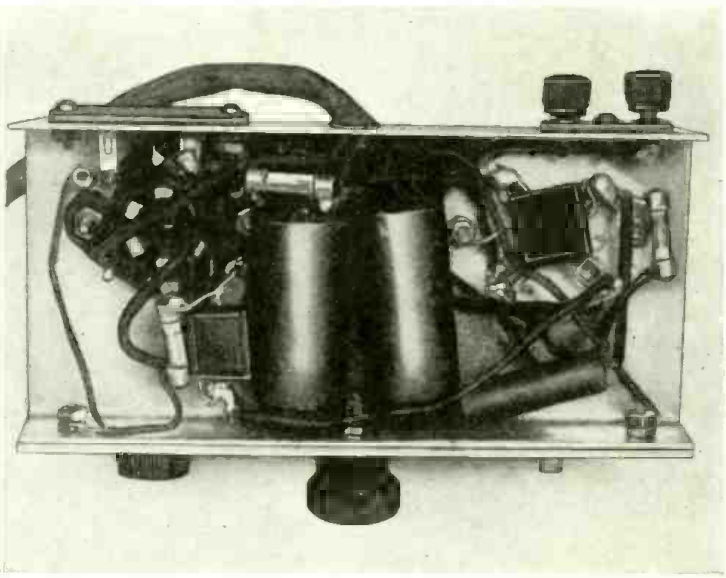
The audio frequency plate current flowing through the resistor, R5, produces corresponding voltage variations across it and these are impressed across the grid of the audio amplifier tube element. The condenser, C5, is employed to prevent the plate voltage of the detector from being impressed on the grid. This necessitates the use of the resistor, R4, to prevent a negative charge from accumulating on the tube and blocking it by reducing the plate current to a negligible value. A negative bias is provided for this tube by the total "B" current flow through the resistor, R2. C4 is employed for by-pass purposes.



Schematic wiring diagram illustrating the general relation of the relatively few parts used in building the "19" Twinplex—a dandy 1-tuber for the embryo short-wave "fan".



Bottom view of the remarkable 1-tube receiver.



Rear view of the "19" Twinplex Receiver.

The amplified audio frequency currents flowing in the plate circuit of the amplifier tube pass through the headphones as shown. The rheostat, R3, is employed to reduce the 3 volt "A" supply, furnished by two dry cells in series, to 2 volts at the tube terminals.

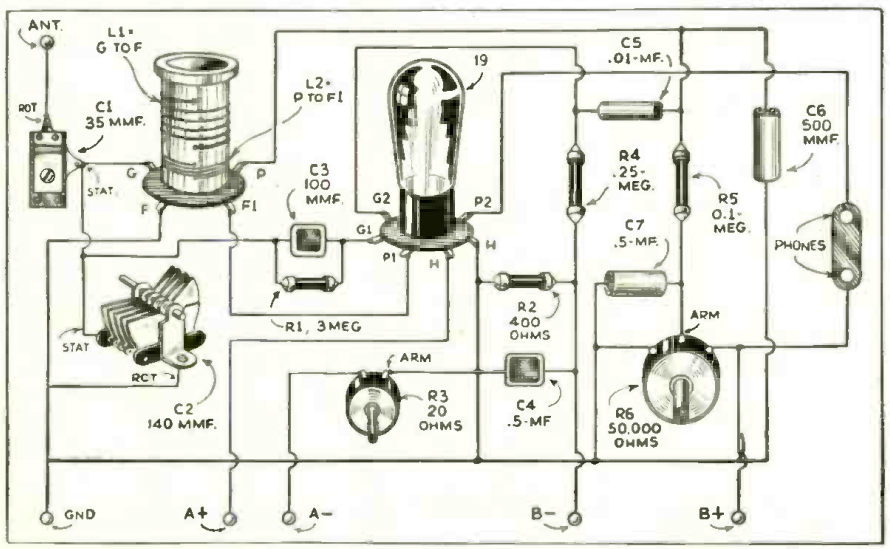
The location of the various parts will be noted from the photographs. The first step in constructing the receiver is to provide the chassis. This consists of a 14 gauge aluminum panel 5"x7" and an aluminum subpanel 7"x3¼"x1". The above subpanel is formed by bending a 5¼"x7" sheet to the above dimensions. On the front panel are mounted the 140 mmf. tuning condenser, C2, the 50,000 ohm potentiometer, R6, and the 20 ohm rheostat, R3. The antenna equalizing condenser, C1, is mounted directly on the tuning condenser as shown.

At the rear of the subpanel are mounted the twin binding post and phone-jack assemblies. A centrally located hole is also drilled to accommodate the battery cable.

Underneath the chassis are mounted the 6-prong tube socket and the isolantite coil socket. The various mica and paper condensers as well as the resistors are mounted directly by their pigtails as shown. Battery connections are made by connecting the cable directly to the proper points.

Parts List

L1, L2—Alden (Na-Ald) Short Wave Coils, 15-200 meters.
C1—Equalizing condenser 3-35 mmf. EC-35; Hammarlund (National, Cardwell).
C2—Isolantite midget condenser, 140 mmf., MC-140-M; Hammarlund (National; Cardwell).
C3—.0001 mf. moulded mica condenser.
C4, C7—.5 mf. tubular by-pass condenser, 200 DCWV.
C5—.01 mf. tubular by-pass condenser, 200 DCWV.
C6—.0005 mf. moulded mica condenser.
R1—3 meg. metallized resistor; Lynch.
R2—400 ohm metallized resistor; Lynch.
R3—20 ohm rheostat.
R4—0.25 meg. metallized resistor; Lynch.
R5—100,000 ohm resistor; Lynch.
R6—50,000 ohm potentiometer; Acratest.
1—Aluminum panel, 7"x5"x⅛"; Blan.
1—Aluminum subpanel 14 ga., 7"x3¼"x1"; Blan.
1—3" vernier dial; National.
1—4-prong isolantite socket; Hammarlund (National).
1—6-prong wafer socket; Alden.
1—Ant.-ground binding-post strip.
1—Twin speaker jack assembly.
1—Type "19" tube RCA (Arco).



Picturized wiring diagram which even the most inexperienced short-wave fan can follow, in order to build this excellent one-tube receiver which gives 2-tube results.

Operating Hints

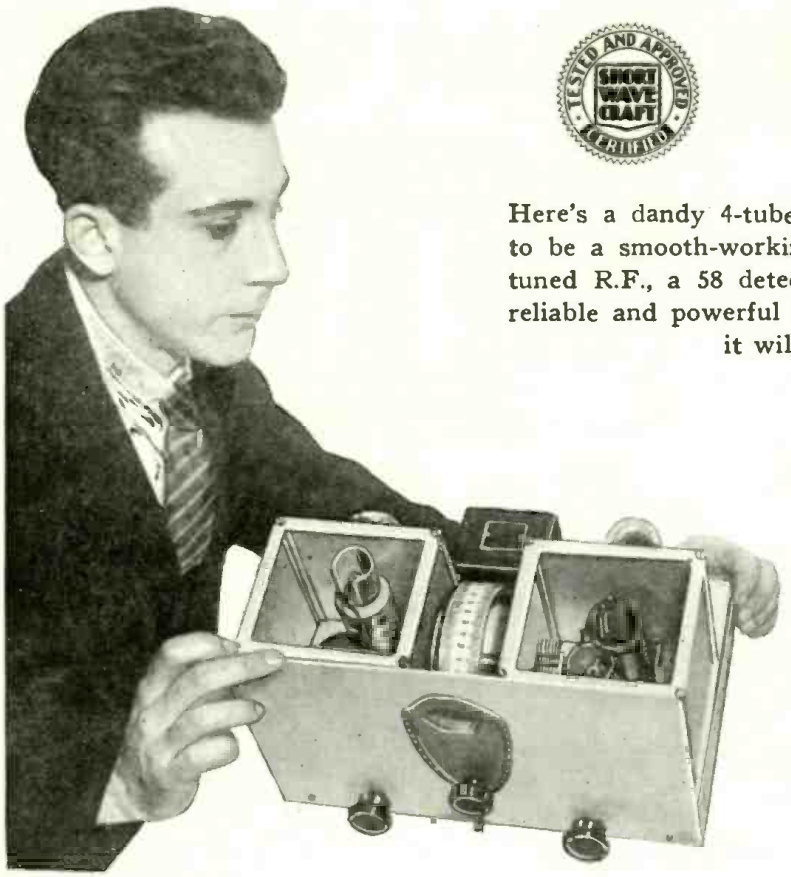
When putting the set into operation the rheostat should be adjusted until the filament voltage is two volts. The potentiometer should be adjusted until the circuit goes into oscillation. When oscillation starts a pronounced thud generally occurs and pronounced clicks will occur when the ungrounded terminal of the tuning condenser is touched with the finger. It will generally be found advisable to readjust the antenna condenser each time a coil is changed. For the smallest coil, best results will usually be obtained with the condenser plate "all out," while for the largest coil the plate should be nearly "all in" for most satisfactory results. This adjustment should be loose enough so that "dead-spots" in the tuning range, caused by antenna resonance, do not occupy more than five or ten degrees on the tuning scale.

This little receiver will pull in signals from all over the world without the slightest difficulty. Even the weakest foreign stations can be pulled in with perfect clarity, under fair receiving conditions, as there is practically no back-ground noise from the receiver itself. Anyone building this set will surely be surprised at the volume it will produce. There are no tricks in tuning the 19 Twinplex; the regeneration control operates very smoothly and causes only an inappreciable detuning effect. As in all short-wave receivers, extreme care must be exercised in operating, otherwise a great number of the weaker stations will be passed up. *So Tune S-l-o-w-l-y!*

PLUG-IN COIL DATA

Meters Wave-length	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch	19 T. No. 30 En. Close Wound (CW)	⅛"
80-40	23 T. No. 28 En. Wound 16 T. per inch	11 T. No. 30 En. C. W.	⅛"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	⅛"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	⅛"

Coil form—2⅜" long by 1¼" dia. 4-pin base.



Duo R.F.

Here's a dandy 4-tube receiver which tests have repeatedly shown to be a smooth-working job. It employs a 58 untuned R.F., a 58 tuned R.F., a 58 detector and a 27 audio stage. It makes a very reliable and powerful headphone receiver and under fair conditions it will work a loud speaker nicely.

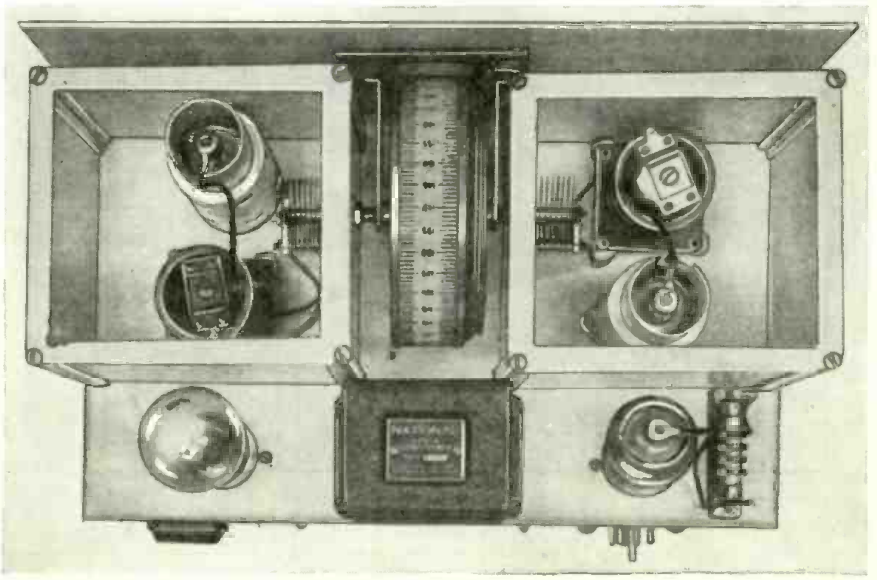
● THIS receiver is a good one for the fellow who now possesses a detector and one or two steps of audio and who does not feel that a superhet could be afforded but believes improvement necessary.

A receiver of this type has several advantages and also unfortunately, disadvantages, one seemingly always the shadow of the other. An R.F. stage frees the detector from antenna load, compatriots from reradiation, ourselves from that lack of sensitivity which cramps on weak stations, and adds selectivity. An R.F. stage, however, aggravates the already lamentable tendency to the blocking and pulling of regenerative detectors on strong signals. If handled correctly though, this liability can be turned into a left-handed asset. The answer is cathode bias control on the R.F. to regulate the volume or amplification of this stage. Previously if R.F. was added, the antenna needs have been pared which increased the noise to signal ratio in eliminating blocking as the R.F. stage working wide open and introducing tube noise was substituted for the length of wire cut off to bring the signal level up to the previous given level. Now this blocking on the strong stations with a large antenna on the R.F. receiver can be done away with by a twist of the wrist, not paring the antenna and still retain the ability to ferret out the weak fellows when needed with less tube noise and trouble than if the antenna was changed from short to long.

The receiver consists of a 58 untuned R.F. with choke coil input, a 58 tuned R.F., 58 detector, and a 27 audio stage. The tuned R.F. and detector stages are mounted in a pair of 5x5x5 shield cans one each side of the drum dial with the untuned R.F. and audio on the platform in back of the cans. (Left to right looking from front.) The aluminum sub-base was bent by scoring the aluminum deeply on both sides and then bending. It is important that the shafts of the two midget tuning condensers be in line for easy turning of the dial. The shield cans should be mounted so when the condensers are in place the shafts will not fall short of the dial set screws. When the cans and the dial are mounted remove one can and insert a piece of shaft with a rough end in the dial so the rough end comes into contact with the side of the can on which the condenser is to be mounted; then clamp the shaft with the set-screws and rotate the dial; the rough end then marking the place to drill the side for the condenser. The hole for the other condenser in the side of the other can can be done in the same fashion. It was found that whether the tops were on the cans or not, it made no difference in the results, so squares were cut out of each top, leaving a small margin all around to hold each can together. This facilitates quick coil changing. The panel and subpanel were given a bath in lye solution for about 15 minutes to acquire a heavy silver finish to match the cans. The tube holes in the subpanel were made by drilling a circle of small holes and using a one-half inch diameter circular file to finish off. The R.F. leads below the subpanel are not shielded and the 58 untuned R.F. stage did not seem to need shielding, even though the 58 has no screen shield over the plate.

The padding condensers for R.F. and detector stages and grid leak and grid condensers for the detector are mounted in the coil forms. The coils should be made as nearly alike as possible, the more similar, the better the set will gang. The secondaries are wound the full length of the form and the tickler is wound in a slot filed around the bottom of the form. It is really no difficult job to make fine looking coils. It will probably require one or two attempts in winding pairs of secondaries to get the right spacing. Seemingly the most desirable way of winding the coils is to hold the form in the left hand and feed the wire with the right hand, the spool in the right hand.

A .5 mf. paper condenser can be connected across the volume control if it is noisy and a 56 could be used in the



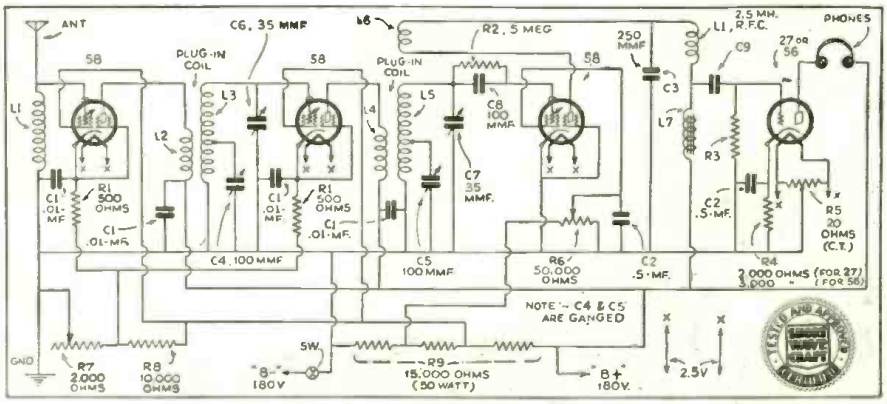
Top view of Mr. Kahlert's Duo R.F. 4-Tube Receiver.

Four Tube Receiver

By E. KAHLERT

audio stage with slightly more gain if desired. A tone addict only would change the cathode bias resistance. Resistance coupling could also be used between the detector and audio tube but the impedance gives much higher gain.

The choke coil in the grid circuit of the untuned stage is held by an old grid-leak mounting, salvaged from the junk box. This special choke is not necessary and a resistor or home-made choke could be used. A choke is preferable, however, as with one there is less liability of B.C.L. station interference than with a resistor. This set has proven entirely free from B.C.L. interference.



Schematic wiring diagram for the 4-tube receiver employing two stages of R.F.

The set is rather simple to adjust and not at all complicated. Move the slider on the voltage divider to about 3,500 ohms from the negative (around 45 volts if a 180 volt supply is used) and vary the voltage on the detector screen with the slider till it oscillates OK within the range of the volume control. The R.F. stages' screen voltage tap should be moved to about 90 volts—that is around the center of the divider. The positions of these sliders depend on the total voltage used. Of course if batteries are used for plate supply one does not want a voltage divider wasting battery power so this would be omitted and the proper voltages brought directly from the batteries. It will be necessary to have a switch on the regeneration control also to prevent current from flowing when the set is turned off, but a better arrangement than a switch would be to use a 100,000 ohm variable resistor in series with the screen and the 45-volt battery tap.

The padding condenser on the detector is used to place the band within the dial range and the one on the R.F. stage to resonate the R.F. stage with the detector when the band is placed. No trouble was experienced with this set except a tendency for the detector to oscillate rather violently with a not-too-large movement of the regeneration control from the edge of regeneration to more screen voltage. This very probably is due to the lumping of the resistance in the control. A straight resistance curve here would be preferable as are wire-wound controls. It should be mentioned here that all parts used should be tested before wiring them into any receiver as even new parts are sometimes defective. A very well filtered power supply is of course necessary with this receiver.

The receiver has performed very satisfactorily for the past eight months on the amateur bands.

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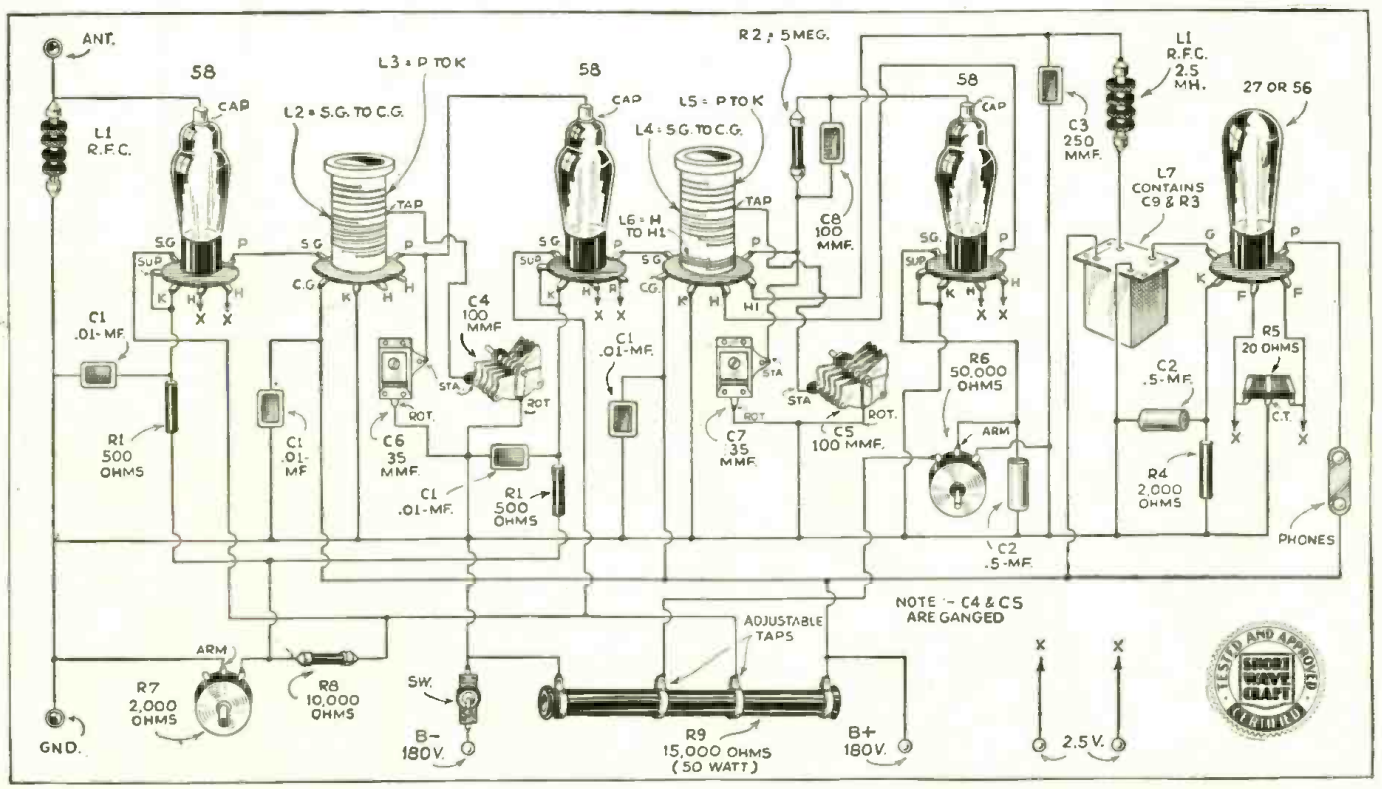
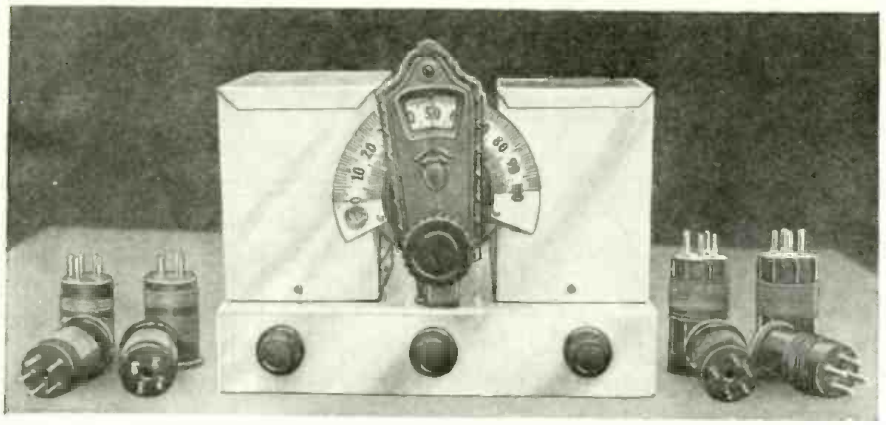


It's a "cinch" to build this dandy 4-Tube Receiver, with its exceptionally high sensitivity for weak or distant signals, by following the picture diagram presented above. The tuning of the set is simple and it will undoubtedly make many friends.



A number of valuable new points in short-wave receiver construction are incorporated in Mr. Malsberger's 5-tube job here presented.

5 tubes are capable of giving a good account of themselves—if they are used in the right circuit, and providing the proper type tubes are selected. Mr. Malsberger, who has the facilities for making hundreds of tests on receiver and other circuits, gives us the benefit of his extensive research on this 5-tube receiver. He has attained a high degree of stability in this set, which is one of the most important features.

An ADVANCED 5-Tube Receiver

By CURTIS E. MALSBERGER

● MODERN short-wave listeners are rapidly tiring of exercising such extreme patience as is frequently required today in tuning for foreign S.W. stations. They are demanding a short-wave receiver that will provide practically the same ease of operation and high degree of stability as that found in our present "broadcast" band receivers.

To meet this demand the writer has developed a five-tube receiver that does provide extremely satisfactory reception at short wavelengths. The *sensitivity* and *gain* of this receiver is such that adequate loud-speaker reception is possible on any short-wave signal whose strength is above that of the static level at the point of reception.

Experiments conducted with this receiver showed that such stations as EAQ, I2RO, DJD, GBS, and many others, were receivable with sufficient strength as to completely overload the 2A5 output tube. This, apparently, would call for a push-pull arrangement in the output stage, however, due to the fact that a single 2A5 tube is capable of delivering 3 watts of undistorted output, a push-pull arrangement was considered unnecessary in the interest of simplicity and economy.

High Stability Attained

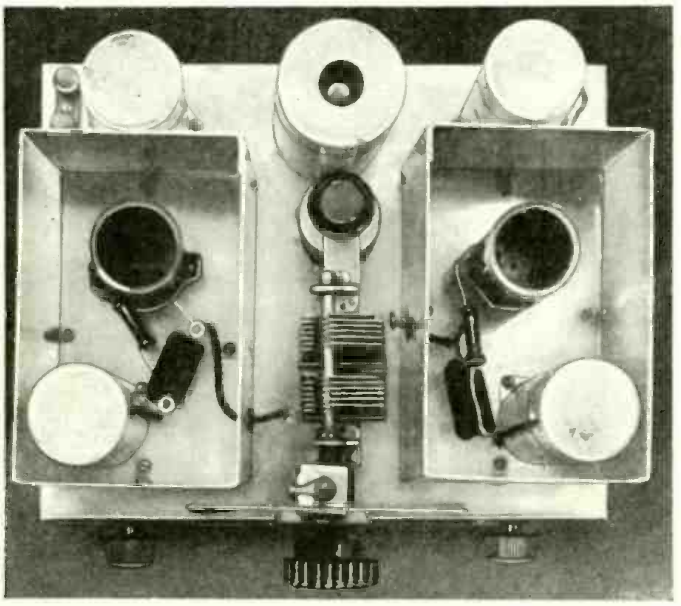
The stability of the receiver has been advanced to a point where it is possible to tune-in the very weak stations by means of the "zero-beat" method, i.e., with the regeneration control advanced slightly beyond the point of *oscillation*, and held thus without fear of "pulling out" of resonance. This is the final proof of stability and is the result of careful circuit design throughout the entire receiver and power supply.

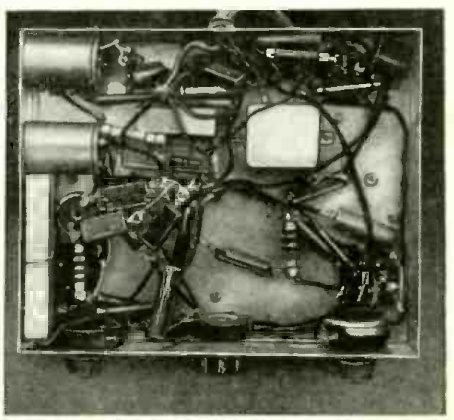
During the course of the preliminary experiments many interesting problems developed, and a point that was particularly noticeable was that a considerable portion of the so-called *fading* effects and erratic behavior of short-wave signals is due more to the instability of the receiver itself than to the peculiarities affecting the transmitted signals in their course through the ether lanes. In proof of this point the writer employed four different short-wave receivers tuned to the same station, at the same time, and it was surprising to note how the volume of one set would drop off, while that of another would hold at constant level, or even, in some instances, increase noticeably.

Cause of Erratic Behavior in Some Sets

Further experiments definitely established the fact that the greatest single cause of this erratic behavior lies in the poor regulation of the power supply. It was found that under these conditions the voltages actually applied to the various elements of the tubes, particularly in the R.F. and Det. stages, varied considerably from time to time, coinciding almost exactly with the fading of signals. What really happened in the receivers was that this varying voltage, due to its effects upon the tube constants, caused a changing load value across the tuning circuits, with the result that considerable frequency-creepage, or *detuning* took place.

There are several causes for this varying voltage in the power-supply and receiver, but space does not permit





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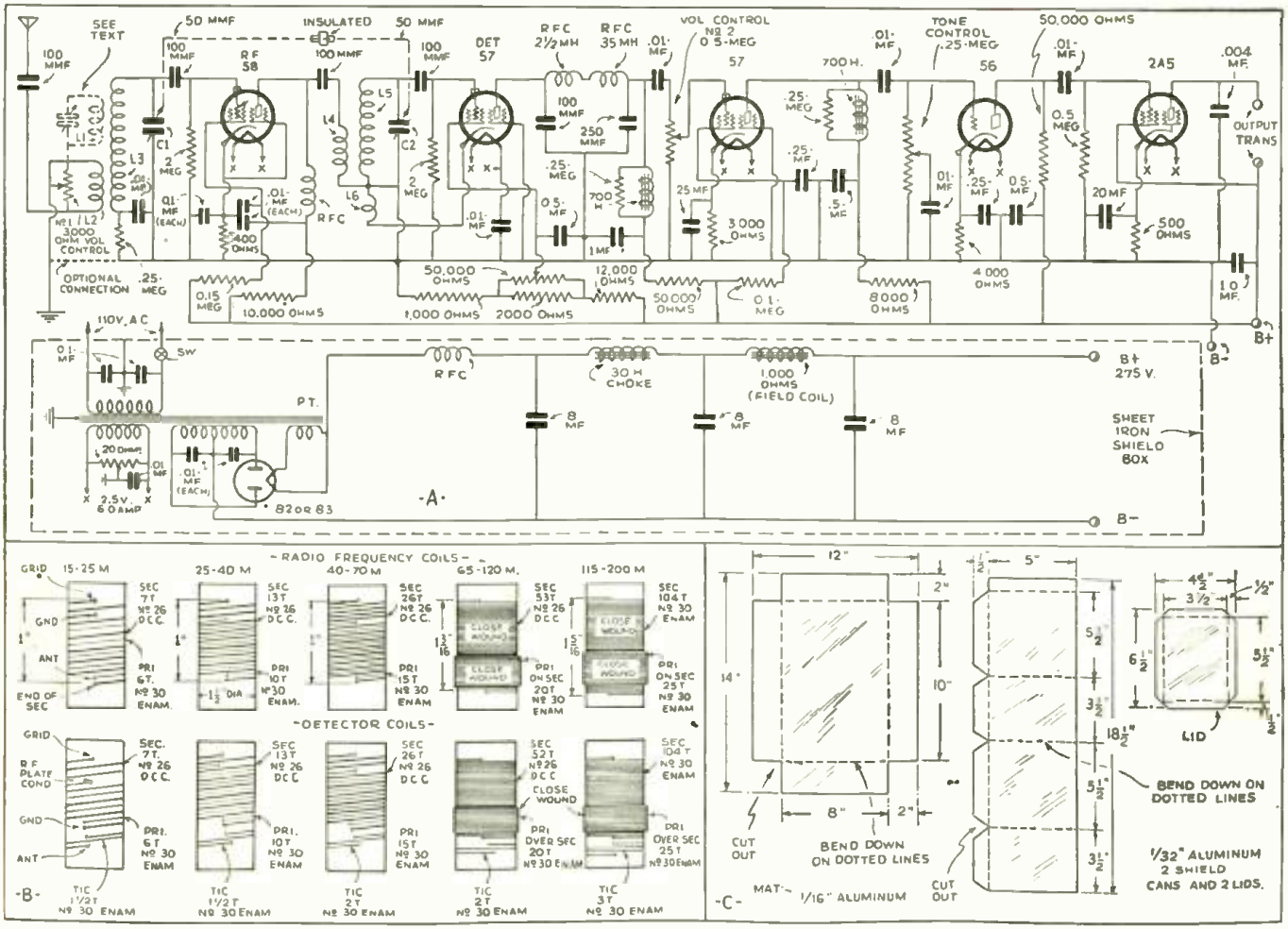
Left — Looking down on Mr. Malsberger's 5-tube SW receiver. The shielding of the various tubes and coils has been carefully worked out by the designer, and particular care and research given to the form of circuit used. Right — A bottom view of the 5-tube short-wave receiver.



Coil data and scheme of connections for the "Advanced" 5-Tube Receiver.

a detailed explanation at this time and it must suffice to say that this trouble can be largely overcome by designing a power-supply capable of really good regulation, and by suitable circuit arrangement whereby the tuning circuits will be working into a practically constant load. This is discussed in detail later.

As will be seen in the diagram (Fig. 1) the receiver consists of a stage of tuned R.F. and an electron-coupled regenerative detector, followed by a 3-stage, "high-gain" audio amplifier that delivers tremendous volume and excellent tonal qualities. The circuit diagram is self-explanatory; however, there are several interesting points worthy of a detailed discussion and these shall be taken up in proper order.

Due to the careful filtering employed, the exact layout of parts, as shown in the photographs, need not be followed. However, the plan shown is particularly advantageous in that it allows for perfect symmetry with simplicity of construction and very short interconnecting leads, an important consideration in any short-wave receiver.

Tuning Circuit Isolated from Tubes

Perhaps the first point that will strike the reader's eye upon examination of the diagram is the unusual arrangement in the R.F. and detector circuits. It will be noticed that the tuning circuits in both these stages are completely isolated from the tubes themselves by the .0001 mf. condensers and the 2 megohm resistors in the grid circuits. This arrangement was adopted in order to provide some assurance that the tuned circuits would be working into high impedance loads of constant value. This procedure results in greatly increased stability, and also provided a means whereby greater accuracy of *tracking* could be accomplished between the two tuned circuits.

The 0.25 megohm resistor and the 0.01 mf. condenser at the low potential end of the R.F. coil (L3) performs the double duty of further isolating this tuned circuit and prevents interlocking of the two circuits.

This circuit isolation was even carried into the plate circuit of the R.F. tube where it will be seen that the plate voltage is applied through the radio frequency choke, R.F.C., instead of the more usual primary coil. A choke of low distributed capacity must be used here, otherwise there will be considerable loss of efficiency at this point. In order to prevent the leakage that usually occurs when a coupling condenser is connected from the R.F. plate to the detector grid circuit, a separate primary (L4) was added to detector coil, and the coupling condenser connected as shown.

Resistance-capacity filters are employed in both the S.G. and plate B plus return leads of the R.F. tube, thus completely isolating this R.F. circuit from the balance of the receiver. Such complete filtering may seem unnecessary; however, the final success of the completed receiver more than warrants the care taken here.

Regeneration Control

The detector system employs the highly stable and effective electron coupling method of regeneration. Under this method the tickler, consisting only of from 1 to 3 turns, is connected in the cathode circuit of the 57 type detector tube. This tickler coil is placed at the low potential end of the coil L5, and *is wound in the opposite direction of this winding*. This is very important, otherwise regeneration cannot take place. Actually the regeneration is controlled by varying the screen-grid voltage applied to this tube, and a very smooth-acting and satisfactory control is afforded if the 50,000 ohm potentiometer is connected across only that portion of the bleeder resistance as shown in the diagram.

Two R.F. chokes are shown in the detector plate circuit, the first is a 2½ M.H. choke (National No. 100) and is bypassed by a condenser of low value (.0001 Mf.) in order to prevent cut-off of the high audio frequencies. The second choke has a value of 85 M.H. and is included to further aid in preventing any R.F. energy from entering the audio portion of the receiver where it would cause instability.

The high impedance chokes used in the detector and 1st audio plate circuits have a value of 700 henries. However, audio transformers, with pri-

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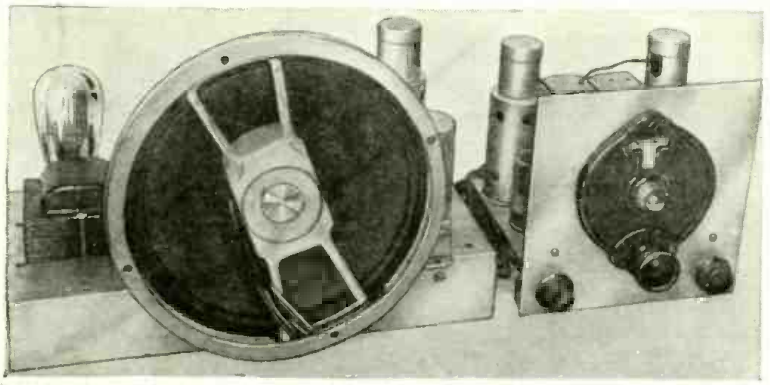


General appearance of the beat oscillator, audio amplifier, and power supply unit, at left; original "2-Tube Superhet" unit at the right.

2-TUBE SUPER-HET— How To Add Beat Oscillator, Amplifier And Power Supply

By HAROLD MITCHELL

There have been many requests for a description of a beat oscillator, audio amplifier, and power supply unit to go with the "2-Tube Superhet" described in the December issue—here it is!

● THE two tube super as originally designed is not the type of set the "Ham" would use as a station receiver; therefore, we set about building a beat frequency oscillator amplifier and power supply to meet the requirements of said "Ham". The finished job more than met with the approval of a very critical "Ham".

Taking as a criterion, the foreign broadcast station "GSB" at Daventry, was received with volume loud enough to be uncomfortable in a large room. On C.W. reception the beat oscillator proved itself of real value, even weak stations would come through with a very distinct note.

To begin the construction of this unit it is first necessary to procure a small metal chassis of the kind used in the manufacture of midget receivers. Get one with enough socket holes for the four tubes and the oscillator coil. (See footnote and drawing, Fig. 1, for constructional details.) Mount all the sockets and the oscillator coil on the chassis. Then mount the 6.3 volt filament transformer, on the under side. Next mount the power transformer, then fasten the two 8 mf. electrolytic condensers on the bottom. A terminal strip is made from a piece of ¼ inch hard rubber, one inch wide and long enough to reach across one side of the chassis. Six binding posts are mounted on the strip. See Fig. 3 for layout. The switch for the beat oscillator "B" voltage is mounted on the back of the chassis in this case as there happened to be a very convenient mounting hole.

Begin the wiring with the conventional-filament first-rule.

The 2½ volt winding on the power transformer supplies heater voltage to the 56 and the 2A5.

The 6.3 volt filament transformer takes care of the 6A7—6F7 and the 6C6. This circuit goes, first to the 6C6 and then to the terminal strip to supply the set. The center taps on both filament windings are grounded to chassis.

The 80 is next wired in on the power transformer. The center tap of the high voltage is not grounded, but instead goes to the speaker field which is used as the choke in the filter circuit. The other end of the speaker field goes to ground and the top to the resistors in the grid circuit of the 2A5. Ground the cathode of the 2A5 as a cathode resistor is not necessary, the tube getting its bias through the 400 ohm section of the speaker field.

Run the B+ wire to the terminal strip and also to the beat oscillator switch. The other end of the switch goes to the R.F. choke in the plate lead of the 6C6.

The screen grid voltage is also taken off at this point through a 150,000 ohm resistor.

A wire is next run to the terminal strip from the plate of the 6C6. If this lead is more than two or three inches long, shielding becomes a necessity.

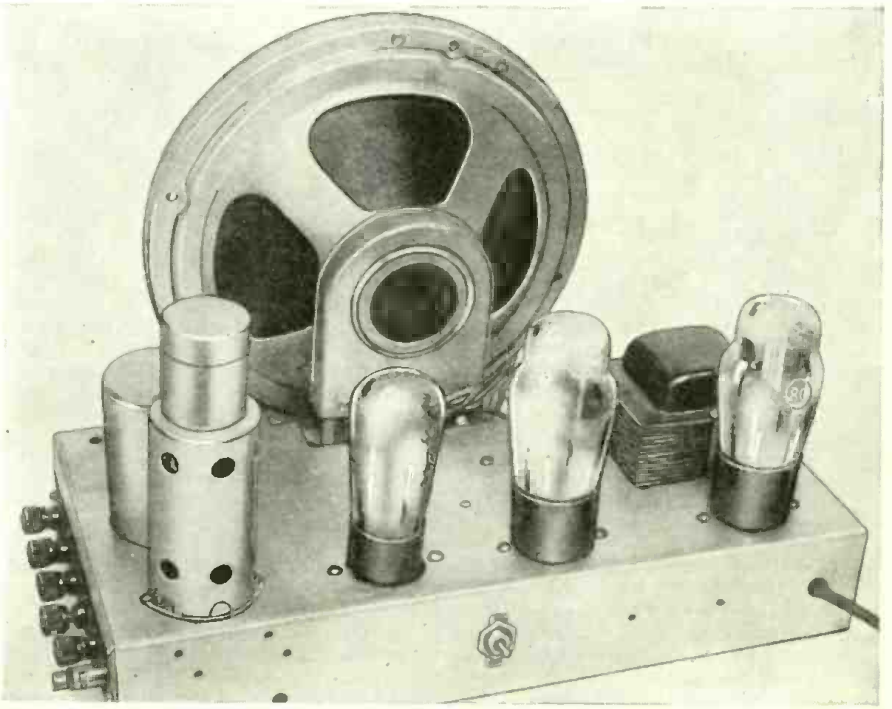
The suppressor grid and cathode tie together and connect to the top on the coil.

Check all circuits carefully and then place tubes in their respective sockets and connect the unit to the set.

