THE RADIO EXPERIMENTER'S MAGAZINE

February
34

SHORT WAVE CRAFT

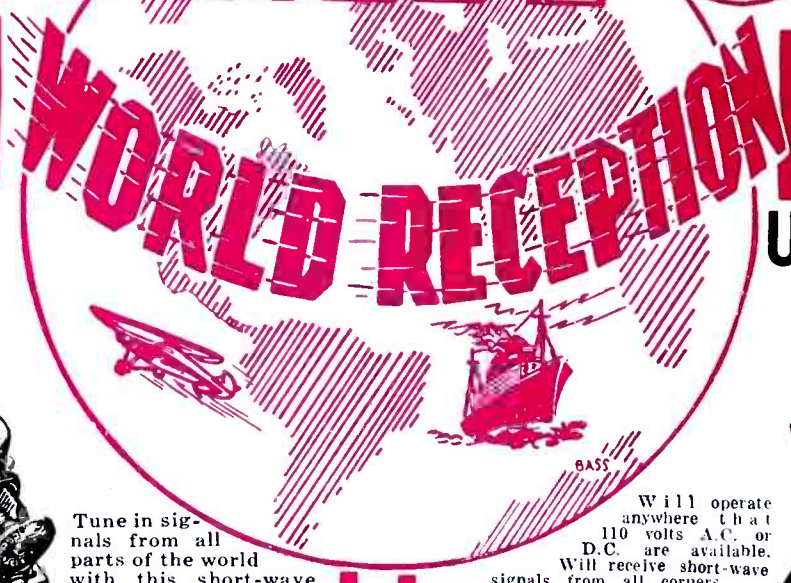
Edited by
HUGO GERNSBACK

THE
Triplex-2
WORKS LOUD-SPEAKER

See Page 588

25¢
IN CANADA
30¢

POWERTONE



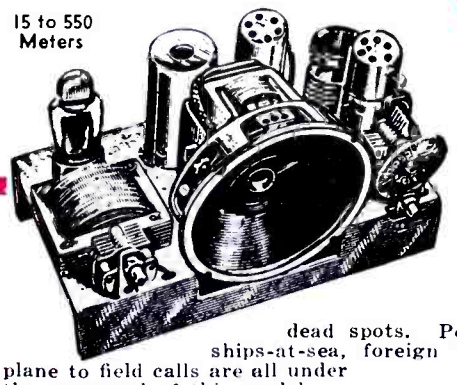
SHORT WAVE

A.C. AND D.C. RECEIVERS

4 Tube A.C. S.W. Receiver

WITH BUILT-IN SPEAKER AND POWER SUPPLY

15 to 550 Meters

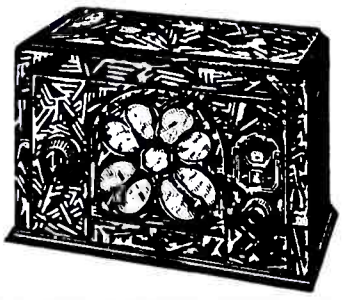


Tune in signals from all parts of the world with this short-wave receiver. It is positively the latest in short wave design. Covers the entire short-wave band from 15 to 200 meters—no dead spots. Police calls, amateurs—ships-at-sea, foreign broadcasts direct, airplane to field calls are all under the command of this model.

As illustrated the chassis is compactly built. The speaker is especially matched for the powerful output of the 2A5 power tube. It is exceptionally sensitive in response to weak signals.

The built-in power supply is entirely free from any hum or disturbing line noises. Uses a specially designed power transformer and high capacity electrolytic condensers.

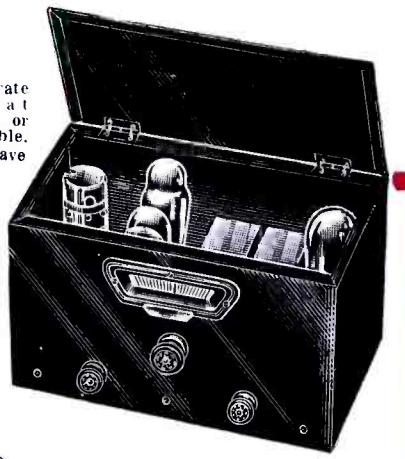
The four plug-in coils supplied with the set are of the octo-form type, insuring any losses. A broadcast coil may be obtained to cover the 200 to 500 meter band. Price only 59c. Uses the latest type tubes, 2—58, 1—80 and 1—2A5 power amplifier.



The entire chassis is placed into a beautiful modernistic cabinet. The wooden front acts as the baffle, greatly improving the accoustic qualities of the receiver.

Complete kit of parts to construct the 4 tube A.C. short wave receiver, less tubes and cabinet.....$11.50
Cabinet drilled for dial escutcheon and regeneration control..... 1.50
Completely wired and tested, less tubes.....$2.00 Extra
Set of R.C.A. licensed tubes for 4 tube short wave set..... 2.25

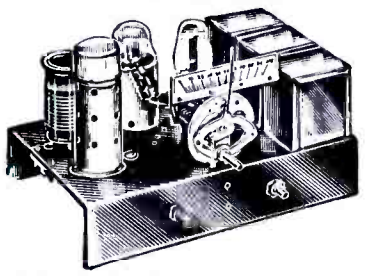
UNIVERSAL A.C. and D.C. Short-Wave Receiver . . .



Will operate anywhere that 110 volts A.C. or D.C. are available. Will receive short-wave signals from all corners of the globe.

The circuit employs all recently developed tubes, 1—78, 1—25Z5, and 1—43 power output tube. They will operate at full efficiency due to the special voltage rectification circuit used. Uses four plug-in coils for maximum efficiency and wide band spread. They cover the short wave band from 15 to 200 meters.

Three oversized filter chokes assure quiet humless reception. The full-vision, slow-motion vernier dial assists in logging the weaker signals. Regeneration is smooth and always under full control.



Tunes from 15 to 200 Meters

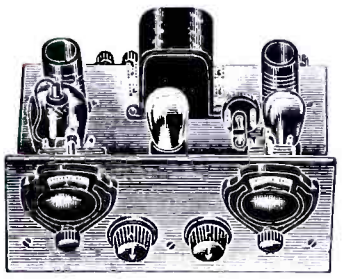
Only the finest parts are used throughout the entire construction of the receiver. Hammarlund tuning and regeneration controls, over-sized filter chokes, high capacity electrolytic condensers, octo-formed plug-in coils, and Powertest R.M.A. color-coded resistors.

CABINET—A firmly built, all metal cabinet, of beautiful design, which serves as a shield against hand or body capacity. Finished in black crystal. Hinged top facilitates the removal of coils and tubes.

Complete kit of parts with constructional blueprint, less tubes.....$8.95
Completely wired and tested for operation.....$2.00 Extra
Complete set of R.C.A. licensed, matched tubes.....$3.25

DIAMOND of the AIR

Electrified S. W. Receivers



Now for the first time Try-Mo introduces the new 1934 ELECTRIFIED Diamond of the Air Short Wave Receivers. Will log stations from all parts of the world regularly.

ELECTRIFIED MODELS

Two tube model employs 1-'57 tube coupled to a '56 type output tube. This model can also be used on batteries. Replace the '57 with a '77 and the '56 with a '37. Loudspeaker reception on all local stations.

Three tube model uses a 58 triple grid, '57 detector, and a '56 as an output tube. For battery use replace with a '77, '78 and a '37. Capable of logging S.W. stations from all parts of the world on a loud speaker.

Two Tube Electrified Model
Complete kit less tubes and pack, with blueprints.....$8.45
Wired and tested less tubes and pack..... 9.45
Complete set of R.C.A. licensed tubes..... 1.45
Three Tube Electrified Model
Complete kit less tube and pack, with blueprints..... 11.45
Wired and tested less tubes and pack..... 13.45
R.C.A. licensed tubes..... 2.45

Electrify S. W. Battery Sets

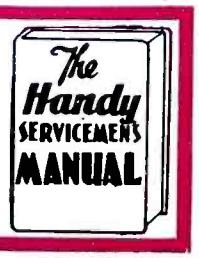
Especially designed for use with Diamond of the AIR Short wave Receivers.

Will deliver 180 volts with taps at 135, 90 and 45 volts. Supplies 2½ volts at 7 amperes for filament drain. Taps terminate to binding post on side of pack. Uses a 280 rectifier tube. Supplies clear-hum-free power regardless of circuit sensitivity. Can be used on any short-wave, battery operated receiver.
Price, including 280 rectifier tube.....$5.95

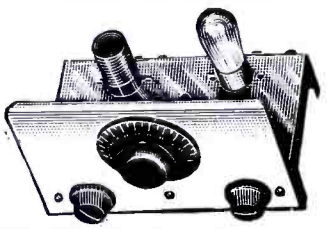
Servicemen's and Set Builders'

HANDY MANUAL

Regular price $1.00
Complete Information **25c**



"ROCKET" 1 and 2 Tube Battery-Operated Short-Wave Receivers



Just the receivers for the short-wave beginner. The one tube model is extremely efficient and will tune from 15 to 200 meters. Uses 1-230 tube, 2-No. 6 dry cells and 1-45 volt standard "B" battery.

The two tube model is of a more advanced type. Remarkable reception and simplicity of tuning make this a popular model. Uses 2-'230 type tubes.

Complete kit of parts to construct the one tube "Rocket," less tube.....$3.95
Completely wired and tested, less tube $1.00 Extra.
Sylvania 230 tube.....$ .70
Kit of parts to construct the two tube "Rocket," less tubes with constructional blueprint.....$4.50
Wired and tested.....$1.00 extra
Two Sylvania 230 tubes.....$1.40

TRY-MO RADIO CO. INC. 85 Cortlandt St. New York

SEND FOR NEW CATALOG—FREE—WRITE TO DEPT. S

I will help You start a Spare Time or Full Time Radio Service Business without capital!

J. E. SMITH, *President*
National Radio Institute

The man who has directed the Home-Study Training of more men for the Radio industry than any other man in America.

Here are a few examples of the kind of money I train "my boys" to make

$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.

Now Owns Own Business

"If I had not taken your Course I would be digging ditches instead of running my own business. One week I made $75 on repairing alone, and this doesn't count sales. If a fellow wants to get into radio, N. R. I. is the starting point."—R. S. LEWIS, Modern Radio Service, Pittsfield, Ill.

Averages $80 per Month in Spare Time

"I am getting along well in my Radio work, always being kept very busy. Since enrolling I have averaged around $80 a month working on Radios just part time, since I am still holding down my regular job."—JOHN B. MORISSETTE, 733 Somerville St., Manchester, N. H.

My Free book gives you many more letters of N. R. I. men who have made good in spare time or full time businesses of their own

SPECIAL Radio Equipment for Broad Practical Experience *Given 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. You learn how sets work, why they work, how to make them work.

Free Book Tells How Mail Coupon!

The world-wide use of Radio sets for home entertainment has made many opportunities for you to have a spare-time or full-time Radio business of your own. I give you instructions early in your Course for doing 28 Radio jobs common in almost every neighborhood. Many N. R. I. men make $5, $10, $15 a week extra in spare time almost at once. I show you how to install and service all types of receiving sets. I give you Radio equipment and instructions for conducting experiments, for building circuits and testing equipment, and for making tests that will give you broad, practical Radio experience. Clip the coupon below and get my free 64-page book, "Rich Rewards in Radio"—it gives you a full story of the success of N. R. I. students and graduates, and tells how to start a spare-time or full-time Radio business on money made in spare time while learning.

Many N. R. I. Men Make $5, $10, $15 a Week Extra in Spare Time Almost at Once

Many of the seventeen million sets now in use are only 25 per cent to 40 per cent efficient. I will show you how to cash in on this condition. I will show you the plans and ideas that have enabled many others to make $5, $10, $15 a week in spare time while learning. Ford R. Leary, 1633 Davison Road, Flint, Mich., wrote: "My part-time earnings while taking the N. R. I. Course were $651."

Get Ready Now for a Radio Business of Your Own and for Jobs Like These

Broadcasting stations use engineers, operators, station managers, and pay up to $5,000 a year. Radio manufacturers use testers, inspectors, foremen, engineers, servicemen and buyers, and pay up to $7,500 a year. Radio dealers and jobbers employ hundreds of servicemen, salesmen, managers, and pay up to $5,000 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. My book tells you of the opportunities in Radio, Set Servicing, Air-craft Radio, Television, Police Radio, Short Wave, and other fields. Get it.

NRA MEMBER U.S. WE DO OUR PART

I Will Train You at Home in Your Spare Time

Hold your job until you're ready for another. Give me only part of your spare time. You do not need a high school or college education. Hundreds with only a common school education have won bigger pay through N. R. I. J. A. Vaughn jumped from $35 to $100 a week. J. E. McLaurine increased his earnings 100 per cent. The National Radio Institute is the Pioneer and World's Largest organization devoted exclusively to training men and young men by Home Study for good jobs in the Radio Industry.

You Must Be Satisfied

I will give you an agreement to refund every penny of your money if you are not satisfied with my Lessons and Instruction Service when you complete my Training. And I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also Advanced Training in any one of five leading branches of Radio opportunities.

Free Book of Facts

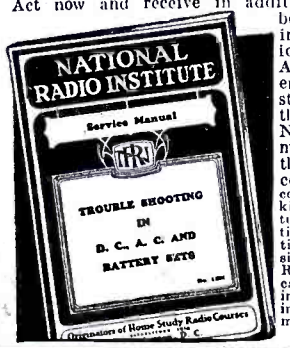
Mail the coupon for "Rich Rewards in Radio." It's free to any ambitious fellow over 15 years old. It tells you about Radio's spare time and full-time opportunities; about my training; what others who have taken it are doing and making. Mail coupon now.

Get my new book It points out what Radio Offers You

J. E. SMITH, Pres.
Dept. 4BB3
National Radio Institute,
Washington, D. C.

Special FREE Offer

Act now and receive in addition to my big free book, "Rich Rewards in Radio," this Service Manual on D.C., A.C., and Battery operated sets. Only my students could have this book in the past. Now readers of this magazine who mail the coupon will receive it free. Overcoming hum, noises of all kinds, fading signals, broad tuning, howls and oscillations, poor distance reception, distorted or muffled signals, poor Audio and Radio Frequency amplification and other vital information is contained in it. Get a free copy by mailing the coupon.



THIS COUPON IS GOOD FOR ONE *FREE* COPY OF MY NEW BOOK — mail it TODAY

J. E. SMITH, *President*,
National Radio Institute, Dept. 4BB3,
Washington, D. C.

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

Name.....*Age*.....

Address.....

City.....*State*..... M

The Famous Course That Pays For Itself

IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Palmer • Hart • Shuart • Malsberger • Denton • Sargent

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

Contents for February, 1934

FEATURES IN NEXT ISSUE

The Quadradyne—4 receivers in 1—by Hugo Gernsback.

An Improved 5-tube Short-Wave Receiver, by Curtis E. Malsberger.

Radio Transformer Construction by O. K. Tipsel.

A New 3-Tube Short-Wave Receiver, Using Latest Tubes, by Clifford E. Denton.

A Good Frequency Meter—How To Build and Use It, by George Shuart, W2AMN.

Short-Wave Transmitting Aerials, by Grant Riggle, W8KJT.

A Crystal-Controlled Transmitter.

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

• OUR cover illustration this month shows the Triplex 2—which, on test, gave a very creditable performance for this type using only dry battery tubes. It actually produces the output of three tubes with but two tubes, thanks to one of the tubes being of the dual element type. You will find this described on page..... 588

Published by POPULAR BOOK CORPORATION

HUGO GERNSBACK, President - - H. W. SECOR, Vice-President
EMIL GROSSMAN - - - - - - - - - - Director of Advertising
Chicago Adv. Office - - - L. F. McCLURE, 919 No. Michigan Ave
Publication Office - - - 404 N. Wesley Avenue, Mount Morris, Ill.
Editorial and General Offices - - 96-98 Park Place, New York, N. Y.
London Agent: HACHETTE & CIE., 16-17 King William St., Charing Cross, W.C.2
Paris Agent: HACHETTE & CIE., 111 Rue Reaumur
Australian Agents: McGILL'S AGENCY, 179 Elizabeth St., Melbourne

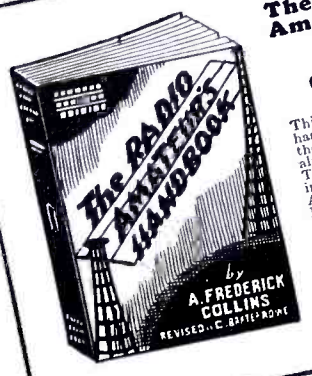
SHORT-WAVE CRAFT—Monthly. Entered as second class matter May 7, 1930, at the post office at Mount Morris, Illinois, under the act of March 3, 1879. Trademarks and copyrights by permission of H. Gernsback, 98 Park Place, N. Y. C. SHORT WAVE CRAFT is published on the 5th of every month. Twelve numbers per year. Subscription price is $2.50 a year in the United States and possessions. Canada and foreign countries, $3.00 a year. Single copies 25c. Address all contributions for publication to Editor, SHORT WAVE CRAFT, 96-98 Park Place, New York, N. Y. Publishers are not responsible for lost manuscripts. Contributions cannot be returned unless authors remit full postage. SHORT WAVE CRAFT is for sale at all principal newsstands in the United States and Canada. European agents: Brentano's, London and Paris. Printed in U. S. A. Make all subscription checks payable to Popular Book Corporation.

The 6 Best Radio Books

We herewith present the six most important books in radio. These volumes have been selected after an exhaustive study of the foremost radio books published today. They represent the finest in radio books, and offer a variety of information on the subject.

THESE BOOKS ARE ALSO OUR 6 BEST SELLERS.

WE PUBLISH NO CATALOG, and ask you to please order from this page. Prompt shipments of all books will be made to you directly from the publishers. We act only as a clearing house for a number of radio publishers, and OUR PRICES ARE AS LOW OR LOWER THAN WILL BE FOUND ANYWHERE. Remit by money order or certified check. Register all letters which contain cash.



The Radio Amateur's Handbook

(New Revised Edition)

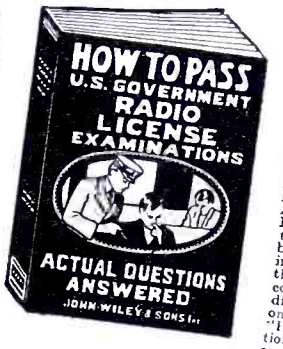
By A. FREDERICK COLLINS

Cloth covers, size 5¾x7¾". 394 pages, 116 illustrations

This standard book on radio appeared among the first, and has been continually reprinted and revised, not only to meet the demand, but also to present constantly a work that is always up-to-date.

The book is almost entirely new in contents. Here are the important chapters: How to Begin Radio; Putting up your Aerial; Simple Telegraph and Telephone Receiving Sets; Electricity Simply Explained; How the Transmitting and Receiving Sets Work; Mechanical and Electrical Tuning; A Simple Vacuum Tube Detector and Short-Wave Regenerative Amplification Tube; The Hammarlund "HI-Q 30" Receiver; A Receiving Sets; Receiving Sets; Short-Wave Regenerative Receiving Sets; The Hammarlund-Roberts Super-Pro; The 245 Pushpull Radio and Phonograph Amplifier; New Developments in Radio Tubes; Operation of Vacuum Tubes; Transmitters; Construction and Use of Wavemeters; Radio and Talking Motion Pictures; The Photoelectric Cell and its Uses; Ultra-Short Waves; Appendix.

Your Price **$1.97**



How to Pass U. S. Government Radio License Examinations

By R. L. DUNCAN and C. E. DREW

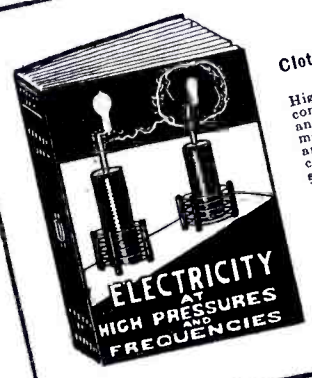
Flexible covers, size 9½x7", 170 pages, 92 illustrations

This is the most important book on this subject ever written. It gives every conceivable angle which will help you to pass a radio license examination successfully.

Here are the contents: Standard Regulations Governing the Issuance of Radio Operator's Licenses; Commercial and Broadcast Transmitters; Radio Receiving Apparatus; Motors and Generators; Storage Batteries and Auxiliary Apparatus; Radio Laws and Regulations; Appendix.

It is extremely important for the radio man who contemplates taking an examination for a government radio license that he be thoroughly familiar not only with the theory involved in radio reception and transmission but also he must be thoroughly conversant with the practica considerations in connection with commercial apparatus which immediately distinguishes the practical man from one who is grounded only in his theory.

"How to Pass U. S. Government Radio License Examinations (Second Edition)" is the *only* publication which gives exactly this information in the most concise and practical form. It is a practical book on commercial practice. Your Price..... **$1.89**



Electricity at High Pressure and Frequencies

By HENRY L. TRANSTROM

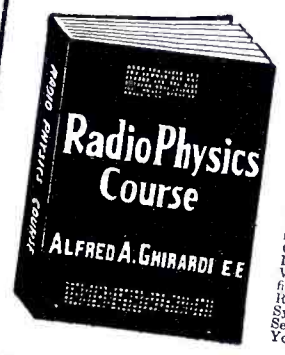
Cloth covers, size 5¼x7½ inches, 141 illustrations, 266 pages.

High pressure and frequency phenomena in electric circuits constitute a field of activity quite foreign to most students and practitioners of radio and electricity. The amazing manner in which conductors become apparent insulators and insulators become apparent conductors under the application of high-voltage alternating currents, constitutes a study which is both instructive and remunerative.

In this standard work on the subject the author clearly defines the line between this and the more familiar field of "commercial" currents and frequencies. He treats his topic without recourse to mathematics.

A discussion of the fundamentals of high-voltage, high-frequency theory is followed by descriptions of every type of generating equipment, **including Tesla and Oudin high frequency coils,** complete construction details are available for the man who wishes to duplicate the results described by the author. Myriad types of Geissler tubes are illustrated and described. This book is recommended to the earnest student of radio and electricity.

Your Price..... **$2.33**



Radio Physics Course

(Second enlarged edition)

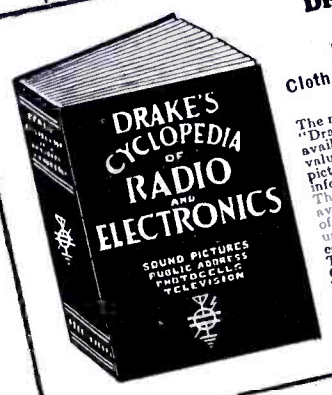
By ALFRED A. GHIRARDI

Cloth covers, size 7½x9¼". 992 pages, 552 illustrations, numerous tables

The finest and most popular book on radio and electricity. Each subject is clearly discussed, with the aid of dozens of excellent drawings.