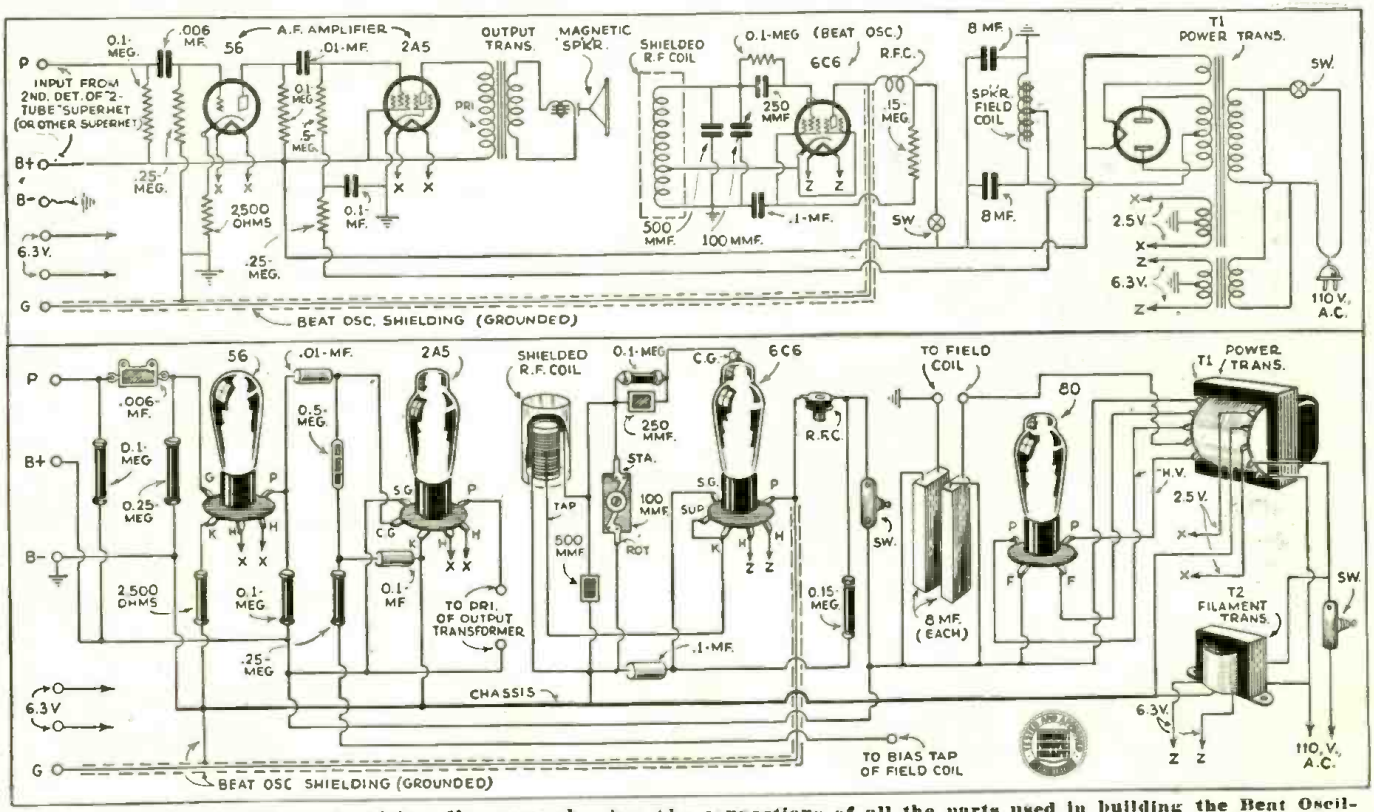
A cable can be used for all wires except the shielded lead to the coupling condenser on the grid of the second detector. This coupling condenser consists merely of two short pieces of hook-up wire twisted together, very loosely, for about two turns. (See sketch, Fig. 2.) The coupling lead is a shielded cable and the shield is grounded at both ends.

Now turn on the set and proceed with the various adjustments. Turn on the beat oscillator and tune the variable condenser until a rushing sound is heard in the speaker. Then tune for a

(*Continued on page* 702)



Top view of the beat oscillator, audio amplifier and power supply unit.



Picture, as well as schematic wiring diagrams, showing the connections of all the parts used in building the Beat Oscillator, Audio Amplifier, and Power Supply Unit here described by Mr. Mitchell, and designed for use with the "2-Tube Superhet" described in the December issue.

The 1934 "PAL" 2-Tube Portable

By H. G. CISIN, M. E.

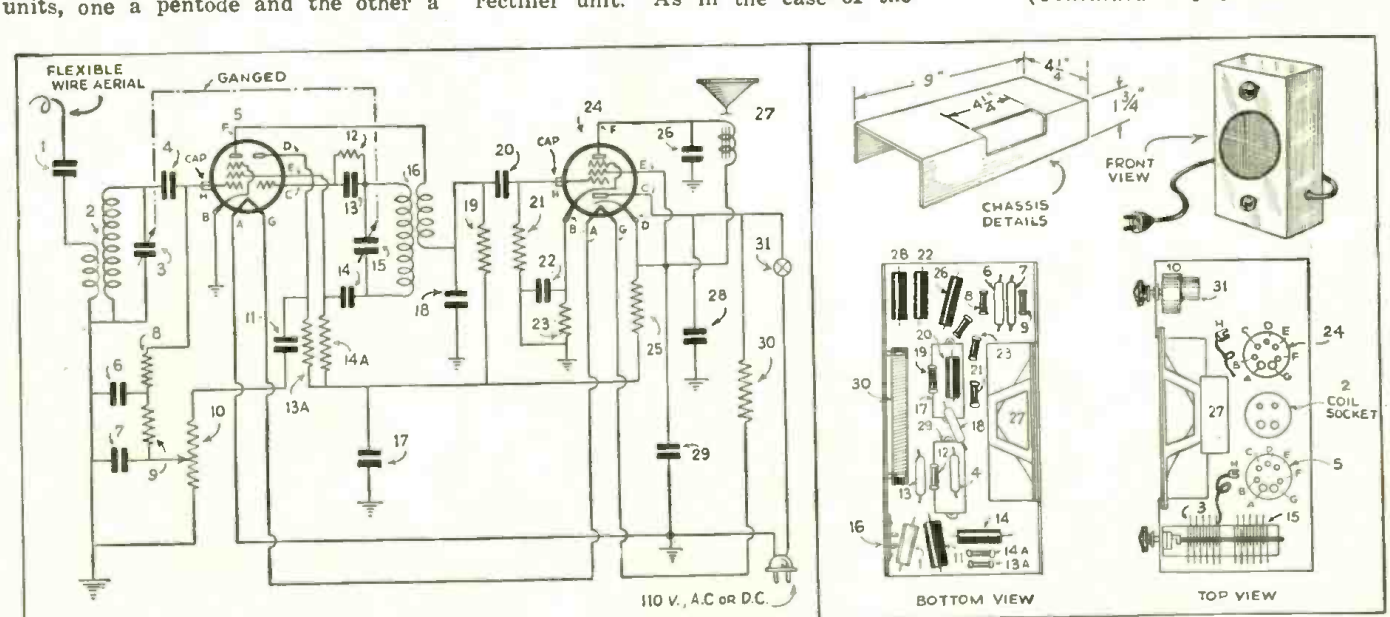
● USING only two tubes to obtain loud speaker operation, the new "Pal" Portable represents a distinct innovation in receiver design. In this set, the trend towards compactness and simplification has been followed to its logical conclusion. Each one of the tubes used, possesses the ability to perform several different functions.

The 6F7 tube consists of two separate units, one a pentode and the other a triode. The pentode unit serves as the first r.f. tube, while the triode unit is used as the detector. By means of a reflex circuit, the pentode unit is again utilized—this time as a first audio tube.

The 12A7 tube combines the functions of a power output pentode and a rectifier unit. As in the case of the 6F7 tube, the two units are both mounted within the same envelope. There is a separate 6.3 volt heater for each unit, the heaters being connected in series internally. Hence, this tube has a rated heater voltage of 12.6 volts.

It can thus be seen that these two tubes are made to perform the same functions which would ordinarily call for the use of five separate tubes.

(*Continued on page* 685)



Constructional details including wiring diagram for building the 1934 2-Tube "Pal" Portable—a pocket-sized set designed to operate on 110 volt A.C. or D.C. circuits.

This 3-tube receiver is to be operated from a 110 volt A.C. circuit. A 58 tube is used as a detector as it is very reliable for this purpose. The detector output is fed into a 56 audio amplifier. The third tube is a rectifier. Plug-in coils are used to change the wave bands.

Left—Appearance of the 3-Tube A.C. Operated Short-Wave Receiver, here described. Before a short-wave fan has hauled in many transoceanic stations, he will find that he has considerable use for a globe like that shown in the picture.

3-Tube A. C. SHORT-WAVE RECEIVER

By HERMAN COSMAN*

● THE receiver shown in the photograph is an effort on the part of the writer to present a receiver using a time-tried circuit, together with all the conveniences of the built-in power supply and being enclosed in a neat, attractive dust-proof cabinet.

It has long been the desire of many short-wave fans to build a receiver, which can be housed in some sort of a cabinet to present a neat appearance, and to do away with the cumbersome external power supply unit which usually was kicked about the operating table and in most cases occupying valuable space.

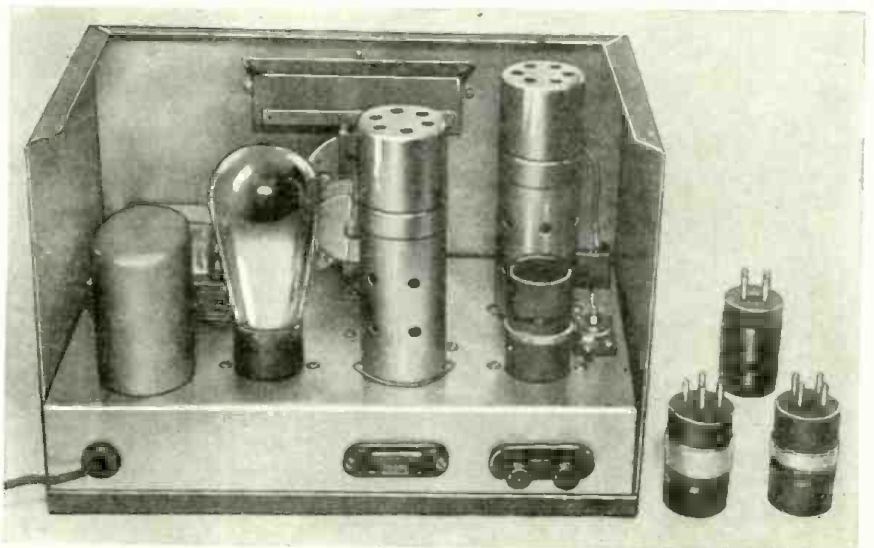
58 Detector Used

A type 58 is used as detector in a conventional circuit utilizing standard plug-in coils. It will be noticed that in the detector circuit, the plate voltage does not flow directly through the tickler winding. The method of regeneration control used in this detector was introduced so far as the writer can recall in the famous Reinartz circuit. The main advantage of this arrangement is that one does not have to be fussy about the number of tickler turns as the regeneration depends entirely upon the capacity of the regeneration control condenser which has a value of 140 mmf. This method of regeneration control cannot be used successfully without an R.F. choke as shown in the diagram. If this R.F. choke was left out, very unsatisfactory results would be experienced. The output of the 58 detector tube is resistance and capacitively coupled to the 56 audio amplifier. A 250,000 ohm resistor is used to supply the plate load for the 58 detector tube. An 800 henry audio choke could be used in place of this resistor with a slight increase in volume. However, this would necessitate a considerable expenditure over the cost of an ordinary 1 watt resistor and was omitted for this reason. The screen voltage of the 58 detector tube is obtained by using a 207,500 ohm voltage divider which consists of one 7,500 and one 200,000 ohm 1 watt carbon resistors connected in series. One side of the 7,500 ohm resistor is connected to the "B" negative and one side of the 200,000 ohm resistor is connected to the "B" positive with a tap between the two resistors being connected to the screen.

This gives the proper screen voltage which provides very smooth regeneration control and very good sensitivity. The point at which these resistors are connected to the screen should be bypassed through a .1 mf. fixed condenser to ground.

Automatic bias is obtained in the audio stage of the 56 tube with a 2,500 ohm 1 watt resistor. In order that there will not be a loss in audio frequency response, this resistor should be by-passed with ½ or a 1 mf. condenser. The power supply portion of the receiver utilizes power transformer having 250 volts each side of the high voltage secondary, one 2½ volt winding for the 58 and 56 tubes, and one 5 volt winding for the type 80 rectifier. The output of the rectified tube is filtered with a single-section filter system consisting of one choke and 8 mf. electrolytic condenser connected on either side. This filter system, while not the most elaborate that can be incorporated in this receiver, provides a minimum of back-ground noise caused by hum.

Looking at the photograph of the chassis, you will find from right to left are mounted, on top of the chassis, the power transformer and filter choke,



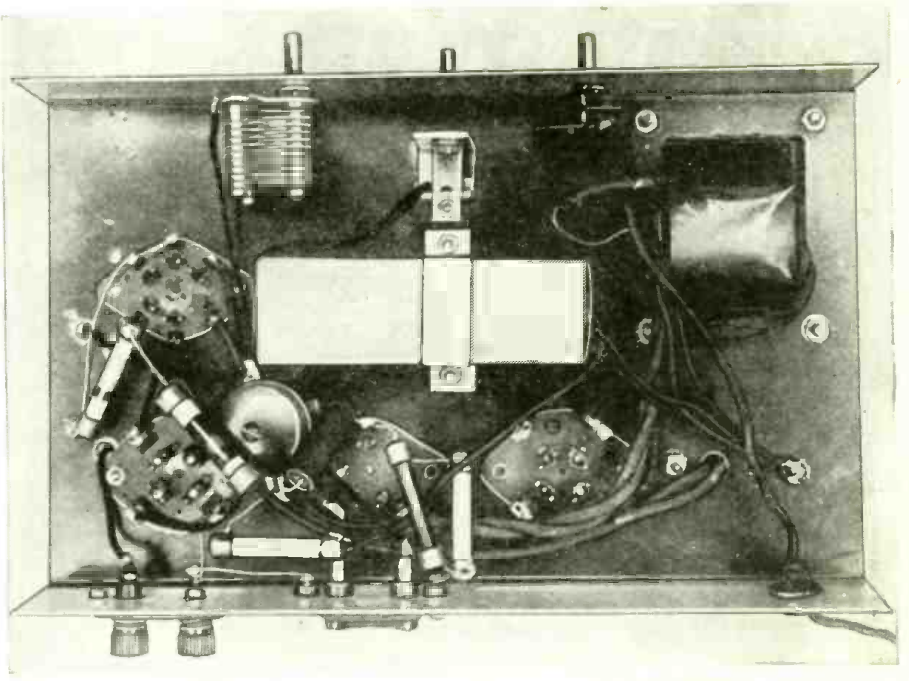
A peek at that 3-Tube A.C. Short-Wave Receiver from the rear—showing the fine "prof" appearance of the set.

* Trymo Radio.

next is the 280 rectifier tube followed by 56 which is shielded. The 58 detector tube is mounted on the extreme left of the chassis directly in front of the plug-in coil. The antenna coupling condenser is mounted as close to the coil as possible in order to maintain a very short lead. All resistors, together with by-pass condensers and filter condensers, regeneration control condenser and 110 volt power switch are mounted underneath the chassis which measures 11"x6½"x2¼".

Tuning the Receiver

Tuning this receiver is about as simple as is possible to obtain in any short-wave receiver. There are only two main controls, one for selecting the station, and one for controlling regeneration. The antenna trimming condenser should be turned to minimum capacity as a starter. Then, turn the regeneration control until oscillation is indicated by a slight rushing sound in the phones. We are now ready to cover the short-wave spectrum. Turn the central tuning dial until the characteristic whistles of short-wave stations are heard, select one of these and adjust the regeneration control until the station is brought in at full volume. By trial the proper adjustment for the antenna condenser will be found and this should prove satisfactory for any given coil. In many cases it is necessary to readjust the antenna, trimming condenser when the coils are changed. This is because of an absorption effect caused by the antenna at different frequencies.

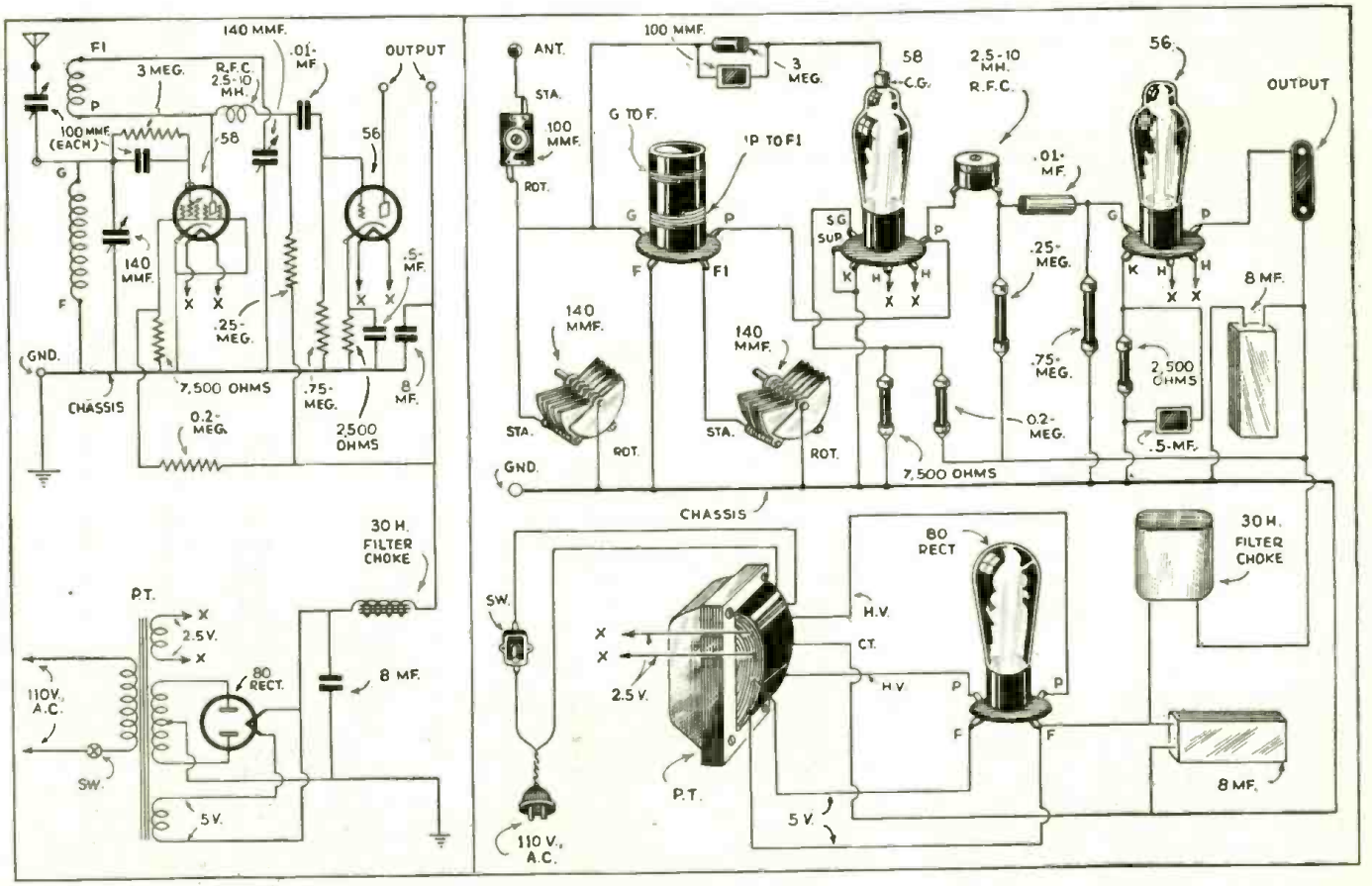


—And here's a bottom view of the 3-Tube A.C. Receiver.

List of Parts

1 Black crackled shield can (Try-Mo).
1 Drilled silver-finished metal base (Try-Mo).
1 Full-vision vernier slow-motion tuning dial.
2 Variable .00014 mf. condensers (Hammarlund).
1 A.C. on-off switch.
3 Knobs.
1 Electrostatically shielded power trans

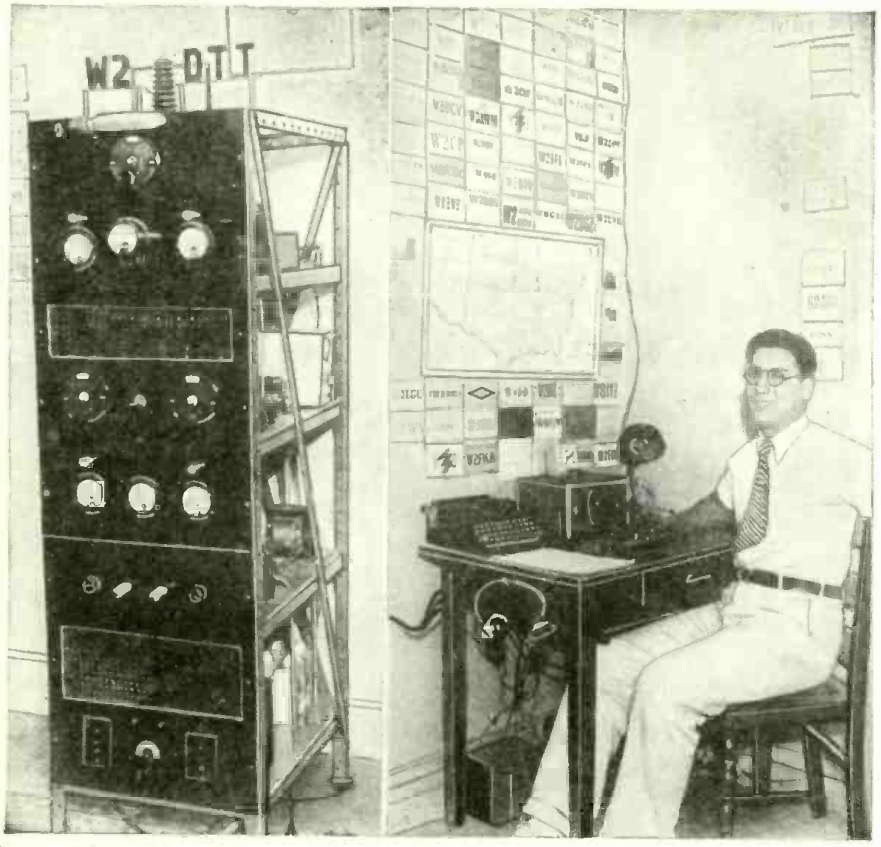
(*Continued on page* 681)



Complete schematic and picture wiring diagram, enabling anyone to build the 3-Tube Short-Wave Receiver here described. It operates on your 110 volt A.C. lighting system—no batteries required and it will haul in the "foreign" stations like nobody's business.

A 250 Watt Crystal-Control

By ALVIN ABRAMS, W2DTT



The complete 250 watt crystal-controlled transmitter owned and operated by Alvin Abrams in New York City under the licensed call of W2DTT. Mr. Abrams is observed seated at his operating desk, together with a small part of the great number of QSL cards he has received from all parts of the world.

● THIS particular transmitter is suited to the more advanced amateur, who has had much experience with smaller transmitters, and who wishes to build a permanent, high-powered job that he can be proud of. It has been designed for 20 and 40 meters, since most DX can be worked on these bands. However, if the builder wishes to QSO on 80 meters, the frequency can be shifted without much loss of time and trouble. Although my set has been built on an all metal chassis, a wooden frame can be substituted, since shielding is not absolutely necessary in a crystal-controlled transmitter.

The 700 Volt Power Supply

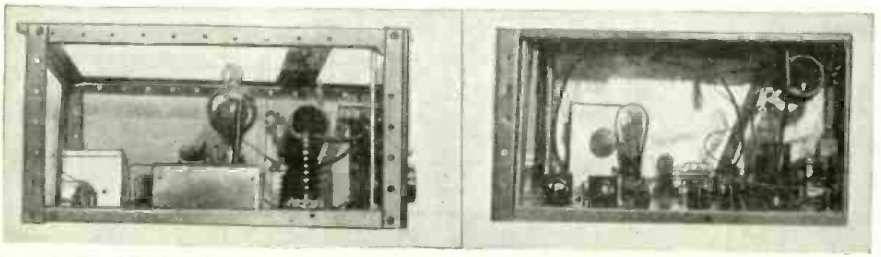
The first division to construct is the 700 volt power supply. Upon examining the circuit you will notice that I have used condenser input from the rectifier, whereas choke input is conventional with a mercury vapor rectifier. However, since the peak load is only 450 mills (milliamperes), you can see that the tube is operating well within its capacity. The benefit derived from this system is that the voltage is increased from 550 volts to 700 volts.

When the circuit is completed, test it by momentarily turning on the current. Then take an insulated screwdriver, or any piece of metal, and short-circuit the condenser terminals. If a brilliant spark and loud flash results, the circuit is functioning satisfactorily.

247 Crystal Oscillator

The next stage to build is the 247 crystal oscillator. This tube was selected because it gives a high output, and keeps the crystal cool. The crystal should have a fundamental frequency of from 3,500 to 3,600 kilocycles for operation in the 7,000 and 14,000 KC bands, and should preferably be an "X" cut, as they are the strongest. One point to keep in mind is that an unclean or soiled crystal will not oscillate, and if you have handled it, wash it with Carbona (carbon-tetra chloride).

The oscillator usually works without much trouble, but should it fail to work, have a radio friend check over the connections, since we seldom find our own mistakes. The normal plate current is usually about 30 mills (M. A.) under load.



The photos above show two rear panel "shots" of Mr. Abrams' transmitter, and gives some idea of his neat workmanship.

The Doubler—Details

Following this stage is the *doubler*, which amplifies the second harmonic of the oscillator, and consequently doubles the original generated frequency. Variable resistors are used for the screen voltage and the grid bias, because a much more accurate adjustment can be made in this way. No. 22 wire is used, and is large enough, because there is only a small amount of radio frequency in the coils. The hook-up is simple and should not cause any trouble, but if the plate of the tube overheats, decrease the plate voltage. Be sure to have a large amount of grid bias. This stage does not have to be neutralized because it operates on a different frequency, and hence cannot oscillate by itself. The doubler is very inefficient at its best, and some other means of increasing the excitation for the final amplifier is necessary.

How the "Buffer" Works

Therefore the *buffer* is added, which is a sort of intermediate amplifier. It operates on the same frequency as the doubler, and requires neutralization. When it has been completely wired, making sure that all plate and excitation leads are as short as possible, it is ready for tuning up.

Neutralizing

Attach the B+ clip about 10 turns from the rotor end of the coil, and then detach the B+ lead from the power supply. Place a flash-light bulb indicator near the doubler tank, and turn on the voltage. The lamp should then light, indicating that the oscillator and doubler are functioning properly. Then slowly turn the buffer tank condenser; as this is done, the bulb will grow dim. Tune the neutralizing condenser so that the original brilliance is returned. Repeat this procedure, tuning the buffer tank until the bulb goes out, and then tune the neutralizing condenser until it returns, until tuning the buffer has absolutely no effect on the doubler. This will be indicated by a continual glow, with no flickering when the buffer is tuned. It is now perfectly neutralized. If, however, it does not neutralize, move the B+ clip forwards or backwards, one turn at a time. The B+ lead may now be reattached to the power supply, and the condenser tuned to resonance. A little practice will make one adept in this matter in a short time.

3,000 Volt Power Supply

Everything is now constructed, except the 3,000 volt power supply, and the final stage. Assemble the power supply with the idea in mind that you have a huge lion that needs hundreds of ropes to keep him still. This of

Transmitter

Mr. Abrams describes clearly the circuits used in his first-class "ham" transmitter, W2DTT. This station has "worked" other ham stations in various parts of the world and the ham who is interested in improving his station will do well to study Mr. Abrams' article carefully. There is no reason why a first-class transmitter, such as Mr. Abrams' cannot be built on the installment plan, buying the parts for each stage as the funds become available. Before you know it you will have a dandy transmitter completed and ready to go on the air.

course refers to the insulation of the high voltage. Use plenty of insulators, and keep the opposite poles of the current away from each other as far as possible—*and don't forget to keep away from it yourself!* A circuit-breaker is optional, but I recommend the use of it very heartily. It has saved my 860 from many overloads that would have "shot" the emission in a matter of split-seconds had there been no automatic protection available.

Use meters throughout the transmitter, preferably a milliammeter in all four stages. When the power supply has been finished, test it the same way as the 700 volts power supply, but do not leave the voltage on the filter condensers for more than a second or two, without any load on them!

Final Amplifier

The last thing to build is the final amplifier; this requires no particular care, except to be sure to keep all plate and grid leads as far away from each other as possible, because the screen-grid of the tube only takes care of the internal inter-electrode capacities, and has no effect on any external capacities which might exist. You will notice that I have used a very small amount of capacity, and a very large amount of inductance in the tuned circuits. This is done to increase the efficiency of the tube.

Be sure to have an efficient grid choke and a small excitation lead to the tube.

Hints on "Tuning Up"

When this stage has been hooked up, and is all ready to tune, decrease the plate voltage to about 1,000 volts, attach the excitation clip, and turn on the first 3 stages. Press the key and note what current the amplifier is drawing. It will probably be about 150 to 200 mills (M. A.). Then quickly turn the tank condenser until it comes into resonance with the *buffer* frequency. The current will then drop to about 10 mills (M. A.). Increase the excitation a bit; if the current drops still further, all the better. Try increasing the excitation until no reduction in plate current is noted. Now test the plate R. F. or "soup" as it is generally called. The spark should be about the same as a 210 with the same voltage. The full voltage may now be turned on, but first attach the antenna, so that the condenser will not arc over.

After building a transmitter of this sort, and having experience with it, I have 3 suggestions to offer in regard to the difficulties that might arise. Firstly, if any meter is placed near a concentrated R. F. field, it will soon burn out, necessitating its replacement.

Secondly, use only high quality parts, since replacements are costly and very annoying.

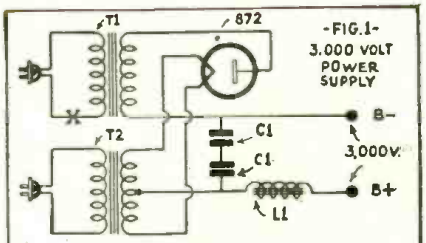
Thirdly, have a high insulation factor; if you can afford transformers with insulation ratings of 10,000 volts, so much the better, etc.

This set uses the same type of antenna as that described by Mr. Victor in the *September* issue of SHORT WAVE CRAFT. It is a Hertz antenna with a single-wire feed arrangement. It closely resembles the usual broadcast antenna, and is very simple to construct. A good idea when using a transmitting aerial is to keep it as far away from other aerials as possible, to reduce BCL's interference. It is best to use long poles for this purpose.

My antenna is cut to 66 feet, for op-

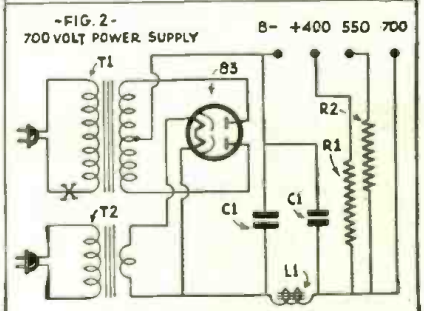
(Continued on page 682)

-FIG. 1- 3,000 VOLT POWER SUPPLY



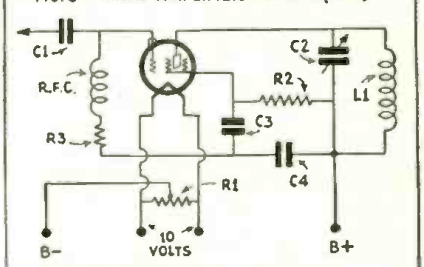
C1 = 8 MF. 1500 V. CONDS. HOOKED IN SERIES TO PROVIDE 4 MFS. AT 3,000 VOLTS.
L1 = 30 HENRY CHOKE. 150 MILLS.
T1 = 3,000 VOLTS, 150 MILLS.
T2 = 5 VOLTS, 10 AMPERES, 5,000 VOLTS. INSUL.
X = KEY IS INSERTED FOR KEYING FINAL STAGE.

-FIG. 2- 700 VOLT POWER SUPPLY



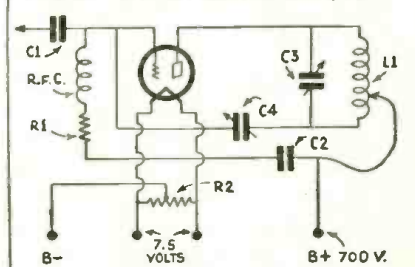
R1 = 10,000 OHMS, 50 WATTS.
R2 = 5,000 OHMS, 50 WATTS.
C1 = 2 MF., (1,000 WORKING.)
T1 = 1,400 V., CENTER TAPPED, 150 MILLS.
T2 = 5 V. FIL. TRANS. 1,000 V. INSULATION.
L1 = 30 HENRIES. 150 MILLS.
X = SWITCH TO TURN ON ALL THREE STAGES.

-FIG. 3- FINAL AMPLIFIER CIRCUIT (860)



R1 = 100 OHMS, CENTER TAPPED RESISTOR.
R2 = 100,000 OHMS, 100 WATTS.
R3 = 20,000 OHMS, 100 WATTS.
C1 = .001-MF., 1,000 VOLTS.
C2 = 70 MMF.
C3 = .01-MF., 1,000 VOLTS.
C4 = .002-MF. 3000 V., OR 2-.004-MF. CONDS. IN SERIES.
L1 = 25 TURNS OF 1/4" TUBING, 2 1/2" INSIDE DIA.
R.F.C. = RADIO FREQUENCY GRID CHOKE.

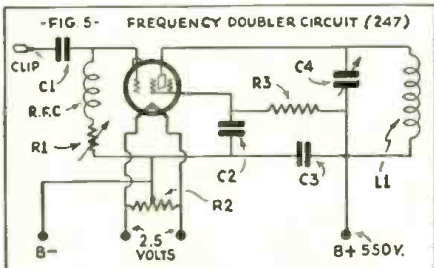
-FIG. 4- BUFFER AMPLIFIER CIRCUIT (210)



R1 = 10,000 OHMS, 25 WATTS.
R2 = 100 OHMS, CENTER TAPPED RESISTOR.
C1 = .001-MF. RATED 800 VOLTS.
C2 = .002-MF. RATED 900 VOLTS.
C3 = 70 MMF.
C4 = 35 MMF. (MIDGET, DOUBLE SPACED)
L1 = 25 TURNS 1/2" COPPER TUBING, 2 1/2" INSIDE DIA.
R.F.C. = RADIO FREQUENCY GRID CHOKE.

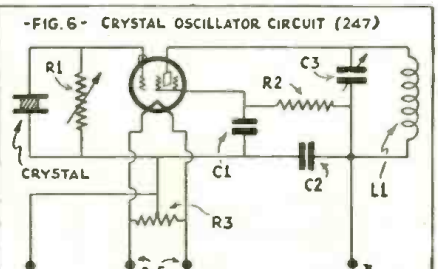
Diagrams above: 3,000 volt power supply; 700 volt power supply; final amplifier circuit using 860 tube; 210 buffer amplifier circuit.

-FIG. 5- FREQUENCY DOUBLER CIRCUIT (247)



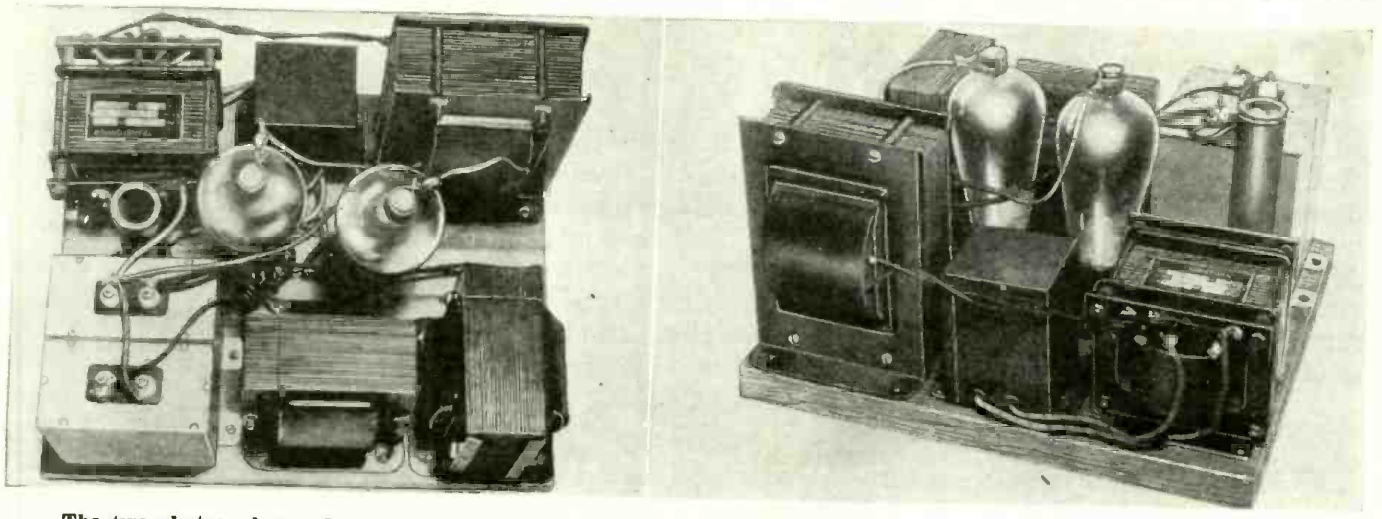
R1 = 50,000 OHMS VARIABLE, 5 WATTS.
R2 = 20 OHMS, CENTER TAPPED RESISTOR.
R3 = 50,000 OHMS VARIABLE, 5 WATTS.
C1 = .001-MF., 700 VOLTS.
C2 = .01-MF., 500 VOLTS.
C3 = .002-MF., 700 VOLTS.
C4 = .0001-MF.
L1 = 10 TURNS OF NO. 22 ON 2" FORM.
CLIP = ATTACH TO TANK OF OSCILLATOR, AND ADJUST FOR PROPER EXCITATION.

-FIG. 6- CRYSTAL OSCILLATOR CIRCUIT (247)



R1 = 20,000 OHMS VARIABLE, 5 WATTS.
R2 = 50,000 OHMS, 5 WATTS.
R3 = 20 OHMS, CENTER TAPPED RESISTOR.
C1 = .01-MF., RATED 500 VOLTS.
C2 = .002-MF. RATED 700 VOLTS.
C3 = 100 MMF., 23 PLATE MIDGET.
L1 = 30 TURNS OF NO. 22 ON 2" FORM.

Above—diagrams with values of condensers and resistors for the frequency doubler circuit and also the crystal oscillator circuit.



The two photos, above, show top and perspective views of the power supply.

Power Supply Unit

For the "Medium Power Transmitter"

By GEORGE W. SHUART, W2AMN

In the February issue there was described a practical, low-priced "Medium Power Transmitter" and, in the accompanying article, Mr. Shuart describes, in easily understood terms, just how to go about building yourself an excellent Power Supply Unit for operating the Transmitter. Two 866 mercury vapor tubes are used as rectifiers.

● THE power supply described in this article was especially constructed to operate the medium-power transmitter described in the February SHORT WAVE CRAFT.

Care was exercised in choosing the different parts for this power supply in order that it would have a good safety factor and be free from future maintenance trouble. Separate filament transformers are used for the power oscillator tubes and the 866 rectifiers. It is safe to say that the majority of poor quality notes to be heard on the various amateur bands are caused by inferior power supplies rather than poorly designed RF portions of the transmitters. One rule which should never be violated in transmitters using self-controlled oscillators is to use separate filament transformer for the oscillator filaments. In almost every case where a poor note is encountered and where it is impossible to obtain a pure D.C. signal, the use of a separate oscillator filament transformer will cure the trouble. If you are having trouble of this sort try a separate transformers.

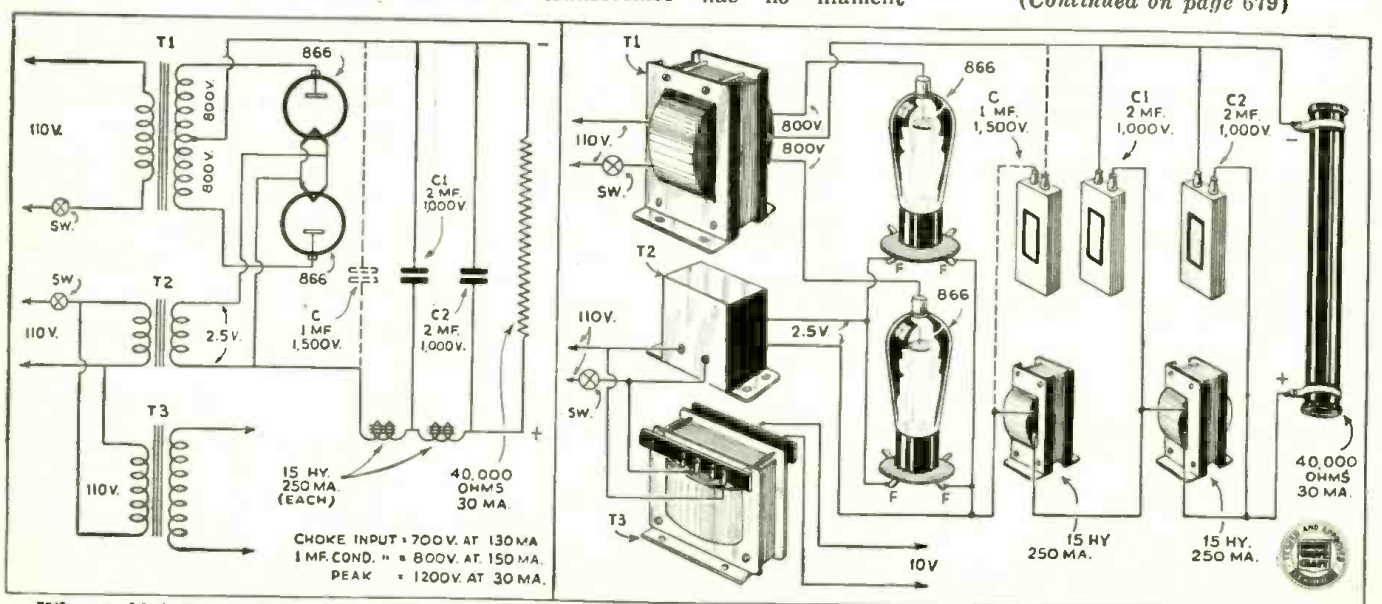
A separate transformer for the rectifier does not seem to effect the characacter of the note and is only used to maintain the filament voltage constant while the transmiter is being keyed and results in longer tube life.