Here are the chapters in this revised edition: Radio Broadcasting System; Sound, Speech and Music as Related to Broadcasting; Electron Theory, Electric Current; Electrical Units and Circuits; Magnetism and Electro-Magnetism; Inductance and Inductors; Condensers; Alternating Current Circuits; Electric Filters; Electrical Measuring Instruments; Radio Transmission; Elementary Study of the Vacuum Tube; Superheterodyne Receivers; Audio Amplification and Loud Speakers; Automobile and Aircraft Receivers; Phonograph Pickups and Sound Amplifier Systems; Short-Wave Reception; Television; Testing and Servicing; Sound Motion Pictures; Appendix.

Your Price..... **$3.89**



Drake's Cyclopedia of Radio and Electronics

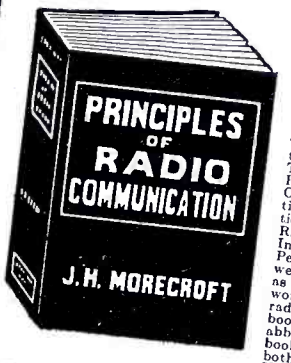
By H. P. MANLY (Fifth Edition)

Cloth covers, size 6x9 inches, 1048 pages, 1178 illustrations, 130 tables, 105 graphs.

The new 1933 edition of that now very well-known volume, "Drake's Cyclopedia of Radio and Electronics," is now available. Included in this latest edition are further invaluable reference data on public address equipment, sound pictures, television, and photoelectric cells; also, up-to-date information on radio transmission and reception, up-to-date The new tubes and the new circuits are described in readily available form. Every technical detail of the great number of topics covered by this reference book is treated individually so that the reader no longer need be in the dark concerning any point.

The keynote today is speed and accuracy; and "Drake's Cyclopedia of Radio and Electronics" is the most comprehensive work available, is the finest book for the technician who wants to get accurate technical information in the shortest possible time.

Your Price..... **$4.88**



Principles of Radio Communication

By J. H. MORECROFT, Professor of Electrical Engineering, Columbia University

Cloth covers, size 9½x6". 988 pages, profusely illustrated.

This book is the radio classic by the dean of radio. It covers the art of radio as no other book does.

The chapters are as follows: Fundamental Ideas and Laws; Resistance—Inductance—Capacity—Shielding; Laws of Oscillation Circuits; General View of Radio Communications; Spark Telegraphy; Vacuum Tubes and Their Operation in Typical Circuits; Continuous-Wave Telegraphy; Radio Telephony; Antennae and Radiation; Amplifiers. Index.

Perhaps the most important single recommendation which we can make for this volume—the radio man's "bible"—as it is called, is that it is the new, 1933 edition. In other words, this most valuable single book in the entire field of radio publications has been brought right to 1933. This book is far too comprehensive to permit more than a greatly abbreviated comment—buy it, if you want a real reference book on the subject covering the broad field of radio theory, both receiving and transmitting.

Your Price..... **$7.35**

NRA MEMBER WE DO OUR PART U.S.

NEW LOW PRICED RADIO BOOKS

Here are 13 new, up-to-date books on every conceivable radio subject, just published. Modern in every sense. All books uniform from 64 to 72 pages; 50 to 120 illustrations. All books are written by well-known radio authors. Order all your books by number.

No. 1 **RADIO SET ANALYZERS**, by L. Van Der Mel

No. 2 **MODERN RADIO VACUUM TUBES**, by Robert Hertzberg

No. 3 **THE SUPERHETERODYNE BOOK**, by Clyde J. Fitch

No. 4 **MODERN RADIO HOOK-UPS**, by R. D. Washburne

No. 5 **HOW TO BECOME A RADIO SERVICE MAN**, by Louis Martin

No. 6 **BRINGING ELECTRIC (RADIO) SETS UP-TO-DATE**, by Clifford E. Denton

No. 7 **RADIO KINKS AND WRINKLES** (for experimenters), by C. W. Palmer

No. 8 **RADIO QUESTIONS AND ANSWERS**, by R. D. Washburne

No. 9 **AUTOMOBILE RADIO AND SERVICING**, by Louis Martin

No. 10 **HOME RECORDING AND ALL ABOUT IT**, by George J. Saliba.

No. 11 **HOW TO BUILD AND OPERATE SHORT-WAVE RECEIVERS**, by the Editors of SHORT WAVE CRAFT

No. 12 **HOW TO BECOME AN AMATEUR RADIO OPERATOR**, by M. F. Eddy

No. 13 **POINT-TO-POINT RESISTANCE MEASUREMENTS**, by Clifford E. Denton.

PRICE PREPAID EACH BOOK ..... **$ .45**

PRICE PREPAID FOR ALL 13 BOOKS..... **$5.20**

HOW TO ORDER

We cannot ship C. O. D. Our prices are net, as shown. Some of the books sent prepaid (in U. S. only). Those that are not thus listed will be shipped by express collect if sufficient postage is not included by you.

RADIO PUBLICATIONS

245-S Greenwich St., New York City

ORDER DIRECT FROM THIS PAGE

• • • 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.

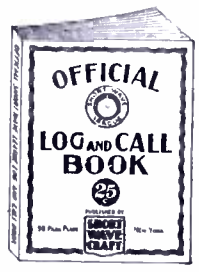
A—SHORT WAVE LEAGUE letterheads, per 100.....**50c**

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.

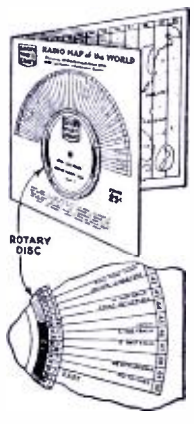
E—SHORT WAVE LEAGUE lapel button.....Prepaid **35c**

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**



C—25c each

SHORT WAVE MAP OF THE WORLD

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

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

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

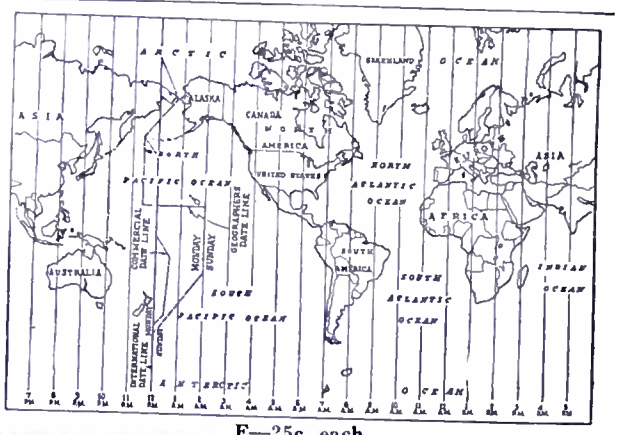
Send all orders for short wave essentials to SHORT WAVE LEAGUE, 98 Park Place, New York City.

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

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

D—$1.25 each

G—15c for 25



F—25c each

E—35c each

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE (2-34)
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:

.....

.....

.....

.....

.....

.....

.....

.....

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

(2-34)

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

HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Amazing Short Waves

An Editorial By HUGO GERNSBACK

● WE become so hardened to the man-made wonders that surround us day by day that we no longer pay much attention to them. Perhaps the greatest wonder of the age are the radio waves which are flung out from thousands of radio stations scattered all over the world nowadays. If you stop to think of it, it is marvelous to find that, day in and day out, the waves of all of these thousands of stations are vibrating right through your own body, without your being conscious of it.

No matter where you are, unless you are actually sealed in a metallic container, these waves pulse through you without your being aware of it. Music, talk, S. O. S. messages, police calls, it matters not what the intelligence is, percolates right through your very body for the twenty-four hours of the day, without your being aware of it; and no matter where the station is located practically all radio waves will reach you. This is proven by the fact that given a sensitive enough receiver, it will bring in *any* station the world over.

But coming to the waves themselves, few among us, unless we are radio experts, even begin to realize their marvels. Radio waves, of course, belong to the same family as, for instance, light waves; they both move at the rate of 186,000 miles a second. And while we can see light waves, the human being has no organ to perceive radio waves. If he had, he would be in a marvelous world—difficult for us to even imagine.

Our technicians are continuously performing black magic with these waves, and the wonders are increasing from day to day. When Heinrich Hertz first started with his induction coil and spark-gap experiments, he created only ripples, similar to what happens when you throw a stone into water. A little later on, when the vacuum tube came along, we obtained the so-called continuous waves, where a uniform wave was propagated out into space instead of ones that started with a small amplitude and then increased to a higher only to die out, and then have the same operation performed over again.

The old Hertz experiments can be compared to stones dropped successively into water, after each ripple has died out.

After continuous waves were invented, engineers succeeded in *modulating* the wave, that is, imposing one wave or frequency upon another wave. Thus, the speech impulses were transmitted on the basic wave, and for this reason it is called the *carrier*,—as if you had a cork floating on our water ripples, the latter carrying the cork super-imposed upon the water waves. Thus the radio telephone and broadcasting were born.

Later still, American engineers, in perfecting the transatlantic telephone, found that many people were listening in and they had to invent still another form of wave, which resulted in *inverted* or *scrambled* speech.

Nowadays, if you have a good short-wave set, you can listen in to the transatlantic telephone, but it is nothing but a lot of "gibberish," meaningless to you, and unless you have the key to *unscramble* it, it is impossible for you to listen to the talk.

It is difficult to explain the technical details of the scrambled wave in a short article of this kind; suffice it to say, that two oscillators are used which send out a double frequency simultaneously. At the receiving end, you use unscrambling frequencies, so that speech becomes intelligible again.

But wonderful as all of this is, we are not stopping here. The latest proposition is a report from Europe where two programs are being broadcast from the same station, on the same wavelength, at the same time! Something similar was already achieved in the United States when the engineers of the Columbia Broadcasting Station in their television experiments succeeded in 1932 to transmit on a single wave both speech and television impulses. By proper means, the speech and television impulses were unscrambled at the receiving end, and the person who had the correct set could, from the single wavelength or frequency, listen to a program and see the television accompaniment at the same time.

A similar scheme is used in the European experiment. Here also, a single carrier wave is used, and at the transmitter the two programs are switched in and out by means of local oscillator tubes which, in technical parlance, applies or removes a paralyzing grid bias from two separate amplifier tubes coupled to the same modulator. At the receiving end, a similar switching arrangement is used, and each program can be listened to at will, merely by the turn of a knob.

It will be seen that this latest invention doubles the number of our stations, and if, for instance, in the United States there are let us say 650 broadcast stations, there could then be 1300 of them without any more wavelengths than we have now.

The same, of course, holds true on the short waves.

But, why stop at two? Long ago, electrical engineers found it possible to transmit 8 messages over a single wire. This is called *multiplex telegraphy*. There seems no reason why, in the future, a broadcast or short wave station could not send out a dozen programs all at once, on a single wavelength. By means of the correct receiving set, in making some adjustments, it would be a simple matter to receive all of the programs, any one of which you could "fish" out.

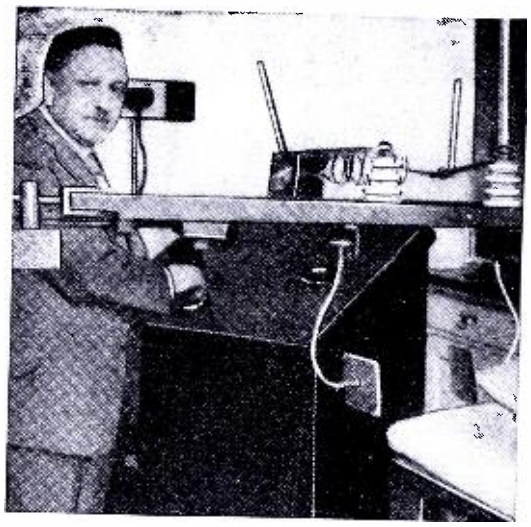
And, of course, all of this by no means exhausts the possibilities of our wonderful waves. Things unsuspected and unthought of will come about by the same wonderful instrumentality in the future.