In order to obtain the full value of the tubes used in last month's (Feb.) transmitter it is necessary to have from 750 to 800 volts on the plates. It is rather useless to install larger tubes and use the same plate voltage that was used on the smaller tubes.

The plate transformer that filled the bill the most satisfactory was a unit having 800 volts each side of center tap and rated at 150 milliamperes. This transformer has no filament windings and hence is not suitable where separate filament transformers are not contemplated.

It is an accepted theory that mercury-vapor rectifier tubes are unquestionably better than ordinary vacuum tubes, because of their low and more constant voltage drop. However, these tubes create quite a lot of noise in the receiver because with a bleeder resistor, they are operating constantly. Here again separate filament transformers are an asset, because the high voltage transformer primary can be opened at will and without affecting the filaments, to obtain quiet reception.

(*Continued on page* 679)



Who couldn't build this power supply unit with the aid of the excellent diagrams shown above? The author has specified good "healthy sized" chokes and condensers, so that a steady, full voltage is maintained at all times.

SHORT WAVE SCOUTS

Heinie Johnson Proud of His Scout Trophy Cup

Johnson Gets Twenty-Seven Foreign Stations, Places First In Contest

Out here in West Texas, noted for the poorest radio reception in the world, Heine Johnson won first place in an international short wave radio reception contest.

Johnson placed ahead of hundreds of other contestants because he picked up stations from every continent in the world within sixty days.

He received verifications from 27 stations on foreign soil.

Short wave stations picked up on the North American continent could not be counted.

Friday he received a beautiful trophy for his achievement from H. Gersback, editor of Short Wave Craft, a radio magazine.

Trophy

The trophy, mounted on an ebony base, is in silver finish. A globe of the world is balanced on the wing tips of two eagles. On the surface of one globe an etching of a radio fan at his set appears. Poised on the globe is a statuette of godess, holding high a torch.

Johnson's name and distinction are etched in at the base of the trophy. It is to be on display in Cunningham and Philips No. 1 store.

All of Johnson's receiving was done on a sort of home made affair He acquired a National set and added to it. E. F. Hauser installed addition parts and perfected the hook-up.

Plain As Cowtown

"You wouldn't believe some of the stations would come in so clearly" said Johnson. "Germany comes in any day just as clear as Fort Worth. Madrid, Spain is just perfect. You never miss a word."

He speaks of Melbourne, Australia and Moscow, Russia, in the same breath. Japan is a next door neighbor to him. Italy, why that's just another station. Santo Domingo, now there's a station that gives a thrill when you pick it up. Its got only five watts.

Gets Europe

England comes in good from about 6 a. m. until ten o'clock," said the winner. "France is good until about 9 a. m. and most European stations are on about that time.

"At midnight you can pick up Australia. When it it's midnight Saturday here its 4 p. m. Sunday in Sidney.

"Japan is good from about 3 a. m. until 5 a. m." And he can recall station after station in country after country. Furthermore, he knows the station call numbers.

His unusually good reception has won for him a position as radio post observer. He gathers information which enables short wave magazines to keep a complete log.

Editor, SHORT WAVE CRAFT:

I honestly believe I am the happiest short-wave "fan" in the world tonight. When the expressman delivered that trophy today I could hardly believe my eyes. It so happened the trophy arrived ahead of your letter notifying me as to the prize and it was therefore a complete surprise! And is it a "butter ball" beauty?

The local papers will publish an article on this trophy tomorrow (Dec. 13, 1933), and it will be exhibited in a shop show window up until Christmas.

Gentlemen, I thank you and want to assure you that the whole world could not have given me a more welcome Christmas gift.

HEINIE JOHNSON,
Big Springs, Texas.

Above — Heinie Johnson, winner of the first Short-Wave Scout "Trophy Cup." The handsome cup appears at the right of the photo. Right—Clipping from "local" paper—some publicity! what?

Set That Won the Cup!

● HEREWITH photo showing my short-wave receiver set-up and also the Short Wave Scout Trophy Cup just awarded me. In my "radio corner," you will note the loop aerial just above my head in the photo. I tried this upon the strength of your recent *Editorial*, suggesting this form of aerial for short-wave reception. On my powerful hook-up the chief value of this loop is an aid to selectivity on 49 meters at night. I am receiving most of my European signals over a 25 meter "doublet" antenna with *transposed* lead-in. I also use a 46 meter "cage" with transposed lead-in for S. A. (South American) signals and find this also very fine for picking up stations in the Orient and Russia. The photo shows the switch for these two antennas, suspended above the cabinet housing my first two stages of T.R.F. Because I know you are interested in how I roll 'em in I am going to explain the whole "set-up" to you. You will note I have two extra knobs on my "National 45." The one to the left is a volume control, connected across the first audio. This permits me to feed the "gain" of the three stages of T.R.F. into my detector at the point of oscillation and then cut down the actual volume coming from the speaker to a whisper if desired. This of course helps the selectivity also. The other extra knob is a *tone-control* connected across the 45's in the last audio stage; a very useful little control at times.

You will also note the other box, housing the first two T.R.F. (Tuned Radio Frequency) stages, which is an old RCA-Victor *Converter* cabinet. Most of the parts for these stages of T.R.F. were salvaged from the same converter. There are four controls on these two stages; the knobs directly under each dial are the .00015-mf. condensers. The one to the extreme left is a grid control on both tubes, which also acts as an aid to selectivity on crowded bands. The knob to the extreme right is a *trimmer* connected across the first stage. I have the main tuning condensers in these two stages so rigged up that I can *gang* them or tune them separately as desired. The tubes used in the first two stages are 58's. I have a filament winding encased in this box for the two tubes; otherwise all power is secured from a National power-pack, which is placed in one of the lower shelves of the large cabinet. Close observation will disclose two 400-ohm resistors in wires between switch and first stage in set. The other knobs and fixings above on cabinet are condensers and *loading coils* in antenna systems, all rigged up on handy switching arrangements.

While photo shows head-phones, I actually get all reception over the RCA-speaker the SHORT WAVE SCOUT trophy cup rests on, unless I want to listen when the folks are all asleep, when the phones prove very handy. You will note I have built in a coil shelf on which the reader will note my array of plug-in coils, which are of National and Hammarlund make.

Here is a strange fact about the hook-up I employ: By tuning the antenna carefully, lining up T.R.F. (Tuned Radio Frequency) stages to the signal, then turning down the grid voltage some on the first two stages, and *peaking* the detector, I can get about the sharpest selectivity I ever saw. Often I pick out signals in less than 5 kc. of dial space and do it without cross-talk from side-band signals on the air at the same time. Referring to the newspaper clipping enclosed, it is somewhat "off," as are most of these "high-speed" write-ups, especially on the subjects I have circled with pen. The reporter either misunderstood me or forgot what I did tell him. I don't know which but I do know I didn't tell him what he wrote up in all cases. Again thanking you for my "Christmas Gift" (the SHORT WAVE SCOUT Trophy Cup), I am,

HEINIE JOHNSON,
Big Spring, Texas.

Wake Up and Win a Trophy like Mr. Johnson! (No Other Entries Received to Date.) Remember the next contest closes March 1st. Also "Verifications" on only one-half the calls submitted are required.

(*Continued on page* 695)

SHORT WAVES and

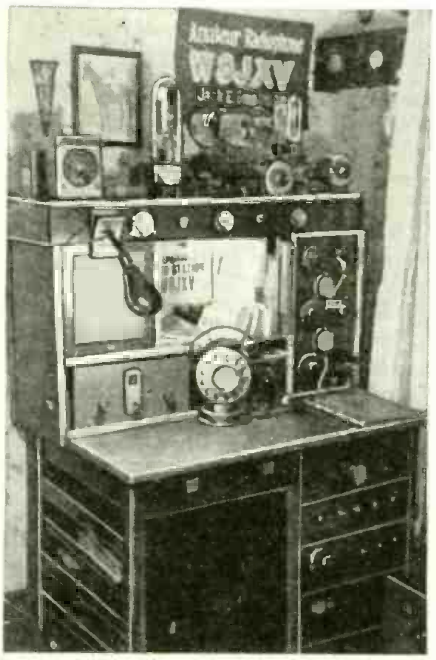
W9CJR Has Cracker-jack Station

Here's a crackerjack station owned by J. Dewey Mills of Mt. Vernon, Mo. This transmitting and receiving station, call W9CJR, is affiliated with the Army Amateur Radio System.

Editor, SHORT WAVE CRAFT:

Being a SHORT WAVE CRAFT fan and reader, I have noticed your invitation to send photos of Amateur Stations, therefore, the enclosed shot of my station with its operator.

The transmitter is of conventional design, using a 47 crystal oscillator, two 47's as doublers and a final stage using the screen grid 860, with about 150 watts input. This "rig" is coupled to a voltage-fed Hertz antenna.



Another dandy short-wave transmitting and receiving station, licensed under the call, W8JXV, and operated by Jack E. Bannon of Oil City, Pa.

The receiver used here is the Hammarlund Comet Pro. Have in the past used the National SW5 as well as several home constructed rigs.

My station, W9CJR, is affiliated with the Army Amateur Radio System as District Net Control station for the 4th district of Missouri. I am a confirmed CW (code) or "Brass Pounder," therefore, my radio time is spent mostly in the handling traffic. I usually operate on 3,840 kcs. but on occasions switch to 7,260 kcs. Have never gone after the DX end of radio in a very earnest manner, though I have worked some few DX stations.

In the photo, the power supply for the transmitter does not show, as it is under the table. At the left side of the photo appears a small 160 meter transmitter which is used in handling "short-distance" messages, and during the regular Monday Night Army Drill. It is the Hartley Circuit using a 210 only. The receiver in the photo is a National SW5. You will note that I am a left-handed operator. Have had an Amateur license for the past five years. Also hold license W9FEH for Aurora, Missouri, and W9LLJ portable license.

With best wishes for every success of SHORT WAVE CRAFT.

J. DEWEY MILLS.

(Sure is a fine station, J. D. M., and you have our "congrats" on your work in developing the station into an Army Amateur Net Control unit.—Editor.)

A DANDY STATION AT W8JXV

Editor, SHORT WAVE CRAFT:

In answer to your request for Amateur Station photos, I am taking the liberty of submitting one of W8JXV.

The transmitter is composed of a 59 xtal or electron-coupled oscillator, 59 buffer doubler, 210 second buffer and 203-A final amplifier, running with about 200 watts input on c.w. The receiver is a National SW-5.

Most districts in Canada and the U. S. have been worked and a "heard" card has been received from England. All apparatus is on hand for 160 meter phone, but as yet has not been attempted due to possible BCL trouble.

Luck to SHORT WAVE CRAFT.

JACK E. BANNON, W8JXV,
412 Seneca St.,
Oil City, Pa.

(Hotcha! Jack—looks like real business. Hope to have many more photos of amateur transmitting as well as receiving stations to show you next month.—Editor.)

1-TUBE "OSCILLODYNE" WORKS WONDERS

Editor, SHORT WAVE CRAFT:

I should like very much to shake the hand of Mr. J. A. Worcester, Jr., and to give him the word "Bravo" for his *Oscillodyne* circuit, which he contributed to the pages of SHORT WAVE CRAFT.

I have built this unquestionably efficient "one-tube" *Oscillodyne* receiver mostly from old parts I picked up from the junk pile, and I have been using it as an adapter with a 4-tube midget B.C. receiver, thanks to the good idea of Mr. Paul Korneke, Jr., who was kind enough in sending in the diagram, which was published on page 289 of SHORT WAVE CRAFT of last September.

With this really wonderful little receiver I can hear Europe as I never did before with other receiving sets having a greater number of tubes. In fact I could never hear European broadcast stations before this, no matter how good the s.w. receiver was supposed to be.

The other morning a friend of mine, who has been struggling for some time with his factory-built 16-tube receiver, trying to bring in European stations, dropped in while my one-tube Oscillodyne was filling the room with the voice of the French announcer from Pontoise (Paris). Was he surprised? Well, you can just imagine.

Our eastern stations, such as W8XK, W3XAL, etc., come in just like locals. Amateurs, phone and code, I hear them from all over the country. The dial, from 0 to 100 is alive almost all the time with signals from brass pounders.

In my own case I found out I was getting much better results when I had the 50,000-ohm variable resistor, which controls the regeneration, replaced by a .00025 variable condenser.

I intend to rebuild this receiver, using good and modern standard parts throughout, with the addition of one stage of R.F. (tuned), and to keep using the 4-tube B.C. receiver, which incorporates 1—'47 in the audio circuit, as an amplifier and power pack. But I am wondering if this arrangement would give better results. I surely would like to know.

J. B. VASSALLO,
966 Pennsylvania Ave.,
San Francisco.

(Very glad to hear, J. B. V., that you have had such fine success with the one-tube "Oscillodyne." We have received many thousands of letters complimenting Mr. Worcester for presenting his very original circuits through the pages of SHORT WAVE CRAFT, *and it is truly remarkable what the Oscillodyne can accomplish, under fair operating conditions.—Editor.)*

OUR SETS ALL TO THE MUSTARD

Editor, SHORT WAVE CRAFT:

Congratulations, Mr. Gernsback, on your wonderful publication. It is without doubt the outstanding short-wave "mag." on the market and I know all will agree with me on that point.

Have built two Doerle's, one Oscillodyne, a two-tube "go-getter" and have just finished a three-tube set using a '30, '32 and '33. They all worked Ok, but again the two-tube "Doerle" is my old reliable. I have just sent for parts to build the "2-tube Super-Het" as described in your December issue. I am confident it will prove more than satisfactory.

I am a member of your SHORT WAVE LEAGUE and since then a score of my friends

LONG RAVES . . . OUR READERS' FORUM

have joined. I would like to hear from other members and anyone interested in short waves. I promise to answer all letters.

CHARLES DAURAY,
625 Park Avenue,
Woonsocket, R. I.

(Congratulations, Charles, on the results you have had with the various receiving sets described in past issues of SHORT WAVE CRAFT *and which you have such good results with. We have had a great number of letters already reporting excellent success, both as to its volume, sharp tuning, and DX qualities, of the 2-Tube Superhet, described in the December number. We are sure that you will find it one of the best sets you ever turned a dial on.—Editor.)*

62 STATIONS FIRST WEEK ON "OSCILLODYNE"

Editor, SHORT WAVE CRAFT:

I never overlook your column of fan mail, but as yet I have never seen a letter from Dearborn, Mich., so what I have to say I hope it makes up for what Dearborn lost. Hi!

I made the *Regenerative-Oscillodyne* from your July, 1933, issue. And, Mr. Editor, it sure is F. B.! In less than a week I have "logged" *sixty-two* (62) stations, my best being DJA, DJB, DJC. DJD. VE3II, VE9JR, VE9DR, VE9DE, VE9GW, VK2ME. VK3ME, GSA, GSF, XDA. XETE. I2RO, HJP, NRH, KKZ, YV1BC, YV3BG, FYA. G5SW and many more from America, Europe and Cuba. Also many "hams, police and airport."

I am inviting all hams, S-W fans and "what have you" to write to me; I will answer all letters.

EDWARD KUBIK,
6600 Neckel Ave.,
Dearborn, Mich.

(FB (fine business). Ed, and Mr. Worcester's "Oscillodyne" circuit, especially the "Regenerative Oscillodyne," seems to have created quite a furore in short-wave circles. We are pleased to note that you report this set as "FB," and that you logged 62 stations in less than a week! Here's hoping you log several hundred more stations with the Regenerative Oscillodyne.—Editor.)

HOORAY FOR "PEE-WEE" 2-TUBER

Editor, SHORT WAVE CRAFT:

Just a few words of well-deserved praise for the FB "Pee-Wee" 2-tuber described in the November issue of SHORT WAVE CRAFT. I constructed the set out of mild curiosity, more than anything else, but on finishing the receiver and trying it out I found myself agreeably surprised. Agreeably surprised, would be expressing it mildly! In fact it "perks" so well that I have put my Pilot Super-Wasp on the shelf!

EVERETT HOTTSTADT.
910½ 26th Ave. S.,
Minneapolis, Minn.

(The "Pee-Wee" 2-Tube Receiver seems to have made quite a hit, Everett, and the designer of this particular set will undoubtedly be glad to read your letter with its commendation of his "brain-child." One thing about the "Pee Wee" 2-Tuber is that most any odd parts to be found in the average radio shack can be used to assemble it, and even if all the parts required to build it have to be purchased new, the cost would still be very modest indeed.—Editor.)

"UNDERGROUND" AERIALS

Editor, SHORT WAVE CRAFT:

A few weeks ago I read your "editorial" in the November SHORT WAVE CRAFT regarding *underground* antennas. Up until this time I had had my short-wave receiver on a table in one corner of my room. The result was that my room was always cluttered up with "junk," as the rest of the family calls it. For this reason I have been wishing that

(Continued on page 699)

A Very Fine S-W "Receiving" Station

Hot Ziggedy! Here's a real receiving station—the operator, William Schubert, of Phila., Pa., has "long wave," as well as "broadcast band" receivers, besides his short-wave receiver.

A VERY FINE S-W "RECEIVING" STATION

Editor, SHORT WAVE CRAFT:

Here is another station photo. As a reader of SHORT WAVE CRAFT, I am enclosing a photo of my receiving station, consisting of a "long-wave," "broadcasting" and "short-wave" set. With your help. I hope to be "on the air" within twelve months. The little table lamp you will notice in the picture is home-made of discarded 199 radio tubes and a 201 tube base.

WILLIAM SCHUBERT.
3246 N. Marshall St..
Philadelphia, Pa.

(Excellent, William, and we trust many more owners of fine S-W "receiving" stations like yours, will send us photos of them. Congratulations!—Editor.)

OUR "SUPER-WASP" ARTICLES SAVED HIM MONEY!

Editor, SHORT WAVE CRAFT:

Here's my answer to your "CQ" call for station photos.

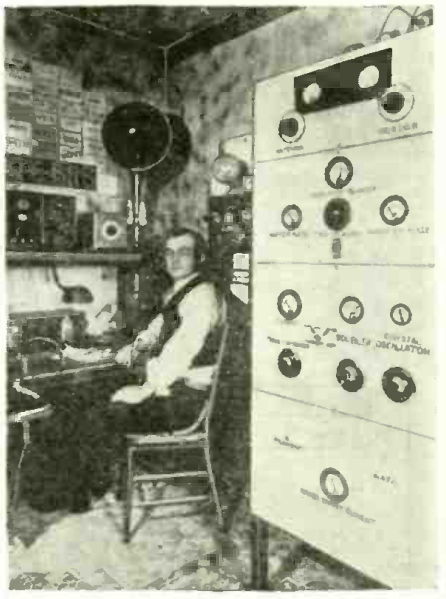
I'm using an xtal 47 with 47 doubler, a pair of 210's as buffer, pair of 242's as buffer, with a pair of 852's in final PP with 2,200 volts on the plate with over 800 watts input. My receiver is an old Super-Wasp which I rebuilt as shown in one of SHORT WAVE CRAFT back issues, using a 47 tube for output. I sure want to recommend the circuit to anyone. I want to thank the editors for this one issue alone, as I feel it saved me the price of a new receiver. I've checked the set with some of the new ones on the market and I will still keep it. I'm sure that I'm not the only one who has received such help from SHORT WAVE CRAFT articles.

I've bought SHORT WAVE CRAFT for years and I for one, was very happy to see it made a monthly magazine, as it is the only magazine on the book-stands that keeps "up-to-date" in this world of progress on radio. Some difference in the radios of today than of yesterday, when we used to use crystals and that good old "spark" set. That's the reason that a fellow has to be "on his toes" and keep up with the times. and I find in SHORT WAVE CRAFT the answer.

I'm glad to receive SWL cards and will gladly answer them, even if just around the corner; also will swap photos with anyone.

LAWRENCE J. KELLEY. WGBRB,
571 Magnolia Ave..
San Bernardino, Cal.

(Thanks, Lawrence, for your compliments and the editors will endeavor to keep the pages filled with up-to-the-minute articles which will merit your attention.—Editor.)



Lawrence J. Kelley, WGBRB, is the proud owner of this interesting looking station.

WORLD-WIDE SHORT-

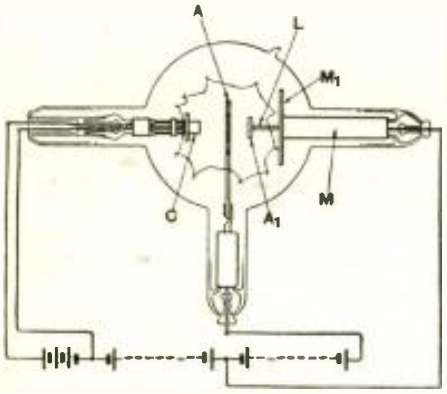
An Ultra-Short-Wave Generator

● A NOVEL method of producing oscillations at ultra-high frequencies was recently described in *Wireless Engineer and Experimental Wireless*, London England.

In generating "centimeter" waves, secondary emission from the electrode A1 of the tube shown in the accompanying illustration, is utilized to impulse a resonant structure in the tube, M, which is housed wholly or in part within the glass bulb.

Electrons from the cathode, C, pass through a highly positive plate, A, on to the electrode A1, which is at a lower positive potential. The resonant structure comprises a disc M1, connected to the electrode A1 by a rod L, and a tube M. Tuning is determined partly by the capacity between the discs A1 and M1, and partly by the inductance of the connecting rod L.

The parts A1 and L may, in fact, be regarded as a radiating antenna, the tubular portion M, serving as a capacity counterpoise.



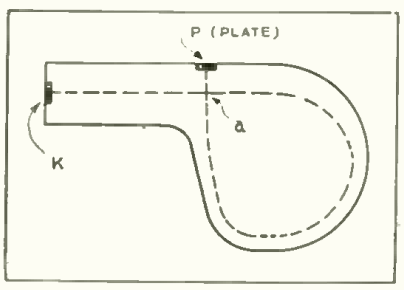
The drawing above shows a new apparatus for producing oscillations at ultra high frequencies.

Grid-less U.S.W. Transmitter Tube

(From Radiowelt)

● THE essential factor in generating radio waves in a vacuum tube is, that the variations of the electronic currents must react by themselves upon the field of the electronic current. This cycle of cause and effect is brought about in the amplifier tube, ordinarily, by an electrostatic steering of the plate current through the feed-back circuit, although it can also be accomplished in another way. Fig. 1, for instance, shows a vacuum tube in which the electronic current flows through a closed circle. At another place (marked a, in the Fig.) the returning electrons bump against the stream which has only just gone a small distance and which is accelerated by the positive charge at the plate P. During this collision a few electrons are being scattered, thus weakening the current. But for this reason the collision, a moment later, will be slightly less vehement when the weakened stream hits on the new, outgoing electrons at a, that is, it crosses its own passage. Periodic variations of the intensity of current result, whose amplitude and frequency depend solely upon the dimensions of the tube and the speed of the electrons.

For the production of ultra-high frequencies, such tubes have already been constructed and higher ultra-frequency energies have been realized than with the customary transmitter tubes. The "looping" of the electronic current is brought about by putting metal strips, negatively charged, on the outside wall of the glass bulb which repel the electrons and cause the stream to be curved in a circular direction.



Here is a "Grid-less" ultra short-wave transmitter tube, in which the electronic current reacts upon itself, as shown by the circular dotted line.

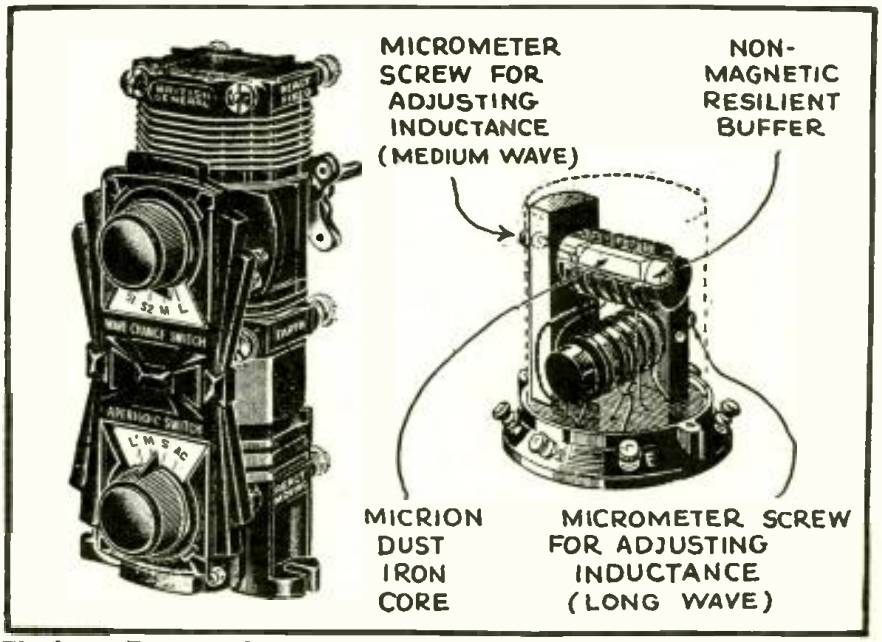
● The editors have endeavored to review the more important foreign magazines covering short-wave developments, for the benefit of the thousands of readers of this magazine who do not have the opportunity of seeing these magazines first-hand. The circuits shown are for the most part self-explanatory to the radio student, and wherever possible the constants or values of various condensers, coils, etc., are given. Please do not write to us asking for further data, picture-diagrams or lists of parts for these foreign circuits, as we do not have any further specific information other than that given. If the reader will remember that wherever a tuned circuit is shown, for instance, he may use any short wave coil and the appropriate corresponding tuning condenser, data for which are given dozens of times in each issue of this magazine, he will have no difficulty in reconstructing these foreign circuits to try them out.

European Short-Wave Coils

● IT is of interest to note several types of coils for long- and short-wave receivers that have made their appearance on European markets.

The use of coils with iron cores of several special types, for the long waves and running down to about 100 meters has been spreading rapidly. These coils, such as the one shown at A in the accompanying illustration are made in several ways. Ordinary iron cores naturally cannot be used for high frequencies as the losses would be entirely too high. To overcome this trouble, iron dust, divided either by electrolysis or some mechanical pulverising method, is employed, in an insulating binder that permits the greatest possible amount of iron, but still insulating each individual particle from all others. In one form, the iron is spread over thin paper strips, divided into groups and then pressed into the paper fibres. This is called the Ferocart coil developed by Hans Vogt. In the type shown, the iron particles are bound in an insulating plastic material and are moulded to the desired shape. The position of the core in the coil can be adjusted to act as a trimmer for the ganged circuits.

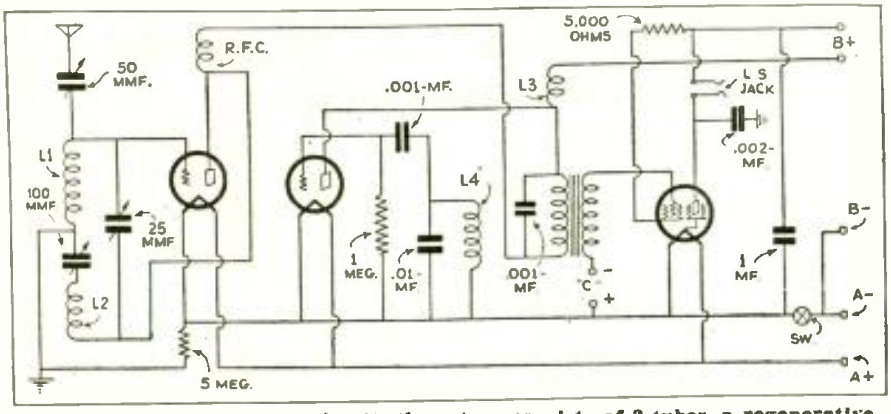
The other coil unit shown, B, is an all-wave inductance unit, covering the wavelengths between 14.5 and 2,000 meters. It also includes the necessary switches as an integral part of the assembly, for changing from one wave band to another; thus simplifying the construction of sets to cover all the wavelengths used for broadcasting.



The latest European design of short-wave tuning couplers are shown above: apparatus at right (A) has coils fitted with special "iron dust" cores, designed for use at high frequencies; (B) left, shows "All-Wave" coupler.

WAVE REVIEW .. Edited by C. W. PALMER

5-Meter Super-Regenerator



5-Meter Super-Regenerator circuit: the set-up consists of 3 tubes, a regenerative detector, a quenching tube and a pentode output tube.

5-Meter Super-Regenerator

● THERE are two types of circuits that have proven their worth on the 5-meter wave-band; the superheterodyne and the super-regenerative circuits. The first of these, however, requires many tubes to give really dependable service, and the adjustment and operation are rather difficut.

The second circuit, the super-regenerative type, uses only a few tubes and while the results may not equal those obtained with a properly constructed superheterodyne, it is much more simple to construct and operate and more economical to operate.

Several super-regenerative circuits have been shown in past issues of this page and we have here another set of this type, using three tubes, that should interest the experimenter in 56 megacycle reception.

The set contains three tubes; the regular regenerative detector with its associated tuning and regeneration coils; a quenching tube with its large tuning coils and a pentode output tube.

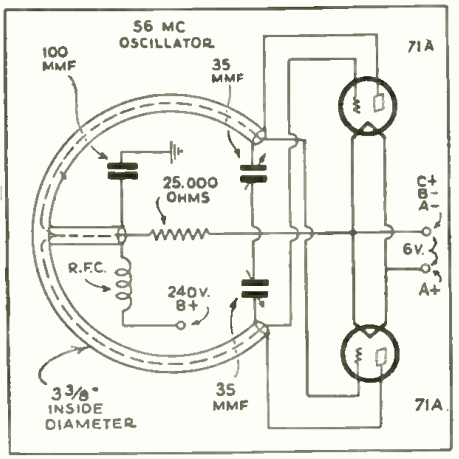
The coils are constructed as follows: Coils L1 and L2 consist of 5 turns each of heavy wire, such as No. 14, wound to a diameter of ½-inch. The turns are spaced about the thickness of the wire, and the coils are mounted side by side (not end to end in the usual way).

The quenching coils consist of 500 turns of No. 34 S.C.C. wire each, wound on a 1-

(*Continued on page* 685)

56 Megacycle Oscillator

● THE circuit here shows the oscillator portion of a 56 megacycle phone transmitter used by the police in experiments between two locations in Sydney, Australia. The method of coupling the grids and plates of the balanced oscillator is novel, in the fact that the grid turn is *through* the inside of the tube which acts as the plate coil.



Oscillator portion of a 56 megacycle transmitter; it employs type 71A tubes for oscillators.

This oscillator, which appeared in *Australian Radio News*, employs type 71A tubes for oscillation. The modulators which are not shown, were English "Cossor" 6251 tubes connected in parallel.

The values of the parts used in the oscillator, including the diameter of the coils, are shown on the schematic circuit. Experimenters in the field of 5-meter transmission might find this novel oscillator of interest.

Amateur Transmitter Improvements

● THE marked interest shown in class "B" circuits in Europe (which we have mentioned before in this department) can be appreciated from this excerpt from an article which appeared in *Wireless World*.

To obtain 100 per cent modulation of a high frequency carrier, the usual modulator tube has to be operated at a higher mean plate voltage than the oscillator. Also, the usual modulator imposes a steady, heavy drain on the plate supply.

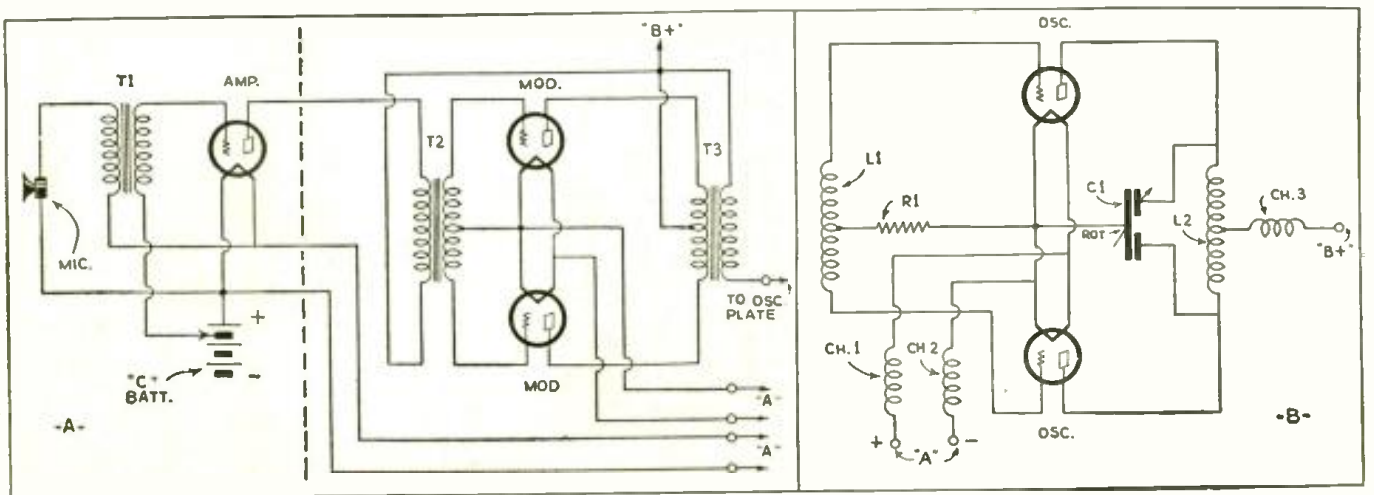
Both of these disadvantages are removed by the use of class B amplification and modulation. The "B" consumption of these systems is proportional to the depth of modulation which results in a saving of "B" current. Also, the efficiency of modulation compares with the efficiency obtained with class "B" amplifiers, and is thus an improvement over the usual methods.

The circuit of an amplifier and class "B" modulator are shown in Fig. A. Transformer T1 is the modulation transformer, while T2 and T3 are class "B" input and output transformers, respectively.

For small installations and especially for portable units, the push-pull oscillator arrangement shown in Fig. B, has many advantages over the ordinary oscillators, where the frequency is likely to shift over wide limits, especially if a high percentage of modulation is used.

While crystal-controlled units, and in some cases, electron-coupled oscillator arrangements are more stable, the push-pull circuit is ideal for portable use and for transmitters with small output. In the circuit shown at Fig. B, C1 is a double stator variable condenser (two gang) with approximately 50 mmf. maximum for each section. R1 is a 10,000 ohm resistor.

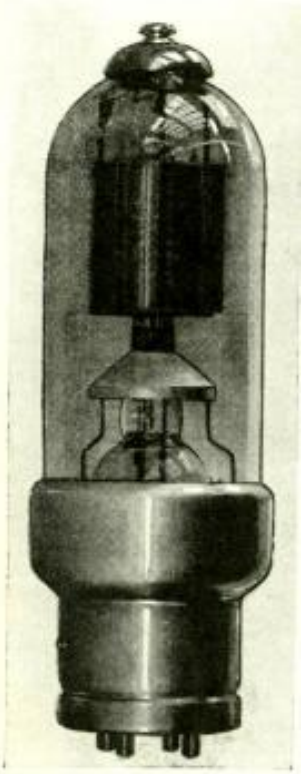
Coils L1 and L2 contain 20 turns of No. 14 wire on 1-in. dia. forms. Chokes Ch1 and Ch2 contain 30 turns of No. 18 D.C.C. wire on forms ½-in. in diameter; Ch3 contains 50 turns of No. 30 D.S.C. wire space-wound on a ½-in. dia. form.



The diagrams, above, show at Fig. A—the circuit of an amplifier and class "B" modulator. For small installations and especially for portable sets, the push-pull oscillator circuit shown in Fig. B will find many friends.

WHAT'S NEW In Short-Wave Apparatus

The short wave apparatus here shown has been carefully selected for description by the editors after a rigid investigation of its merits.



The "GAMMATRON"—An Improved 100 Watt Transmitting Tube

● THE Gammatron transmitting tube, recently announced, apparently has quite a few advantages over the ordinary tube, and an effort has been made in designing this tube to eliminate all the weak spots found in many tubes.

This tube is intended exclusively for amateur use and is designed so far as information obtainable is concerned to be a *general purpose tube.* It is capable of a plate dissipation of 100 watts. While this may seem to be quite a husky tube from its rating, its size is considerably smaller than the average 50 watt tube. Its maximum overall height from the base pins to plate lead, which is taken out through the top of the tube, is 7¼". The usual stem which supports grid and plate elements in the regular 50 watt tube is entirely absent in the new Gammatron.

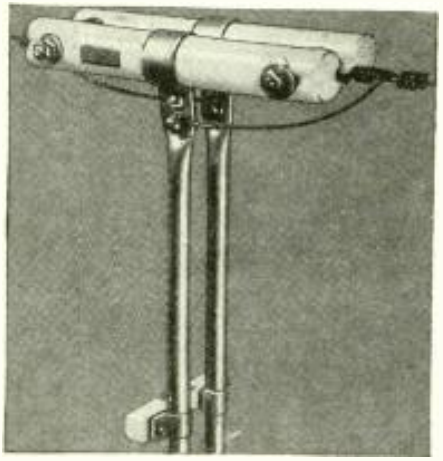
The plate is suspended directly from the top of the envelope and there is, of course, an extremely high insulation factor due to this method of mounting the plate. The grid and plate elements are constructed of tantalum, a metal which gives up practically all of its gas at a temperature in the neighborhood of 800 degrees C. This material also has a tendency to absorb small amounts of gases when running at a temperature that would cause the plate to assume a dull red color. These facts alone produce a tube of extremely high vacuum. This tube has a 5 volt double inverted "V" filament, constructed of thoriated tungsten. Thoriated tungsten has proven to be the most reliable material that can be found for filament construction.

Extremely long life in this tube should be obtained due to the extremely high vacuum, which in fact approaches the degree of vacuum found in an X-ray tube. The construction of the grid in this tube is entirely different from that used in any other tube, so far as the writer is aware. The grid wires run vertically. These wires come together at the top of the filament, completely screening it from the plate; from the construction of the tube it would be deduced that the internal capacities are extremely low and that it would be very well suited for the high frequency amateur bands. However, at this time no information regarding the internal capacities of the tube is available. Particular notice should be taken of the metal base of the tube which is of the standard 50 watt variety and which has an extra inverted bell-

(*Continued on page* 692)

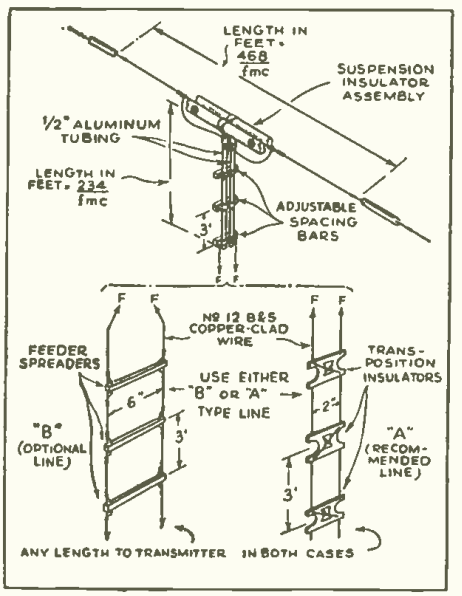
New Antenna Impedance-Matching Link

● MATCHING radio frequency feed-lines to transmitting antennas has always been quite a problem to the amateur. It is a well-known fact that the amount of energy transferred from the feed-line to the antenna proper, is entirely dependent upon the degree of impedance matching between the transmission line and the antenna. The illustration clearly shows a new commercial feed-line impedance-matching system which should find much favor among the transmitting amateurs.



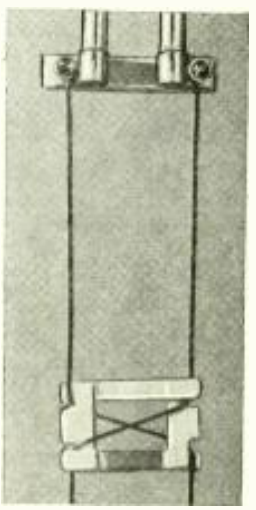
The new type "Q" Antenna lead-in (No. 142).

The entire antenna system when using this impedance-matching device, is a half-wave current-feed doublet. While not the most flexible antenna system that can be constructed the doublet is one of the most efficient. The method of matching consists of placing two aluminum (or copper) tubes ¼ wavelength along, in parallel and separated approximately 1½". These tubes are ½" in outside diameter and are held parallel by small insulating blocks with adjustable clamps. The spacing between these two tubes must be varied so that compensation can be made for various changes in the main feed-line such as wire size, and spacing between the parallel wires.



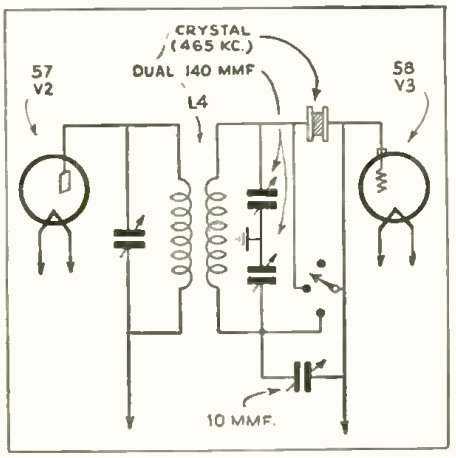
This system is extremely light in weight and no difficulty should be experienced in supporting it with the antenna wire alone. However copper clad, rather than solid copper wire, is recommended because of the greater strength of copper-clad wire over solid

(*Continued on page* 685)



Dimensions of a lead-in constructed on the new type "Q" system is shown at left. Above—Transposition block in position.

(Names and addresses of manufacturers furnished upon receipt of stamped envelope; mention No. of article.)