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

This is the February, 1934, Issue—Vol. IV, No. 10. The next Issue Comes out February 5th

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

New Short-Wave MEDICAL Applications In Europe



In this photo we see Dr. Paul Groag, director of the Rainer Hospital, Vienna, with his hand on one of the controls of the short-wave oscillator.

Here a patient is receiving short-wave stomach treatment by means of a single electrode, the apparatus being rated at 6 to 600 watts.

Human ailments are now being treated in European clinics with improved forms of ultra short-wave oscillators. Some of the interesting results obtained are here described, including the results obtained at the Rainer Hospital in Vienna

● IN the investigations which were conducted in the last few years in Austria, Germany, France, England and the United States, ultra short-waves appeared as a new form of a highly effective treatment for certain ailments.

The idea of treating diseases with short radio waves originated in Vienna; short waves were employed by the physician, Dr. Stiebock, in 1925.

Among the many hospitals of Vienna, which have built short-wave apparatus for the treatment of their patients, the Rainerspital (Rainer Hospital) plays the most prominent rôle. This modern infirmary has a 600 watt radio transmitter (used as an oscillator). The director of this institution, state-counsellor Dr. Paul Groag and engineer, V. Tomber, the builder of the apparatus, have just published the results of a scientific investigation, which shows the growing importance of this new *short-wave* healing method.

The ultra short waves offer the physical possibility of bringing medical aid to every point of the body, at any place and at any depth.

The waves oscillate in the body up to .01 millionth of a second, warm up the tissues (electrical exercise) besides producing a particular electric effect which has new curative properties.

All inflammation processes are reduced. Furuncles, carbuncles, inflamed glands shrink, dental diseases are cured, rheumatism disappears; neuralgia and many other ailments are cured. The treatment is incredibly simple.

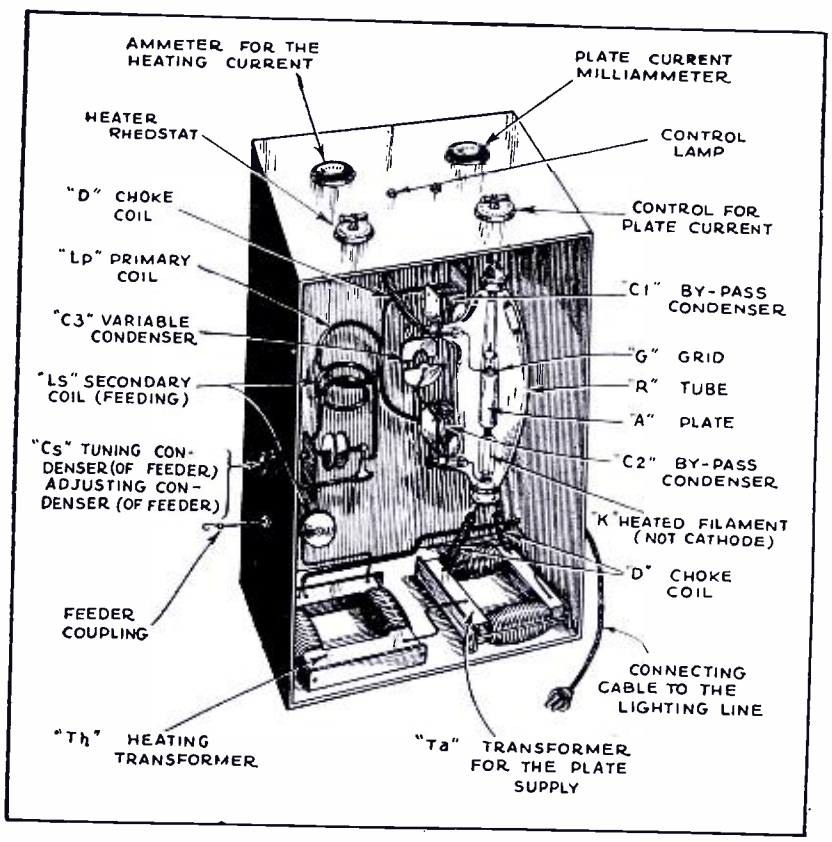
Either the patient sits between two movable electrodes or a special electrode is placed on the affected spot. A contact between the body and the high frequency oscillator is not necessary, so that the patient is not even obliged to remove his clothes. The short waves reach the ailing spot on or within the body even through a plaster cast and a bandage. Sores, which cannot be touched, are at once accessible to short waves.

Although there is no direct contact, each point in the vicinity of the electrodes is uniformly well irradiated. Also in connection with dental troubles and beauty treatments, the waves perform a new and distinct service.

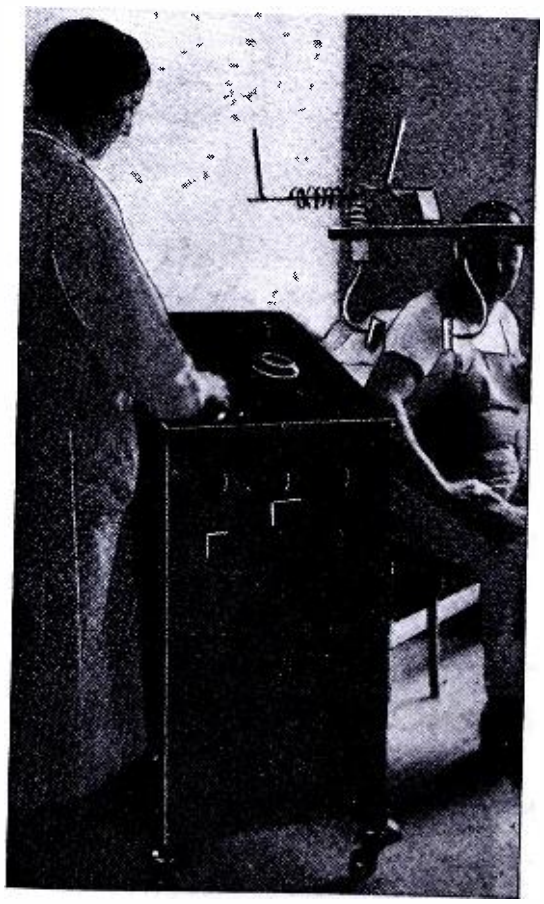
Modern electro-therapeutics discloses with this new tool possibilities, which are, to a certain extent, completely unexplored. At any rate, the Viennese physicians succeeded, during their researches in stopping the development of some diseases after the first treatments and to cure the ailment after a few more applications.

A sensational success in the treatment of angina was lately achieved at the Rainerspital. The wonderful effects of the short waves are particularly apparent here, because the pain disappears after the first irradiation (treatment), the high fever subsides

(Continued on page 621)



Left—a comprehensive view of the short-wave oscillator mounted in the control cabinet. The apparatus includes a frequency indicator, frefrequency control switch, and a switch to regulate the output from 6 to 600 watts.



Right—a torn shoulder ligament receiving short-wave oscillator treatment, the shoulder being placed in the condenser field between the double pole electrodes.

A New "Collector Rod" Receiving Antenna

By Everett L. Dillard

A brand new "collector rod" receiving antenna for short-wave reception is here described by Mr. Dillard, well-known short-wave engineer. This "rod" antenna, in many of the tests conducted, was only three feet high and it was placed directly on top of or along side the receiving set itself. The signals picked up with it were as strong as those ordinarily picked up on a 40 foot antenna, with a marked decrease in "noise" pickup. Several alternative forms of the new collector rod are discussed by the writer.

● THIS article describes a new departure in short-wave receiving antennas. The aerial system was designed to do away with the present cumbersome single-wire antennas which clutter up the roof of so many homes and apartment buildings, and to provide as a substitute an easily portable arrangement which can be installed and taken down upon a moment's notice.

As finally evolved the antenna was only three feet high and could be placed directly on top of or beside the receiver. The signal strength obtained was the equal of and the *received signal to background ratio* was an actual improvement over a 40-foot single-wire antenna used for signal comparison purposes. The actual performance on several different stations, all on different wave-bands, is shown in the table given in Figure 1. These tests were conducted on a Hammarlund "Comet-Pro" superhet. Other tests with a National SW45 regenerative receiver gave comparable results.

Essential Circuit

Figure 2 shows the essential circuit arrangement of the new antenna. L is the tuning inductance; C, the tuning capacity; and R, the low-loss signal collector rod. L and C in combination serve to perform two functions in the operation of the antenna. First, they tune the three-foot collector rod R to resonance with the working wavelength providing a *maximum sensitivity and response to the desired signal,* and excluding all others in favor of the signal wanted. Electrical noises and static not having any definite specific frequency of operation are relegated to the background since the collector rod R, due to its small size, is a very poor signal collector except to the one signal to which the antenna system as a whole is tuned.

We have carried the tuning of a three-foot signal collector to an extreme by tuning it to resonance with the incoming signal, which may even have a wavelength of 100 meters or more. But at these extremes in tuning we still notice a remarkable gain in signal level when the system is tuned to the incoming signal's wavelength—a gain far more than we had hoped for or thought possible from such a small signal collector as R.

First Tests With Regenerative Set

Our first tests were conducted on the regenerative receiver and we noticed that signals were unusually sharp which action, no doubt, was due to the added selectivity produced by the newer type of antenna. In addition, we found that by increasing the length of R over a certain value for the range of wavelengths to be received, we actually lowered the signal value instead of increasing it as we had expected to do; and, also, the selectivity seemed to decrease far more in proportion to what we thought should actually be the case for the slight additional increases we had made in the length of the collector rod R.

This, then, brings up the second part of our theory of operation of the new antenna and accounts for the increase in selectivity we had experienced and is also a plausible explanation as to why there is a critical length to R, above and below which values the signal strengths and selectivity seem to go "hay-wire." Notice Figure 3. It is the familiar series tuned band-pass filter circuit using the inductance L_1 and the capacity C_1.

L_1 and C_1 are the circuit elements which determine to what wavelength the system is most resonant. Now look at L and C again in Figure 2. Except for the collector rod R, L and C form a series tuned bandpass filter as in Figure 3. In fact they form a very good filter circuit due to the fact that in order to load the collector rod R to the working wavelength a large amount of inductance is required with a comparatively low value of capacity —these are the requirements of a good so-called "stiff" electrical filter circuit giving a high degree of selectivity.