The Postal S-W superhet crystal filter circuit. (No. 146)

New S.W. Set Has "Single-Signal" Crystal Filter

● OWING to the extreme selectivity necessary to separate the phone and CW stations on the various amateur bands, a quartz crystal has been added to the Postal International Receiver. True *single-signal* reception can now be obtained with this receiver. The installation of a crystal renders the receiver so selective that the CW beat oscillator can be detuned or off-set, from the intermediate frequency 1,000 cycles and each CW signal will be one single 1,000 cycle note. The audio image, that is, the other half of the signal will be seemingly absent. The crystal filter unit designed for the Postal receiver can also be applied to any modern short-wave superheterodyne or to previous models of the Postal receivers which do not have crystal control. The entire unit may be installed at low cost and the standard model of this receiver has holes already provided to accommodate the Bliley crystal-holder and the condenser.

All controls are brought out to the front panel by means of bakelite rods. These rods also tend to eliminate hand-capacity effects and allow a true adjustment to be obtained. The variable selectivity switch has three positions, one for parallel connection, which is considered best for the reception of phone signals, the series position for the reception of single signal CW signals, and the third position, which renders the crystal filter inoperative, making the set a regular superheterodyne, the same as it was before the crystal was installed. The accompanying diagram shows the connection of the crystal filter unit. The only connections necessary are to the plate circuit of the first detector, and the grid of the first I.F. stage.

The "Pretzel-Bender Two"

By HUBERT SHORTT *

A Powerful But Inexpensive Short Wave Receiver for the Beginner

● HERE is a novel little battery-operated short-wave receiver having many features which will appeal to the beginner, but also possessing new and improved points which will appeal to the "old-timer" as well. A glance at the illustration immediately impresses one with the fact that here is something new in chassis design. This type of construction originated by the writer after considerable research, and called "Uni-Shielding" possesses a number of advantages over the standard models of chassis construction. In the present design, the chassis is made out of two pieces of metal fastened together and bent so as to form a U-shaped channel for tubes and coil and another inverted channel for the other receiver components.

As a result of this design, the tubes and coil are self-shielded and the chassis itself acts as a shield to isolate the variable condenser and other parts. Hence, extra shielding is dispensed with and the set is efficient, rugged, compact, attractive in appearance and economical. It will be noted that the panel is sloping. The chassis will readily slide into a metal or wood carrying case, and may be used for portable work if desired.

The circuit consists of a directly-coupled regenerative detector using a 34 tube, and an audio output stage using a 33 tube. Both tubes are pentodes of the 2-volt filament type. The "A" supply for this receiver may be two ordinary bell-ringing type 1½-volt dry cells, an air cell "A" battery or any standard storage battery. Depending upon the type of "A" battery source, a voltage reducing resistance in series in the filament supply circuit is utilized to bring the voltage down to the required two volt value. For example, a .7 ohm resistance is required in series with an air cell battery or with a single cell of a storage battery; a 3 ohm resistance is needed in series for two 1½-volt dry cells, etc. The total filament current is only .32 amperes and this drain is so slight that even the 1½-volt dry cells will last for a long time without requiring replacement.

Three 45-volt "B" batteries are required and 13½-volts of "C" battery. The "B" current and "C" current drains are both minute and hence this set is very economical in operation.

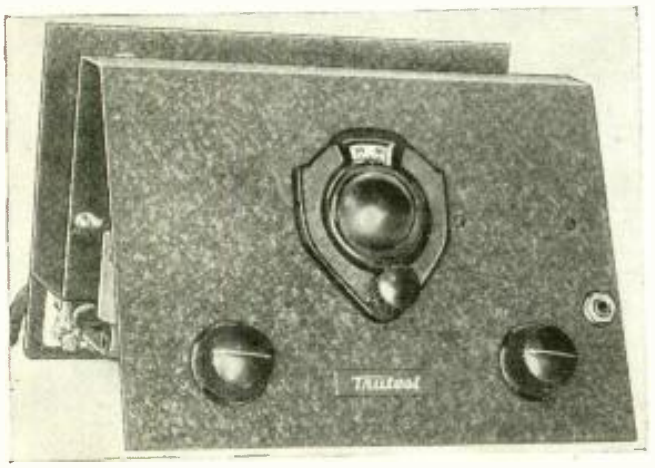
Plug-in Coils Used

A small trimmer condenser in the antenna circuit permits this receiver to be adjusted for varying length aerials. The plug-in coils used are standard Trutest four-prong coils. The longer winding is tuned by the 140 mmf. variable condenser, while the shorter winding serves as the tickler. Regeneration is controlled by a 50,000-ohm potentiometer in the screen grid circuit of the 34 tube. While this is a standard method for screen-grid tubes, the action is smooth and efficient. A 2½ millihenry R.F. choke in the plate circuit of the 34, by-passed by a small-capacity mica condenser, keeps the R.F. current out of the audio portion of the circuit, thus eliminating chance for distortion from this source.

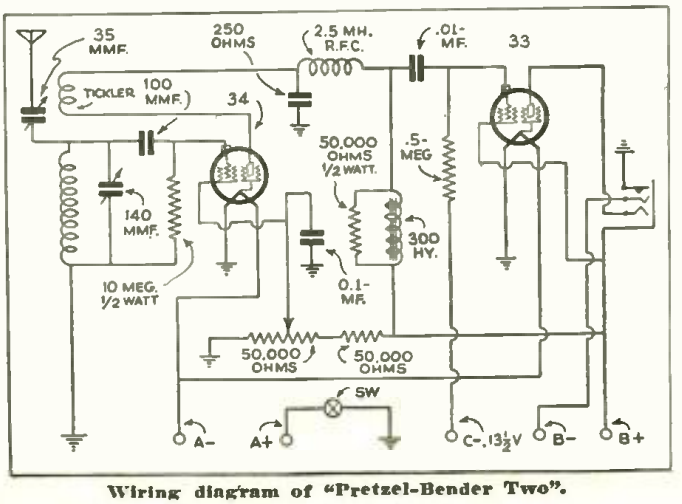
The use of a plate choke also adds greatly to the efficiency of this receiver permitting a higher plate voltage on the detector and thus increasing the sensi-

(*Continued on page* 697)

* *Chief Engineer, Wholesale Radio Service Co.*

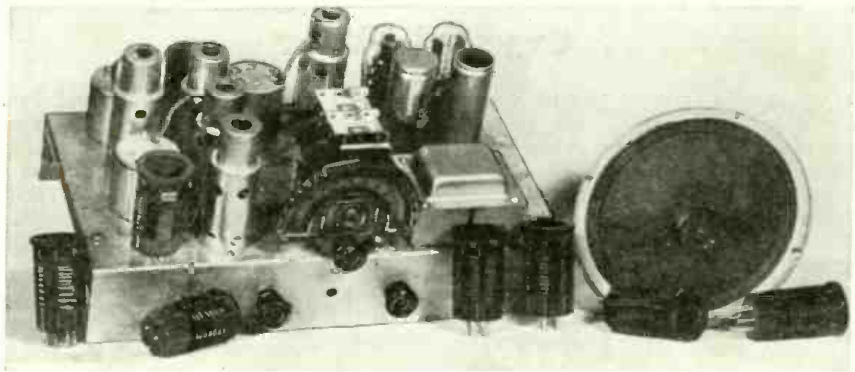


Appearance of the "Pretzel-Bender Two" (No. 144).



Wiring diagram of "Pretzel-Bender Two".

(Names and addresses of manufacturers furnished upon receipt of stamped envelope; mention No. of article.)



This photograph clearly shows the neat arrangement of parts used in this modern short-wave superhet.

This set represents one of the most carefully designed and smooth working short-wave superheterodyne receivers that the editors have had the pleasure of operating. It incorporates the greatly needed automatic volume control, which effectively reduces to a minimum fading and the erratic reception usually obtained on short-wave receivers not having the advantage of automatic volume control. Full speaker volume is obtained on "foreign" broadcast stations with this receiver in the heart of New York City, which is not the quietest place in the world to operate short-wave receivers—a real hard test for any set.

6-Tube Super HAS AUTOMATIC VOLUME CONTROL

By H. W. SECOR

● HERE is a 6-tube, all-electric, short-wave superheterodyne, utilizing plug-in coils, and capable of really fine performance under the most adverse conditions. The tubes used are as follows: 57, as a power first detector. The high frequency oscillator is a 56 with regular plate feed back. The 56 oscillator is coupled to the first detector by a separate winding on the oscillator coil. There are two stages of high gain intermediate frequency amplification so connected to lend themselves readily to automatic volume control. The actual automatic control of volume in this new Supertone "Superba" 6-tube superhet receiver is accomplished with the 2A6, second detector and automatic volume control tube. The output of the 2A6 is connected through a suitable radio frequency filter network to the 2A5 pentode power amplifier. SW1 cuts out the A.V.C. Plate power is supplied from a 280 rectifier tube and the filter consists of one 8-mf. and one 16-mf. electrolytic condensers connected either side of the 1,800 ohm dynamic speaker field which serves as the filter choke.

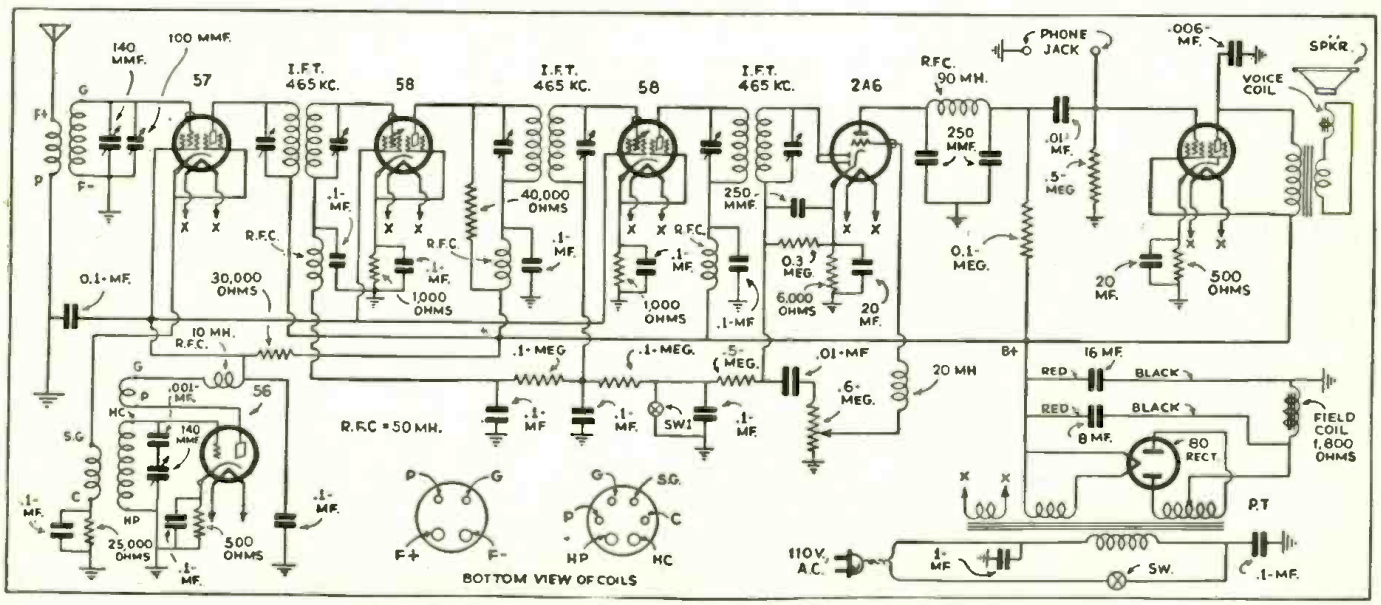
It will be noticed by referring to the diagram that plenty of by-pass condensers and radio frequency choke coils have been incorporated in this set, with the result that this is one of the most stable and smoothest operating receivers the writer has had the pleasure of operating. For a minimum of image response a 465 kc. intermediate frequency was selected. While a 175 kc. intermediate gives a higher degree of selectivity, it would have necessitated the use of at least one and probably two stages of tuned R.F. ahead of the first detector, in order to effectively eliminate the image response or to reduce it to that experienced on 465 kc.

The photograph clearly shows the mountings of the various parts, and particular notice should be taken of the placement of the plug-in coils. Every effort was made to keep these two coils as far apart as possible in order to eliminate any reaction that might occur between the first detector and high frequency oscillator stages.

Plug-in Coils Used

The first-detector plug-in coil is of the standard 2-winding, four-prong variety consisting of antenna and grid windings. Inductive coupling is used in this circuit to reduce the loading effects of the antenna upon the grid circuit as much as possible and still maintain an effective degree of coupling. The oscillator coil has three windings on a 6-prong form. One winding of this coil is used to couple the oscillator to the first detector in order to accomplish changing of the frequency of the incoming signal to the 465 kc. intermediate amplifier frequency. Sev-

(*Continued on page* 684)



Schematic diagram of the Superba Short-Wave Superheterodyne.

"Short-Wave Transmitting Antennas"

By GRANT RIGGLE, W8KJT

Mr. Riggle's comment on various angles of short-wave transmitting antennas should prove of value to the embryo short-wave "Ham" and also to the beginner who is interested in learning something about the transmitting end of the game.

● MANY Amateur Radio operators are in difficulty when it comes to erecting efficient antenna systems for their transmitters. Some are not fortunate enough to have "back yard space." Others are hindered by power lines and other nuisances which prevent them from "getting out."

In this article I will try to clear up one of the outstanding faults of amateur radio equipment.

Proper Insulation Important

A properly insulated antenna will increase the efficiency of any transmitter. Antenna systems should be erected in the open if possible. Wire for both antenna and feeders should be of single strand copper, No. 12 gauge. No. 14 wire may be used if No. 12 cannot be secured. Feeder wires should be kept at least a foot and one half from buildings and wires. Insulators should be four inches long, and two of these should be fastened together for insulating one end of the antenna. *Never connect transmitting antennas to metal poles.* The antenna current will be absorbed by the pole, and there will be a change in frequency for which it is hard to compensate.

The 80 meter band is usually the most popular for the beginning "Ham," and therefore all antenna data is given for this band. Of course, if higher frequencies are to be used, dividing the given antenna lengths by 2 will be for the 40 meter band, and by 4, the 20 meter band. A transmitter may be operated on a fundamental wavelength of say 40 meters, and yet the antenna may be of 80 meter length. The transmitted note will be in the 40 meter band, but as a harmonic of the antenna.

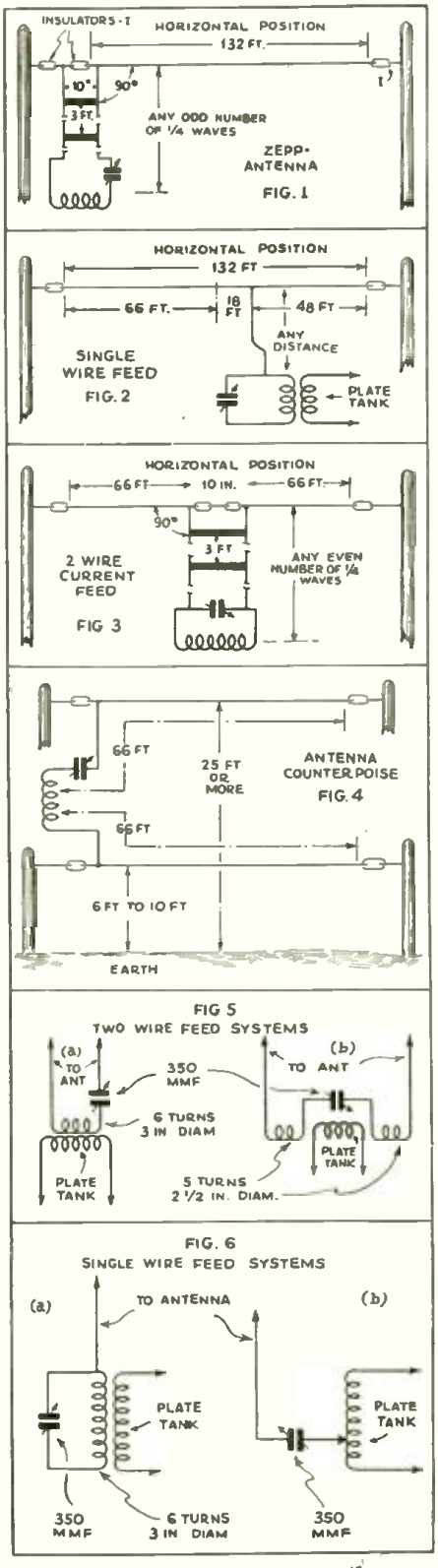
The "Zepp" Antenna

Figure 1 illustrates the Zepp Antenna. It is well known among amateurs and is one of the most popular types. It is a non-directional type of antenna and works well on any band.

The "Flat top" should be as high as possible. An angle of 90° should be made between the antenna and feeders for a distance of at least one third of the total feeder length. The "spacers" between the feeders can be small wooden sticks, ½" x ½" x 12". Pine, which has previously been boiled in paraffin, is preferred. Glazed Porcelain or Isolantite would serve most excellently. On each end a slit of one inch is cut, so that the feeder wire will fit tightly. To prevent the "spacers" from slipping, a small nail may be driven in the end after the wire is placed in the slit.

The Single Wire Feed antenna is shown in figure 2. This system is used mainly on the T. N. T. (tuned plate, fixed tune grid) circuit and similar circuits.

Cut the antenna to length and then double it. Mark the wire at this point. From here measure exactly 18 feet and attach the feeder. It should be well soldered and made secure, or it will change frequency if moved.



The diagrams above show the Zepp antenna; single wire feed; antenna-counterpoise system, current feed coupling method, and different forms of voltage feed coupling.

Figure 3 shows one of the current feed systems. It is a well balanced antenna and is easily erected. The "spacers" are the same as described in figure 1. An angle of 90° must also be kept between the "flat top" and the feeder wires.

Counterpoise System

The Antenna-Counterpoise system, figure 4, is another great favorite, especially with those who live in crowded cities. The wires do not have to run in a straight line but are attached to the antenna tank and stretched as far as the wire will go. One wire should run fairly close to the ground. The other may go in any direction that is convenient.

Current Versus Voltage Feed

There are two methods of coupling antennas to the transmitter. They are Current Feed and Voltage Feed Systems.

Figure 5 illustrates two kinds of Coupling. (a) uses a single coil and works on any antenna except the single wire voltage feed antenna. Figure 5 (b) is the best known hookup and is recommended by the author. This method of coupling requires a rather large space and sometimes cannot be installed for this reason.

Figure 6 illustrates two kinds of Voltage Feed coupling. These couplings are to be used on single wire feed systems only. (a) is the best type and will insure protection against illegal coupling. Both kinds may be used with the T. N. T. circuit and other similar circuits. (b) is a common type but is very dangerous. A very good variable condenser must be used in the antenna circuit to prevent short circuit. *Direct coupling between the antenna and the transmitter is illegal in the United States.* (This does not apply to Hertzian antennas.)

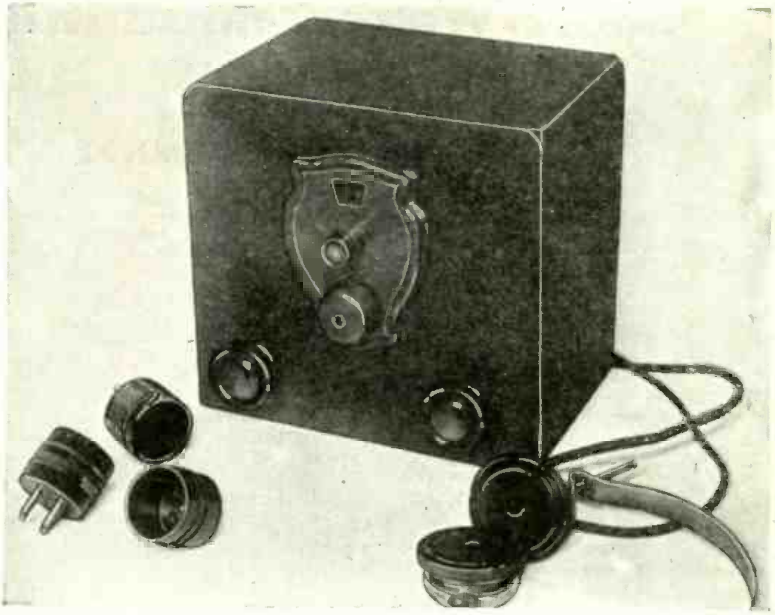
Antenna Coils

The antenna coils may be made from ¼" copper tubing or from No. 12 wire wound on a cardboard tube. Old copper tubing may be purchased very cheaply at any store that has electric refrigerator repair service. The tubing can be easily cleaned by mixing a solution of washing soda and water. One heaped tablespoonful of washing soda to one quart of luke-warm water is about right. The solution does not have to be exact because it will not harm the tubing and will remove the dirt and corrosion effectively. A piece of steel wool should be rubbed on the tubing so as to remove any dirt that has not been removed by the solution. The tubing should be cleaned vigorously until it is clean and shiny. A coat of clear Duco lacquer is then applied.

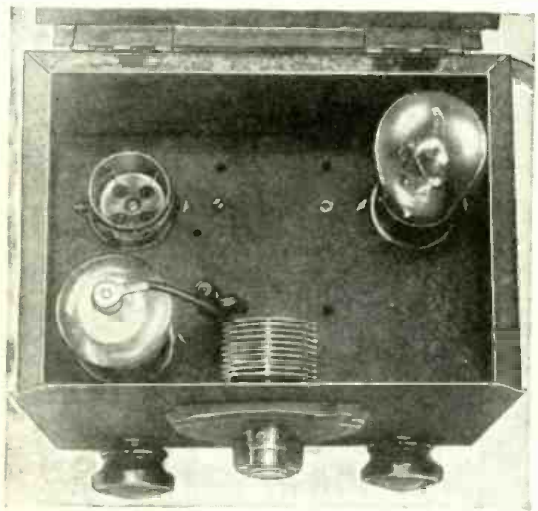
How to Make the FULTONE II

By LEONARD J. VICTOR

This short-wave receiver is particularly adapted to head-phone reception of both foreign and American short-wave stations and it can be operated from batteries, the tubes employed being of the 2-volt variety. A 33 pentode output tube is provided.



This battery operated short-wave receiver employs plug-in coils and uses but two "low-drain" 2-volt battery tubes to give a good "healthy" signal in the phones.



Looking down inside the Fultone II, 2-tube battery receiver.

● THE Fultone II, which is available in both kit and wired form, is an extremely efficient yet comparatively simple short-wave battery type receiver. Extreme care has been used in the design of this set by its sponsors—Harrison Radio, with the result that the performance obtained is as good as can be gotten with any two-tuber. While this set is easy enough for the beginner to construct, it is admirably fitted for use by the more advanced short-wave fan and radio amateur.

Circuit

The set comprises a detector and one stage of audio-frequency amplification. The detector tube is the two volt screen-grid type 32, used in a regenerative circuit. Screen-grid tubes in general are extremely sensitive (and the 32, which was designed for high-frequency work, is especially so, when used with the correct voltages and proper circuit. The audio stage of the receiver uses a pentode tube, type 33. This tube operates with very little signal input, and gives an output of over 600 milliwatts. Because of the use of the pentode, there is really as much gain as from two stages of triode audio. A straight-forward regenerative circuit is used, with two winding plug-in coils. Regeneration is controlled by a resistance, in the screen grid of the detector tube, as this is a very quite-working arrangement, and causes very little detuning effect.

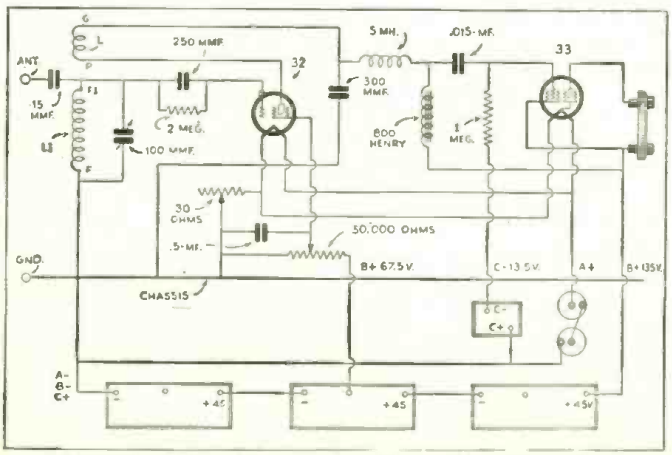
Layout

Good results in a set depend on three things, circuit, physical layout, and choice of parts. If one of these three is faulty, good results cannot be expected. The circuit used is a time-honored and oft proved one, and the physical layout is the result of very extensive experimentation. The layout makes for the shortest possible leads and the straightest connections. The detector tube is placed in the upper left-hand corner of the set, and directly behind it is the socket for the coil. The amplifier tube is in the rear right-hand corner of the chassis. All the other parts of the set are mounted under the chassis. The vernier in the center of the panel controls the tuning condenser. The rheostat is the lower left. and the regeneration resistance in the lower right-hand corner of the panel.

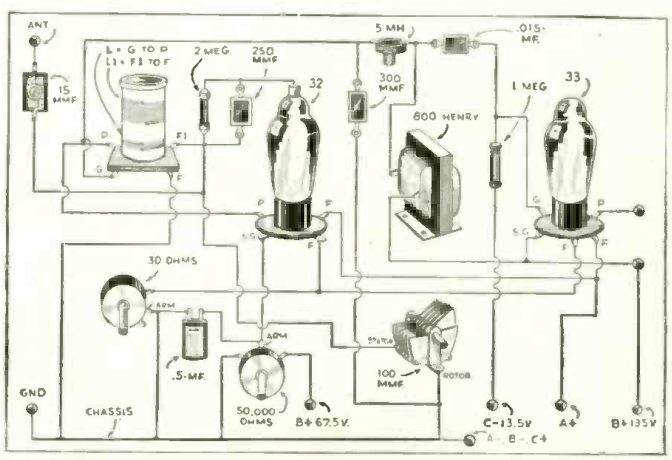
Parts

Extreme care should always be taken to make sure that the parts used in a set are efficient as well as ornamental. Good insulation is the pass-word to real results. For that reason wafer sockets are used in the construction, as they have less mass. and consequently lower loss at the higher frequencies. Another important thing is the choice

(*Continued on page* 682)



Schematic wiring diagram for the Fultone II—a 2-tuber.



A picture diagram for those not familiar with schematics.

SHORT WAVE LEAGUE

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What Readers Think About The "Code-less" Ticket

"Code-less" License Favored

Editor, SHORT WAVE CRAFT:

For a long time I have been reading arguments on your "No code below six meters" proposition and I have always intended to write you and tell you what I think of it, and I always put it off. But when I read Marvin Farr's letter in the January issue I made up my mind to write you at the first chance. I believe that I could pass the license "exam," even if I did have to learn code, because that is not the hardest thing in the world, but I intend to build a phone transmitter and I am not going to learn any fool code and then just discard it. There are plenty who will agree with me, and lots of them could build a transmitter twice as good as Marvin Farr's. In that issue is a letter from Robert Miller saying that all the present hams are selfish. He is perfectly correct in saying this, because no other person likes to see another person get away with something that he had to do. They are not only selfish this way but they are "air hogs." I have one of the *Minidynes* that you described a short time ago and was recently listening to a station and was all set to get the call letters, when up popped a "ham" with his old dots and dashes and made so much noise that you could not hear a thing, much less get the call letters. Besides, half of the hams are "terrible" operators and when you try to read their stuff, it comes in so irregular that nobody, not even the best operators can understand it, but with phone all this silly quacking would be over and real English would be heard. What is it that the Columbia Broadcasting System is trying to accomplish with the weekly programs from the Byrd Antarctic Expedition besides entertainment—why, development of the phone over all kinds of conditions. This is what the hams of today should be doing, instead of fooling around with a lot of dots and dashes that nobody, unless they have studied it, can understand.

So in closing I say that the code test *should* be abolished below six meters.

MITCHELL BARRETT,
28 East 70th St.,
New York City.

He Favors "Code-less" Ticket

Editor, SHORT WAVE CRAFT:

I firmly believe that those who favor a "no code" exam. to obtain a ticket to operate a transmitter on five meters should be congratulated.

How many of the opposers to the "no code" exam. have ever listened on the five-meter band? How many who have built good five-meter receivers say that only rank beginners with no technical knowledge of radio want to experiment with five-meter phone without bothering to learn a code which they will never use in their experiments?

When an experimenter comes to the front with enough ambition to build a phone for five meters, why can't we get behind him and give him a boost instead of trying to hold him back by insisting that only brass pounders should be given a license?

I like C. W. but fone is also a great institution. Of course I don't believe that everyone who learns the answers to a few questions should be given a five-meter ticket. I would say, "Give the applicant for a license an examination which will cover his knowledge and ability to operate a (phone) rig on the five-meter band."

PAUL G. WHITE,
221 Clark Ave.,
Bonner Springs, Kans.

P. S.—SHORT WAVE CRAFT is the best all-around radio publication printed—so help me.

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.

All Aboard for the "Code Class"

Editor, SHORT WAVE CRAFT:

Well "dern it," here goes, something I've wanted to do since I first purchased your good old mag. in March, 1932, and kept getting it ever since. I don't think there's another one like it. Right now, the 7-tube Michell S.W. Superhet described in the December issue is giving me *high fever* and it won't be long before a crisis will come, result—I'm going to build it! I've got at the present time, a "3-lunger," which, with its gasping and puffing was good up to the time I found the article on the 7-tuber described above. The only trouble I've got now is getting parts, etc. I'll have to order them from the good old U. S. A.—reason, I can't get them here—at least not all of them, and if I was able to, the price would be so high that it would take the joy out of experimenting, and building sets and transmitters which all would-be "hams" like to do. I just about have a transmitter completed using A.C., stepped up, filtered and rectified, delivering 500 v. each side of C.T. The transmitter itself is an oscillator using two 95's, 245's in push-pull. So I think when I get my ham ticket it will be great fun brass-pounding into the "wee small hours" of the morning to some ham in the "land of somewhere."

I quite agree with Mr. Don Meissner's letter on page 480 of the SHORT WAVE CRAFT. For those jelly-fish "nit-wits," as he refers to them, haven't got the backbone and brains to put in a bit of time each day learning the code and to study up on the things that make a transmitter work and why, as the commission requires them to know, why I think a fellow that wants his "ticket" without doing what our brother hams have done in order to get their's, isn't worth a grain of salt. Why even the YL's (young ladies) are showing the men up—i. e., those that are crying and hellyaching about the "no-code test." And the YL's are referred to as the "helpless, timid little things" but by golly they sure can show the opposite when they can pass their "exams" and get their "ham ticket" so that they can chew the rag over the air when they've run out of chewing it "over the back fence." How do you like that—Mr. No-Code-Test? I think the fellow that cries about the no-code test, whether it be below 5 meters or not, simply hasn't got the brains to memorize the code or is too lazy to do so, in which case he should leave the ham's organization be, and turn to lollypops. In conclusion I say a thousand *no's* to their no "code-test" cries; let them all take their exam. and if they don't want to, why they can drop the thing then and there and leave the "Ham Fraternity" be, which is something great to achieve and get into.

ADOLPHE PUTICH,
Natal, B. C.,
Canada.

He's Against "Code-less" License

Editor, SHORT WAVE CRAFT:

I have been reading SHORT WAVE CRAFT for only a few months. Of course by that time I have become a short wave addict. I enjoy the magazine very much but do not care for so many manufacturers' sets.

I wish to add my voice in protest against the codeless license below 6 meters. I believe that the exam should be kept very stiff to prevent any "hobbyists" from cluttering up the air. Many of those who want no code below 6 meters just want a chance to see what radio is like. They haven't got a bona-fide interest in radio. They are the type that likes to "take a shot" at everything but sticks to no one thing. Also how can the fellows that are really trying to do something for radio, do anything when there are a lot of fellows with transmitters that have been "thrown together" and chewing the rag with their friends and causing a lot of unnecessary QRM.

Many of your correspondents have commented on those ambitionless fellows who start in on radio with "mail-order" sets, without knowing what it is all about and with no knowledge as to how to tune a transmitter. If below 6 meters becomes "code-less," that is the type that will make up a good part of the "operators" and "station owners."

Talk about not being able to learn the code! Those fellows with the mail-order sets

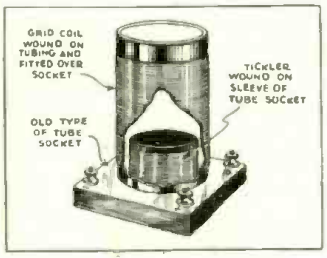
(*Continued on page* 702)

$5.00 First Prize

COIL HINT

I am submitting the following for your page of "the best S-W Kink" of the month. Where space is limited for winding coils, an old type tube socket of the sleeve type can be used for winding the tickler coil. The grid coil is then wound on a piece of tubing and fitted over as illustrated. Tube socket connections can be used for coil ends.—John A. DeCarmo.

Note: Tubing cut away to show tickler coil and tube sleeve.

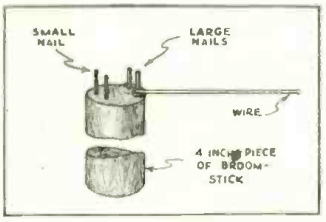


$5.00 FOR BEST SHORT WAVE KINK

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.

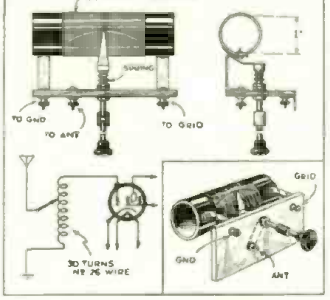
A HANDY WIRE-BENDING TOOL

The wire-bending tool shown in Figure 1 is useful for making "eyelets" in bus wire. It is made from a section taken from an old broom-stick, being sawed off square and having three nails driven in the end. The end of the wire is placed between the nails and the wire is carefully bent around either the larger or smaller nail, according to the size eyelet desired. Perfect eyelets can be made with this tool.—Harry D. Hooton.

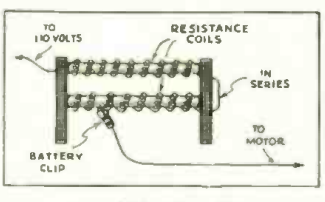


SIMPLE BOOSTER

Here is a simple booster for coupling the antenna to the untuned R.F. stage. Since the tuned stage requires another dial and shielding, this device helps considerably, and is controlled by a knob on the front panel. It does not require tuning for each station, but is merely set for



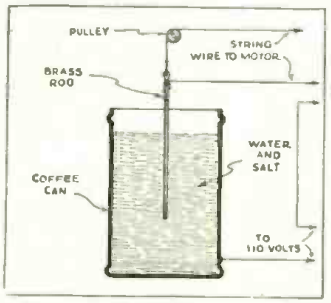
each coil. It should be mounted away from the panel. Use a ¼" dowel for a shaft. A snug fit on the coupling saves bother with set screws. The center bearing and shaft was taken off an old three-circuit tuner: the contact arm from a rheostat. Between 30 and 35 turns of about No. 26 enamel wire used.—Ralph S. Thompson.



2 RHEOSTATS

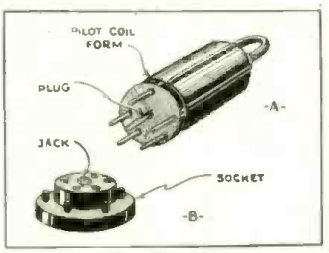
A rheostat which will be found very useful for "slowing down" a 110-volt lathe motor for winding coils and transformers can be made from an old street-car or other electric heater. These are usually made of heavy iron wire wound on a porcelain core and two of them are mounted on one frame. Connect the frames in series and wire the ungrounded side of the 110 into the heater. Put a small battery clip on the wire leading into the motor and the speed can be regulated by moving the clip.

Another rheostat can be made utilizing a tall coffee can and a brass rod. The can may be filled with water and a little salt added. One lead should be soldered on the bottom of the can and the other on the brass rod. The speed can be varied by moving the rod up or down by a ratchet or pulley.—Charles H. Hall.



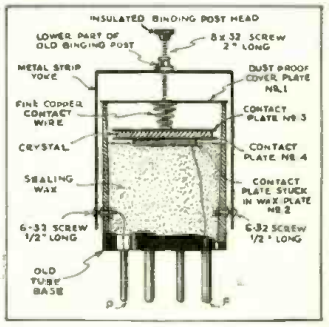
6-PIN FORM FROM 5-PIN

Figure A shows how a Pilot coil form was fitted with an extra terminal. A banana plug was employed for the extra terminal, and was mounted in the center of the base of the coil form. There was already a hole drilled in the center of the base, but in order to bring the tip of the plug flush on a level with the other prongs, it was necessary to countersink this hole with a ⅛-inch drill to a depth of ⅛ inch. It was found best, however, to have the plug overlap the other prongs slightly, for then it acted as a guide for inserting the coil. In order to provide a suitable socket, a five-prong base mounting Na-ald bakelite socket was drilled in the center and fitted with a jack, as shown in Figure B. To insure the proper alignment of the plug and jack, the coil form, with the plug unattached, was placed in the socket and a hole drilled through both, the former acting as a guide.—Harold H. Okasaki.



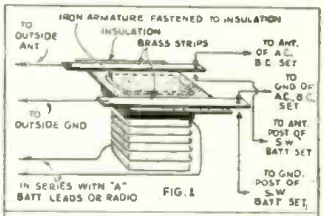
A PLUG-IN CRYSTAL HOLDER

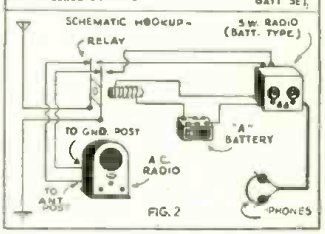
The first thing to do when beginning the construction is to bore two small holes directly opposite about ⅝ inches up from the bottom of the tube base for fastening the yoke. Next take the metal strip for the yoke and bend as shown in the diagram, being sure that it will swing over the edge of the tube base when revolved on the two machine screws. Bore a small hole in the exact center of the yoke. Sweat the lower part of the old binding post on so that the (2"x8-32) machine screw will clamp the dust-proof cover on the tube base. Grind the bottom of plate No. 1 and the top of the tube base so that they will be dust-proof. Plates Nos. 3 and 4 must be ground perfectly flat so that they will make good contact to the crystal. (This may be done by laying a very fine piece of sandpaper on a piece of glass and rubbing the metal plate on it.) Take metal plate No. 2 and grind one side very smooth so that it will make good contact to plate No. 4. Solder a short length of copper wire to the bottom of it and connect to the "F—" prong of the tube base. Also connect one of the small machine screws to the plate prong. Next melt the sealing wax and pour it into the tube base, keeping it level so that the wax will dry that way. Solder a four-inch piece of copper wire to the bottom of plate No. 1. Coil the wire so that it has enough spring to make good contact to plate No. 3 when the plate is placed on top of the tube base.—Earl Beardmore, W9AEY.



S-W, B-C RELAY

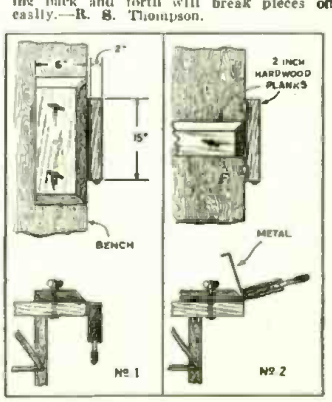
Here is a useful automatic relay which connects the aerial and ground to either the broadcast receiver or else to the short-wave set, without having to manipulate an extra switch. The relay winding is connected in the battery and filament switch circuit of the short-wave receiver. When the S-W set is switched on, the relay magnet attracts the armature and connects the aerial and ground to that set. When the S-W set is switched off, the relay armature spring pulls it back and closes the contacts for the "A" and "G" to the broadcast receiver.—Oron C. Dakin.





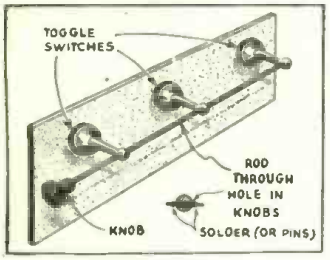
DEVICE FOR BENDING ALUMINUM

The beveled edge shown is necessary, for in bending a 90 degree angle, the metal has to be bent slightly beyond and springs back. To bend all four sides, as in a pan shaped sub-panel, bend two ends and straighten out flat by hand. The crease will remain and can be brought back to shape with a bench anvil, or square block. To bend corners and narrow pieces, the top piece is placed as in Fig. 2. Hardwood is used. The hinges are sunk into the wood so that edges of pieces come close together. I have bent 12 gauge iron with this handy rig. To cut aluminum, score deeply along line with sharp knife and place in bender. Bending back and forth will break pieces off easily.—R. S. Thompson.



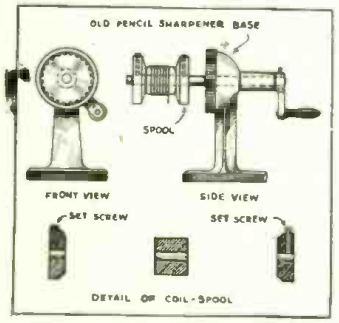
GANGING TOGGLE SWITCHES

This trick is not original with the writer but is worth reporting for the edification of all short-wave fans. A brass rod is passed through holes drilled in the knobs on the handles of the toggle switches. The rod may have pins piercing it either side of the toggle levers or a dab of solder may serve to move the switch lever as the rod is pushed or pulled. In other words the holes through the switch levers are drilled or reamed a little larger than the rod. This is necessary as the switch levers turn to a different angle as they are flipped "off" and "on."—H. S.



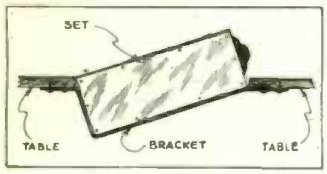
COIL WINDER

An old pencil sharpener makes the coil winder sketched here. The parts needed are: an old pencil sharpener base, a large spool and a square piece of metal (this may be bought in any hardware store, cast iron, steel, brass, etc.). The sketch is self-explanatory.—S. Woolman.



MOUNTING RECEIVER

Why mount the S-W receiver always in the same old way—flat on the table. Some commercial apparatus utilizes the stunt here illustrated. As seen the cabinet is mounted in a "slot" cut through the top of the table. This places the panel and control knobs at a convenient angle for operating. The set is held in position by a metal strap bent to the shape shown and screwed to the bottom of the table.—H. S.



SHORT WAVE STATIONS OF THE WORLD

SECTION TWO

The lists that appear herewith comprise Section Two of the SHORT WAVE CRAFT index of the world's short wave stations, which has proved very popular with S. W. fans everywhere. As compared with Section Two published in the February, 1934, number, it represents many additions and corrections.

Section One of this list, which appeared in the February, 1934, number, contained a "grand" list of short wave relay broadcasting, experimental and commercial radiophone stations. It will appear in the April, 1934, number, with further additions and last minute corrections.

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. We will safely return to you any verifications that you send in to us. Communications of this kind are a big help.

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.

ALL STATION TIME GIVEN IS "EASTERN STANDARD TIME"

TELEVISION STATIONS

According to frequency and wavelength

1600-1700 kc. 176.5-187.5 m.
W2XR—Radio Pictures, Inc.
Long Island City, N. Y.

W8XAN — Sparks-Withington Co.
Jackson, Mich.

2000-2100 kc. 142.9-150 m.
W9XAO—Western Television Corp.
Chicago, Ill.

W6XAH—Pioneer Mercantile Co.
Bakersfield, Cal.

W9XK—Iowa State University
Iowa City, Iowa

2100-2200 kc. 136.4-142.9 m.
W3XAK—National Broadcasting Co.

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

W6XS—Don Lee Broadcasting Corp.
Los Angeles, Calif.

W9XAP—National Broadcasting Co.
Chicago, Ill.

W9XAK—Kansas State College
Manhattan, Kans.

2200-2300 kc. 130.4-136.4 m.
W9XAL—First National Television Corp.
Kansas City, Mo.

2750-2850 kc. 105.3-109.1 m.
W9XG—Purdue University
W. Lafayette, Ind.

W2XAB—Atlantic Broadcasting Corp.
New York, N. Y.
(not oper.)

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.

W9XE—U. S. Radio & Tele. Corp.
Marion, Ind.

W8XF—WJR - Goodwill Station
Pontiac, Mich.

W3XAD—RCA-Victor Co.
Camden, N. J.

W2XBT—National Broadcasting Co.

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

W9XAT—Dr. Geo. W. Young

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

W6XAO—Don Lee Broadcasting System
Los Angeles, Calif.

W3XE—Philadelphia Storage Battery Co.
Philadelphia, Pa.

W2XAK—Atlantic Broadcasting Corp.,
New York, N. Y.

W10XX—RCA-Victor Co.
Portable and Mobile.

W8XAN — Sparks - Withington Co.
Jackson, Mich.

W8XL—WGAR Broadcasting Co.
Cuyahoga Hts., Ohio

AIRPORT RADIO STATIONS

The airport stations do not follow any fixed schedules, and are likely to be heard any time of the day or night. The airplane transmitters are usually heard on the same wavelengths.

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
Orland 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.	KGTY
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.

Atlanta, Ga.	WQPD
Big Spring, Tex.	KGUG
Brownsville, Tex.	KGUE
Burbank, Calif.	KGUR
Cincinnati, Ohio	WSID
Dallas, Tex.	KGUF
Douglas, Ariz.	KGUN
El Paso, Tex.	KGUA
Frijole, Tex.	KGUM
Indio, Calif.	KGUQ
Jackson, Miss.	KSDB
Little Rock, Ark.	KQUU
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
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.

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.

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

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.
KGZG	Des Moines, Ia.
WPDZ	Fort Wayne, Ind.
WPDT	Kokomo, Ind.
WPEC	Memphis, Tenn.
KGPI	Omaha, Neb.
WPDP	Philadelphia, Pa.
KGPM	San Jose, Cal.
KGPW	Salt Lake City, U.
KGPK	Sioux City, Ia.
WRDQ	Toledo, Ohio
WPFL	Gary, Ind.
WPFQ	Swathmore, Pa.
WPFO	Knoxville, Tenn.
WPFR	Johnson City, Tenn.
WPEM	Woonsocket, R. I.
WPFV	Pawtucket, R. I.
KGZT	Santa Cruz, Cal.
WPGK	Cranston, R. I.
KGZU	Lincoln, Neb.

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.
KGZS	McAlester, Okla.
WPDG	Youngstown, Ohio
WPGD	Rockford, Ill.

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.
KGZP	Coffeyville, Kans.
KGPQ	Honolulu, T. H.

2442 kc.-122.8 m.

WPFZ	Miami, Fla.
WPGA	Bay City, Mich.
WPFG	Jacksonville, Fla.
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.
WPFE	Reading, Pa.
KGZR	Salem, Ore.
WPES	Saginaw, Mich.

2430 kc.-123.4 m.

WPEK	New Orleans, La.
KGPB	Minneapolis, Minn.
WPDI	Columbus, Ohio
KGPP	Portland, Ore.
WPDM	Dayton, Ohio
KGZD	San Diego, Cal.
WPFD	Highland Park, Ill.
WPFK	Hackensack, N. J.
KGZJ	Phoenix, Ariz.

2422 kc.-123.8 m.

KSW	Berkeley, Cal.
WMJ	Buffalo, N. Y.
KGPE	Kansas City, Mo.
KGZC	Topeka, Kan.
KGPG	Vallejo, Cal.
WPDW	Washington, D. C.
WPFU	Portland, Me.

2414 kc.-124.2 m.

WPGB	Port Huron, Mich.
WPDY	Atlanta, Ga.
KGPS	Bakersfield, Cal.
WCK	Belle Island, Mich.
WPDX	Detroit, Mich.
KGZA	Fresno, Cal.
WRDR	GrossePt Vil.,Mich.
WMO	Highland Pk., Mich.
KGPA	Seattle, Wash.
WPDA	Tulare, Cal.
KGZM	El Paso, Tex.
WPFH	Baltimore, Md.
KGZN	Tacoma, Wash.
WPFI	Columbus, Ga.
WPFM	Birmingham, Ala.
WPFR	Clarksburg, W. Va.
KGZO	Santa Barbara, Cal.
KGPD	San Francisco Cal.
KGZX	Albuquerque,N.Mex.
WPGS	Mineola, N. Y.

1712kc.-175.15m.

WPED	Arlington, Mass.
KGPJ	Beaumont, Tex.
WPDB	Chicago, Ill.
WPDC	Chicago, Ill.
WPDD	Chicago, Ill.
WKDU	Cincinnati. Ohio
KVP	Dallas, Tex.
KGPL	Los Angeles, Cal.
WPGF	Providence, R. I.
KGJX	Pasadena, Cal.
WPDU	Pittsburgh, Pa.
KGPC	St. Louis, Mo.
KGZI	Wichita Falls, Tex.
WPFA	Newton, Mass.
KGZL	Shreveport, La.
WPEH	Somerville, Mass.
WPEP	Arlington, Mass.
KGZB	Houston, Tex.
WPFJ	Hammond, Ind.
WPFN	Fairhaven, Mass.
KGZQ	Waco, Tex.
WPET	Lexington, Mass.
WPEI	E. Providence, R. I.
UYR	Montreal, Can.

1574 kc.-189.5 m.

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

1558 kc.-192.5 m.

WEY	Boston, Mass.
WKDT	Detroit, Mich.

1534 kc.-196.1 m.

WPGC	S.Schenectady,N.Y.
KGHO	Des Moines, Ia.

190 kc.-1579 m.

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

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.	2430 kc.
KGPC	St. Louis, Mo.	1712 kc.
KGPD	San Francisco, Cal.	2414 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.
KGPK	Sioux City, Iowa	2470 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.
KGPQ	Honolulu, T. H.	2450 kc.
KGPS	Bakersfield, Cal.	2414 kc.
KGPW	Salt Lake City, Utah	2470 kc.
KGPX	Denver, Colo.	2442 kc.
KGPY	Baton Rouge, La.	1574 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZA	Fresno, Calif.	2414 kc.
KGZB	Houston, Tex.	1712 kc.
KGZC	Topeka, Kans.	2422 kc.
KGZD	San Diego, Cal.	2430 kc.
KGZE	San Antonio, Tex.	2506 kc.
KGZF	Chanute, Kans.	2450 kc.
KGZG	Des Moines, Iowa	2470 kc.
KGZH	Klamath Falls, Ore.	2442 kc.
KGZI	Wichita Falls, Tex.	1712 kc.
KGZJ	Phoenix, Ariz.	2430 kc.
KGZL	Shreveport, La.	1712 kc.
KGZM	El Paso, Tex.	2414 kc.
KGZN	Tacoma, Wash.	2414 kc.
KGZO	Santa Barbara, Cal.	2414 kc.
KGZP	Coffeyville, Kans.	2450 kc.
KGZQ	Waco, Tex.	1712 kc.
KGZR	Salem, Ore.	2442 kc.
KGZS	McAlester, Okla.	2458 kc.
KGZT	Santa Cruz, Cal.	2470 kc.
KGZU	Lincoln, Neb.	2470 kc.
KGZX	Albuquerque, N. Mex.	2414 kc.
KSW	Berkeley, Cal.	2422 kc.
KVP	Dallas, Tex.	1712 kc.
UYR	Montreal, Can.	1712 kc.
WBA	Harrisburg, Pa.	190 kc.
WBR	Butler, Pa.	190 kc.
WCK	Belle Island, Mich.	2414 kc.
WDX	Wyoming, Pa.	190 kc.
WEY	Boston, Mass.	1558 kc.
WJL	Greensburg, Pa.	190 kc.
WKDT	Detroit, Mich.	1558 kc.
WKDU	Cincinnati, Ohio	1712 kc.
WMB	W. Reading, Pa.	190 kc.
WMDZ	Indianapolis, Ind.	2442 kc.
WMJ	Buffalo, N. Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1574 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.
WPDG	Youngstown, Ohio	2458 kc.
WPDH	Richmond, Ind.	2442 kc.
WPDI	Columbus, Ohio	2430 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.
WPDS	St. Paul, Minn.	2430 kc.
WPDT	Kokomo, Ind.	2470 kc.
WPDU	Pittsburgh, Pa.	1712 kc.
WPDV	Charlotte, N. C.	2458 kc.
WPDW	Washington, D. C.	2422 kc.
WPDX	Detroit, Mich.	2414 kc.
WPDY	Atlanta, Ga.	2414 kc.
WPDZ	Fort Wayne, Ind.	2470 kc.
WPEA	Syracuse, N. Y.	2458 kc.
WPEB	Grand Rapids, Mich.	2442 kc.
WPEC	Memphis, Tenn.	2470 kc.
WPED	Arlington, Mass.	1712 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.
WPEI	E. Providence, R. I.	1712 kc.
WPEK	New Orleans, La.	2430 kc.
WPEL	Middleboro, Mass.	1574 kc.
WPEM	Woonsocket, R. I.	2470 kc.
WPEP	Arlington, Mass.	1712 kc.
WPES	Saginaw, Mich.	2442 kc.
WPET	Lexington. Mass.	1712 kc.
WPFA	Newton, Mass.	1712 kc.

(Continued on page 681)

SHORT WAVE QUESTION BOX

EDITED BY

GEORGE W. SHUART, W2AMN

● Because of the amount of work involved in the drawing of diagrams and the compilation of data, we are forced to charge 25c each for letters that are answered directly through the mail. This fee includes only hand-drawn schematic drawings. We cannot furnish "picture-layouts" or "full-sized" working drawings. Letters not accompanied by 25c will be answered in turn on this page. The 25c remittance may be made in the form of stamps or coin.

Special problems involving considerable research will be quoted upon request. We cannot offer opinions as to the relative merits of commercial instruments.

Correspondents are requested to write or print their names and addresses clearly. Hundreds of letters remain unanswered because of incomplete or illegible addresses.

THE PALMER RECEIVER

Bernard Kraus, Ransom, Kansas.

(Q) I purchased your book, THE SHORT-WAVE BEGINNER'S BOOK, and built the Beginner's Short Wave Receiver, by C. W. Palmer. All I can get is one continuous howl. One time I heard a man talking but it was not loud enough to understand and I could not get rid of the howl.

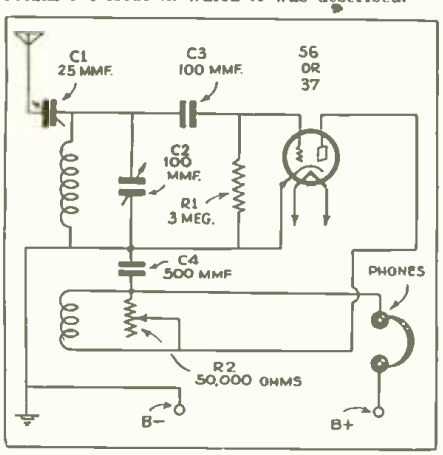
(A) We believe you must have made some error in constructing your set, otherwise you would not encounter the howling sound. We suggest that you check it over again very carefully.

(Q) Will a postage stamp condenser work better for aerial coupling than brass angles?

(A) The postage stamp type variable antenna trimming condenser would undoubtedly prove to be more successful than the two brass angles you are now using, as the condenser is adjustable.

OSCILLODYNE DIAGRAM

We have received literally hundreds of requests for a diagram of the *Oscillodyne 1-Tube Wonder Set*, and we are reproducing it here for the benefit of those who did not obtain the issue in which it was described.



One tube Oscillodyne Circuit.

BINNEWEG SET

Albert L. Bradfield, Lawrence, Mich.

(Q) I have constructed the 2-Tube Binneweg Short-Wave Set described and illustrated in TEN MOST POPULAR SHORT-WAVE RECEIVERS and it works very fine but requires a large amount of tickler turns. Twenty turns are required to give sufficient regeneration on the 50 meter band, and the detector goes into oscillation with a click. Reversing the filament connections does not seem to correct this fault.

(A) We suggest that you try another detector tube in your Binneweg short-wave receiver. Make sure you use 45 volts on the detector plate. If your coils have the correct number of tickler turns and you have followed the wiring diagram carefully, there is no reason why you should not obtain excellent results with this set. Also we suggest you try a higher value of grid-leak.

POWER SUPPLIES

William W. Uttley, Jr., Lewistown, Pa.

(Q) I would like to have a good non-humming power supply for A.C. sets, and a good D.C. supply for "A", "B" and "C". All of these should operate from a 110 volt 60 cycle lighting source. These power supplies are to be mounted on a panel and used in conjunction with experimental work.

(A) As suitable power supplies to be used in your experimental work we suggest the receiver power supply unit shown in the December, 1933, issue of SHORT WAVE CRAFT on page 484. A transmitter power supply is shown in the October, 1933, issue on page 343.

BY-PASS CONDENSER RATING

George J. Katelus, Elizabeth, N. J.

(Q) What is the voltage rating of the various by-pass condensers used in the Doerle A.C. Receiver described in the August, 1933, issue of SHORT WAVE CRAFT?

(A) The working voltage rating of the by-pass condensers used in the A.C. Doerle Receiver is 200 volts. Higher voltage condensers can be used, of course, with no difference in results.

ADDING POWER AMPLIFIER TO ALL-WAVE SET

Robert F. Martin, Chicago, Ill.

(Q) Which would be the most suitable power amplifier tube to add to the *South American Seven Tube All-Wave Superhet*, described in the April, 1933, issue of SHORT WAVE CRAFT: and would it be advisable to put the additional stage on the same chassis?

(A) A suitable power amplifier to be added to the *South American Seven-Tube All-Wave Superhet* would be a type 245 tube. This tube should be coupled to output of the 7-tube superhet through a 3:1 ratio audio transformer. This can be mounted directly on the chassis of the receiver. Triode power amplifier tubes do not give as much trouble from feed-back as pentodes, and you should experience no reaction between the amplifier stage and the balance of the receiver.

47 AND 59 TUBES

Harry Rabe, Cleveland, Ohio.

(Q) Please show diagram using the 59 instead of the type 47 power amplifier tube, used in Mr. Burton Currie's 5-Tube T.R.F. receiver, described in the January, 1933, issue of SHORT WAVE CRAFT.

(A) When connected as a pentode there is no difference between the 47 and 59 tube, and we believe it will be of no value to make this change.

(Q) Would the power-pack for the *Master Composite*, which was described in the June, 1933, issue of SHORT WAVE CRAFT work this set to full capacity?

(A) The power supply designed for the *Master Composite Receiver* should work very satisfactorily with Mr. Currie's 5-Tube T.R.F. Receiver.

FIELD COIL CAUSES VOLTAGE DROP

R. E. Edsom, Chicago, Ill.

(Q) I have a short-wave set using one 57, one 58, one 56, and one 59 in a circuit, having one stage of R.F. with two stages of resistance-coupled audio. The type 59 is used as a pentode. My power supply is capable of delivering 55 M.A. at 250 volts output, yet when I connect a 2,500 ohm dynamic speaker field coil in place of one of the filter chokes, the output voltage is reduced to about 150 volts. How can I overcome this trouble?

(A) It is necessary that you either use a power transformer with higher secondary voltages, or else a speaker with a lower resistance field winding in order to obtain higher voltages at the output of your power supply. We suggest a field coil resistance of about 1,000 ohms. This should give satisfactory results.

PORTABLE TRANSMITTERS

Stanley W. Grandil, Phoenix, Ariz.

(Q) I would like to build a portable transmitter that will work on batteries.

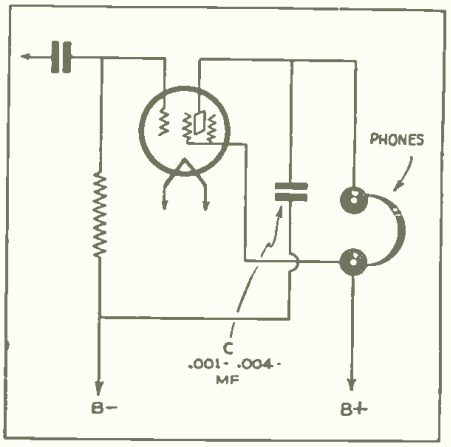
(A) Regarding a transmitter to be used with batteries for portable work, we suggest that you refer to the circuit used in the *E.T. Beginner's Transmitter* shown on page 353 of the October, 1933, issue of SHORT WAVE CRAFT. If 171A tubes are used, the 50,000 ohm grid-leak should be replaced with one having a resistance of 10,000 ohms.

(Q) If a hot-wire ammeter is used, what range should be selected, 1½, 3, or 5 amperes?

(A) In conjunction with low-power transmitter a zero to 1½ amp. meter (or less) should be used.

ELIMINATING AUDIO FEED-BACK

Many of our readers have been experiencing difficulty in regenerative receivers due to serious feed-back when using a pentode audio amplifier. In most cases this can be eliminated by connecting a .001 mf. to .004 mf. fixed condenser from plate of the tube to B negative as shown in the diagram illustrated on this page.



"C" eliminates howl.

MALSBERGER RECEIVER

V. F. Smith, Waltertown, S. Dak.

(Q) I would like to construct a tuned R.F. receiver utilizing some of the advantages introduced by Curtis E. Malsberger in his illustration on page 411 of the November, 1933, issue of SHORT WAVE CRAFT. What would be the correct manner in which to connect the detector and what are the correct voltages for the screens and plates?

(A) Since the November issue of SHORT WAVE CRAFT, Mr. Malsberger has written an article which appears in this issue, covering the construction of a receiver utilizing all the various improvements mentioned in the article in the November issue of SHORT WAVE CRAFT. We suggest that you read this article carefully and follow the many constructive suggestions introduced by Mr. Malsberger.

BATTERY TRANSMITTERS

Herbert Lucke, Woodland, Mo.

(Q) I live in a rural district outside the zone served by power lines and would like to

(*Continued on page* 703)

Power Supply Unit

(*Continued from page* 662)

The filter is the next in line on the power supply and deserves very careful attention. Nothing but the best chokes should be used together with condensers that will not puncture because of exceeding their rated voltage. It is much cheaper to start off by using good condensers rated to operate continuously at the voltage used, with no further expense, than to use low voltage condensers and be in danger of not only ruining the condensers but the rectifier tubes as well.

Chokes

The filter chokes employed are 15 henry heavy-duty units rated at 250 mills. These may seem to be heavier than necessary but a choke of this type provides better regulation and there is no danger of saturation due to over-loading.

With mercury vapor rectifier tubes it is generally accepted that a *choke-coupled input* to the filter is best. The diagram shows this method. And the resultant voltage with a 130 mill drain is 700 volts. With condenser input (C dotted in) the voltage is raised to 800 with a 150 milliampere load. The steady D.C. voltage across the filter condensers with a 1 M.F. condenser input to the filter system, and with no load other than the 30 mills (M.A.) drawn by the 40,000 ohm bleeder, is 1,200 volts. This may seem too high for the 1,000 volt filter condensers, but on the other hand a good paper condenser, rated at 1,000 working volts, will stand around 1,500 volts peak, without breaking down; this applies to condensers c1-c2. C should have a working voltage of around 1,500. The 800 volts obtained with condenser input provides a noticeable increase in R.F. output of the transmitter over the 700 obtained with choke input and no ill effect to the rectifier tubes was experienced, because even with condenser input the tubes are run far below their rating. By no means, however, should this power supply be operated without a bleeder resistor. 40,000 ohms is indicated but a much lower value would improve the regulation considerably. Lower values of bleeder resistances would impose a further load on the power transformer and this would necessitate a lower plate input to the oscillator tubes. In other words if the oscillators were drawing 150 mills (M.A.) and the bleeder 50 mills (M.A.) the 150 M.A. rating of the power transformer would be exceeded and the regulation would be no better than with the high resistance bleeder.

With the 40,000 ohm bleeder and condenser input, the voltage is 1,200 with the key up and 800 with the tubes oscillating. This, while not the best regulation, does not result in heavy key impacts or a chirpy note. The regulation is twice as good with choke input, being 900 with no oscillator load and 700 with the oscillators drawing 130 mills (M.A.); the bleeder in each case remaining the same value.

Whether using condenser or choke input, this power supply in conjunction with the transmitter, produces a pure and steady D.C. note.

Parts List for Power Supply

1 800-0-800 volt 150 M.A. power transformer.

1 10 volt 7 amp. filament transformer. (For 830 tubes.)

1 2.5 volt filament transformer. (For 866 tubes.)

2 15 henry 250 milliampere filter chokes.

2 2 mf. 1,000 (working voltage) filter condensers.

1 1 mf. 1,500 (working voltage) filter condenser; optional for cond. input.

1 40,000 ohm bleeder resistor, 50 watt.

2 4 prong sockets.

2 866 mercury vapor rectifier tubes.

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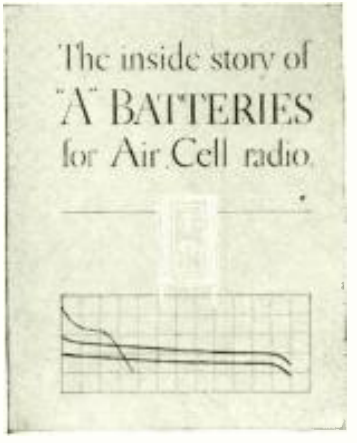

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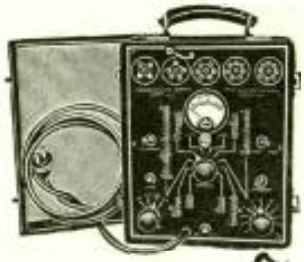

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Type No.	Fil. Voltage	Your Cost	Type No.	Fil. Voltage	Your Cost
00A	5.0	.40	82	2.5	.85
01A	5.0	.30	83	5.0	.85
1	6.3	.85	84	6.3	.85
10	7.5	1.10	85	6.3	.60
12A	5.0	.40	89	6.3	.60
20	3.3	.40	X199	3.3	.40
22	3.3	.85	V199	3.3	.40
24A	2.5	.40	2A3	2.5	1.10
26	1.5	.30	2A5	2.5	.85
27	2.5	.30	2A6	2.5	.85
30	2.0	.60	2A7	2.5	1.10
31	2.0	.60	2B6	2.5	1.10
32	2.0	.60	2B7	2.5	1.10
33	2.0	.85	5Z3	5.0	.85
34	2.0	.85	6A4	6.3	1.10
35	2.5	.60	6A7	6.3	1.10
36	6.3	.60	6B7	6.3	1.10
37	6.3	.60	6C6	6.3	.85
38	6.3	.60	6C7	6.3	.85
39	6.3	.60	6D6	6.3	.85
40	5.0	.40	6D7	6.3	.85
41	6.3	.60	6E7	6.3	.85
42	6.3	.60	6F7	6.3	.85
43	25.0	.85	6Y5	6.3	.85
44	6.3	.60	6Z3	6.3	.85
45	2.5	.40	6Z4	6.3	.85
46	2.5	.60	6Z5	6.3	.85
47	2.5	.60	12A5	6.3	.85
48	30.0	1.10	12Z5	6.3	.85
49	2.0	.85	25Z5	25.0	.85
50	7.5	1.10	12Z3	12.6	.85
51	2.5	.60	182B	5.0	.85
53	2.5	.85	183	5.0	.85
55	2.5	.60	401	3.0	1.50
56	2.5	.60	403	3.0	2.00
57	2.5	.60	484	3.0	.85
58	2.5	.60	485	5.0	.85
59	2.5	.60	586	7.5	2.10
71A	5.0	.30	686	3.0	.85
75	6.3	.85	866	2.5	2.75
77	6.3	.85	PZH	2.5	.85
78	6.3	.85	WD11	1.1	.60
79	6.3	1.10	WD12	1.1	.60
80	5.0	.40	216B	7.5	.85
81	7.5	1.10	213	5.0	.60

RECTIFIER AND CHARGER BULBS

125 Mil. rectifier tube B.H. (Raytheon type).....$1.25
6-10 Amp. trickle charger Bulb (Tungar type)..... 2.00
2 Amp. charger Bulb (Tungar type)..... 2.00
5 and 6 Amp. charger Bulb (Tungar type)..... 3.75
15 Amp. charger Bulb (Tungar type)..... 7.50
UX-280M—5.0 Full Wave Mercury Vapor Rectifier.. 1.10
VX-281M—7.5 Half Wave Mercury Vapor Rectifier.. 1.90
UX-871 —2.5 Half Wave Mercury Vapor Rectifier.. 1.10
UX-872 —7500 Volts Half Wave Merc. Vap. Rec... 11.00

TELEVISION TUBES and PHOTO ELECTRIC CELLS

Photo Cell, "Potassium", 3½" overall length, Type C. $2.10
Photo Cell, "Caesium", 4½" overall length, Type A 7.90
Photo Cell, "Caesium", 3-1/16 overall length, Type R. 5.90
Photo Cell, "Caesium", Type T, same as UX-868. 5.90
Reflectron Neon Television Tube, 2" Cathode Square, Type C..... 2.85
Neon Television Tube, 1½" Cathode Square, Type V. 3.85
Neon Television Tube, 1" Cathode Square, Type X. 2.85

ARCO TUBE COMPANY
40 Park Place Newark, N. J.

An Advanced 5-Tube Receiver

(*Continued from page* 655)

maries and secondaries tied together, may be used without appreciable loss of volume. The 0.25 megohm resistors connected across these impedances aid in flattening out the frequency response, but may be eliminated if desired.

Audio Amplifier

The audio end offers no difficulties, but it is not recommended that any changes be made in either the resistor or condenser values shown. These values have been carefully tried out and provide the best possible compromise between volume, tone, overload, feedback and hum.

It will be noted that a potentiometer of 250,000 ohms and the 0.01 Mf. condenser in the grid circuit of the second A.F. tube is used as a tone control. This aids considerably in reducing the unwanted noises which are usually of a high freqnency nature.

Volume Control

The volume control (Marked No. 2), in the grid circuit of the first A.F. tube is worthy of inclusion as it allows the detector and R.F. stages to be set at maximum sensitivity when searching for weak signals, and at the same time the output volume can be kept down to a respectable level. (The family and neighbors will appreciae this feature.) However, this form of volume control is not entirely satisfactory when employed alone because of the fact that no provision has been made to prevent the stronger signals from *overloading* the detector tube, and thereby causing blocking and serious distortion. Hence the reason for the additional control across the antenna coil (marked No. 1).

The only other point of which mention need be made is the method used in coupling the antenna to the R.F. stage. Here, the antenna coil (L2) is interwound between the turns of the secondary (L3). However, instead of the usual arrangements, the antenna is connected, through a small condenser of .0001 Mf. to the low-potential end of the coil L2, and the ground is connected to that end of the primary that is closest to the grid end of the secondary.

This method is used in the new National FB-7, and it is particularily efficient in that while the input coupling is rather tight, it is almost purely inductive, and also very little of the antenna resistance and capacity is reflected into the secondary circuit. This fact and the further consideration that both tuned circuits are physically alike and working into equal loads, as was previously explained, eliminates the need for any form of compensation to provide constant *tracking* between the tuned circuits.

The tuning condensers employed are of low value (50 mmf.), necessitating five sets of coils in order to cover the entire band from 14 to 200 meters. Considerably greater ease of operation results from the use of this size condenser, and stations formerly "unheard" can now be tuned in with relative ease.

83 Rectifier Employed

As shown, a type 83 rectifier tube is used in the power supply in order to provide greater voltage regulation, and mention is made of the fact that there is not the slightest trace of "hum" in the receiver, even when receiving stations at the low wavelength of 15 or 16 meters.

The writer has no hesitation in heartily recommending this receiver to anyone who wants an outfit capable of providing highly satisfactory reception from those otherwise elusive foreign short-wave stations. On this receiver these stations can readily be tuned in and their programs enjoyed for hours on end, without the constant necessity of fussing with the controls as is usually the case with the average receiver.

Coil data are given in the diagram.

An Advanced S.W. Receiver Parts List

1 Dual gang 50 mmf. (.00005 m.f.) variable condenser. National (Cardwell; Hammarlund).
2 6-prong isolantite sockets. National (Hammarlund).
2 5-prong isolantite sockets. National (Hammarlund).
2 6-prong wafer sockets. Na-ald.
1 5-prong wafer socket. Na-ald.
1 4-prong wafer socket. Na-ald.
5 .0001 mf. mica condensers.
1 .00025 mf. mica condenser.
12 .01 mf. mica condensers.
1 .004 mf. mica condenser.
2 0.1 mf. tubular condensers.
4 0.5 mf. tubular condensers.
3 0.25 mf. tubular condensers.
1 1.0 mf. tubular condensers.
1 20 mf. Electrolytic 25 volts, tubular condenser.
3 8 mf. Electrolytic 500 volts, tubular condenser.
2 2.0 meg. ½ watt resistors. Lynch (Int. Res. Corp.)
3 0.25 meg. ½ watt resistors. Lynch (Int. Res. Corp.)
1 0.5 meg. ½ watt resistor. Lynch (Int. Res. Corp.)
1 0.15 meg. ½ watt resistor. Lynch (Int. Res. Corp.)
1 5000 ohms, ½ watt resistor. Lynch (Int. Res. Corp.)
1 0.1 meg. ½ watt resistor. Lynch (Int. Res. Corp.)
1 4000 ohm, 1 watt resistor. Lynch (Int. Res. Corp.)
1 500 ohm, 1 watt resistor. Lynch (Int. Res. Corp.
1 3,000 ohm, 1 watt resistor. Lynch (Int. Res. Corp.
1 4,000 ohm, 1 watt resistor. Lynch (Int. Res. Corp.
1 8,000 ohm, 1 watt resistor. Lynch (Int. Res. Corp.)
1 10,000 ohm, 1 watt resistor. Lynch (Int. Res. Corp.)
1 50,000 ohm, 1 watt resistor. Lynch (Int. Res. Corp.)
1 3,000 ohm, potentiometer. Acratest.
1 50,000 ohm, potentiometer, with switch. Acratest.
1 250,000 ohm, potentiometer. Acratest.
2 2½ M. H. Radio Freq. Chokes. National (2½ M. H.)
1 85 M. H. Radio Freq. Chokes. National 90 M. H. (Hammarund.)
1 power transformer. National. 300-300 volts. (R. T. Co.)
1 30 H. choke. National. (R. T. Co.)
2 700 H. audio chokes. Acratest. (R. T. Co.)
1 20 ohm center-tap filament resistor. (R. T. Co.)
1 shield can. 7"x7"x7" (sheet iron), for power supply.
1 58 tube R.C.A. Radiotron (Arco).
2 57 tube R.C.A. Radiotron (Arco).
1 56 tube R.C.A. Radiotron (Arco).
1 2A5 tube R.C.A. Radiotron (Arco).
1 83 mercury vapor rectifier. R.C.A. Radiotron (Arco).

What is the
TETRADYNE?
• • •
See April
Issue

S-W Stations of the World

(*Continued from page 677*)

WPFC	Muskegon, Mich.	2442 kc.
WPFD	Highland Park, Ill.	2430 kc.
WPFE	Reading Pa.	2442 kc.
WPFG	Jacksonville, Fla.	2442 kc.
WPFH	Baltimore, Md.	2414 kc.
WPFI	Columbus, Ga.	2414 kc.
WPFJ	Hammond, Ind.	1712 kc.
WPFK	Hackensack, N. J.	2430 kc.
WPFL	Gary, Ind.	2470 kc.
WPFM	Birmingham, Ala.	2414 kc.
WPFN	Fairhaven, Mass.	1712 kc.
WPFO	Knoxville, Tenn.	2470 kc.
WPFP	Clarksburgh, W. Va.	2414 kc.
WPFQ	Swathmore, Pa.	2470 kc.
WPFR	Johnson City, Tenn.	2470 kc.
WPFU	Portland, Me.	2422 kc.
WPFV	Pawtucket, R. I.	2470 kc.
WPFZ	Miami, Fla.	2442 kc.
WPGA	Bay City. Mich.	2442 kc.
WPGB	Port Huron, Mich.	2414 kc.
WPGC	S. Schenectady, N. Y.	1534 kc.
WPGD	Rockford, Ill.	2458 kc.
WPGF	Providence, R. I.	1712 kc.
WPGK	Cranston, R. I.	2470 kc.
WPGS	Mineola, N. Y.	2414 kc.
WRDH	Cleveland, Ohio	2458 kc.
WRDR	GrossePt.Village,Mich.	2414 kc.
WRDQ	Toledo, Ohio	2470 kc.
WRDS	E. Lansing, Mich.	1574 kc.

3-Tube A-C Short-Wave Receiver

(*Continued from page 659*)

former (Powertest) 250-0-250, 5 volts, 2.5 volts.
1 Filter choke (Powertest), 30 H.
1 Set of 4-plug-in coils wound (15-200 meters); Gen.-Win. (Alden).
1 100 mmf. ant. series condenser; Hammarlund (National).
1 Ant. and grnd. binding posts.
1 Phone binding post.
1 A.C. cable cord and plug.
1 Coil socket.
1 58 socket.
1 56 socket.
1 80 socket.
2 Tube shields.
1 .01 mf. fixed condenser.
2 8 mf. electrolytic (500 volts) filter condensers (Powertest).
1 R.F. choke (Trymo.)
1 2,500 ohm resistor; Lynch (Int. Res. Co., optional).
1 7,500 ohm resistor; Lynch (Int. Res. Co., optional).
1 200,000 ohm resistor; Lynch (Int. Res. Co., optional).
1 250,000 ohm resistor; Lynch (Int. Res. Co., optional).
1 750,000 ohm resistor; Lynch (Int. Res. Co., optional).
1 3 meg. resistor; Lynch (Int. Res. Co., optional).
1 .0001 mf. fixed mica condenser.
1 Roll hookup wire.
1 Kit of assorted hardware.
1 80 type tube; R.C.A. Radiotron (Arco.).
1 56 type tube; R.C.A. Radiotron (Arco.).
1 58 type tube; R.C.A. Radiotron (Arco.).

Na-ald Plug-in Coil Data

Meters Wave-length	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch	19 T. No. 30 En. Close wound (CW)	⅛"
80-40	23 T. No. 28 En. Wound 16 T. per inch	11 T. No. 30 En. C. W.	⅛"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	⅛"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	¼"

Coil form—2½" long by 1¼" dia. 4-pin base.

THE GAL WHO MADE GOOD!

(*A True Tale* . . . THOUGH A BIT TWISTED)

ONCE upon a time there was a Twist. She was very easy to tune in, too. Her shape was nothing to brag about even though she was thick across the middle. She wasn't hard to look at, though, as she presented a swell front. In fact her front was so swell that she looked like a million dollars even though her price was much below that figure.

Underneath it all there wasn't much to speak of. No frills—nothing fancy. Just plain and simple. She always came well heeled (or should I say shielded?) against the possibility of becoming a bit garbled. Her Dial was as big as a Big Ben and when she was "sitting pretty" she didn't take more room than a cozy cat.

She traveled around on two cylinders all of the time for Economy's sake. (Economy was her Pal.) Figured that she didn't need more than two to get results. Must have been right, too, because she covered the waterfront . . . and when I say waterfront I mean every port! London, Buenos Aires, Tokio, Melbourne, Manila, Caracas—were only a few! What she couldn't pick up was nobody's business!

At first some folks figured she'd never be able to take it, but after a while she won the admiration of every Ham that ever got a whistle. Young Fellers just starting Life on a Short Wave learned a lot from her. (She knew all the tricks.) She'd never lead you to believe that she was taking you places and then leave you out on a limb. No, Sir! She meant business every time. **When she started, you went places!**

Boy, she was a great Gal! Everybody thought she was a Honey. And the letters that people wrote about her would fill volumes. She could spot Shanghai Lil 4 Tubes and still leave her muttering under her breath in the distance.

You'll run across her one of these days . . . but if you want to fix it up previously, the coupon and $5.75 will arrange it. Her name? I almost forgot! It's Pretzel Bender, the Gal who made good. (I attach her photo.)

AUTHOR'S NOTE—The "Pretzel Bender" is a sensational new type 2 tube S.W. set for beginners—manufactured and sold exclusively by Wholesale Radio Service Co., Inc. The kit of parts is $5.75, less tubes and coils.

Wholesale Radio Service Co., Inc.
Dept. S.W.-34
100 Sixth Avenue
New York, N. Y.

☐ Send me 1 kit of parts, less tubes and coils for Pretzel Bender "2" at $5.75.

☐ Send additional information.

Name .....

Address .....

City..... State.....

"HAM" ADS

Advertisements in this section are inserted at 5c per word to strictly amateurs, or 10c a word (8 words to the line) to manufacturers or dealers for each insertion. Name, initial and address each count as a word. Cash should accompany "Ham" advertisements. Advertising for the April issue should reach us not later than February 10.

SELLING OUT: 4-TUBE SHORT WAVE Receiver D.C., $10.00; pilot 5-tube electric set with short wave adapter, $15.00; gasoline washing machine engine, driving 110 volt A.C. generator, $15.00; A.C. generators for automobiles, $10.00. Neal Brown, Richland Springs, Texas.

MARINE, BROADCAST, AMATEUR, RADIOphone C.W. Transmitters and complete station apparatus. Receivers in four to ten tube designs, for short wave or broadcast, also long wave. Manufacturers of complete line of apparatus, including frequency meters, inductances, short wave and long wave, transmitter power units. Panels, racks, inductances, transmitting condensers. We design apparatus to order. Prices on request. Ensall Radio Laboratory, 1527 Grandview St., S. E., Warren, Ohio.

QSL CARDS, NEAT, ATTRACTIVE, REASONably priced, samples free. MILLER, Printer, Ambler, Pa.

QSL'S, SWL'S 75c A HUNDRED. W9DGH, 1816 Fifth Ave., No., Minneapolis, Minn.

ONE TUBE RECEIVER USING 27 OR 37 TUBE wired and tested on foreign reception, with coils, $5.25 pospaid, choice of tube free. Short Wave Radio Laboratories, 310 Grant, Cedar Falls, Iowa.

SHORT WAVE SETS, KITS, SUPPLIES. Wholesale catalogue 5c. Federal Telegraph, 4224 Clifford Road, Cincinnati, Ohio.

TRANSMITTER SPECIALS. 325 Volt PURE DC Power supply and 2½ Colt CT filament $4.50. For AC receivers at $6.00. General Engineering, Charlotte, Michigan.

TEN PRACTICAL AND INEXPENSIVE changes converting Dodge 12-V. Fort T. A., Chevrolet Delco 6-V generators into 100-500 watt capacity A.C. generators, or into 32-110-V D.C. motor or generator. Dodge is 500-W. self-excited. All in one book illustrated with complete simplified instructions and drawings for only $1. Autopower, 414 S. Hoyne Ave., Chicago.

DIZZY CARTOON FOR QSL OR SHACK. Send $2 with your rough idea for large original pen drawing. W1AFQ, Harwich, Mass.

ENJOY SHORT WAVE RECEPTION: MASter Code. Simple method. 25c. Code Master, Box 326, Braddock, Penna.

AIREX TUBES, 230, 257, 258, 246 GUARANteed $0.56. Transformers 1100 Volt, 100 mills, $2.25. Mershon Electrolytics 8-8 Mfd. $0.75. Harold Vavra, 1411 7th Ave., Cedar Rapids, Ia.

KRUSE'S RADIOPHONE GUIDE WAS REordered within two weeks by most dealers. If yours is "out" send 35c to Robert S. Kruse, R. F. D. 2, North Guilford, Connecticut.

CRYSTALS: ¾ BLANKS, 25c; 1", 50c; FINished 160 m, 80 m, $1.00. Standard Plug-in Holders, 60c. Compound, 25c. Booklet "How to Grind Crystals," 25c. Free bargain catalog. Mid-Con, 3007 Main, Kansas City.

PLUG-IN COILS—TALL BAKELITE FORMS, wound for your receiver, four for 75c. Irving Hall, Brockton, Mass. WIBTE

TUBELESS CRYSTAL SET, SOMETHING new. Separates all stations, operates speaker. 750 miles verified. Blueprint, 6 others, 25c coin. Modern Radiolabs, 151-A Liberty, San Francisco.