Dual Purpose of L and C

Thus, in the circuit action of the new antenna as shown in Figure 2, L and C perform a dual purpose: they load the antenna system comprising L, C and R to the working wavelength; and, they act by themselves as a series tuned preselector circuit. As long as R is no longer than three feet it has but little loading affect on L and C because the additional inductance and capacity of R is so small that it does not change the fundamental of the antenna system as a whole appreciably from that of L and C functioning by themselves as a series tuned filter circuit. So, up to a certain value of R (until at the working wavelength it begins to load the antenna circuit to a much higher wavelength than that of the filter circuit alone) the antenna

(Continued on page 631)

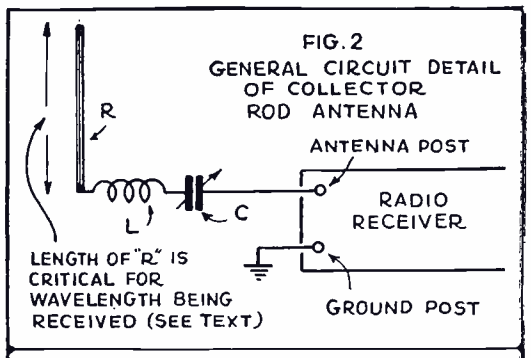


FIG. 2
GENERAL CIRCUIT DETAIL OF COLLECTOR ROD ANTENNA

FIG 3
SERIES TUNED BAND PASS FILTER CIRCUIT

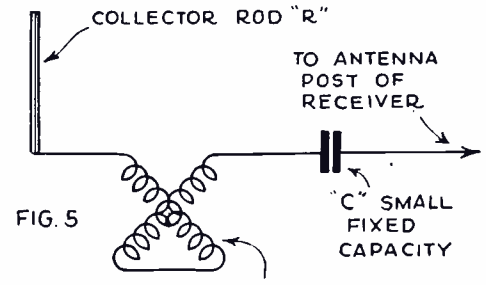


FIG. 5

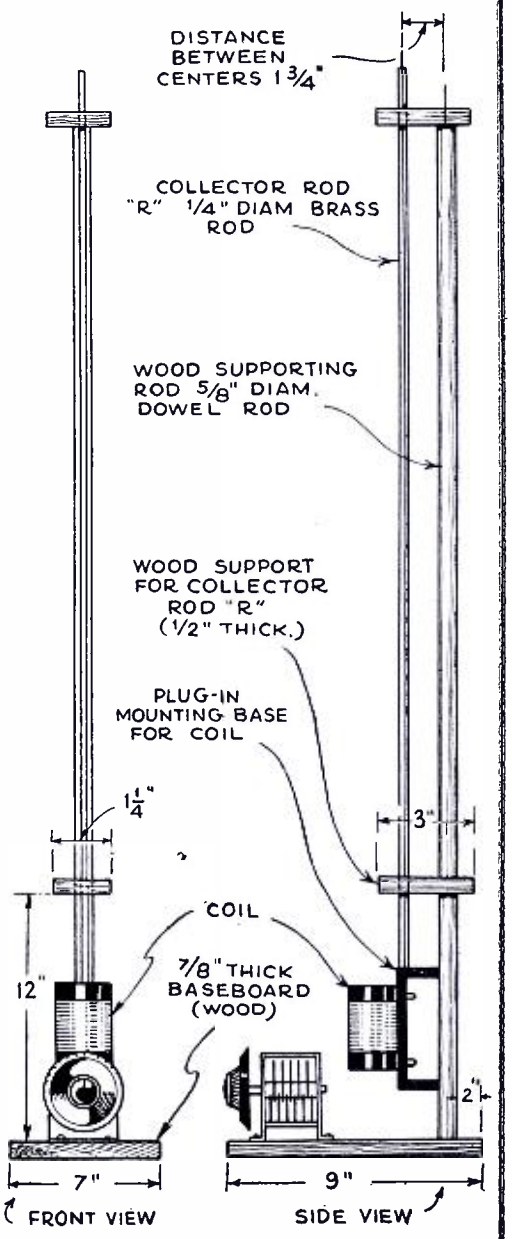
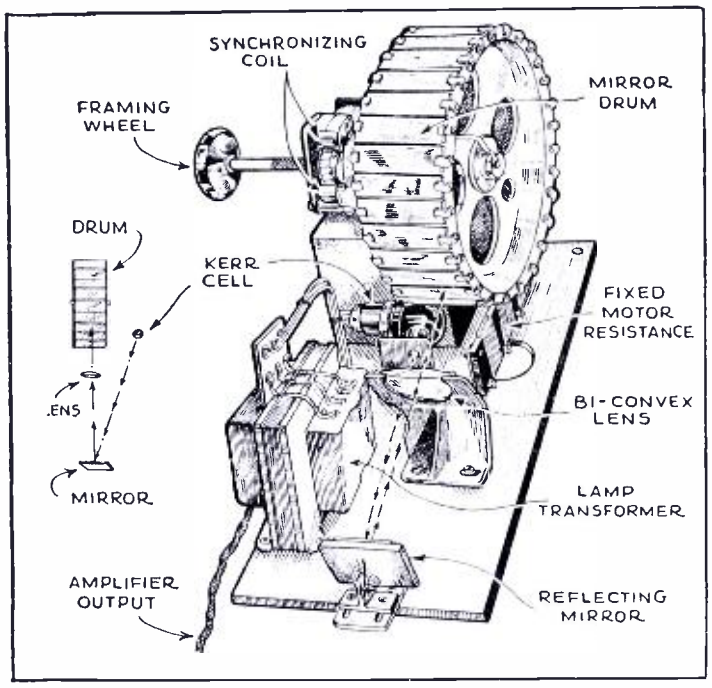


FIG. 6
~GENERAL DETAILS FOR CONSTRUCTION OF ANTENNA~
NO SPECIFIC HEIGHT IS GIVEN AS THIS WILL DEPEND ENTIRELY ON LENGTH OF COLLECTOR ROD "R"

WORLD-WIDE SHORT-

A New Television Receiver



The latest English television scanner, which utilizes a revolving mirror drum and a Kerr cell.

● *Television*, London, England, recently contained an announcement of a new television receiver using a mirror-drum scanning system, which has been introduced on the English market. This set uses a Kerr cell which modulates a beam of light and the modulated beam is reflected from the mirror drum to a screen 9 x 4 inches in area. This projector is shown in the accompanying illustration.

With the present British Broadcasting Co.'s "telecasting" carried out on a 30 line, 12½ picture system, the mirror drum method is probably as satisfactory as any other. It is only when greater definition is employed at the transmitter that the advantages of cathode-ray and other such systems can be used to advantage.

The mirror drum idea has been utilized successfully in this country on 60 lines.

Novel Television Schemes

● THE magazine *Television*, published in London, England, contains many wide-awake items on the subject for which it is named.

For example, a recent issue presented the circuit shown in Fig. A. It will be noticed that this is a D. C. power unit which also contains some of the parts of the television receiver. The items of interest in this circuit are the use of a synchronizing tube connected in the plate circuit of the power tube and controlling the speed of a disc motor arrangement, which, in turn, governs the speed of the scanning disc or drum. This synchronizing tube is fed through a tuned transformer which selects the synchronizing currents accompanying the television signals. In this way automatic synchronizing is achieved.

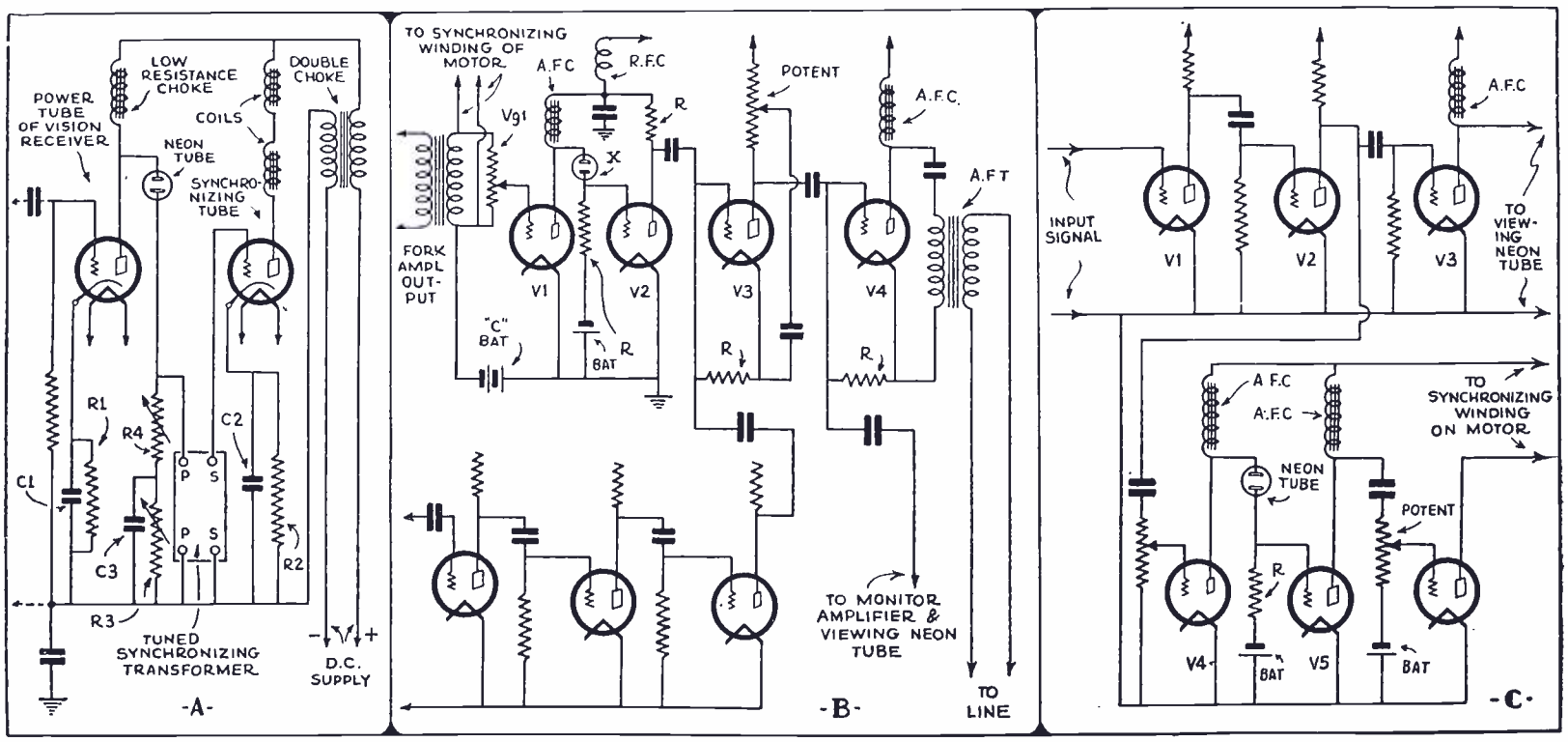
Another interesting item on a similar subject appeared in the same issue. The action of the system can best be understood by reference to Fig. B, which shows the *transmitter* end. The impulses from the fork amplifier are taken to the synchronizing winding of the transmitter and also to the grid of a rectifier V1, the signals being applied by means of potentiometer Vg1. A neon tube, X, is inserted in the plate lead of V1 and couples this plate to the grid of V2, through potentiometer R. This tube may be biased so that it is just "glowing," but on the point of "extinction." When positive half cycles are incident on the grid of V1 the tube is extinguished, current down R zero and the grid of V2 becomes less negative. Plate current in V2 increases, plate volts at V3 increases, V3 grid is actuated and a synchronizing signal is sent to the line via V4. The television signals are impressed on the grid of V3 by means of the normal television amplifier.

By suitably adjusting R, the duration of the synchronizing pulses can be adjusted as required. In this way, the scanning line can always be phased so that the synchronizing injection takes place at one end of their traverse on the screen. When this phasing has been obtained, the complete signal embracing both the synchronizing impulse and the television signal can be put on the line. The amplitude of the synchronizing signals can be adjusted to the desired extent, at one of the stages of the amplifier, so that it is higher than the picture signal amplitude.