PLUG-IN COILS. 15-210 METERS. SET OF four wound on Bakelite forms, 50c. Noel, 809 Alder, Scranton, Penna.

SELLING FOR FRACTION OF COST 50 Watt Multi-Stage Crystal Transmitter. Write for details. W2EUN, 619 Leland Ave., Bronx, N. Y. C.

How to Make the Fultone II

(*Continued from page* 672)

of a plate impedance in the detector circuit. Unless this is a really good choke, signal strength will be lost without any apparent reason. Needless to say, nothing but the best makes of tubes from reputable manufacturers should be used. It is likewise a piece of economy to pay a little more and purchase good batteries. Cheap batteries go dead quickly, and have an annoying habit of becoming noisy. Also remember that the more sensitive the phones, the more stations will be heard. If it is desired to use more than one pair of phones, connect them in series.

Assembly

Mount all the sockets from the underside, with the holes facing as illustrated, and soldering lugs under the mounting nuts wherever shown. Before mounting the plate impedance, carefully bend the terminal lugs so that when the impedance is mounted the lugs do not short to anything. One screw is used to hold one side of the 33 socket and the plate impedance to the chassis. The remainder of the parts are mounted as shown in the pictorial diagram. A Fahnestock clip is soldered to one post of the antenna coupling condenser. Be sure that it does not touch the mounting screw. Before mounting the tuning condenser on the panel solder a piece of wire about 5 inches long to the outside lug nearest the 32 tube.

Wiring

The wiring of the receiver is very easy. By carefully following the diagram no difficulty should be encountered. Place every part and wire exactly as shown. When a connection is made to the chassis the paint must be thoroughly scraped away from the mounting hole so that the screw head can make a good positive contact to the chasis and provide a ground. The grid-leak and condenser are placed side by side and soldered directly to the tuning condenser, on the side nearest the 32 tube.

Operation

After the receiver is wired check and double check the wiring. Then insert the tubes in their socket and connect up the phones, antenna, and ground. Connect the batteries as shown. Turn on the rheostat until the filaments glow a dull red color. At some point in turning the regeneration condenser a rushing noise will be heard. This point is just before the tube goes out of oscillation, and it is here that the signals are the loudest. For voice reception, taking the set just out of oscillation will take away the carrier wave whistle, and clear up the voice. While tuning with the vernier dial always keep the rushing noise at its loudest point, as this is the spot at which most stations will be heard. The antenna coupling condenser should be varied for best results. Generally, it should be kept as tight as possible with the set regenerating all over the dial. A regular antenna should be used with the set, 50 to a 100 feet long, well insulated, and as high and clear as possible. Do not forget that a good ground is necessary; connect a ground clamp to a cold water pipe.

This little receiver is capable of very fine results. If it has been built properly, with good parts, it will afford boundless enjoyment and should bring in practically anything on the air under favorable conditions.

Coil data (National Co.) for use with 100 mmf. tuning condenser connected across grid coil.

Grid Coil	Tickler	Wave Length Range in Meters
63 T. No. 28	5 T. No. 32	200-115 m
35 T. No. 24	4 T. No. 32	115- 65 m
20 T. No. 18	4 T. No. 32	70- 40 m
12 T. No. 18	3 T. No. 32	41- 23 m
6½ T. No. 16	3 T. No. 32	25- 14.5 m
3 T. No. 16	3 T. No. 32	15- 9 m

Dia. form 1½", 6 pin.

Parts List for Fultone II Receiver

1 chassis and cabinet; Harrison Radio.
1 100 mmf. tuning condenser.
1 250 mmf. mica condenser.
1 300 mmf. mica condenser.
1 15 mmf. antenna trimmer.
1 .015 mf. audio coupling condenser.
1 .5 mf. bypass condenser.
1 R.F. choke, 5 M.H.
1 2 meg. grid-leak.
1 1 meg. grid-leak.
1 50,000 ohm potentiometer.
1 30 ohm. rheostat.
1 800 henry audio choke. Harrison Radio.
2 4 prong wafer sockets. Na-ald.
1 5 prong wafer socket. Na-ald.
1 set of plug-in coils; Harrison Radio. (See coil data also.)
1 32 tube, R.C.A. (Arco.)
1 33 tube, R.C.A. (Arco.)

A 250 Watt Crystal Control Transmitter

(*Continued from page* 661)

eration in the 40 meter band, and the feed line is attached 9 feet from the center. When using the set on 20 meters, no change is necessary, since the same antenna works satisfactorily on either band. Be sure to have a fixed condenser in series with the lead-in, so that in case you should accidentally touch the antenna while it is in operation, you will not get a shock.

The combination of this transmitter and antenna should prove a very effective combination in getting some real "DX." My reports average R7 to R8 from Sweden, Poland, and Germany and other European countries. The usual input is about 350 watts, 3,000 volts at 120 mills (M. A.), and with an efficiency of 70%, which is about right, the output is 250 watts! At this input the plate runs cool, with no signs of overheating.

The Receiver

The receiver in use at my station, is a 2-tube set, using the 2 volt tubes, the 232 screen-grid, and the 233 pentode. Although it is quite simple in construction, it was extremely difficult to get working, as it was afflicted with a severe howl. However, when I finally got it working, it had a very low noise-level, and sure did bring in the "foreigners" surprisingly well, considering that it only has 2 tubes. The howl was later found to be caused by insufficient capacity between the grid and plate coils.

List of Parts for Abrams' 250 Watt Transmitter

3,000 VOLT POWER SUPPLY
C1—8-mfd. filter condensers, 1,500 volt working.
L1—RCA-Victor 125 mill. choke.
T1—3,000 volt center-tapped plate transformer. 200 mills.
T2—5 volts, at 20 amperes. 10,000 volt insulation.
X—Transmitting key, ¼" dia. contacts.

700 VOLT POWER SUPPLY
R1—50 watt resistor, 10,000 ohms.
R2—50 watt resistor, 5,000 ohms.
C1—2 mf., 1,000 volts (working) filter condensers.
T1—1,100 volt transformer, 175 watts.

T2—Trutest filament transformer, 5 volts, 4 amperes.
L1—RCA-Victor 125 mill. choke.
X—Switch.

860 FINAL AMPLIFIER CIRCUIT
R1—100 center-tap resistor.
R2—100,000 ohm, 200 watt resistor.
R3—20,000 ohm resistor, 50 watts.
C1—.001 mf. receiving condenser.
C2—70 mmf. condenser.
C3—.01 mf. receiving type condenser.
C4—.002 mf. 5,000 volt condenser.
L1—25 turns of ¼" copper tubing, 2½" inside diameter.
R.F.C.—National Short Wave R. F. Choke.

210 BUFFER AMPLIFIER CIRCUIT
R1—25 watt resistor. 10,000 ohms.
R2—100 ohm center-tap resistor.
C1—.001 mf. receiving type condenser.
C2—.002 mf. receiving type condenser.
C3—70 mmf. receiving type condenser.
C4—.0001 mf. midget condenser. (Rotor and stator double spaced.)
L1—25 turns of ¼" copper tubing, 2½" inside diameter.
R.F.C.—National Short Wave R. F choke.
T1—7½ volt transformer.

247 FREQUENCY DOUBLER CIRCUIT
R1—50,000 ohm variable resistor.
R2—20 ohm center-tap resistor.
R3—50,000 ohm variable resistor.
C1—.001 mf, receiving type condenser.
C2—.01 mf, receiving type condenser.
C3—.002 mf. receiving type condenser.
C4—100 mmf. variable condenser.
L1—10 turns of No. 22.
Clip—Attach to tank of oscillator, and adjust for proper amount of excitation.
T1—Trutest 2.5 volt transformer.

247 CRYSTAL OSCILLATOR CIRCUIT
R1—25,000 ohm variable resistor.
R2—50,000 ohm variable resistor.
R3—20 ohm, center-tap resistor.
C1—.01 mf. receiving type condenser.
C2—.002 mf. receiving type condenser.
C3—100 mmf. variable condenser.
L1—30 turns of No. 22 wire.
T1—2.5 volt transformer. Trutest.

New Stand-off Insulator

● THE design of the insulators shown in the accompanying illustration permits the use of stand-off insulators on metal panels and chassis where they heretofore could not be incorporated.

The insulator is built in two sections, one section having a sleeve which is an integral part of the lower half of the insulator. This tends to increase the insulation between the shaft of the insulator and the metal panel. The top half of the insulator is hollowed to fit the entire length of the lower section. This means that any insulator can be installed on panels ranging from ⅛" to ½" in thickness.

These new Birnbach insulators are manufactured in two types, one type having regular binding post connections and another having jacks which fit the standard size banana type plug. This means that inductances can be mounted on these insulators and the connections can be taken off the bottom of the insulator underneath a metal shelf. This alone eliminates running wires above the baseboard and tends to make a much neater and less complicated job.

The insulators are constructed of the finest grade, pure porcelain, and are thoroughly glazed with a smooth finish so necessary in high and ultra high frequency work. All mounting surfaces of the insulating material are perfectly flat permitting a good mechanical job to be obtained without the use of washers, which in most cases are necessary due to unevenness and which in many cases causes breakage.

(No. 145: Name and address of manufacturer furnished upon receipt of stamped and addressed envelope.)

Now
The "PRO" Will Grace Your LIVING ROOM

CHOOSE for your COMET "PRO" the handsome new "Moderne" Console, the table model in shielded metal cabinet, or the chassis only—each will give you world-wide reception on all wavelengths from 8 to 550 meters.

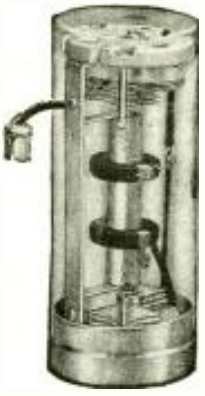
The "PRO" is now supplied in four complete models: Standard; Standard plus A.V.C.; Crystal; and Crystal plus A.V.C.—Battery, D.C. or A.C.—All voltages; all frequencies.

Hammarlund's 33 years of engineering leadership guarantees thrilling performance of this receiver in your home.

Modified modern lines harmonize with other room furnishings. Complete with speaker and built-in power supply. Hinged top provides easy access to chassis and storage rack for coils.

The Quartz Crystal Filter Unit, also Automatic Volume Control, may be added at moderate cost to the Standard Model "PRO".

Air-Tuned
I. F. TRANSFORMERS



Where 100% efficiency and stability are essential requirements, these new laboratory type "air-tuned" units are an absolute necessity.

The coils are Litz-wound and are tuned by AIR-DIELECTRIC, Isolantite-insulated condensers. This feature assures peak I. F. selectivity and a gain of 200 per stage. Unaffected by temperature, humidity or other atmospheric conditions.

For Better Radio
Hammarlund
PRECISION
PRODUCTS

COIL FORMS—SOCKETS

Isolantite Coil Forms for Ultra-short Waves. Low losses. No drilling. 4, 5 or 6 prongs for standard or Isolantite sockets.

Sockets have Isolantite base and perfect spring contacts. Low losses and noiseless. 4, 5, 6 and 7 prongs.

NRA

Mail Coupon for Details.

HAMMARLUND MANUFACTURING CO.
424 W. 33rd St., New York
—Check here for detailed description of the COMET "PRO."—Check here for information about adding Crystal Filter or Automatic Volume Control to the Standard "PRO".—Check here for General Catalog "34" of Radio Parts.

Name .....
Address .....
..... SW-3

3 Meter Wave Kills Tumors

Ultra short-waves capable of destroying tumors are those of wavelengths between 3 and 4 meters, one authority recently showed. Metabolic tests on tumor cells following exposure to ultra short-waves disclosed that the metabolism is inhibited. Comparative tests on tumors treated with X-rays revealed that enormous doses of these rays are required to produce the effects given by ultra short-waves. It is thought that the inhibition of the metabolic processes effected by the ultra short-waves is alone sufficient to explain the destructive action on tumor cells, but whether it is the only cause or whether the rays produce still other impairments cannot be decided on the basis of the studies carried on thus far. The ultra short-waves hold promise that this therapy will aid the treatment of malignant tumors in human beings.

Berlin Gets 2nd Ultra Short-Wave Transmitter

Work is at present under way to complete the second ultra short-wave transmitter (7 meters) which will shortly be installed at Berlin-Funkstunde. The power in the aerial is to be slightly higher than that of the present ultra short-wave transmitter—namely, about 2.5 KW for telephony. The new transmitter will be used to provide the regular daily television transmissions with the necessary sound accompaniment. But, apart from that, the modulation stage permits of the application of up to 500,000 c/sec. modulation, equivalent to a television picture (German normal size) with 180 scanning lines and 25 frames per second. It is understood that this transmitter will be ready by the spring.—World-Radio.

NEW SENSATIONAL OFFER

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PAY FOR TRAINING AFTER YOU GRADUATE

To a few honest fellows I am offering an opportunity to get a training and pay for it after they graduate in easy monthly payments. You get Free Employment Service for life. And if you need part-time work while at school to help pay expenses, we'll help you get it. Coyne is 33 years old. Coyne Training is tested—You can find out everything absolutely free. Just mail the Coupon for My Big Free Book.

Jobs Leading to Salaries of $50 a Week and Up

Jobs as Designer, Inspector and Tester—as Radio Salesman and in Service and Installation—as Operator or Manager of a Broadcasting Station—as Wireless Operator on a Ship or Airplane, as a Talking Picture or Sound Expert—Hundreds of Opportunities for fascinating Big Pay Jobs!

10 Weeks' Shop Training AT COYNE IN CHICAGO

We don't teach you from books. We teach you by Actual Work on a great outlay of Radio, Broadcasting, Television, Talking Picture and Code equipment. And because we cut out useless theory, you get a practical training in 10 weeks.

TELEVISION Is Now Here!

And Television is already here! Soon there will be a demand for Television Experts! The man who gets in on the ground floor of Television can have dozens of opportunities in this new field! Learn Television at Coyne on the very latest Television equipment.

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Talking Pictures, and Public Address Systems offer golden opportunities to the Trained Radio Man. Learn at Coyne on actual Talking Picture and Sound Reproduction equipment.

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Don't spend your life slaving away in some dull, hopeless job! Don't be satisfied to Work for a mere $20 or $30 a week. Let me show you how to make Real Money in Radio—the fastest-growing, biggest money-making game on earth! Get my big Free book and all details of my pay after graduation offer. Mail the coupon today.

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Dear Mr. Lewis:
Send me your big Free Book; details of your Free Employment Service; and tell me all about your special offer of allowing me to pay for training on easy monthly terms after graduation.

Name .....
Address .....
City..... State.....

6-Tube Super Has Automatic Volume Control

(*Continued from page 670*)

eral methods of coupling have been tried and this was found to be the most satisfactory and troublefree.

Operation of this receiver is the same as any superheterodyne intended for short-wave use. The two circuits, oscillator and first detector, are ganged, and the .001 mf. padding condenser in series with the oscillator tuning condenser allows these two circuits to track remarkably well over a very wide range of frequency. The first detector is equipped with a small trimming condenser which can be adjusted to compensate for any effects that might be caused by the antenna and permits a manual control for keeping the oscillator first detector accurately matched.

In tuning short-wave receivers automatic volume control presents somewhat of a problem because when the manual volume control is turned full on in tuning, the set will be at maximum gain and sensitivity in between stations and considerable *background* noise will be present. However, when a station is tuned in, the volume is automatically adjusted according to the strength of the incoming signal and hence the background noise is considerably reduced. All those familiar with tuning broadcast receivers with automatic volume control will be aware of this fact but it is mentioned here in order that short-wave fans not accustomed to automatic volume control will not be misled by its action. Right in the heart of the city in the laboratory in which this set was designed and which is about the most noisy location that can be found, "foreign" broadcast stations come in with volume equalling a regular broadcast station. "Big Ben" in London could have been used as a "community alarm clock."

Coil Data for Supertone Super-Het Detector Coils

Coil No. 1—
Ant. 7 turns No. 22 enam.
Sec. 7 turns No. 18 enam.
Coil No. 2—
Ant. 10 turns No. 22 enam.
Sec. 13 turns No. 18 enam.
Coil No. 3—
Ant. 12 turns No. 24 enam.
Sec. 22 turns No. 22 enam.
Coil No. 4—
Ant. 20 turns No. 26 enam.
Sec. 45 turns No. 24 enam.

Oscillator Coils

Coil No. 1—
Pick-up coil 3 turns No. 22 enam.
Sec. 7 turns No. 18 enam.
Tickler 7 turns No. 22 enam.
Coil No. 2—
Pick-up coil 7 turns No. 22 enam.
Sec. 13 turns No. 18 enam.
Tickler 10 turns No. 22 enam.
Coil No. 3—
Pick-up coil 15 turns No. 24 enam.
Sec. 22 turns No. 20 enam.
Tickler 12 turns No. 24 enam.
Coil No. 4—
Pick-up coil 30 turns No. 26 enam.
Sec. 45 turns No. 24 enam.
Tickler 20 turns No. 26 enam.

All coils wound on 1½-inch diameter ribbed form.

Sec. windings spaced to length of ½ inch.

Pick-up winding is inter-wound with secondary.

System in Short-Wave Reception

(*Continued from page 647*)

means that the station may fade out entirely, so you can hardly hear it at all, and within the next thirty seconds it may come in loud enough to operate your loudspeaker! Many foreign stations have this characteristic, and the English and German stations mentioned above are received in this manner in the Eastern United States. It is obvious that if you tune in at a period when the station has almost faded out completely, you will hear nothing. Yet, returning thirty seconds later to the same spot on your dial, the station will be there and uncomfortably loud, only to fade out again, rhythmically, later on. This pulsing of certain foreign stations is something that you cannot rectify unless, of course, your set is so powerful, and has automatic volume control, that the fading no longer is discernible. But it needs a ten-tube set or better to accomplish this.

And, as I started out to tell you, you require *system!* Do not search the bands *blindly*. First of all you must know where the stations come in on your dial. You should draw up a calibration chart, such as are printed in the OFFICIAL SHORT WAVE LOG AND CALL MAGAZINE, and then go systematically after every foreign station. You should have your log book and know exactly what stations are on the air at certain times; and once you have logged a few, you can easily plot the exact spot where another station should come in. You bear this spot in mind on your dial, and every once in a while you return to it, to verify if the station is on the air. Sooner or later, in this manner, you will run across it.

For instance, if you know that EAQ, Madrid, 10,000 kilocycles, comes in at 90 on your dial, you will be more alert to watch for it there than if you went hunting all over for it. Once you get down to using your set systematically, you will be astonished at the ease in logging the foreign stations.

And, of course, after you have once located the "star" stations, that is, those that are most easily received, then the work begins in earnest to go after those who have not got the great power of the star stations, and here the real skill of the short-wave fan meets its test. After all, it is a comparatively simple matter for a veteran listener to pull in the powerful star stations, yet, it is a horse of a different color to tune in a "hundred watter" across the ocean. This comes under the head of "rare accomplishment." Yet, it is worthwhile going after it because things that come easily are usually not very highly prized.

The "UNITROL" RECEIVER Makes "Band-Spread" Tuning a Cinch!

•

GEORGE SHUART describes it in complete detail in the April Issue!

DON'T MISS IT!!!

New Antenna Impedance Matching Link

(*Continued from page* 668)

copper, thus ensuring less stretching due to the weight of the feeder system. The impedance-matching section is termed quarter-wave but its exact physical length is only 90% of that length.

One can readily appreciate the value of such a matching system when we find that the impedance of the average transmission line using a pair of No. 14 conductors spaced six inches apart is approximately 629 ohms and the impedance of a half-wave antenna is only 75 ohms. When we study the above figures we can readily see that most amateur stations have been depending entirely upon "brute force" because the actual radiation of an antenna with no matching device is 50% less than that obtained with a system such as outlined herewith.

In other words a system of this type, properly constructed and adjusted, would accomplish the same results as an ordinary doublet antenna with half the power. The length of the main feed line connected to the aluminum rods is not important and no appreciable losses have been experienced with lengths up to several hundred feet.

Transposition blocks or regular spreaders can be used in supporting these transmission wires. The dimensions for a typical 20 meter antenna would be as follows:

Antenna length, 33.45 feet.
Length of quarter-wave section, 16.73 feet.
Spacing between quarter-wave rods, 1⅞ inches.

The main feeder would be constructed of No. 12 copper-clad enameled wire and supported by 2 inch transposition blocks. The weight of the entire feeder section is only 1.85 pounds.

World-Wide Short-Wave Review

(*Continued from page* 667)

inch form about ⅛-inch apart. They can be made conveniently by forming spools with three fiber or wooden discs fitted on the coil form so that a space of ⅛-inch is left between each. The wire is then wound jumble fashion until the 500 turns are in place.

The remainder of the parts used in the set are all standard sizes and any well known parts can be employed. It is pointed out in the article which appeared in *Amateur Wireless* that the record of transmission on 5 meters in England is at present 200 miles and this gives an added incentive to set builders to try to exceed this mark.

The 1934 "Pal" 2-Tube Portable

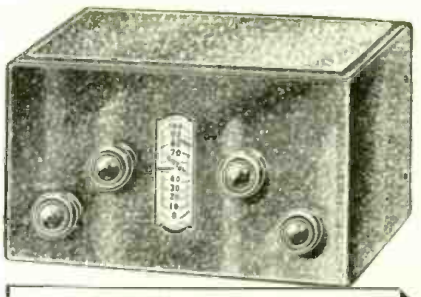
(*Continued from page* 657)

Alden plug-in coils are employed, thus permitting the reception of short wave stations from 15 to 200 meters and also standard broadcast stations between 200 and 550 meters. The antenna coil (2) is a standard four-prong Alden plug-in coil, while coil (16) is also a standard coil, slightly altered as explained in the constructional directions.

The secondaries of both Alden coils are tuned by means of a dual Hammarlund variable condenser. A special circuit is used which permits the "Pal" to be operated interchangeably either on an A.C. or a D.C. power supply. Due to the use of this circuit, no power supply transformer is required. A potentiometer connected in the circuit as shown at (10), gives smooth, even volume control. The resistor (30) reduces the line voltage to the correct value required for operation of the tube heaters. Of course, the latter are connected in series. By-pass and filter condensers give stabilized operation and prevent hum. Metallized resistors are used throughout this receiver, because of their superior accuracy and longer life. The small

(*Continued on page* 690)

The NEW
ROYAL PR-5
ALL-WAVE
BAND-SPREAD
RECEIVER



A new professional type receiver for the Short Wave Listener and the Amateur incorporating many exclusive Royal developments.

Full Band Spread of all bands from 8 to 2,000 meters—Twin Master Control of tank and bandspread condensers—Royal "Trans-X" Coupling—Humless all A.C. operation with self-contained power supply—Consistent Loud Speaker reception of foreign broadcast stations—Triple inductances on genuine Royalite forms—Velvet smooth regeneration control—Battleship construction—Peak efficiency with latest tubes—56, 2A5, 80 and two 58—Unconditionally guaranteed.

An excellent receiver at a moderate price.

SEE JANUARY SHORT WAVE CRAFT or Send for FREE LITERATURE!

— SPECIAL OFFER —
(Until March 30th)
ROYAL PR-5, COMPLETE with 13 to 205 Meter Inductances and Tested Tubes.... $31.50

WHAT A SET!!

Short Wave Fans surely know a good thing when they see it! We've been actually swamped with orders for the sensational

12,500 Mile Two Tube Receivers

Clubs are ordering ten and twenty at a time—Many of our customers are selling them as fast as they can wire them (An excellent way to make your hobby pay, too!)—Schools are placing quantity orders—And Short Wave enthusiasts everywhere are buying them so fast that even we are amazed!

The reason? RESULTS and VALUE!!

Results that make the novice tingle with delight and which thrill even the hard-boiled "old-timer"! Results that make the editors of leading magazines and newspapers write articles glowing with praise! Results that in unbiased, competitive tests put to shame all other one and two tube "wonder" and "marvel" short wave receivers. Results that seem almost unbelievable, even to experienced short wave engineers!

But, you don't have to take our word for this! We have actual proof! Hundreds of unsolicited letters from delighted purchasers contain glowing reports of verified reception of English, French, African, Asian, South American, Australian, and many other stations under all kinds of conditions and in almost unbelievable locations! Of foreign stations received regularly, day after day, with loud speaker volume! Not one cent was paid for these testimonials, the writers' only motives being sheer gratitude and pride in the possession of such a remarkable receiver.

VALUE? Such as you have never seen before!

"How are you able to sell these neat, professional appearing receivers for only $4.75", we are constantly asked. We answer, "By making only a small margin of profit and letting the sensational VALUE and astounding RESULTS boost our sales into tremendous quantities!"

But, wait! Don't let the low price fool you! It does not mean that we have sacrificed quality! On the contrary, these kits are composed of the finest materials available—HAMMARLUND Condensers—Polymet—SAMSON Audio Unit—CRL—Allen-Bradley—etc. All HF insulation is of genuine Bakelite. The four coils (15 to 200 meters) are wound on polished Bakelite forms. All losses are minimized! KK vernier dials make tuning easy and sure. The heavy crystal finished metal chassis has all holes drilled and this, together with the clear, plain instruction sheets and diagrams makes construction a simple matter, even for the most inexperienced! THE IDEAL BEGINNER'S SET!

Better order yours NOW, before we are forced to higher prices!

Dry Cell or AC Model. COMPLETE KIT— $4.75

— The FULTONE II —

● SCREEN GRID
● POWER PENTODE

A modified version of the well known 12,500 Mile Two Tuber which uses a 32 screen grid detector and a 33 power pentode output tube. (Dry cell operation.) This combination results in even more sensitivity and volume! An excellent and time proven Short Wave Receiver.

Complete Kit, including coils (15 to 200 meters), heavy, attractive metal chassis and cabinet with hinged cover and clear instructions $6.25
Set of Matched Tubes $1.50

Deposit required. Postage extra.

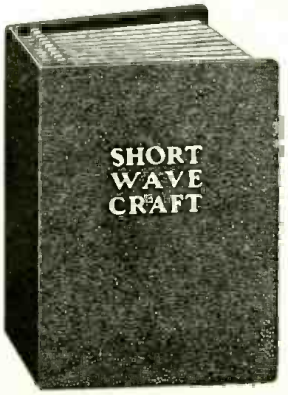
— ACCESSORIES —

TUBES—230, 64c. 201A, 30c. 227, 35c. 56, 50c. 80, 40c.
Lightweight Headphones—2000 ohms.....$1.05
4000 ohms.....$1.45 Supersensitive.....$1.90
2½ volt Filament Transformers..... .95
Special AC Power Pack for AC Model. Complete kit 4.85
Extra coils to cover 200 to 625 meters..... 1.25
Neat metal cabinet with hinged lid..... 1.00
Add $1.50 if you wish the kits assembled, wired, and laboratory tested.

FREE SHORT WAVE LITERATURE On Request—

Send two 3c stamps for our BIG 64 PAGE RADIO CATALOG!

HARRISON RADIO CO. Dept. C-3 New York City 142 Liberty Street
★★THE HOME OF FOUR STAR SERVICE★★



CERTAINLY

this is not the sort of magazine that you read and then discard.

Readers keep their copies *for years as a steady reference* and thousands of letters attest to this.

It is now possible to *save your copies* and for this purpose we designed a splendid binder for you which holds twelve copies. It is made of *heavy substantial material* and is covered with black grain leatherette. The name of the magazine is stamped in gold on the cover.

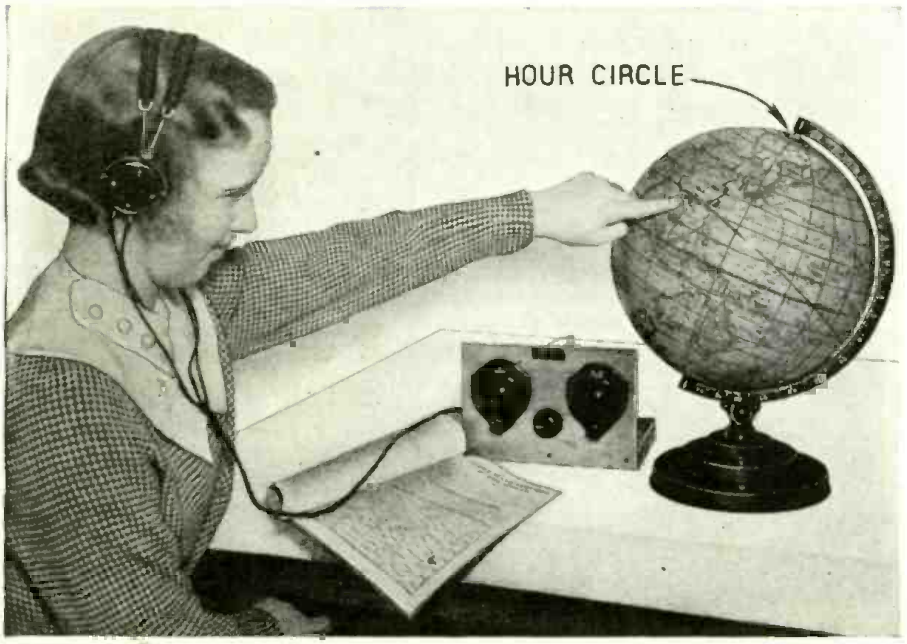
An ingenious mechanical arrangement is provided which makes it possible *to hold the copies flat when reading from the binder.*

SHORT WAVE CRAFT Binder as described, prepaid in the United States..... $1.25

Canada and foreign countries 25c extra. We accept money order, check, stamps or cash.

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

EVERY FAN NEEDS A GLOBE



A Man's Sized Globe for Short-Wave Fans

This remarkable globe, which measures 12" in diameter—total height with pedestal 16", and printed in fourteen different colors, is waterproof and easily washed by using a damp cloth.

There is a graduated "Meridian" scale of black enameled metal. An additional feature is the movable hour scale found at the north pole—this facilitates determining the hour in any part of the world.

Only on a globe of this size is it possible to get an accurate picture of countries and their relative positions to each other. You will actually be amazed when you compare distances—from New York to Moscow; from Cape Town to Tokio; from Los Angeles to Rio de Janeiro, etc. A flat map is deceptive for measuring, but take a small string and stretch it across the globe, from city to city, and you have the correct distances.

Here is the globe that adds dignity to home, office, studio or laboratory—it's a globe that everyone would be proud to possess.

The World Short-Wave Globe, printed early in 1934, contains over 7,500 names and cities. All spellings conform to standard rulings of U. S. Department of Commerce and Royal Geographic Society of London, England.

All globes are packed in cartons assuring safe delivery. Send money order or check for $3.75, plus sufficient postage for delivery by parcel post. Register letter if it contains cash or stamps. If preferred specify that shipment be sent express collect. Shipping weight, 8 lbs.

Gentlemen:
I have received the World Globe and wish to state that I am certainly well pleased with its completeness, appearance and its usefulness.
Short wave listening has become a hobby with me in the last two years, and this World Globe is a necessary accessory to any short wave listener or, for that matter, to any home, especially where there are children.
P. C. ELLIS, Supt.,
Laboratory — 19th and Campbell Streets,
Kansas City, Mo.

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

NOW $3.75

SPECIAL
To SHORT WAVE CRAFT READERS

For a limited time only, and as long as they last, we will send you six back numbers of SHORT WAVE CRAFT assorted, your choice, for 85c.

The usual price for six copies would be $1.50 and most publishers charge a higher price for back numbers over one year old.

We can supply all copies except the following: June-July, Aug.-Sept., 1930; Dec.-Jan., Feb.-Mar., April, May, June, July, Oct., 1932; May, June, 1933.

If you do not specify copies we will use our own judgment in sending assorted numbers to fill your order. Note we cannot exchange the copies for ones that have been sent to you.

Practically every copy of SHORT WAVE CRAFT contains important information that you should have. Here is a chance to get those copies.

As we have only a small supply of back numbers on hand, this offer will be withdrawn as soon as they have been sold.

We accept U. S. stamps, U. S. coin or money order. Rush your order today.

SHORT WAVE CRAFT, 96 Park Place, New York, N. Y.

Short Wave Craft 3-34
96 Park Place,
New York, N. Y.
Gentlemen: I enclose herewith 85c for which you are to send me six back number copies of SHORT WAVE CRAFT as follows:

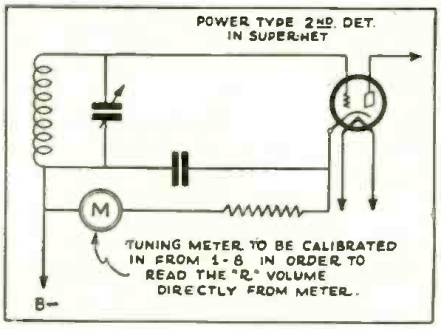
Name.....
Address.....
City..... State.....

How "Signal Strength" Is Rated

● DURING the course of "logging" various short-wave stations, how many times have you found the necessity for some system of recording their signal strength? Transmitting amateurs have a system of recording signal strength by gauging the volume and readibility in numbers from 1 to 5, known as QSA-1, etc. Among short-wave listeners not definitely engaged in the transmitting field, this method is not extensively employed and we can see no reason for this being the case. For example, when you write to some foreign stations for verification of your having received them, you can only say these signals were either *fair, good* or *poor*. It is the purpose of this article to inform all of our readers of a method, not new, but NOT employed as we said before in this section of radio. The well-known method of recording signals for the amateur station are listed in the following table:

QSA-1 equals "not readable"
QSA-2 equals "readable at times"
QSA-3 equals "readable with difficulty"
QSA-4 equals "good, readable at all times"
QSA-5 equals "very good, and readable at all times"

It can be seen by referring to this table and substituting *understandable* for *readable* that this system will apply to general broadcast short-wave reception. A study of this table will enable you to state a *definite degree* of *understandability* of any station you may receive, whether you are telling a friend how loud or how good a certain station came in, or writing to various foreign stations for verification letters. We would like very much to see this method of explaining the type of reception obtained from different stations become prevalent, in fact common among short-wave listeners, as well as the transmitting amateurs, because it provides some definite means of a person explaining just how good his receiver really is.



Tuning Meter Circuit.

Another system is used by transmitting amateurs for recording signal strength by "*not understandable*" or *quality*. This is known as the "R" system and is also graduated in numbers from 1 to 8. It is rather difficult to apply this system to general short-wave reception by just using the ear as a means of judging the signal strength, whereas in the former table we had the system pertaining to *understandability* and *quality* which can be judged by the ear. In this we have a definite volume table which varies with different conditions such as a poor hearing ability, background noise, etc. However, this system can be used by those possessing receivers of the multi-stage type, such as the super-heterodyne, wherein the detector is operated in an non-oscillating condition. Such a circuit is shown in the drawing. The most accurate method for recording volume is to place a zero to 1.5 milliammeter in series with the cathode bias resistor, similar to the usual "tuning indicators" employed in various receivers. It will be noticed by those familiar with the broadcast receivers employing this type of tuning arrangement, that variation in signal strength shows up very prominently on the meter so the method of

(*Continued on page* 693)

Duo R. F. 4-Tube Receiver

(*Continued from page 653*)

COIL TABLE

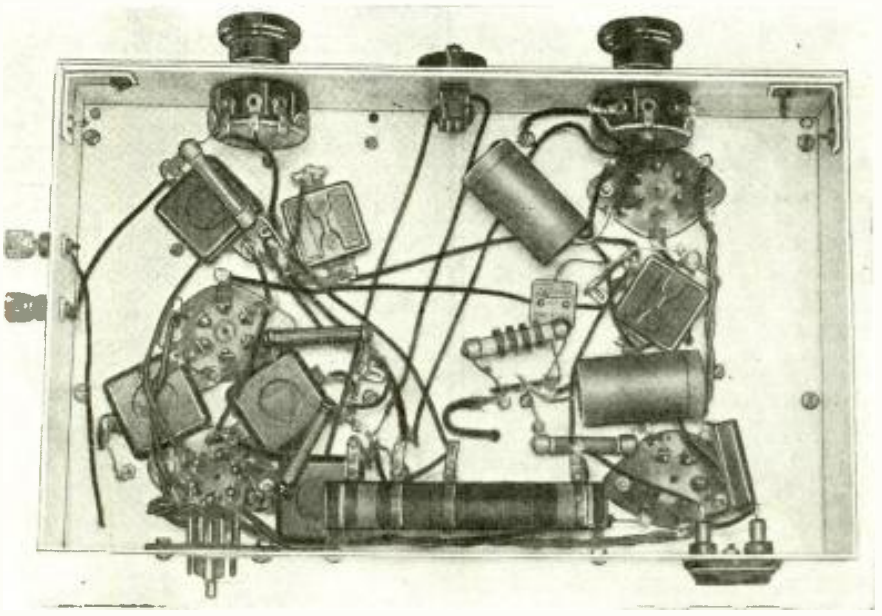
Coils are wound on standard National 6-prong coil forms. No. 24 DSC wire is used to wind the secondaries. No. 36 DSC to wind the interwound primaries and the coils are doped to keep the windings in place and to make them impervious to dirt. The tickler is wound in the filed slot with No. 36 DSC.

	20 meters.	40 meters.	80 meters.
L3, L5	9t.	19t.	32t. No. 24 DSC
L3, L5, tapped turns from bottom	2¼	5¾	16¾
L2, L4	7t.	14t.	20t. No. 36 DSC
L6	3t.	3t.	4t. No. 36 DSC

General coverage coils for 17 to 100 meter range would have the same turns as the bandspread coils but each tuning condenser would then be across the whole of its secondary.

Parts List for Kahlert 4-Tube Set

2—2.5 mh. R.F. chokes, National
1—Audio coupling impedance unit (L7, C9, and Re) National S101 Impedaformer
4—.01 mf. mica condensers
2—.5 mf. by-pass condensers
1—.00025 mf. mica condenser
2—100 mmf. tuning condensers, National (Hammarlund)
2—35 mmf. padding condensers (mounted in coil forms) Hammarlund
2—500 ohm, 1 watt resistors; Lynch (Int. Res. Corp.)
1—5 meg. grid leak, ½ watt; Lynch (Int. Res. Corp.)
1—2,000 ohm, 1 watt resistor; Lynch (Int. Res. Corp.)
1—20 ohm center tap resistor
1—50,000 ohm potentiometer
1—2,000 ohm variable resistor
1—10,000 ohm, 1 watt resistor; Lynch
1—15,000 ohm voltage divider with two supplying taps
1—On-Off switch
6—National R-39 coil forms
2—National special coil sockets
3—6-prong wafer sockets
1—5-prong wafer socket
1—National type F dial
2—5"x5"x5" stage shield, Blan.
1—8"x12½"x ⅛" panel, Blan.
1—7½"x12½"x2" aluminum chassis, Blan.
3—type 58 tubes R.C.A., Radiotron (Arco).
1—type 56 or 27 tube R. C. A., Radiotron (Arco)



Bottom View of Duo R.F. Receiver.

$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 (March 1 for the May issue, etc.)

The judges will be the editors of SHORT WAVE CRAFT, and George Shuart and Clifford E. Denton, who will also serve on the examination 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 CRAFT Magazine, 96-98 Park Place, New York, N. Y.

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The circuit is a seven tube superheterodyne, using two plug-in coils for each band, total four bands, or eight coils.

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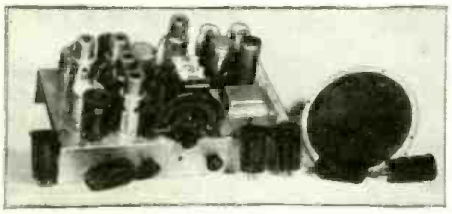

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When to Listen In

By M. Harvey Gernsback

All Times Given Are Eastern Standard Time.

Daventry

● THE British Broadcasting Corp. stations at Daventry are operating as follows at present: Transmission 1, 3-5 a.m. on GSD and GSF. Trans. 2, 7-8:45 a.m. on GSG and either GSF or GSE. Trans. 3 9-11 a.m. on GSE and either GSF or GSB; 11 a.m.-1 p.m. on GSB and either GSD or GSA. Trans. 4, 1:15-4 p.m. on GSB and GSD; 4-5:45 p.m. on GSB and either GSD or GSA. Trans. 5, 6-8 p.m. on GSC or GSB and either GSA or GSD. The frequency of each follows. All use 20 kw. of power in the aerial.

GSA 6050 kc.
GSB 9510 kc.
GSC 9585 kc.
GSD 11,750 kc. (G-5SW's old frequency)
GSE 11,865 kc.
GSF 15,140 kc.
GSG 17,790 kc.

* * *

The German Stations

The German stations at Zeesen are inaugurating the new German Empire service by means of directional transmissions to all parts of the world. There are beam aerial arrays for North America, South America, South Africa, and The Far Eastern zones. The power of the transmitters is now 20 kw. Schedules are as yet unknown except that "The Program for North America" will probably be broadcast as at present from 6 to 9 or 10:30 p.m. on DJC, operating on 6020 kc. One schedule we have seen for their new world-wide service follows. (We cannot vouch for its accuracy):

DJB, 15,200 kc., 12:35 *a.m.*-2 *a.m.* Note that this is *a.m.*, not *p.m.* Possibly DJE, 17,760 kc. will also be used at the same time. This transmission is obviously directed to listeners in the far east.

DJC, 6020 kc. and DJD 11,760 kc., 1:00-4:30 p.m. for South Africa.

DJA, 9560 kc., 8-11 a.m. (probably to Central Asia).

DJA, 5-7:30 p.m. for South America.

And DJC, 6-10:30 p.m. for North America.

We hope to have accurate details next month.

* * *

Norway

The corrected schedule of LCL at Jeloy, Norway is 11 a.m.-6 p.m. daily. They are on 6990 kc.

* * *

Belgium

ORK, a commercial phone station at Ruysselede, Belgium, on 10,330 kc. or 29.04 met. is now relaying the broadcasts of a station in Brussels daily from 1 p.m. for the benefit of listeners in the Belgian Congo, Africa. The power used is 10 kw.