At the receiver end, the circuit is shown in Fig. C. Both picture and synchronizing signals are passed to V1 and after amplification arrive at V3 and V4. The signals from V3 operate the neon viewing tube, but signals from V4 only operate V5 when the higher amplitude synchronizing voltages are applied to V5 grid. This is accomplished by means of a coupling neon tube biased in a similar manner to that described in the transmitting unit. Hence while the complete signal is applied to the neon tube used for viewing the picture, only the synchronizing impulses will be passed to the synchronizing winding of the motor driving the receiving scanning discs. This motor can be adjusted so that the black bar, due to the synchronizing signal appears at the top of a picture when the disc will be in synchronism with the transmitting disc.

The schemes set forth should find favor among American experimenters and tend to stimulate interest in television.

We don't hear much of television in this country these days and unless we get busy the foreign boys will have the jump on us.



The three circuits illustrated above show respectively: Fig. A—television receiving circuit utilizing a motor "synchronizing" tube; Fig. B—improved television transmitting circuit and hook-up to synchronizing motor; Fig. C, new television receiver circuit showing "image" and "motor" amplifiers.

WAVE REVIEW

Edited By C. W. Palmer

Trans-Ceiver and Super-Regenerator

● IN a recent issue of *The Wireless Engineer & Experimental Wireless*, several new patents issued in England, were discussed.

One of these was a "combined" transmitter and receiver for short waves, in which the tubes served double duty. The tubes V and V1 are arranged in push-pull across the input circuit LC, which is back-coupled to a similar output circuit L1 C1. A grid-leak GL is adjusted to "quench" the oscillations at a super-audible frequency. The choke L2 in the plate supply circuit forms one arm of a Wheatstone bridge. Modulated signals are applied across a diagonal of the bridge from a microphone M, while received signals are taken off from the other diagonal to an amplifier V2 and headphones. The grid condenser may be disconnected during periods of transmission, by means of switch S.

Another interesting patent was that for a "super-regenerative" receiver. Two super-regenerative amplifiers are coupled in direct cascade, a common "quenching" frequency being applied to both stages simultaneously. The quenching oscillations from a generator O are fed to a coil L, tuned to the same frequency by a fixed condenser C, which is connected in parallel through leads X, Y, with a similar fixed condenser C1 in the input of the first stage. The coils L2, L, L3, in the input circuit of the second stage are tuned to the signal frequency by a variable condenser C2, while the split coils of the first input are similarly tuned by a condenser C3. The output coil L4 of the second stage is back-coupled to the input coils to maintain the system in self oscillation, a similar back-coupling being effective between the output and input coils of the first stage.

Both stages are operated on the push-pull principle, the grids of each pair of tubes being "quenched" alternately.

This is about the most unique transceiver arrangement we have had the pleasure of seeing in a long time. This arrangement should find much favor with the 5-meter "ham" as considerable thought has been given to the design of transmitter receiver.

Transmission and Reception on 5 Meters

● *Le Haut-Parleur*, published in Paris, France, recently contained a review of circuits for ultra-short-wave work, that should interest every radio enthusiast.

A typical transmitter is shown in circuit 1. It is made up of a simple coil with a variable condenser inserted in the wire loop. At 2 is shown a derivation of the Hartley circuit. The coil for this unit consists of 7 turns of wire on a diameter of 2 inches. Circuit 3 is a full-wave arrangement in which both sides are balanced. Each coil circuit contains one turn on a diameter of 5½ inches.

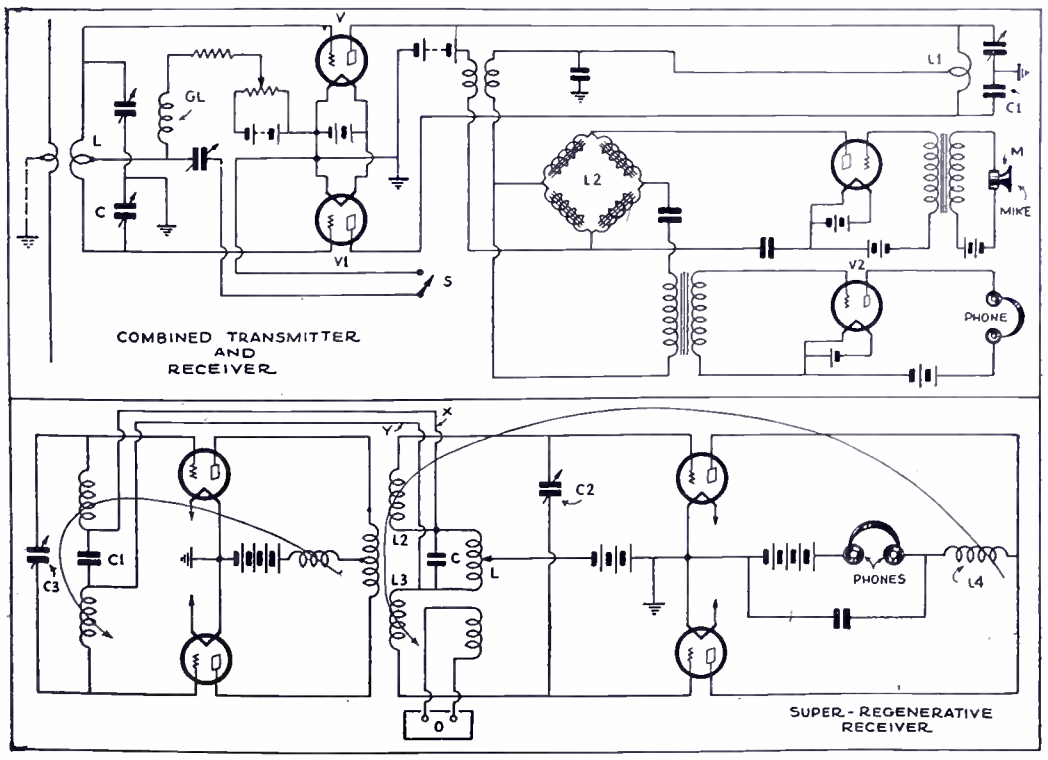
Circuit 4A is a derivation of No. 1; however, the condenser is replaced by another tube. A practical circuit of this type is shown in 4B. The circuit at 5 is a self-rectifying arrangement, similar to circuit 3. Circuit 6 is derived from the Colpitts system, and circuit 7 is another Hartley arrangement.

Circuit 8 is another two-tube unit, which is particularly efficient on 5 meters. The values are as follows: C1 50 mmf., double gang; R1, 10,000 ohms; L1, 20 turns of wire on a diameter of 1 inch; Ch1 and Ch2 30 turn chokes wound on forms ½-in. in diameter; Ch3, 50 turns on a ½-in. form.

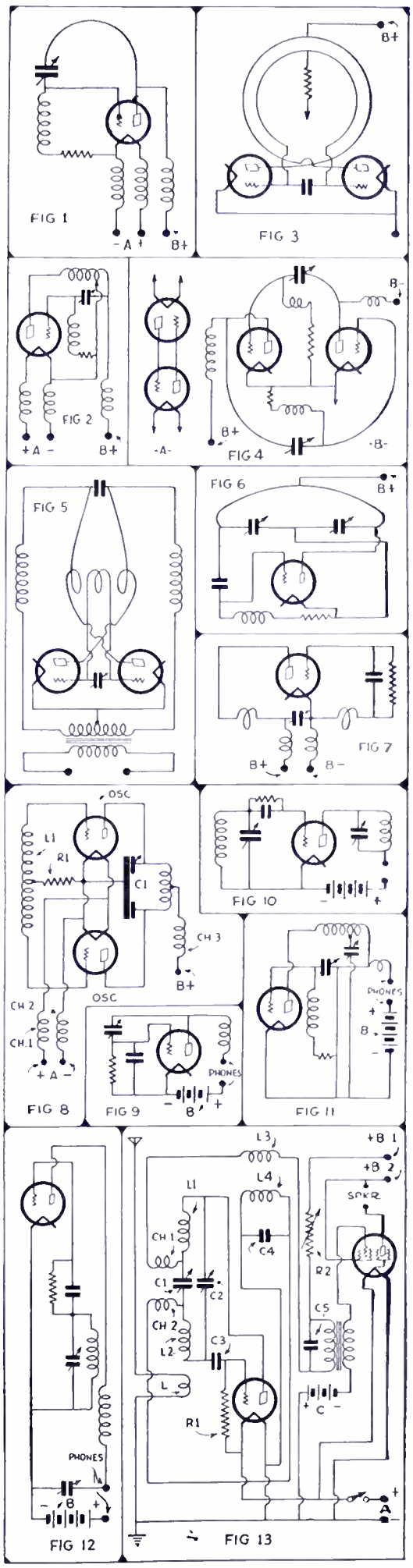
Next we have the receivers: Circuit 9 shows a simple receiver in which a grid-plate tuning arrangement is employed. Circuits 10 and 11 represent respectively an Armstrong regenerative set and a Hartley type set. The latter is similar to the transmitter in No. 2. No. 12 is another circuit of the "feed-back" type.

The last circuit is a modern super-regenerative receiver using one triode and one pentode audio tube. The values of parts are as follows: R1, 2 megs.; R2, sensitivity control, 50,000 ohms; C1, 50 mmf.; C2, 35 mmf. max.; C3, .0001 mf.; C4, .004 mf.; C5, .001 mf.; Ch1 and Ch2, 50 turns of No. 32 wire on ½-in. dia. forms; L1 and L2, 3 turns of heavy wire on forms ¾-in. in diameter; L3 and L4, 500 turn honeycomb coils.

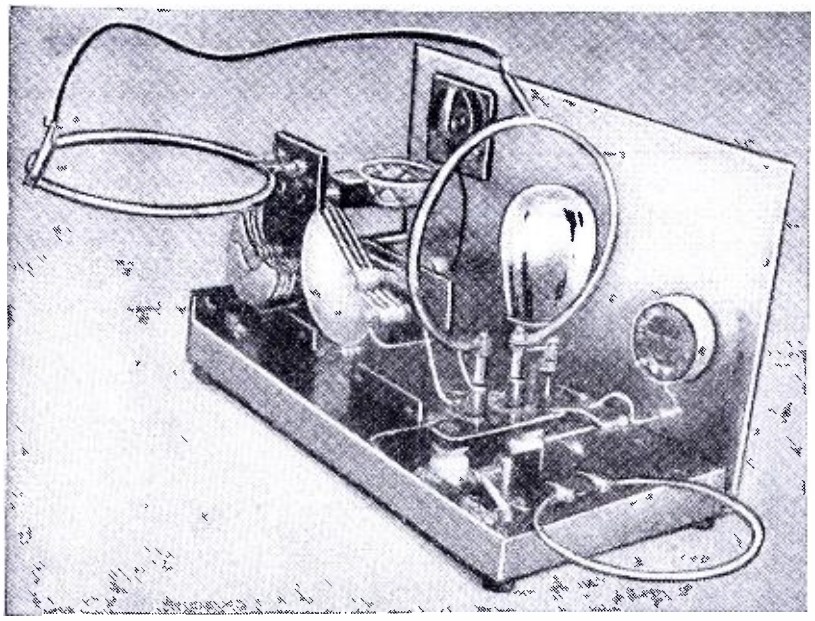
The ultra-high frequency spectrum provides a paradise for the fellow who is bent on experimenting.



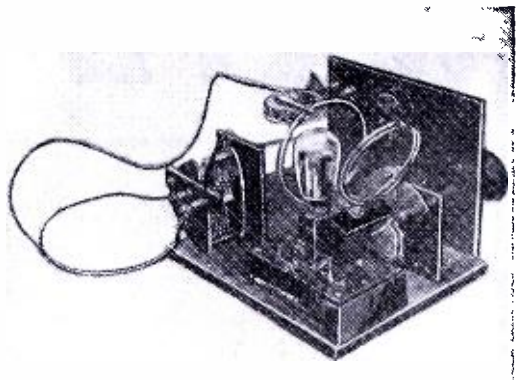
Above, we have two interesting circuits; the first, that for a combined transmitter and receiver; the other for an improved super-regenerative receiver.



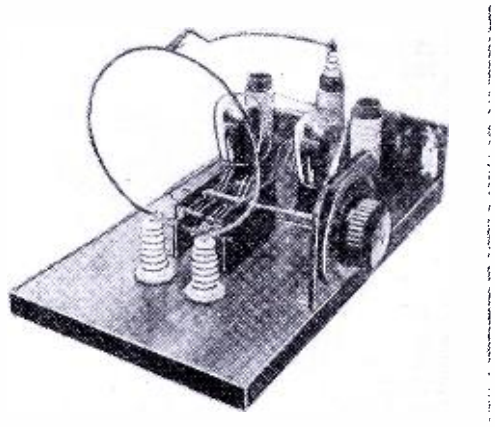
This illustration shows a number of novel 5-meter transmitting and receiving circuits recently introduced in France.



Left—one of the latest European ultra short-wave receivers, which is here described by Messrs. Frese and Braun.



Right—Fig. 2, top photo shows a larger size ultra short-wave receiver.



Below, a push-pull ultra short-wave transmitter.

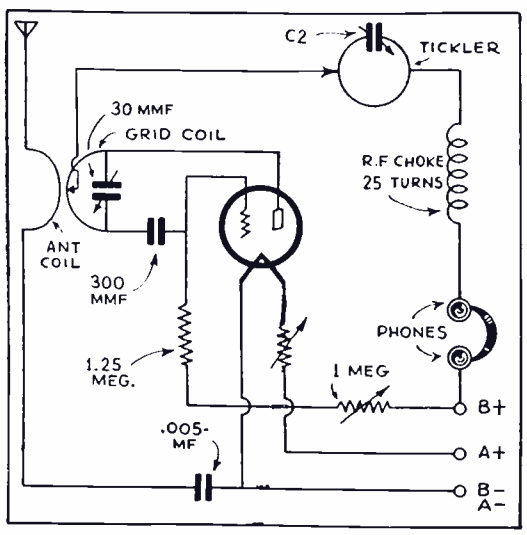
A Novel Ultra Short-Wave Receiver

By F. FRESE and J. BRAUN, D4VAS

European short-wave experts have devised many new and interesting circuits, and we are pleased to present herewith one of the newest ultra short-wave receiver circuits.

● IT was evident immediately after the first reception tests, that very little will be achieved with the ordinary type of detecting circuit, and therefore a search began for a good receiver operating on a wavelength between two and seven meters. It was apparent to us that only a 60 volt battery should be used for the plate supply, in order to be able to use the receiver as a *portable* outfit. Most of the ordinary circuits did not show good regenerative features; the operation of the ordinary three-point circuit was pretty good, but even here the feed-back action depended a great deal on the received wavelength.

Then, one day, we came across a circuit, which, although known for a long time, had not achieved any great popularity. From the start this circuit had been working better than the others, but even so circuit changes were made. The modified basic circuit is shown in Fig. 1. The first thing we would like to call your attention to, is the fact that the grid-leak is not connected to the negative side of the filament, but to the B plus of the plate battery. The result of this is almost a 100% increase in loudness of the incoming signal. In order to control the regeneration, the fixed resistor of about 1.25 megohms was connected to the B plus, through a variable resistor of about one megohm.



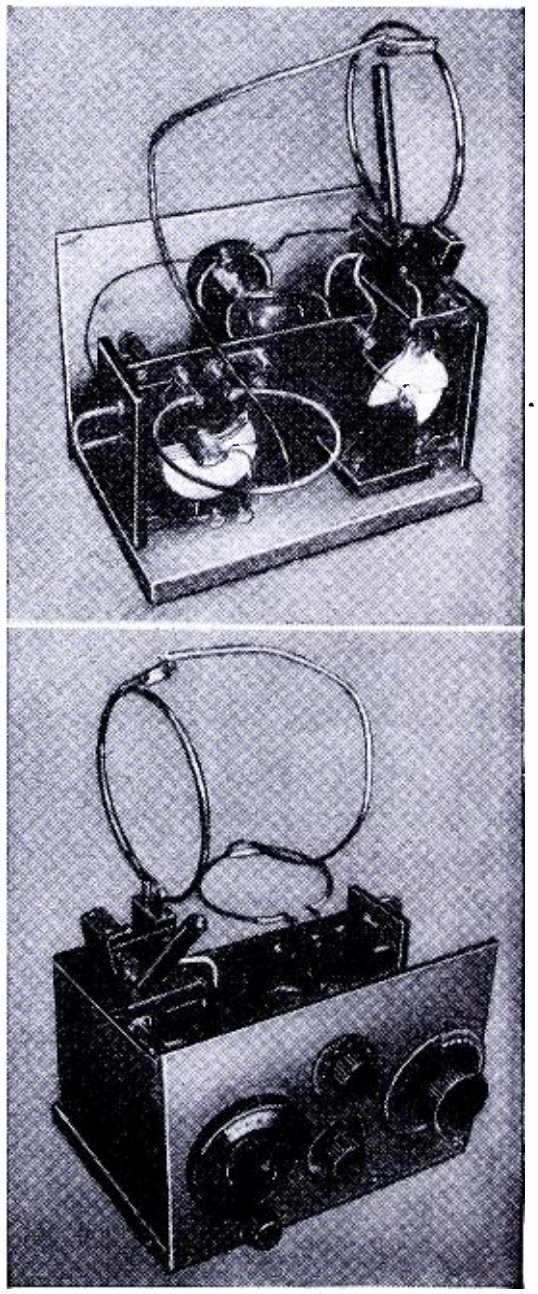
Basic circuit of the ultra short-wave receiver here described.

Two models of this apparatus were built. Fig. 2 shows the larger type. The receiver shown in Fig. 3 uses the same circuit, but the mounting for the transformer is made smaller. The variable condensers, which we made ourselves, may be observed in the photograph. Naturally, good commercial neutralizing condensers can be used. The receiver shown in Fig. 3 originally had vertical coils, and the incoming signal was not very strong. Furthermore, even at short distances from the transmitter, the tuning was so difficult and the signal strength so low, that good reception could not be expected. We are still unable to explain this phenomena.

The connection to the antenna is made through a special antenna coil, which has two turns, and which can be easily recognized in Fig. 2. One end of the antenna coil is connected to the antenna, while the other end leads over a .005 mf. condenser to the common minus. A wire from two to three meters (6.4 to 9.6 ft.) long is used as an antenna for positions not too far from the transmitter (about 500 to 1550 ft.). For greater distances the antenna is about 20 meters (64 ft.) long and is connected through a variable condenser.

As it was mentioned before, we made the variable condensers for this receiver, by taking out plates from an old

(Continued on page 627)

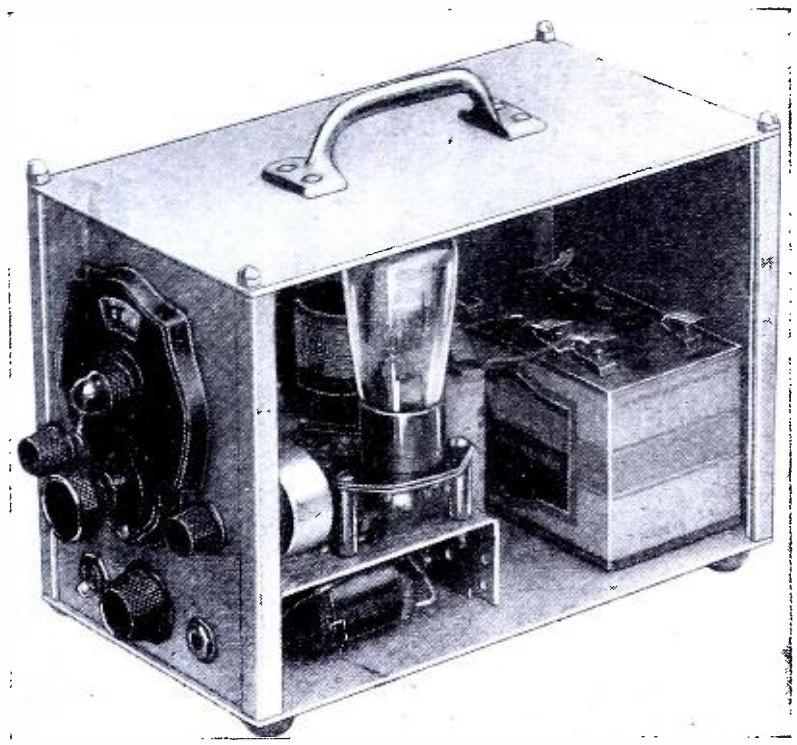


Another ultra short wave receiver, (Fig. 3), which is a particularly compact model. Lower photo, Fig. 4, shows front view of the receiver.

A Portable Battery-Type TRANS-CEIVER

By GEORGE B. HART

Engineer, WLW-WSAI-W8XAL
Operator, Ex-U8DK-W8GCR



Trans-ceivers are commanding a great deal of attention from the short-wave fraternity today, as they greatly simplify the building of a light-weight transmitter, the same tubes being used for reception as well. This set is now being used with fine results by a National Guard signal corps unit in Ohio. There are no switches to throw in changing from "transmitting" to "receiving."

● IN the old days portable sets were in fashion only in summertime; nobody cared to sit out in a field with a portable station during the winter months. However, there are some amateurs whose business interests take them far from home and station; therefore having need of a transmitter-receiver.

Now it is a pretty fair electrical rule that one can always use a generator as a motor—or a transmitter as a receiver. With a few exceptions, that applies to all our circuits. So, too, the Hartley circuit makes a good receiver or transmitter, provided one makes a few changes to fit the job. Figure 1, the schematic, discloses that there is nothing unusual about the circuit from either a transmitting or a receiving angle. The only peculiarity is the fact that the key is shunted with a pair of headphones. They complete the receiving circuit, in which a simple form of grid-blocking super-regeneration makes possible the remarkable efficiency of the set as a receiver.