* * *

Rome

I2RO at Rome, Italy, now broadcasts from 12-1:30 p.m. and from 4-6:30 p.m. daily on 11,810 kc. with 9 kw. power; this is the latest schedule.

* * *

Holland

PHI, the famous short wave station at Huizen, Holland, is now working from 7:30-9:30 a.m. on Mon., Wed., Fri. and from 7:30-10 a.m. on Sat. and Sun. on 11,730 kc. 20 kw. is the power used at PHI.

* * *

NRH

NRH, possibly the world's most erratic station as far as schedules are concerned, is now broadcasting from 7-8 p.m. on 9675 kc.

* * *

EAQ—Madrid

EAQ, Madrid, has lengthened its schedule. It now broadcasts daily from 5:30-8 p.m. The English program formerly broadcast from 7 to 7:30 p.m. is now broadcast for a full hour from 7-8 p.m. The station also operates from 1-3 p.m. on Saturdays as heretofore. This transmission is the one best received in the U. S. A. at this time of the year.

W8XAL at Cincinnati, Ohio, is again active on 6060 kc. It can be heard almost any day from early morning till 10 p.m.

* * *

W3XL

W3XL at Bound Brook, N. J., has an additional wavelength. Your columnist heard them in the last week of Dec. at 4 p.m. one afternoon on 17,310 kc. or 17.33 met. relaying WJZ. I believe they use this wave on Fridays from 11 a.m. till 5 p.m. in place of W3XAL on 17,780 kc. W3XL can also be heard relaying WJZ on Fridays from 5:30 p.m.-1 a.m. on 6425 kc. W3XL is an experimental transmitter operating on waves reserved for experimental purposes and hence its schedule is apt to be very irregular. The transmitter of W3XAL and W3XL is one unit. The difference is only in the waves and the call signs used. W3XAL still operates on Sat. from 5:30 p.m.-1 a.m. on 6100 kc., relaying WJZ, New York.

* * *

Brazil, S. A.

Many listeners report reception of broadcast programs of the Radio Club of Brazil, originating in Rio de Janeiro, Brazil. Announcements are made in Portuguese and English. They generally broadcast nightly from 6:30-7:30 p.m. Sometimes the programs start as early as 5 p.m. The programs are radiated on PSK, 8185 kc. or 36.65 met. with 1½ kw. power. Occasionally PSH, 10,220 kc. or 29.35 met, is used instead. PSK and PSH are commercial phone stations and are borrowed for the occasion. PSK came in very well here in early Dec. but has not been heard well recently.

* * *

Bermuda

Listeners report ZFD at St. George, Bermuda on 10,335 kc. or 29.03 met. calling various commercial stations. The call letters ZFD and the wave used were originally assigned to a Bermuda station using code. The Bermuda phone stations are ZFA and ZFB on 5025 kc. (59.7 met.) and 10,055 kc. (29.84 met.), respectively. It is possible that the call ZFD and its frequency, 10,355 kc., has been allocated to the phone station to take the place of ZFB.

* * *

Byrd Expedition

The Byrd Antarctic Expedition station aboard the S.S. *Jacob Ruppert* using the call KJTY has had several additional frequencies assigned to it. They are 9490 kc. (31.61 met.), 6120 kc. (49.02 met.), 11,830 kc. (25.36 met.) and 15,270 kc. (19.65 met.) The last 3 are the assigned frequencies of W2XE, Wayne, N. J., the s-w station of the Columbia network. KJTY has been given temporary permission to use these. When the station is set up in "Little America" it will be using the call letters KFZ.

Amateurs who made good

Marcus L. Potter

● MR. POTTER was born in Chicago, Illinois, April 23, 1901. He was educated at St. Johns Military Academy and Purdue University, graduating from the latter institution with a B. S. degree in electrical engineering. Mr. Potter became interested in radio in 1915, going on the air at that time in Kankakee, Illinois, with a one-half inch spark coil and two-slide tuner receiver, operating under the call of 9ANI.

Immediately after the World War a new call—9ABL—was issued to Mr. Potter and one of the most powerful amateur stations in the country soon went into operation; the transmitter consisting of a one kilowatt United Wireless open-core transformer, synchronous rotary spark gap, and other associated equipment. The receiver was a Grebe CR3 with detector and two-step amplifier.

Marcus L. Potter

In 1921 Mr. Potter attended Purdue University and it was through his commercial operator's license that Purdue's broadcasting license call WBAA was issued.

In 1927 Mr. Potter became "phone-minded" and a small station was set up under the call of 9DMI. At the present time Mr. Potter is located in Park Ridge, Illinois—a suburb of Chicago—and has a 350 watt carrier, 100% modulated phone on the air, operating in the 3900-4000 kilocycle band under the well-known call of W9FQU, which incidentally has been in New Zealand with an R8 phone signal.

Amateur radio is strictly a hobby with Mr. Potter, his occupation being advertising manager of the Vortex Cup Company, Chicago, Illinois—the world's largest manufacturers of sanitary paper cups.

5 and 10 Meter Gossip

Conducted by George W. Shuart, W2AMN

● The writer suggests that the "5 and 10" meter enthusiasts get busy and do some experimenting with transmitting and receiving antennas, especially for the 5 meter band. Almost any amateur operator on 5 meters will tell you that a slight change in the antenna length, direction, or height, will sometimes bring in stations with good volume that were otherwise inaudible.

* * *

At the high-frequency end of the 5 meter band, time signals can be heard on the hour, each hour throughout the day. These signals start at about two minutes of the hour and end with a long dash directly on the hour. The writer has been informed that the station call is W2CYD, located in New York City and special experiments are being conducted.

* * *

On November 2 from 10 to 11 p. m., the writer was in communication on 5 meters with W2AG at Yonkers, N. Y. About two weeks later contact was again established with W2AG and the following information was received: W3BYM, located at Palymra, N. J., seven miles north of Philadelphia was picking up W2AG's signal QSA 3-4, R5-6; no mention was made of W2CBC's signal. W3BYM gave definite proof of his reception by mentioning parts of the conversation between CBC and AG. W2AG, has also been heard at special listening posts over distances of 125 miles! This is a very fine record and a word or two might be said here regarding the equipment used at 2AG's. The transmitter consists of a M. O. P. A. circuit using two 10's as oscillators, two 46's as "buffers"; two 10's with 550 volts on the plate as modulated amplifiers feeding the antenna which is atop a mast 110 feet off the ground. 2AG is located on the top of the Palisades overlooking the Hudson and his fine equipment, together with his excellent location, probably accounts for the great distances he has covered on 5 meters. Next month we will endeavor to have information regarding the DX records of other 5 meter stations.

* * *

10 meters has remained as quiet as ever and we have no information regarding operation on this band, in this "neck of the woods," this month.

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These coils are considered the finest made. Each coil is Precision wound on a different colored bakelite form for quick identification of wave lengths. Used and highly recommended by all short wave experts. Range (16 to 225) meters, using a .00014 or .00015 mfd. condenser. Recommended for the following sets: "The Globe Trotter," "The Overseas," "The Doerle 12,500 Mile Two Tube Receiver and Doerle Three Tube Signal Gripper," "The Megadyne."

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Broadcast Coil, (200 to 550 meters) 55c

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No. 200—for '27, '37 and '56 Det. tube.... $1.39

No. 201—for '24, '35, and '36 Det. tube $1.39

ALL-WAVE COIL KIT Range 25 to 550 Meters

Comprises a precision wound tuner and R. F. coil, both having tapped secondaries, which permits you to enjoy both SHORT WAVE and BROADCART PROGRAMS. If you own an Ambassador or any other three circuit tuned receiver, you can easily convert the set into an all wave receiver, by replacing the coils, with these new GEN-WIN ALL-WAVE coils. Coils may be had for use with either .00035 or .0005 Mfd. condenser. Specify which when ordering.

Wiring diagram included free with coils. Separately 10c.

All Wave Tuner (as illustrated) 90c

All Wave R. F. Coil..... 75c

Send remittance in check or money order. Register letter if it contains currency

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SHORT WAVE RECEIVER

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CONE SIZE 13½ INCHES

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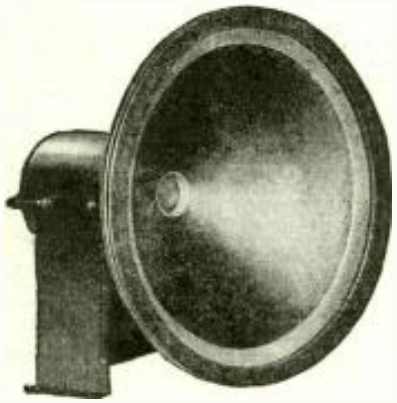

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The rotor turns on ball bearings. Shaft length (driving end), 2 ins.; diameter 9/16-in.; the end is threaded for a distance of ⅝-in. Case dimensions, exclusive of the shaft, 4½ x 6¼ in. in diameter. Guaranteed new and perfect. Worth $75.00, but while they last, only $4.95, plus shipping charges. Shipping weight 13 lbs.

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The 1934 "PAL" 2-Tube Portable

(*Continued from page* 685)

size Lafayette magnetic speaker is mounted directly on the metal chassis.

The chassis is of standard "sub-midget" size. Hence, there is plenty of room for all components. In fact, those who have the ability to wire up the various parts in limited space, could probably reduce the "Pal" to one-half the size shown, without interfering with its efficiency. When used for local reception, it is merely necessary to use a short flexible wire as an indoor aerial. For "dx" reception, however, a good outdoor aerial is recommended. Where there is local interference tending to prevent distance reception, due to motors, bells, switches, violet ray apparatus, etc., this may be eliminated through the use of one of the various noiseless lead-in systems.

The first step is to mount the four sockets on the drilled metal chassis. It will be noted that socket (16) is mounted on the rear chassis wall. As a result the field of coil (16) is at right angles to that of coil (2). The dual Hammarlund Condenser (3, 15) is mounted next on top of the chassis at the right front. The combination volume control and switch is mounted on a bracket at the left. Finally, the magnetic speaker is mounted at the center as shown in the top view. Three small bolts are used to fasten the cone to the front chassis wall, while the permanent magnet is fastened to the top of the chassis by means of a small right-angle bracket.

The chassis is now turned upside down and the limiting resistor (30) is fastened to the inside of the rear chassis wall. The cardboard contained electrolytic condensers (17) and (29) are fastened to the underside of the chassis. The remaining components, which include fixed resistors and cartridge and mica condensers are soldered in place during the process of wiring. Each part should be placed as close as possible to the other component with which it functions. For example, resistor (13A) should be soldered directly to the "P" terminal of socket (5); resistor (14A) should be soldered directly to the "E" terminal of socket (5); etc. In this way, wiring is reduced to a minimum, reducing the chance of unwanted circuit interaction and also resulting in a better looking job.

Since the tube socket terminals are all lettered to correspond with lettering on the schematic diagram, the wiring should present no difficulty whatsoever, even though the new tubes are not familiar to the set builder. Note that the letters are shown on top of the socket, with B to the left of A, etc. Naturally, when the chassis is turned upside down, B will be to the *right* of A. A and G are the terminals for the two large heater prongs. For best results and neatest appearance, it is suggested that wiring be performed with No. 18 solid core push-back wire.

The grid circuits are wired in first, then plates, then cathodes, by-pass condensers, filter condensers and filament circuit. In wiring socket 2 for the Alden antenna coil, looking at the bottom of the socket with the two larger holes at the right, the lower large hole terminal should be connected to condenser (1) and the upper large hole terminal should be connected to ground (chassis). The upper left terminal connects to the stator of (3) and the lower left to ground (chassis).

Looking at the bottom of socket (16) with large holes at the right, the upper right terminal must be connected to the rotor of (15) or to chassis. The lower right terminal connects to the plate terminal F of tube (5). The upper left terminal connects to the stator of (15), while the lower left connects to condensers (18) and (20) and resistor (19).

Before it can be used at (16), the standard Alden four-prong coil must be altered as follows: First remove the small winding on the bottom of the form. Then wind an interwinding between the turns of the secondary. The number of turns should equal two-thirds of the particular coil being changed. Number 34 to 36 enamelled wire should be used. The new winding should be connected to the prongs in place of the one which was removed.

The 1934 "Pal" Portable

The 1934 "Pal" gives loud speaker operation with only two tubes. Local stations come in at "room" volume, using only an indoor aerial. Two of the newest tubes, the 6F7 and 12A7 are used in a unique circuit whereby the 6F7 functions as a r.f. stage, a detector and a reflexed first audio stage, while the 12A7 acts as a second audio (output) stage and a rectifier. The utilization of the "Cisin" A.C.-D.C. circuit permits operation on any house lighting circuit without changes in tubes or wiring. While the present design is that of a standard "sub-midget," this receiver may be built up in such compact size that it will fit into a coat pocket! Alden plug-in coils enable this set to bring in short wave and broadcast stations. Both coils are tuned by a compact dual Hammarlund variable condenser.

Complete List of Parts Required

1—Hammarlund Dual Midget Condenser, .00014 mfd. per section, type MCD-140-M (3, 15)
1—75,000 ohm Volume Control Potentiometer, type RI-202-P (10) with switch (31)
1—400 ohm, 50 watt Wire Wound Resistor, type C-4, with sliding clip set at 340 ohms (30)
1—Set of Alden Plug-in Coils—four coils to set—covering short wave band from 15 to 200 meters, type 704 SWS (2)
1—Alden Plug-in Coil Covering Broadcast band, type 704 SWO (2)
1—Set of Alden Plug-in Coils, type 705 SWS, with primary changed as explained in article (16)
1—Plug-in Coil, type 704SWO with primary changed as explained in article (16)
1—Mica Condenser, .00005 mfd. (13)
4—Mica Condensers, .0001 mfd. (4, 6, 7, 18)
2—Cartridge Condensers, .006 mf. (1, 26)
2—Cartridge Condensers, .01 mf. (11, 20)
1—Cartridge Condenser, .1 mf. (14)
1—Electrolytic Cartridge Condenser, 4 mf., 150 volt (28)
2—Electrolytic Condensers, Cardboard Container, 4 mfd. (17, 29)
1—Cartridge Electrolytic Condenser, 10 mfd., 25 volt (22)
1—I. R. C. 1000 ohm, ½ watt Metallized Resistor, type F½ (23)
2—I. R. C. 5000 ohm, ½ watt Metallized Resistors, type F½ (14-A, 25)
3—I. R. C. 50,000 ohm ½ watt Metallized Resistors, type F½ (1, 12, 13-A)
1—I. R. C. 100,000 ohm, ½ watt Metallized Resistor, type F½ (19)
1—I. R. C. 200,000 ohm, ½ watt Resistor, type F½ (21)
1—I. R. C. 1 meg., ½ watt Metallized Resistor, type F½ (8)
2—Alden Seven-Prong Molded Sockets, type 437-A (5, 24)
1—Lafayette 6F7 Tube (5)
2—Alden 4-Prong Molded Sockets (2, 16)
1—Lafayette 12A7 Tube (24)
1—Lafayette Magnetic Speaker, Small Size (27)
1—Roll Hook-up Wire, Solid Core
1—Drilled Metal Chassis 9¼"x4¼"x1¾" high; Blan
1—Noise Eliminating Aerial Lead-in System; Lynch

(Numbers in parentheses refer to corresponding numbers on diagram.)

Alden 4-Pin Plug-in Coil Data

Meters Wave-length	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch	19 T. No. 30 En. Close wound (CW)	⅛"
80-40	23 T. No. 28 En. Wound 16 T. per inch	11 T. No. 30 En. C. W.	⅛"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	⅛"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	⅛"

Coilform—2⅛" long by 1¼" dia. 4-pin base.

Short Waving With Byrd

(*Continued from page* 649)

the location of the apparatus. Over flat country or from elevations overlooking the surroundings, Admiral Byrd's men will be able to talk and receive over distances of from 10 to 20 miles, when desired. From higher points of vantage, even greater distances of course are possible. This remarkable little battery set during tests has worked 95 miles from a mountain top, and when fitted with 6-volt automobile type tubes and 180 volts "B" supply, it has been heard over 100 miles from an airplane. A flip of a switch permits the operator to either *transmit* or *receive*. A single button microphone is used with the *trans-ceiver* and sensitive headphones such as the Trimm, over 40 pairs of which are carried by the expedition, serve for reception. An aerial about 8 feet in length is all that is required with 5-meter sets such as this.

Main and Forward Base Receivers

We are advised by Prof. C. S. McCaleb, technical advisor to the Byrd Expedition, that at the main base in "Little America," a National AGS type receiver will be employed for official broadcast pick-up and general communication; also, a model FB-7 National receiver for reception from the forward base and sledge parties, with one SW-58 National receiver as an emergency unit. At the forward base, another AGS receiver will be on duty, also an FB-7 National receiver, as well as an SW-58.

It is interesting to note that over 440 receiver tubes are being carried on the expedition and altogether there are 10 transmitters, 14 receivers, 143 transmitting tubes, 23 microphones, 2 complete recording machines, and 55 measuring instruments. A Hammarlund Comet-Pro is included in the receiver equipment.

Another one of the high-class short and broadcast wave receivers carried on the Byrd expedition — the Hammarlund Comet-Pro.

Aircraft Receivers

The aircraft carried on the Byrd Expedition will be fitted, of course, with short-wave transmitting and receiving equipment. For the aircraft, there have been officially assigned four National SW-3 receivers. These receivers are ideal for use on an expedition located so far from the usual sources of supply, as they may be efficiently operated on batteries. The tuning of these receivers is also very simple and is practically all done on one dial. These 3-tube aircraft receivers, although using but three tubes, one R.F., a regenerative detector, and one audio stage, are particularly well shielded so far as interstage feed-back is concerned, and due to the high insulating value of the parts used, they will yield a maximum response on the weak signals liable to be encountered on aerial reconnoitering trips in the Antarctic.

The receivers carried on the Byrd Expedition, in general, have all been tested exhaustively under all sorts of operating conditions, before the expedition left on its journey. The sets were tested particularly for reliability of operation and also for sensitivity. When you

THE PLACE WHERE ALL AMATEURS GET THE MOST FOR THE MONEY!

RED HOT RADIO BARGAINS FROM UNCLE DAVE

ALL RADIO SUPPLIES SOLD BY UNCLE DAVE - ARE BACKED WITH THE UNCONDITIONAL GUARANTEE!

PEERLESS RADIOPHONE TRANSMITTERS—8 to 10 watts output, 100% modulation, excellent quality guaranteed. MOPA constructed for operation in the 160 meter phone band; uses 45 oscillator, 46 modulator, 56 speech amplifier, 250 modulator.—includes Gavitt Star single button microphone, all tubes adequately filtered, extra heavy power supply...the whole transmitter is designed to operate at the greatest efficiency. Wiring diagram and detailed instructions for operating are included. Complete with microphone, tubes, milliammeter, tested and ready to plug into 110 A.C. line.....$36.50

LOOK AT THIS! The above transmitter, crystal controlled, with crystal ground to your frequency in the 160-meter band; exactly the same as above except with 47 crystal oscillator. SPECIAL.....$41.25

PEERLESS 1-TUBE BANDSPREAD RECEIVER—A neat compact receiver with general coverage 15 to 230 meters. Bandspread over any part of the band. Uses a type 30 tube. Neatly enclosed in metal cabinet, finished in black with all coils and 4-foot battery cable, special.....$4.85

PEERLESS 2-TUBE LOUDSPEAKER RECEIVER—A very popular distance-getting receiver which on actual tests has received all of the major European short-wave broadcasting stations. This receiver will pull in practically all the short wave stations in almost any location. Embodies latest type tubes in the most efficient circuit it is possible to design...only two major controls make for easier tuning of distant stations. Perons with no previous experience with short waves have tuned in foreigners the very first day they operated the set. Hundreds of enthusiastic letters from satisfied customers prove the ability of this receiver to reach out and drag them in. Designed by an engineer having years of experience in the short wave field. This receiver embodies 32 and 33 tubes and operates from 2 dry cells and 2 45-volt B batteries. A real distance-getter!

Complete with coils from 15 to 200 meters, special.....$10.85
Broadcast coil, each..... .75

CRYSTALS AND HOLDERS

PEERLESS ADJUSTABLE, MOULDED BAKELITE, DUSTPROOF CRYSTAL HOLDER.$ .74
SAME AS ABOVE, but plug-in, each.....$1.05

PEERLESS PRECISION COMMERCIAL TYPE PLUG-IN CRYSTAL HOLDER, for the Ham that wants the best, SPECIAL.....$1.29
JACK MOUNT FOR ABOVE.....$ .30

PEERLESS PRECISION CRYSTALS, made of best grade Brazilian quartz obtainable, ground to your specified frequency in 1,715 or 3,500 kc. band to a guaranteed accuracy of 0.1%. Molded bakelite adjustable dustproof crystal holder FREE with purchase of this crystal at only.....$2.75

PEERLESS CRYSTAL complete with commercial type plug-in holder.....$3.60
7,000 kc. Crystals.....5.50
Finished Oscillating Blanks, guaranteed, each.....1.60
Unfinished blanks, guaranteed, each.....1.00
Precision grinding—your present crystal ground to any higher frequency.....1.50

SL. USED TELEPLEXES, complete with three tapes, ONLY.....$10.00
SL. USED OMNIGRAPHS, 15-dial, each.....$12.95

EXTRA HOT SPECIALS

WESTON sl. used DC Milliammeters, all ranges, EACH.....$3.69
SPECIAL WHILE THEY LAST—250 Hitest tubes, each.....$ .69
Light Duty 866's, 30-day gtd., each..... .77
81-M MV tubes, 30-day gtd..... .95
15-Watt 30-day guaranteed Hitest 210's, with plate lead on top, each..... .89

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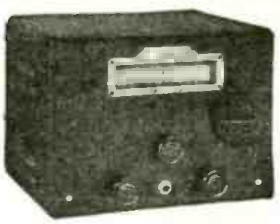
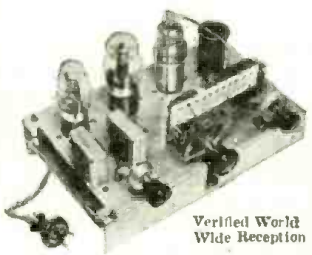
Short Wave Sets

The Best Values . . Dollar for Dollar . . on the Market



ALAN ACE
110 v. A.C.-D.C. S.W. (15 to 200 Meters) 3 Tubes—6F7—43—25Z5 Front Panel Plug-in Coils; Absolutely Quiet Power Built-in Supply Field supply for speaker, phone jack on front panel; completely shielded in metal cabinet.
Complete with 4 coils (15-200 M) less tubes.....$16.95
Set Arcturus Tubes..... 3.95
Complete Kit with Blue Prints 13.95
Broadcast Coil..... 1.49



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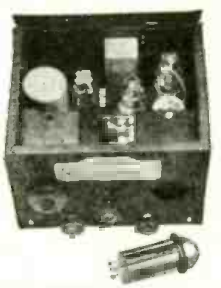
ALAN PRIZEWINNER
A.C.-D.C. S.W. (15 to 200 Meters)
Completely self powered latest type 77-43 and 25Z5 Tubes. Provision for Head Phones and Speaker.
Complete, less tubes, in rich crackle-finish cabinet. Assembled, wired, tested, ready to plug in.....$12.95
Complete Kit of parts with prints 10.55



ALAN INTERNATIONAL
110V. A.C.-D.C. S.W. 15-200 meters. 4 tubes: 2-78's, 1-43 and 1-25Z5. Built-in power supply. 4 pairs of plug-in coils. Other specifications same as Alan Ace. Complete, including 4 pr. coils, 15-200 m.....$24.95
Set Arcturus tubes..... 4.95
Complete Kit with blueprints. 21.95
Pair Broadcast Coils..... 2.75

NEW! The Byrd 2-tube Kit, complete parts, nothing extra to buy. 34 Detector, 33 Pentode
★ Output. Micro-Vernier dial, black crackled finish, hinged top cabinet. Set 4 coils, 15-200 meters. Complete specifications, blueprints, hardware, wire.....$5.75
Set of matched and guaranteed tubes..... 1.95

ACE and INTERNATIONAL also available for straight A.C. or D.C. (110 or 220 V.), 2 and 6 V. battery operation.
Write Today for Full Particulars.

ALAN RADIO CORP.
Specialists in Short Wave Receivers
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MICROPHONES

With the prices of materials going higher every day it will soon be necessary for us to advance our prices. Mayo microphones have gone over the top in sales. The radio trade is quick to realize real value at low price, and if it were not for the volume of sales that we have had we could not afford to sell this truly $25.00 mike for $5.00.

At Your Distributor or Sent Postpaid on Receipt of Remittance

$5.00 NET TO THE TRADE

THE MAYO type "F" is a large, heavy, polished chromium plated, commercial type microphone two button, gold contacts, NEW SPECIAL HEAT TREATED DURALUMINUM DIAPHRAGM, on stretched cushion. Special process long life carbon. Frequency response 30 to 5000 cycles. Size 2½"x3½", weight 1¼ lbs. Furnished either 100 or 200 ohms per button.

If you cannot obtain this microphone from your distributor send us your order, IF YOU ARE NOT THOROUGHLY SATISFIED RETURN WITHIN FIVE DAYS AND WE WILL REFUND PURCHASE PRICE.

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Repairing microphones is part of our vast service. Our complete equipment and trained engineers insure accurate repairs to any make or type of microphone.

OUR REPAIR PRICES ARE LOW
FLOATING DIAPHRAGM FROM.....$1.00 to $2.50
STRETCHED DIAPHRAGM FROM....$2.50 to $4.50
OTHER PRICES ON REQUEST
CARBON—Special processed for repacking your own microphone, enough to repair five microphones—50c.

DISTRIBUTORS—Write for our proposition

MAYO MICROPHONES
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SUPER TESTING KIT!

Pencil Type Handles with interchangeable Tip End. Kit complete with 2 Plug-in-Prongs, 2 Alligator Clips, 2 Needle Point Phone Tips, and 2 Spade Lugs, Long, Thin Pencil-Type handles for easy testing in tight places. Ideal for testing Long and Shortwave Sets, Coils Condensers, Etc. Complete kit. Write for free catalog.

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LEARN Radio and Television! *Broadcast, Service,* etc.
Leaders predict new system television requires thousands relay and broadcasting stations. Ultra-short waves permit 80,000 television stations in America alone. Here's opportunity! Get in NOW and "build up" with new industry in new era. Thorough training qualifies for 1st Class Radiotelephone operator license. Real experience at Television Station W2XAL. Write for free folder, "Pictures on the Air."
S. O. Neet, Pres. First National Television, Inc.
Dept. S-1, Power & Light Bldg. Kansas City, Mo.

are thousands of miles away from the nearest supply depot you must have a receiver which will guarantee reception at all times and one which will not be put out of commission due to vibration or a little rough handling; some of the equipment having to be carried either by airplane or dog-sled to the base, for example, and a receiver that will withstand the vibration in an airplane, will operate 100% perfect in any other location.

1,000 Watt "Main Base" Transmitter

Admiral Byrd's is the first Polar Expedition to carry a sufficiently powerful transmitter (it is rated at 1000 watts, and transmits on various short waves, a number of which have been assigned to it by Uncle Sam) to enable the members of the expedition to talk back to their home country. The efficient 1 kw. transmitter, built by a Cedar Rapids, Iowa, radio manufacturer, carried by the expedition is shown in one of the accompanying photos and it was installed on the flagship, *Jacob Ruppert*. This transmitter will be transferred to the main base at "Little America" and serve to link it with the world. As explained at length in our especially illustrated article in the January issue, the 1000 watt transmitter will be used to broadcast radiophone programs (such as its broadcast over the Columbia network every Saturday night at 10 o'clock, E. S. T.) up to a short-wave relay station located at Buenos Aires, S. A. From here the Byrd programs originating in "Little America" will be relayed northward to the RCA receiving station located at Riverhead, L. I. The programs are then transmitted by wire to the RCA Control Station located in New York City; thence they go to CBS headquarters at 485 Madison Avenue, New York City. From this point the programs are dispatched over the telephone line network extending all over the United States and the program is simultaneously broadcast from 59 Columbia network stations. In a dispatch to the designer and builder of the 1 kw. transmitter, Admiral Byrd sent a radio message stating that the transmitter had been operating excellently for their weekly broadcasts from the *Jacob Ruppert* and that when located 6,000 miles from New York, with good atmospheric conditions, reports had indicated that the signals were received well in New York and San Francisco.

Some idea of the high efficiency required in the 1 kw. transmitter carried by the expedition may be realized when we consider that for ordinary 3,000 mile transoceanic radiophone work, the regular commercial plants use 40 to 50 kw.

In addition to this main 1 kw. transmitter, two smaller transmitters of the same manufacture are being carried for use for communicating between the different camps or bases of the expedition. When the main base is set up at "Little America," these transmitters will be connected to a Bruce-type directional antenna, trained on Buenos Aires and New York, thereby increasing the radiation efficiency and the effective power of the 1 kw. transmitter to several kilowatts. Short wave amateurs will hear KITY, the call of the *Jacob Ruppert*, and KFZ, which is the call to be used in "Little America," on the following frequencies: 3,105 kcs., 4,140 kcs., 5,520 kcs., 6,210 kcs., 8,280 kcs., 11,040 kcs., 12,420 kcs., 16,560 kcs., 22,080 kcs.

Conventional radio code transmitters are also installed aboard both of Admiral Byrd's ships and they are used for communication with other vessels and shore stations and also to contact amateurs when time permits.

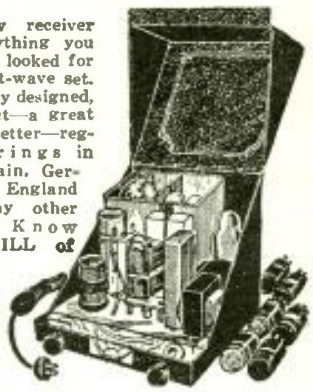
The "Gammatron"

(*Continued from page* 668)

shaped section which completely surrounds the base of the tube, adding greatly to the mechanical strength. The recommended plate voltage at which this tube is supposed to be operated is 2,000 volts.

We are led to believe that this is another one of those tubes where full efficiency is not obtained unless near its maximum plate voltage is applied.—(Refer to No. 141.)

Leotone SHORT WAVE A.C.



This new receiver has everything you have ever looked for in a short-wave set. It is newly designed, is compact—a great distance getter—regularly brings in Italy, Spain, Germany, England and many other countries. Know the THRILL of distance—listen-in on police calls, air-craft communication. Can be installed in your car or motor boat.

The LEOTONE A.C. Receiver uses the following Arcturus tubes: 58-R.F., 57-detector, 56-1st. A.F. 2A5-2nd. A.F., and 80 Rectifier. Complete Kit with 2 sets of Gen-Win coils (8 coils) and Arcturus Tubes $18.95
Completely wired and tested with matched kit of Arcturus tubes.....$21.95

Special Shielded S. W. Battery Set
Built in same Foundation Kit as above.

Perfect performance assured—this set has a "KICK." Uses the following tubes: 1-30, 1-32, 1-33, 1-34 low current drain tubes. Complete kit of parts with two sets of Gen-Win coils (8 coils) and Arcturus Tubes, $11.95. Kit completely wired, including Arcturus Tubes, $14.45.

LEOTONE RADIO CO.
63 DEY STREET NEW YORK, N. Y.

5 *and* 10 METER TRANSMITTERS

We carry all the parts listed in the articles written by Geo. W. Shuart in the January, February and other issues. We carry a tremendous variety of parts for short wave enthusiasts.

Among them are:

GENERAL RADIO CO.
NATIONAL CO.
McMURDO SILVER
SYLVANIA
CARDWELL
LYNCH
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"The Home of RADIO"

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Get the New "KEY KLIX"?

● Thousands of amateur radio items, at the lowest prices, are contained in this FREE, 132 pages, Big Book, together with many interesting articles by people well known in amateur radio circles.

AMERICAN SALES COMPANY
Wholesale Radio Distributors
44 W. 18th St., S W., N. Y., N.Y.
The Oldest Amateur Supply House, Est. 1919

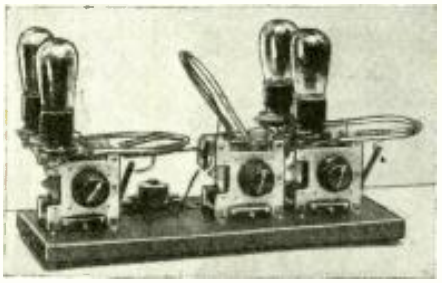
How "Signal Strength" Is Rated

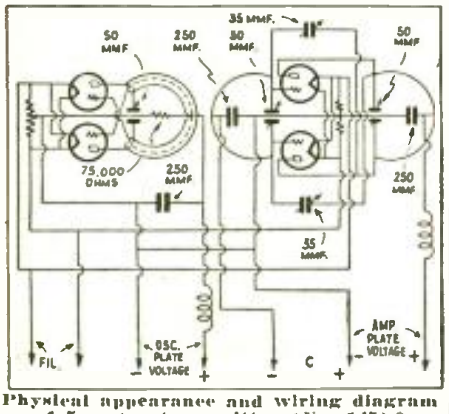
(*Continued from page* 686)

calibration can be reduced to simply this. Tune in a signal which is QSA-5 from the first table and as loud as you have heard an ordinary short-wave station; this would be known as a station received *very good* and *readable at all times* with *maximum volume*. Note the setting of the volume control and in judging the signal strength and quality of any other stations, always return the volume control to this point; otherwise your "R" system of volume recording will be greatly in error. Then tune in another station that you would say was QSA2, *readable at times*, and note the volume on the meter. A signal that is *readable at times* need not necessarily be a weak station; a stronger station having quite a bit of interference on its frequency band could be QSA-2 and R-8. Thus you can readily see that there is a distinct difference between the two systems employed. In calibrating the meter it is advisable to receive a station QSA-2 that is understandable at all times and quite weak in volume.

This we can term QSA-2, R1 or 2. Calibrating the intermediate points such as R3, 4, 5, 6 and 7 is just a matter of repeating the operations above with various stations of differing volumes. Always start with a *weak* station and then tune in the *loud* ones in order to get your calibration chart as nearly correct as possible. It is hoped that this method will produce a more systematic and accurate method of reporting "signals heard."—*G. W. Shuart*, W2AMN.

5 Meter M. O. P. A. Transmitter





Physical appearance and wiring diagram of 5 meter transmitter (No. 145).*

● A MASTER-oscillator type of transmitter for 56 mc. operation is becoming more and more popular where it is desired to minimize interference by eliminating frequency modulation. Such a transmitter is that shown.

This transmitter uses two tubes as oscillators in a unity-coupled circuit. This circuit is more efficient than the usual 5-meter oscillator, and its frequency is adjusted by a single control. A split stator condenser is used in order to equalize the output of each tube. The power amplifier is similar to any amplifier except that it is inductively coupled to the oscillator in order to obtain sufficient voltage for the grids of the amplifying tubes. The amplifier is neutralized.

* Name and address of manufacturer supplied on receipt of stamped and addressed envelope.

Look for these FEATURES

14 to 540 Meters

When purchasing a good All-Wave, Custom Built, superheterodyne receiver be sure and look for these features.
TUNED R.F. PRE-SELECTOR STAGE — New triple shielded drawer coils — Instantaneous 180 degree band spread—True tracking single dial control—Electron coupled oscillator—Audio beat oscillator—Automatic phone jack—Plate supply switch—Antenna tuning—Complete in one unit—Totally shielded—Guaranteed humless reception on phones—3 watt output on loud speaker—Especially designed for short waves—10 kc. selectivity on the broadcast band—Actually laboratory custom-built.
Although the above features are very necessary for efficient and precision short wave reception, they are found only in the new 1934 9-tube Custom Built POSTAL INTERNATIONAL. IRON CLAD GUARANTEE.
The year's outstanding receiver—the POSTAL INTERNATIONAL—is sold directly from our laboratory on a 10-day trial in your home. Consistent foreign reception on the dynamic reproducer is guaranteed or your money refunded.
Send 3c stamp immediately for special price offer, circuit diagram, completely illustrated folder and proof of consistent foreign reception.

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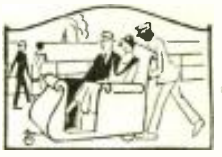
135B Liberty St. New York, N. Y.
NRA

American or European Plan—Complete Garage Facilities

The Breakers
ATLANTIC CITY, NEW JERSEY
On the Boardwalk



Extraordinary Reduction In Rates

AS LOW AS

Without Meals $2.50 Daily per Person

With Meals $5.00 Daily per Person

Hot and Cold Sea Water in all Baths

SHORT WAVE LEAGUE MEMBERS
IDENTIFY YOURSELVES WITH THE ORGANIZATION

In order that fellow members of the LEAGUE may be able to recognize each other when they meet, we have designed this button, which is sold only to members and which will give you a professional appearance.

If you are a member of the LEAGUE, you cannot afford to be without this insignia of your membership. It is sold only to those belonging to the LEAGUE and when you see it on another, you can be certain that he is a member.

See page 643

Lapel Button, made in bronze, gold filled, not plated, prepaid.....35c
Lapel button, like one described above, but in solid gold, prepaid.$2.00

WORLD-WIDE
SHORT-WAVE STATIONS
Nearly 9,000 Short-Wave Radio Stations Listed in This Book

For Sale On All Principal Newsstands
Look for the Yellow Cover

25c A Copy

WE ARE happy to present to our friends, the second issue of the OFFICIAL SHORT WAVE LOG AND CALL MAGAZINE, just off press.

To the thousands of readers who bought the first issue, we express our thanks, with the hope that they liked our presentation. And those of you who bought the first issue certainly will wish to get the second one too, as it is far more complete than the first. It has been entirely revised, and brought up to date, up to the time we went to press.

There are nearly 9,000 listings of radio 'phone short-wave stations in this magazine, and, from the very nature of it, you appreciate how many changes occur from month to month.

ONLY ONE OF ITS KIND

THE OFFICIAL SHORT WAVE LOG AND CALL MAGAZINE is the only publication in print that publishes ALL the short-wave 'phone stations of the world. Thousands of stations that the average listener hears are listed here, and you need no longer be puzzled as to whence the call emanates.

As only a limited quantity was printed for the second issue, it is possible that your newsdealer sold out his supply.

Should you not be able to secure a copy at your newsstand, use the handy coupon.

This is one of the finest books that the publishers of SHORT WAVE CRAFT have ever turned out. You will be proud to possess it.

The size of this book is 9x12 inches, same size as SHORT WAVE CRAFT magazine. It is printed on a good grade of paper, and has a heavy durable cover.

SHORT WAVE CRAFT 96-98 PARK PLACE NEW YORK, N. Y.

MAIL THIS COUPON TODAY!

SHORT WAVE CRAFT
96-98 Park Place, New York, N. Y.

Gentlemen: I enclose herewith 25c for which send to me prepaid, immediately a copy of your new OFFICIAL SHORT WAVE LOG AND CALL MAGAZINE. (Send money order, check, cash or new U. S. Stamps. Register letter if it contains stamps or currency.)

Name .....

Address .....

City ..... State .....

SW-3-34

Partial Contents

1. THE OFFICIAL SHORT WAVE LOG AND CALL MAGAZINE contains the largest listing of short-wave stations in the world. BECAUSE OF SPACE LIMITATIONS, NO REGULAR MAGAZINE CAN PUBLISH ALL THE WORLD STATIONS. There are so many short-wave stations which normally cannot be included in any monthly magazine; but frequently you hear these calls, and you must know where they come from. THE OFFICIAL SHORT WAVE LOG AND CALL MAGAZINE gives you this information, besides a lot of other data which you, as a short-wave enthusiast, must have.

2. Log List. The log section gives you dial settings, time, date, call letters, location, and other information. Thus, when you hear a station, you make a permanent record, which is invaluable.

3. Another large section has squared-paper pages on which you can fill in your own frequency (wavelength) curve for your particular receiver. This helps you to find stations which otherwise could never be logged by you. These tuning charts are listed in two sections; one reading 0 to 100 degrees and the other from 0 to 150 degree tuning dial.

4. World Airline Distance Chart, showing the approximate distance between principal cities of the world. Invaluable in quickly verifying distances from any country in the world.

5. A new "Meter to kilocycle" conversion chart. Quite often short-wave broadcast phone stations announce their frequency on the latter scale when signing off, and many listeners do not know the relation between them. A chart anyone can read.

6. A list of international abbreviations used in radio transmission.

7. A chart of complete Morse and Continental International Code Signals, as used in all radio work.

8. World Time Chart. This tells you instantly what the time is, anywhere in the world. Necessary for every short-wave listener.

9. Improving your Short Wave Reception. An invaluable chapter by the well-known authority on short waves, Clifford E. Denton.

10. Identification chart of stations by their call letters.

11. Map giving the standard time zones of the entire world, for quick reference.

12. New and complete list of phone stations on the ocean liners.

13. "Q" readability systems. "T" Tone system. "R" audibility system. Invaluable to amateurs.

14. New Straight-Line World Distance Chart.

15. International prefixes by which you can recognize each foreign country when you hear a call.

Mr. Hugo Gernsback,
96-98 Park Place, New York City.

Fairview, Oklahoma,

My Dear Mr. Gernsback:

Have just finished reading your Newest Brain Child the *Official Short Wave Log and Call Book*, and find it good.

Although I am no critic, but I have followed through your radio publications your efforts for better radio, your attempts to bring the user in to the light that radio is the cleanest sport that man has found for a hobby and taught the manufacturers of radio sets that the buying public wants to also know the circuits involved, you have carried a campaign for the release of data for the service man.

In all, Mr. Gernsback, I have grown to manhood reading your radio publications and I hope that my sons find them as interesting as I do as I have two small sized "Hams."

So Mr. Gernsback why not say to you, you have found your work and it is well done.

73 (s) E. B. ALLEN, 483 Fairview, Oklahoma.

Short Wave Scouts

(*Continued from page 663*)

Trophy Contest Entry Rules

● NOTE that we have amended our rules, and you will find that the rules now read:

Fifty Per Cent Verified and 50% Unverified

In other words, if you send in a list of 100 stations, and at the same time you send in 50 verification cards, you will get credit for 100 stations, beginning immediately. This, we believe, should take care of all SHORT WAVE SCOUTS handsomely and give them the benefit of the doubt.

In order to protect everyone, the rules have been amended that a sworn statement before a Notary Public, which only costs a few cents to get, must be sent in at the same time. This is done to protect the honest and conscientious SHORT WAVE SCOUTS from the practical jokers and irresponsible elements who are unfortunately always with us.

It is to be hoped that the amended rules now make it much easier for the would-be entrants.

For the complete article of the Purpose of the SHORT WAVE SCOUTS, we refer to page 393 of the November, 1933, issue.

Here are the rules amended:

You wish to know how you can win this valuable trophy, and here are the simple rules. *Be sure to read them carefully. Do not jump at conclusions.*

1.—A monthly trophy will be awarded to one SHORT WAVE SCOUT only.

2.—The purpose of this contest is to advance the art of radio by "logging" as many short-wave commercial phone stations, in a period not exceeding thirty days, as possible by any one contestant.

3.—The trophy will be awarded to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during one month.

4.—In the event of a tie between two or more contestants, each logging the same number of stations, the judges will award a similar trophy to each contestant so trying.

5.—Verifications are necessary; these must be sent in with each entry. All cards or verification letters must be sent in at the same time, with a statement by the SHORT WAVE SCOUT, giving the list of stations in typed or written form, with the station calls, wave-lengths, and other valuable information. (See below.) The verification letters and cards will be returned to the SHORT WAVE SCOUT at the end of each monthly contest. (See Jan. 1933, editorial how to obtain verifications.)

6.—Inasmuch as not all stations send out verification letters or verification cards, each contestant is entitled to report not more than 50% of station calls for which no proper verification is submitted. For example, if you should mail a list of 100 stations, and submit 50 verification cards or letters with this list, the Judges would allow the 100 stations, providing such data is given for the 50 unverified stations as to enable an intelligent check to be made by the Judges. In the interest of all SHORT WAVE SCOUTS, however, contestants should try to send in as many verifications as possible. Each list submitted must be sworn to before a Notary Public, as follows:

The undersigned declares under oath that the stations listed in this list and submitted in the SHORT WAVE SCOUT Contest were received by me during the past thirty days, that the reception was bona fide and was obtained by me without assistance from any outsider, and that I personally listened to the station announcements as given in this list.

7.—This is an *international* contest in which any reader, no matter where located, can join. It is allowable for SHORT WAVE SCOUTS to list stations in their own countries, if they desire to do so. In other words, SHORT WAVE SCOUTS residing in the United States can log stations in the United States, as well as foreign stations. There will be no discrimination in this respect.

8.—SHORT WAVE SCOUTS are allowed the use of any receiving set, from a one-tuber up to one of sixteen tubes, or upwards, if they so desire.

9.—When sending in entries, note the following few simple instructions: Type your list, or write in ink, *pencilled matter is not allowed.* Send verification cards, letters and the list all in one package, either by mail or by express prepaid; *do not split up the package.* Verification cards and letters will be returned, at the end of the contest, to their owners; the expense to be borne by SHORT WAVE CRAFT magazine.

10.—In order to have uniformity of the entries, when writing or typing your list observe the following routine: USE A SINGLE LINE FOR EACH STATION; type or write the entries IN THE FOLLOWING ORDER: Station call letters; frequency station transmits at; schedule of transmissions, if known (all time should be reduced to Eastern Standard which is five hours behind Greenwich Meridian Time); name of station, city, country; identification signal if any. Sign your name at the bottom of the list and *furthermore state the type of set used by you to receive these stations.*

11.—Don't list amateur transmitters in this contest, *only commercial phone stations,* no CW and no "code" stations.

12.—This contest will close every month for the next twelve months on the first day of the month, by which time all entries must have been received in New York. Entries received after this date will be held over for the next month's contest.

13.—The next contest will close in New York March 1st.

14.—The judges of the contest will be the editors of SHORT WAVE CRAFT, and their findings will be final.

15.—Trophy awards will be made every month at which time the trophy will be sent to the winner. Names of the contesting SCOUTS not winning a trophy will be listed in Honorable Mention each month.

16.—From this contest are excluded all employees and their families of SHORT WAVE CRAFT magazine.

17.—Address all entries to SHORT WAVE SCOUT AWARD, 98 Park Place, New York City.

How to Get Verification Cards

First of all, write the letter neatly, typewritten or ink, never in pencil! Give the exact local time of reception, as well as Greenwich meridian time, which is figured as follows:

Greenwich time is five hours ahead of Eastern Standard Time; six hours ahead of Central Standard Time; seven hours ahead of Mountain Time; eight hours ahead of Pacific Time, etc. In other words, when it is six o'clock Eastern Standard Time, it is 11 o'clock Greenwich Meridian Time. *Always* give the Greenwich time, because the broadcasters will know that this is the correct time.

Be sure to mention that part of the program which you listen to.

Be sure to thank the station manager for giving you the program, and how much pleasure you received by listening to his station.

State in the letter that you enclose an *International Postage Reply Coupon.* Never send cash or stamps. The foreign stations cannot use them. The International Postage Reply Coupon costs 9c. You must buy it at your local Post Office; no one else sells it. This coupon is better pinned, not pasted, to your letter.

Print your address at the bottom of the letter, and print the same address on the envelope.

Next—and most important, where most fans fall down, is the matter of postage. Letters to Europe, Australia, Asia, Africa and most of the foreign islands go at the rate of 5c, if the letter weighs less than an ounce. If it weighs above this, extra postage must be prepaid. We discourage the use of postal cards, because with the postal card you cannot send the International Money Coupon, and you will find that *only a small percentage of stations will answer your requests, unless the International Postage Reply Coupon is used!*

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ACT NOW—MAIL COUPON

Start this very minute! Send for full details of our plan and free booklet that explains how easily you can now cash in on radio quickly. Don't put it off! Write today. SEND NOW!

RADIO TRAINING ASSN. of AMERICA
Dept. SWC-3, 4513 Ravenswood Ave., Chicago, Ill.
Gentlemen: Send me details of your Enrollment Plan and information on how to learn to make real money in radio quick.
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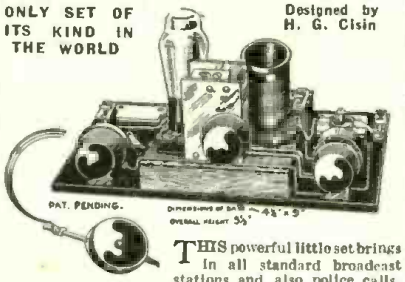
Address .....
City ..... State .....

ALL-WAVE AIR SCOUT

ONLY SET OF ITS KIND IN THE WORLD

Designed by H. G. Cisin



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Use a postcard only. Never write a letter. Address postcard as follows:
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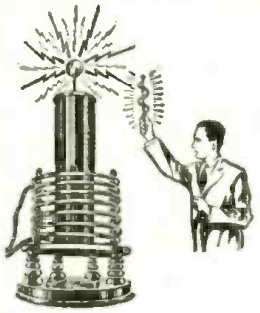

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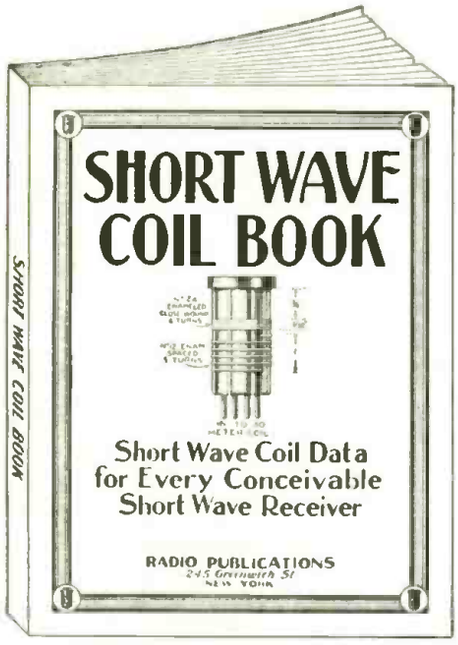

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"Pretzel-Bender Two"

(*Continued from page 669*)

tivity enormously. Otherwise the coupling between the detector and the output is conventional. Since both the 34 and the 33 tubes are pentodes, and furthermore since the circuit design takes full advantage of the potential possibilities of these tubes, this little set is capable of bringing in foreign stations and of producing results seldom obtainable except in receivers having many more tubes and costing very much more.

The 33 output tube has an undistorted power output of 700 milliwatts. Its power handling ability is made possible by the addition of both a suppressor and a screen between the grid and plate. The supressor is placed next to the plate and is connected inside the tube to the filament.

A triple spring, open-circuit jack permits the use of earphones or loud speaker. When the plug is inserted into the jack, this automatically closes a second circuit between B— and the chassis. The jack is insulated from the chassis.

While the "Pretzel-Bender Two" has sufficient power to operate a loud speaker on local stations, it was purposely designed for high R.F. sensitivity so as to be able to bring in the "hard-to-get" foreign stations on earphones. Due to the fact that this receiver is carefully designed and also since the circuit is so exceedingly simple, it is perfectly stabilized and very easy to tune.

As regards the construction, the novice will encounter no trouble whatsoever in putting this set together and wiring it. The complete kit, including bent and drilled chassis, is available and detailed instructions are furnished, giving the various steps to be followed in mounting the parts and completing the wiring. Only a few feet of wire are needed for this job.

(For coil data (4-prong) see page 681.)

Newest

ULTRA

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will be described in the next issue

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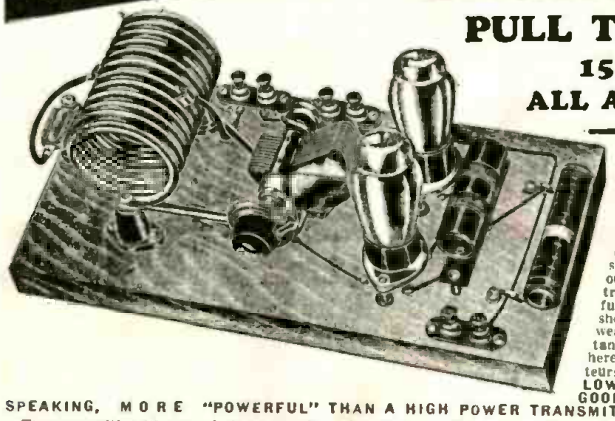


It's Fool Proof—Because It's Simple

This transmitter with a power output of anywhere from 10 to 30 watts (depending on the type of tubes employed) is a real globe girdler. Some people have the impression that a transmitter with a power output of, let's say, 10 watts, will transmit only several miles and no further. This is not the case, for in short wave transmission, location and weather conditions constitute important factors. The transmitter described herewith has actually "worked" amateurs in the far corners of the earth. **A LOW POWER TRANSMITTER IN A GOOD LOCATION IS, PRACTICALLY SPEAKING, MORE "POWERFUL" THAN A HIGH POWER TRANSMITTER IN A POOR LOCATION.**

The transmitter illustrated, is essentially a low powered, low cost, outfit for the beginner. It is not, however, confined to the beginner. Many dyed-in-the-wool amateurs have one or more of these transmitters handy as auxiliaries. Two type 45 tubes are used as oscillators. These tubes are used because of their low cost and because, in actual operation, they have practically the same output as the type 210 tubes, at one-third their cost. The circuit is of the type using fixed-tuned grid, tuned plate.

All grid coils are wound on one inch bakelite tubing with fine wire so that their natural frequency response is near the center of each amateur band. The frequency peaks of these coils are rather broad which means that **THE ENTIRE BAND OF ANY GIVEN COIL CAN BE COVERED WITH THE PLATE CIRCUIT, WITHOUT THE TWO CIRCUITS GETTING OUT OF RESONANCE.** These grid coils are of the 3-prong plug-in type. The plate coils are of copper tubing and are mounted on stand-off insulators. They are easily interchangeable for the various bands.

The construction of this transmitter is the simplest ever devised. From the diagram printed in the editorial section of this catalog it can be seen that no grid or filament by-pass condensers are used and that the usual R.F. choke has been omitted from the plate circuit. No benefit was derived from their employment and hence they were not used. The method of coupling the antenna to the output circuit is unique, and is a desirable feature. The antenna suggested for use with this transmitter is the single-wire-feed Hertz. **THE TRANSMITTER IS SUPPLIED WITH A SET OF 160 METER COILS.** Coil sets to cover the other amateurs can be had at the addition prices shown below.

POWER SUPPLY

The power supply to operate this transmitter delivers 400 volts at 150 milliamperes for the plates of the tubes and 2.5 volts for the filaments. A type 83 mercury vapor rectifier is used because of its low voltage drop which permits excellent regulation. The filter consists of a 30 Henry iron-core choke with two 2 mf. 1000 volts condensers on either side. A suitable size bleeder resistor is connected across the output filter to further aid in regulation by suppressing the high voltage peaks when there is no load on the power pack as is the case when the key is in the "off" position. Ship. wt., 8 lbs., for transmitter and 18 lbs. for power pack.

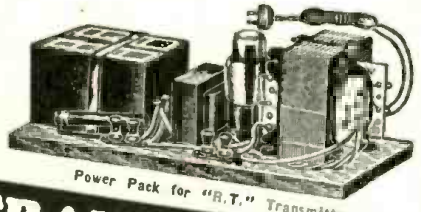
No. 2121 "R.T." Push-Pull Transmitter, complete with 160 meter coils, but less tubes.
YOUR PRICE **$5.97**

No. 2122 Power Pack for R.T. Transmitter, less tube.
YOUR PRICE **8.02**

No. 2123-A Plug-In Coils for 20 Meter Band,
YOUR PRICE **1.82**

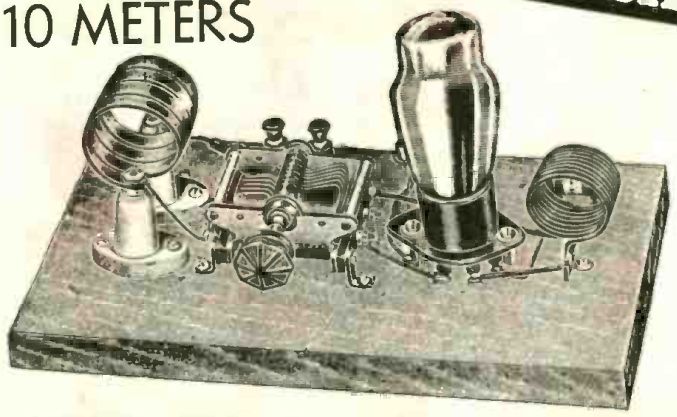
No. 2123-B Plug-In Coils for 40 Meter Band.
YOUR PRICE **1.82**

No. 2123-C Plug-In Coils for 80 Meter Band.
YOUR PRICE **1.82**



Power Pack for "R.T." Transmitter

Popular 1-TUBE "PUSH-PULL" TRANSMITTER for 10 METERS



Paradoxical as it may sound, this ten meter transmitter **EMPLOYS A SINGLE TUBE IN PUSH-PULL ARRANGEMENT.** Heretofore the word "push-pull" automatically implied the use of two tubes, yet here we are with a one tube push-pull transmitter.

It is the advent of the new type 53 tube, which makes this feat possible. This tube is actually **"TWO"** tubes, in one glass envelope. It was designed primarily as a class "B" twin amplifier

This transmitter is not a high power job, for high power is not necessary on ultra short wave work. When properly coupled to a suitable antenna system such as a single-wire-fed Hertz or the familiar "Zeppelin" antenna, it will, under favorable conditions, go a long way. The circuit is of the fixed-tuned grid, tuned plate type and utilizes a solenoid of solid copper ribbon as the plate coil. All component parts are of the highest possible quality, since R.F. losses in ultra short wave work are fatal.

There are any number of uses to which a compact unit of this type may be placed. For instance it can be used as a master oscillator for multi-stage high frequency transmitters **OR** two such units may be connected together to produce a complete master oscillator—R.F. amplifier transmitter. Neutralizing condenser must be added when used as an R.F. amplifier. The transmitter requires 2½ volts either A.C. or D.C. for the filament of the 53 tube and anywhere from 180 to 350 volts "B" supply. A key circuit is in the cathode lead. The transmitter on its neat bread-board measures 11" long x 6¾" wide x 6" high overall. Furnished complete with a set of 10 meter coils. Shipping weight 6 pounds. No. 10-M Versatile 10 Meter Transmitter less Tube.
YOUR PRICE..... **$4.52**

EXCELLENT FOR PHONE WORK

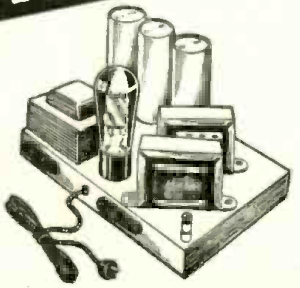
A single button microphone can be inserted in series with the grid return lead (using no transformer,) thereby obtaining from 50 to 75% modulation.

Special A. C. Short-Wave Power Pack

Everyone knows that an A. C short-wave set is no better than the power pack which supplies its power! A power supply for short-wave use must be constructed with extreme care. It must be absolutely free from hum or other disturbances caused by insufficient filtering, poor wiring, or faulty equipment.

This unit has a two-section filter circuit, employing two heavy-duty 30 Henry chokes and a tremendous amount of capacity. This assures PURE D. C. with practically no ripple at all.

This power pack supplies 250 volts at 50 mils for the plates of the tubes, 22½ volts for the screens, and 2½ volts at 5 amperes, for the filaments. Furthermore, provisions are made for energizing the field of a dynamic speaker. Any speaker having a field resistance of from 1500 to 2500 ohms may be thus energized. All the component parts of this pack are built into a sturdy, metal base. The pack employs a type 280 full-wave rectifier which is inserted in a socket on top of the base. A convenient on-off switch is mounted on the side. The pack is sold complete with four feet of connecting cord, terminating in a standard male plug. Measures 7¼" long x 4" wide x 4½" high overall. *Sold complete with 280 tube.* Ship. wt. 10 lbs. **No. 2149** Short-Wave Power Pack, including 280 tube
YOUR PRICE **$7.28**



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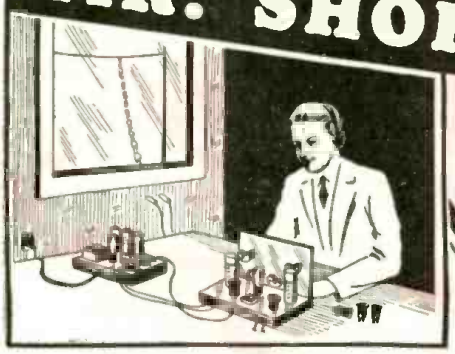
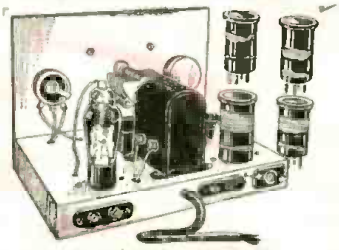


The Twinplex One Tube "Double-Action" Receiver



Real Two Tube Performance

It may seem paradoxical when we say that this 1 tube receiver is a 2 tube set, but actually that is so. The type 53 tube employed is the latest to be placed on the market. It contains in one glass envelope, **TWO ENTIRELY INDEPENDENT RADIO TUBES** which have only their cathodes in common. Hence this receiver is a **REAL** 2 tube set.

This "2 tube" Twinplex can now be constructed for the same money required to build a 3 tube receiver.

In operation this set is exactly the same as 2-tube regenerative receivers. The results obtained during a week of testing have been exceedingly good. Some of the foreign stations received during this period include EAQ, GBS, GSA, DJC, HKD and OXY. **FOR A MAN WHO IS FIRST STARTING IN SHORT WAVES, THIS TWINPLEX RECEIVER IS THE "BEST BET."**

The receiver is **UNIVERSAL** in operation, that is it may be operated either with batteries or an A.C. 110-volt power pack. A plate potential of 180 volts is required. The heater requires 2½ volts either A.C. or D.C.

Only high grade parts such as Hammarlund Condensers, etc., are used in the constructions of this set. All component parts are mounted on a cadmium-plated metal chassis, measuring 6" x 9" x 6¼"

SPECIFICATIONS

No. 2115 Twinplex 1 Tube Short Wave Receiver Wired, but less tubes and accessories. Ship. wt. 9 lbs.
YOUR PRICE $9.52

No. 2116 Twinplex 1 Tube Short Wave Receiver in Kit Form including instructions. Ship. wt. 10 lbs.
YOUR PRICE $8.52

No. 2117 ACCESSORIES ONLY—FOR A. C. OPERATION—Including 1 special Hum-Free A. C. Power pack, 1-80 Rectifier tube, 1-53 Tube and one set of matched head-phones. Ship. wt. 15 lbs.
YOUR PRICE $10.37

No. 2118 ACCESSORIES ONLY—FOR BATTERY OPERATION—Including 1-53 Tube, 3-45 volt B Batteries, 4 No. 6 Dry Cells (arranged in series—parallel) and 1 set of matched head-phones. Ship. wt. 15 lbs.
YOUR PRICE $6.27

The OSCILLODYNE 1-Tube Wonder Set

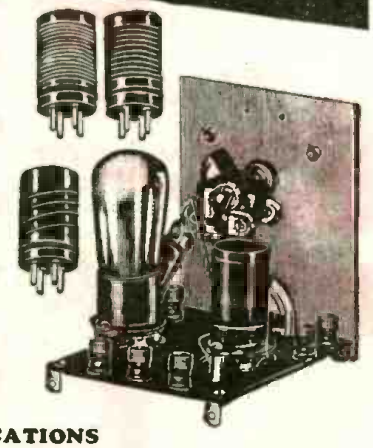
ABSOLUTELY FOOL-PROOF

Simple directions and blueprints show you how to build and operate the set for best results. It may be used either on A.C. or with batteries. If A.C. is employed, a type 227 tube is used in conjunction with a suitable A.C. power pack (such as the one listed on the opposite page. If batteries are employed, a 237 tube should be used in conjunction with either a storage battery or four No. 6 dry cells and two 45 volt B batteries.

If you have never operated a short-wave set, this is the one with which to start! It is a set which will convince you that foreign stations CAN be tuned in whenever they are on the air.

Its circuit which is of the regenerative variety, acts like a super-regenerative set although it does not belong in that class. Its sensitivity is tremendous.

Here, then, is a set which brings in stations thousands of miles away; a set which frequently brings in Australia, loud enough to rattle your phones, and with power to spare; a set which, if you do not wish extreme distance, will bring in stations several thousand miles away without aerial or ground.



SPECIFICATIONS

The set is exactly as illustrated here, size of aluminum panel is 6" high by 4½" wide, base 5½" long by 4½" wide. List of materials used:

No. 2146. Official One-Tube Wonder Set, completely wired and tested as per above specifications. YOUR PRICE $7.23

No. 2147. Official One-Tube Wonder Set, but not wired, with blueprint connections and instructions for operation, complete shipping weight 3 lbs. YOUR PRICE $6.38

No. 2148. COMPLETE ACCESSORIES, including the following: one 6 month guaranteed Neontron No. 237 tube; one set No. 1678 Brandes matched headphones; four No. 6 Standard dry cells; two standard 45-volt "B" batteries, complete shipping weight 22 lbs. YOUR PRICE $5.53

THE WORLD FAMOUS DOERLE RECEIVERS

Both A. C. and 2-Volt Battery Sets

Rear View of Battery 2-Tube Set

If you are a constant reader of this magazine, you have probably noticed our consistent advertisements of these famous Doerle receivers. It is no longer necessary to describe them in minute detail. The tremendous sale of these receivers is in itself a fine tribute to their quality and performance.

Two different styles are available, each style having two models. THE A. C. TYPE is designed for metropolitan areas where electric service is available. It is obtainable in 2 and 3-tube models, each requiring a power pack such as the one illustrated on the opposite page. THE 2 VOLT BATTERY TYPES were designed particularly for rural districts. They, too, are available in 2 and 3-tube models.

There is no question but what these receivers are comparable to, and in many instances even surpass many of the more expensive short wave receivers. Thousands of testimonials in our files laud these sets to the skies. *Only the finest parts go into their construction.* Stations which you have never heard before will come in clearly and regularly. Yet withal they are extremely simple and therefore absolutely foolproof. All 2-tube models measure 9"x6"x6⅛"; 3-tube models measure 10½"x7"x8".

FREE! BOOKS

YOUR CHOICE

No. 830

of either one of books illustrated herewith—FREE OF CHARGE—with the purchase of any of the short-wave receivers listed on these pages.

Book No. 866 explains the ways and means of obtaining an amateur transmitting license. Book 830 is a comprehensive compilation of the most prominent short-wave receiver circuits published during a period of two years.

No. 866

Battery Doerle Sets

No. 2140. TWO TUBE 12,500 MILE 2-VOLT DOERLE SHORT WAVE RECEIVER, completely wired and tested. Shipping wt., 5 lbs.
YOUR PRICE $9.92

No. 2141. Same as above in kit form, with blueprint connections and instructions. Shipping wt., 5 lbs.
YOUR PRICE $8.72

No. 2142. COMPLETE ACCESSORIES, including 2 No. 230 tubes; one set of Headphones; 2 No. 6 dry cells; 2 standard 45-volt "B" batteries complete. Shipping wt., 22 lbs.
YOUR PRICE $5.42

No. 2143. THREE TUBE 2-VOLT DOERLE SET, completely wired ready for use.
YOUR PRICE $12.87

No. 2144. THREE TUBE 2-VOLT DOERLE SET IN KIT FORM, with blueprint connections and instructions. Shipping wt., 7 lbs.
YOUR PRICE $11.52

No. 2145. COMPLETE ACCESSORIES, including 2 No. 230 tubes; and one type 34, one set of Headphones; 2 No. 6 dry cells; 3 standard 45-volt "B" batteries; 1 B. B. L. 9 inch Magnetic Loudspeaker. Shipping weight, 32 lbs.
YOUR PRICE $11.52

Electrified Doerle Sets

No. 2174. Electrified 2 Tube 12,500 Mile Doerle Receiver, completely wired and tested, less tubes. Ship. wt. 5 lbs.
YOUR PRICE $10.47

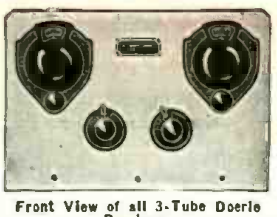
No. 2175. Same as above in kit form, less tubes, but including blueprints and instructions. Shp. wt. 5 lbs.
YOUR PRICE $9.27

No. 2176. Complete set of tubes for above: either one—57 and one—56 for A. C. operation, or one—77 and one—37 for battery operation.
YOUR PRICE $1.62

No. 2177. Electrified 3 Tube Doerle Signal Gripper, completely wired and tested; less tubes. Shipping wt. 7 lbs.
YOUR PRICE $15.22

No. 2178. Same as above in kit form, including blueprints and instructions; less tubes. Ship. wt., 7 lbs.
YOUR PRICE $13.77

No. 2179. Complete set of tubes; either one—58 one—57 and one—56 for A. C. operation or one—78 one—77 and one—37 for battery operation.
YOUR PRICE $2.52



Front View of all 3-Tube Doerle Receivers

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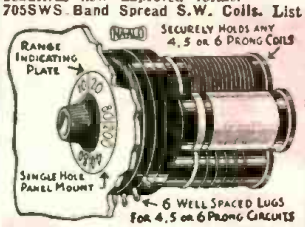
NEW ALDEN PARTS

705SWS BAND SPREAD S-W COILS

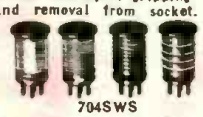
705 SWS

Simplifies tuning by spreading out the S.W. bands. Secondaries tapped for most efficient operation. May be easily substituted for the 704 SWS Coils. Precision wound on beautiful new improved forms.
705SWS Band Spread S.W. Coils. List pr. $2.50 Set.



New No. 700 S.W. Coil Selector Unit instantly swings any coil into circuit by turning knob. All 4, 5 and 6 prong coils are rigidly held by the specially constructed sockets without adjustments of any kind.
Knob and indicator on face of panel show what coil is in circuit. Simple - compact - rugged - electrically efficient. Don't fail to use it in sets you are building and new equipment you are designing.
No. 700 COIL SELECTOR UNIT without coils. List Price $3.50

Precision wound coils with the convenient gripping-ring for easy insertion and removal from socket.



704SWS

The famous set of four precision wound S-W coils as specified for dozens of receivers described in "S-W Craft." 10-200 meters with .00014 mfd. condenser. Coils have UX bases.
704SWS ..... List price $2.00 set

706BCS

New! 706BCS Set of two 6-prong coils with 3 windings on each. Covers 100 to 550 meters with .00014 mfd. condenser thus matching 704 BCS secondaries. 706BCS extends tuning range of receivers using 706 SWS. Precision and bank wound with silk insulated wire for maximum efficiency. 706BCS 3-circuit B.C. Coils List price $2.00 set.

706SWS

New! 706SWS Set of four six-prong coils with pri., sec., and tickler windings. Secondaries precision matched with 704SWS secs. for perfect tracking. 10-200 meters with .00014 mfd. condenser. Uses standard six-contact tube socket.
706SWS List price $3.50 set.

HERE'S THE DATA YOU WANT
Send two 3c stamps for NEW CATALOG-DATA BOOKLET showing socket diagrams of over 265 different tubes, analyzer rewiring data, new tube replacement data, sockets of all kinds, coils, forms, adapters, kits, diagrams for rewiring tube checkers, etc.

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Many instructors and ops in U. S. Army, Navy, Aviation, Marines and Coast Guard are Candler trained. 22 years successful experience and thousands of the most skilled amateurs and commercial operators back of CANDLER SYSTEM.

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World's Only Code Specialist

Short Waves and Long Raves

(*Continued from page 699*)

I will try to give you more information from time to time, as I prepare a special note book, just for "DX" work on short waves only, where I am going to note everything down.

WERNER HOWALD,
632 S. Fetterly,
Los Angeles, Calif.

(Great work, Werner, and it just shows that our "short-wave" and "all-wave" set manufacturers are progressing! Your antenna experiments are interesting, and we've always felt that there was, and in fact is, a pile of research to be carried on with different styles of antennas.—Editor.)

GREAT WORK WITH THE OSCILLODYNE

Editor, SHORT WAVE CRAFT:

I found a copy of your magazine, the April, 1933, issue at a friend's house and became interested immediately. I started to build the Oscillodyne receiver a few days later. Even though I had never built a radio before, I was amazed at the results I achieved with this one-tuber. Here are a few stations I pulled in FYA, DJD, DJA, GSB, GSC, HBL, VK2ME, and countless American Commercials and Amateurs.

If there are any fans in Germany who read this I wish they would correspond with me, as I am especially interested in German radio stations. I will promise to answer them all in German.

I also would like to hear from other fans who have built this receiver.

HENRY MELLIN,
47 North Broadway,
Yonkers, N.Y.

("F.B" Henry and you will undoubtedly hear from some of the German S.W. "fans." Yes, our readers have had some very interesting results with the Oscillodyne.—Editor.)

Short Wave League

(*Continued from page 673*)

evidently haven't even got the brains or spunk to make their own equipment.

By the way, don't think that I'm making hasty decisions. I listened in on the short waves quite some time before coming across your interesting and very useful magazine.

RICHARD L. BALDWIN,
Oakville,
Conn.

A BEAUTIFUL

5 - METER

TRANSMITTER-RECEIVER

OF THE "PORTABLE" TYPE

Described in the Next Issue. It's a Honey!

2-Tube Super-Het

(*Continued from page 656*)

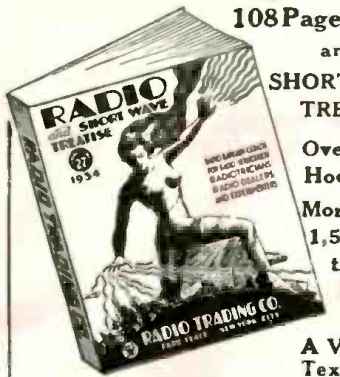
C.W. signal. If this adjustment is properly made you will get a very clear note instead of the usual mushy sound heard on a super.

If *motorboating* is experienced in the audio section reduce the value of the grid resistor or the 56 tube to 150,000 ohms.

Now that it works (we hope), we will leave you to have many happy hours, with your little super, in a different field.

FREE!

108 Page RADIO and SHORT WAVE TREATISE



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This completely revised and enlarged 1934 edition contains 108 solid pages of useful radio information, diagrams, illustrations, radio kinks and real live radio merchandise. It contains more valuable radio information—more real live "meat"—than many textbooks on the subject. As usual considerable space has been devoted to the beginner in radio.

PARTIAL LIST OF CONTENTS

Chapter Two of "Fundamental Principles of Radio for the Beginner"—The New Tubes, Their Uses, and Their Fundamental Circuits—How to Make Money with Public Address Systems. How to Install and Maintain Them—How to Revamp Six-Volt Battery Sets to Use Two-Volt Tubes—Prize Winning Kinks and Short Cuts in Radio—How to Build the "R T" Beginner's Transmitter—How to Build the Famous Twinplex Short Wave Receiver—How to Construct an Amateur Radio Transmitter—A Most Modern and Complete Tube Chart Including Socket Connections for all Tubes—Numerous Free Offers, etc., etc.

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SOLAR RAY LAMP

The Solar-Ray *Carbon lamp* pays for itself in a few treatments. Everyone in the family *needs* the *health giving Ultra Violet Rays* that you get from the sun during the summer and which you *need in the winter more than at any other* time of the year.
This is a LARGE LAMP, used by Physicians who charge $5.00 for a treatment. Height 12½" overall. Face of lamp 10⅛". Width 10¼". Depth 12½". List Price with Screen and Goggles, Complete $17.50.
OUR PRICE PREPAID $3.38
Large Professional Model. Full descriptive circular mailed upon request.

STOPPANI COMPASS

A *Precision Instrument* made in Belgium. Purchased by the U. S. Government at more than $30.00 each. Ideal for Radio Experimenters Laboratory, also may be used as a Galvanometer for detecting electric currents in radio circuits. Ruby, jeweled, solid bronze, 4 inches square, fitted in a hardwood case.
Our price prepaid $4.50 each

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112S Chambers St. — S.W. — New York City

• Index to Advertisers •

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

Parts List for Mitchell B.O. Unit

1 Chassis; Blan.
1 Power transformer—suitable for 4-2½ volt tubes (R. T. Co.).
1 Filament transformer, 6.3 v.-1½ amps. (R. T. Co.).
1 Tube shield.
1 R.F. choke, 85 M.H. (Hammarlund).
3 .1 mf. conds., tubular.
1 .01 mf. conds., tubular.
1 2,500 ohm 1 watt resistor; Lynch (Int. Res. Corp.).
3 100,000 ohm 1 watt resistor: Lynch (Int. Res. Corp.).
1 150,000 ohm 1 watt resistor; Lynch (Int. Res. Corp.).
2 250,000 ohm 1 watt resistor: Lynch (Int. Res. Corp.).
1 500,000 ohm 1 watt resistor; Lynch (Int. Res. Corp.).
2 8 mf. electrolytic condensers—cardboard case.

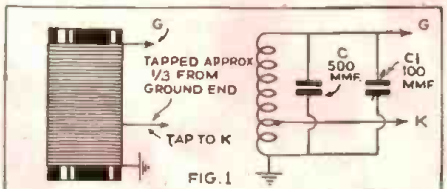

FIG. 1

BEAT OSCILLATOR COIL MADE FROM SECONDARY WINDING OF AN R.F. COIL. SHUNT WITH A .0005-MF. MICA CONDENSER AND A .0001-MF. PADDING CONDENSER.

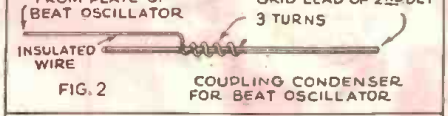

FIG. 2 COUPLING CONDENSER FOR BEAT OSCILLATOR

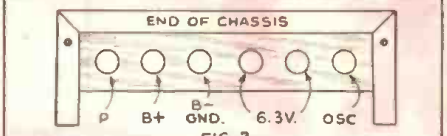

FIG. 3
LAYOUT OF BINDING POSTS OF TERMINAL STRIP

Detail of beat oscillator coil, coupling condenser, etc.

1 .006 mf. mica condenser.
1 .00025 mf. mica condenser.
6 Binding posts.
1 56 socket.
1 2A5 socket.
1 80 socket.
1 6C6 socket.
2 Toggle switches.
1 Line cord and plug.
1 .0005 mf. mica condenser.
1 .0001 mf. padding condenser.
1 R.F. coil—shielded: Gen.Win. (Na-ald).
1 56 tube. R.C.A. Radiotron (Arco.).
1 2A5 tube, R.C.A. Radiotron (Arco.).
1 80 tube. R.C.A. Radiotron (Arco.).
1 6C6 tube, R.C.A. Radiotron (Arco.).

Short Wave Question Box

(*Continued from page 678*)

know if type 31 tubes used in conjunction with B batteries for the plate supply, would be practical for a low-powered transmitter.

(A) The number 31 tubes should serve very nicely in a low-power battery-operated transmitter. The size of the various coils used in this transmitter would be identical to those shown in the low-powered transmitters described in SHORT WAVE CRAFT magazine. Using different type tubes does not necessarily mean that you have to use different coils.

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BC3	1.7, 3.5, 7	0.5 Kc	0.03%	Mtd.	6.85
BC5	100Kc	Exact	0.05%**	Mtd.	9.50
BC2	1.7-3.5Mc. or 7Mc holder for BCX				1.50
BC6	1.7, 3.5 or 7Mc holder-oven for BCX				7.50
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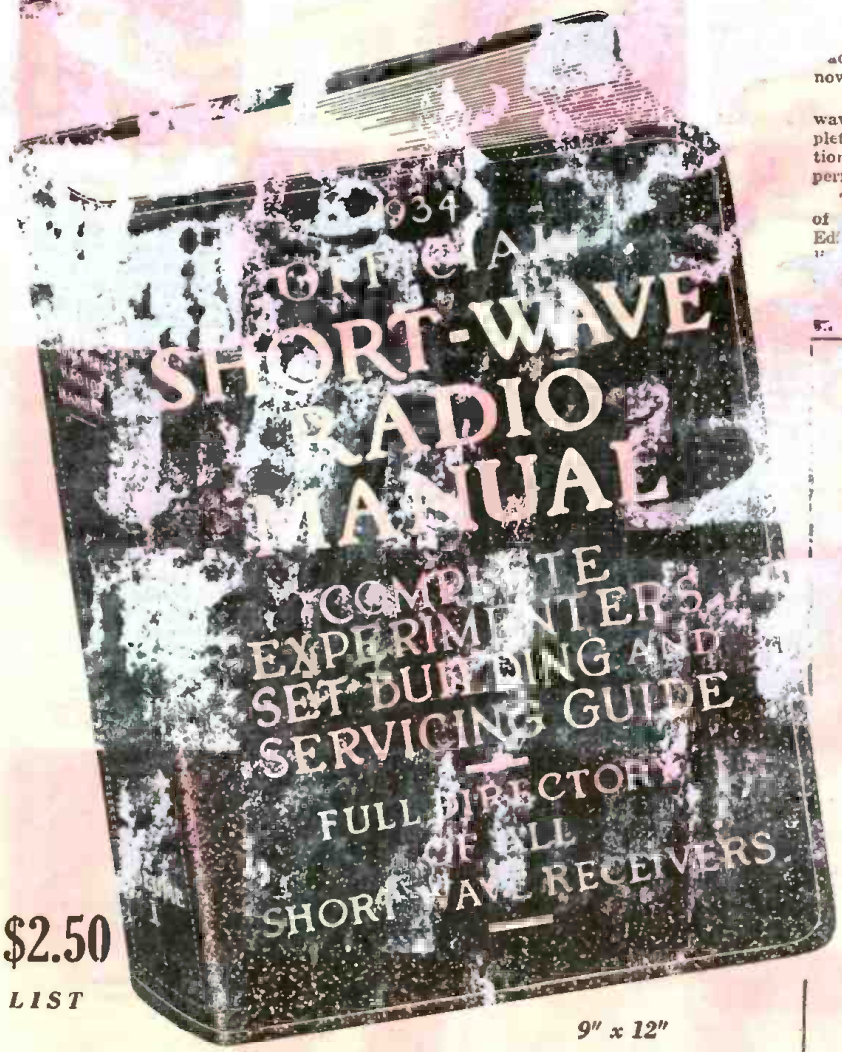

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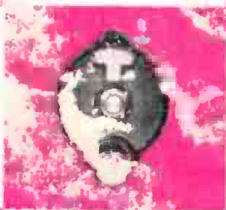

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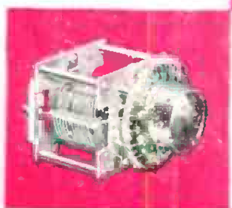

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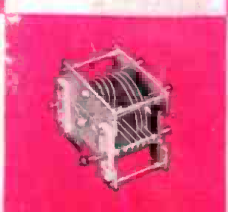

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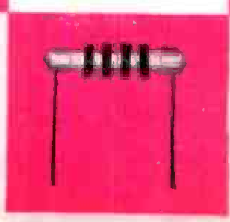

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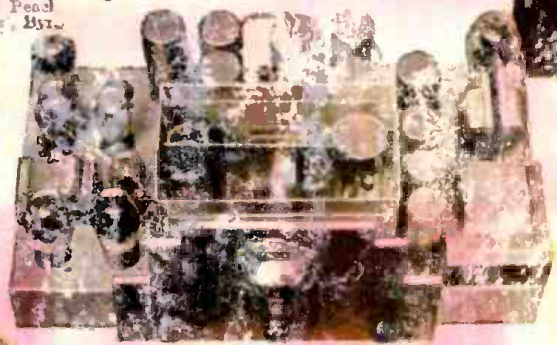

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