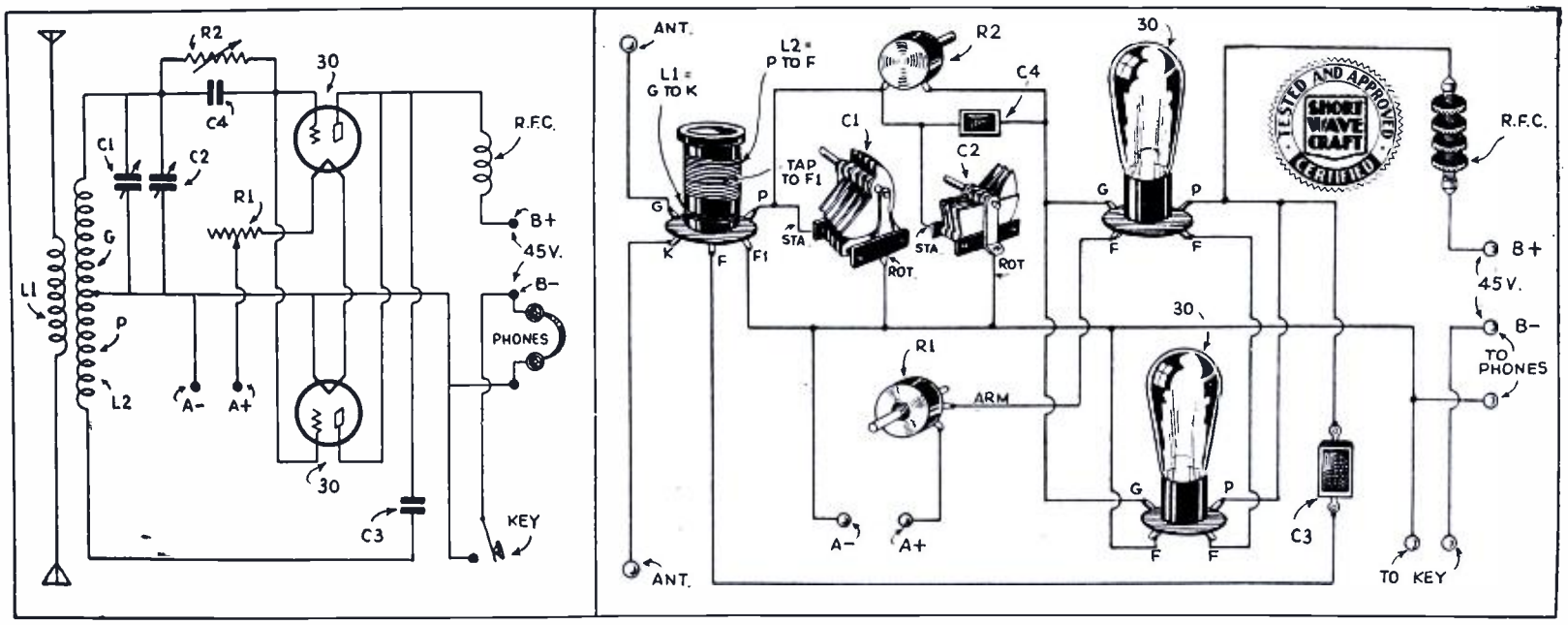
The circuit comprises a modified Hartley hook-up using two type 30 tubes, their filaments in series and their grids and plates in parallel, which for all purposes provides sufficient oscillation for transmission and ample volume on the phones for reception. While it is apparent that no extravagant claims can be made as regards "DX" (distance) possibilities, there is little doubt that for purely "local" communication with an improvised antenna system and low plate supply, this little set is hard to beat.

Portability being the desired characteristic, coupled with efficient local operation, it was found possible to construct the entire mechanism in an aluminum can 6"x5"x8". The container not only houses the *transceiver*, but also the power supply of 45 volts; the total weight being less than four pounds.

Condenser C1 is a 50 mmf. variable condenser used as the transmitting tuning condenser. This control is set for operation within the amateur band selected and C2 employed to tune the receiver. C2 is a 7 mmf. variable condenser and is readily returned to zero mesh for transmission. Its small size assures band-spread tuning. The remainder of the components are not unusual with the exception of R2 which is a variable 0-50,000 ohm grid-leak. In fact, grid leak control is the secret of the set when operated as a receiver.

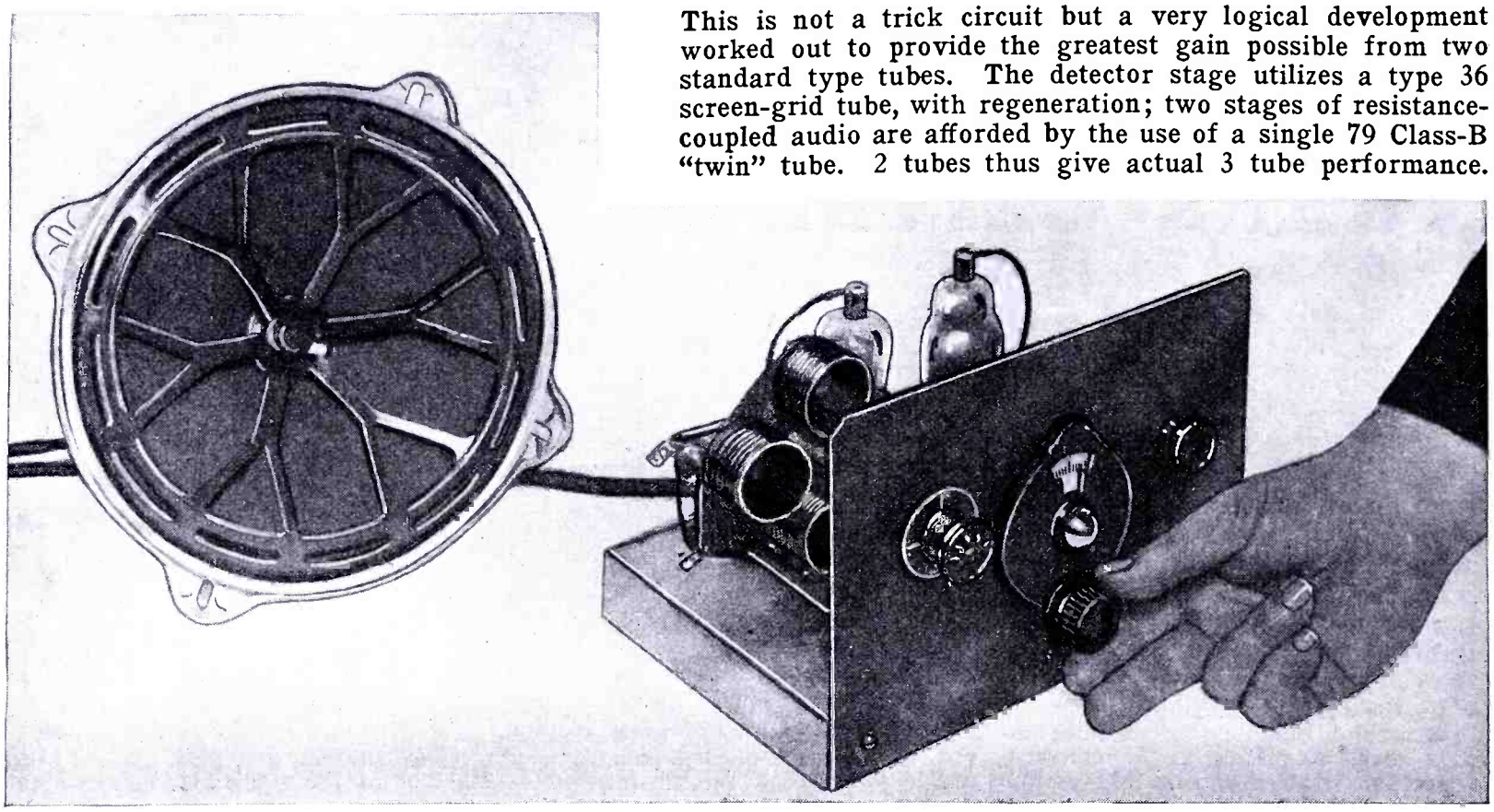
To operate as a receiver, screw the grid-leak down tight and light the filaments to full brilliancy. The set will then oscillate quietly but too strongly to receive any but the strongest local signals. To check this, listen in on another receiver. Proper operation should result in the paralysis of the second receiver. Now increase the grid resistance slowly and the set will burst into a quiet whistle that denotes super-regeneration. This whistle is not annoying. Signals will now be heard, the volume of which, may be increased by slowly increasing R1. The whistle will increase in volume and in frequency but only up to a certain point, after which the signals will not be heterodyned but will have a blocking effect on the tube, stilling the whistle and giving the effect of a *back-wave*.

Fortunately, the best adjustment for receiving is also the best for transmission. *(Continued on page 635)*



You have probably never seen a simpler circuit for a combination short-wave TRANSMITTER and RECEIVER than the one here pictured. The great things are simple someone has said, and so it is with this Trans-ceiver—and it surely steps out and delivers the goods as many tests have demonstrated.

This is not a trick circuit but a very logical development worked out to provide the greatest gain possible from two standard type tubes. The detector stage utilizes a type 36 screen-grid tube, with regeneration; two stages of resistance-coupled audio are afforded by the use of a single 79 Class-B "twin" tube. 2 tubes thus give actual 3 tube performance.



Besides providing 3-tube loud-speaker performance from only 2 tubes, the "Triplex-2" includes a new wave-band change switch.

The TRIPLEX 2 — It Works

By GEORGE W. SHUART, W2AMN

Loud Speaker

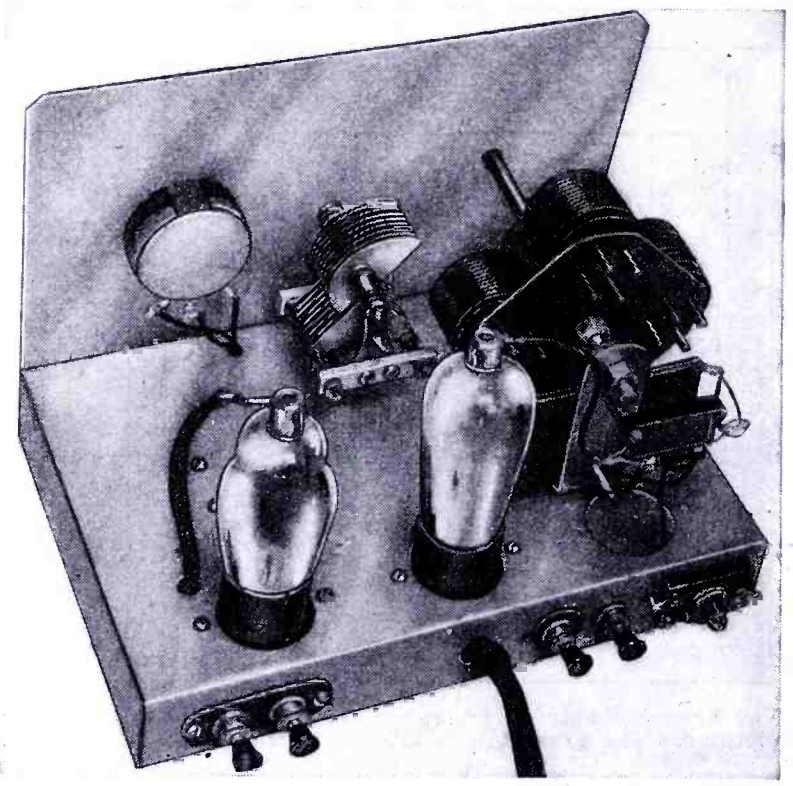
● THE *"2-Tube Triplex"* embodies several new features which are a decided asset to any short-wave receiver. First, it has a very efficient coil switching arrangement, which entirely eliminates the bothersome operation of reaching behind the panel to plug in the various coils. The second new feature lies in the audio channel, where a single 79 class "B"-twin tube, is made to function as a two stage class "A" audio amplifier; the two triodes in this tube are operated in cascade. This permits good loud speaker operation on two tubes as actual tests have demonstrated.

Automobile type tubes were used in this set for the benefit of those living in the rural districts, where 110 volt A.C. service is not available. These tubes permit the use of a six volt storage battery and 180 volts of "B" batteries for the plate supply. Operating a short-wave receiver in this manner gives the lowest possible background noise and even the weakest stations can be tuned in with perfect clarity. The 2.5 volt A.C. tubes can be used in this set with no change in wiring except to the pin connections on the sockets. A good line-up would be a 57 detector and a 53 as the two-stage audio tube; this of course would necessitate the use of sockets to fit these tubes.

No Trick Circuits

There are no tricks about this circuit, it is a straight regenerative set-up with two stages of resistance coupled audio; and the most inexperienced short-wave "fan" can build it without difficulty. No band-spread arrangement is shown in the diagram; however, if a 35 mmf. midget variable condenser were connected in parallel with the tuning condenser shown, this would be an ideal receiver for the Amateur or "Ham."

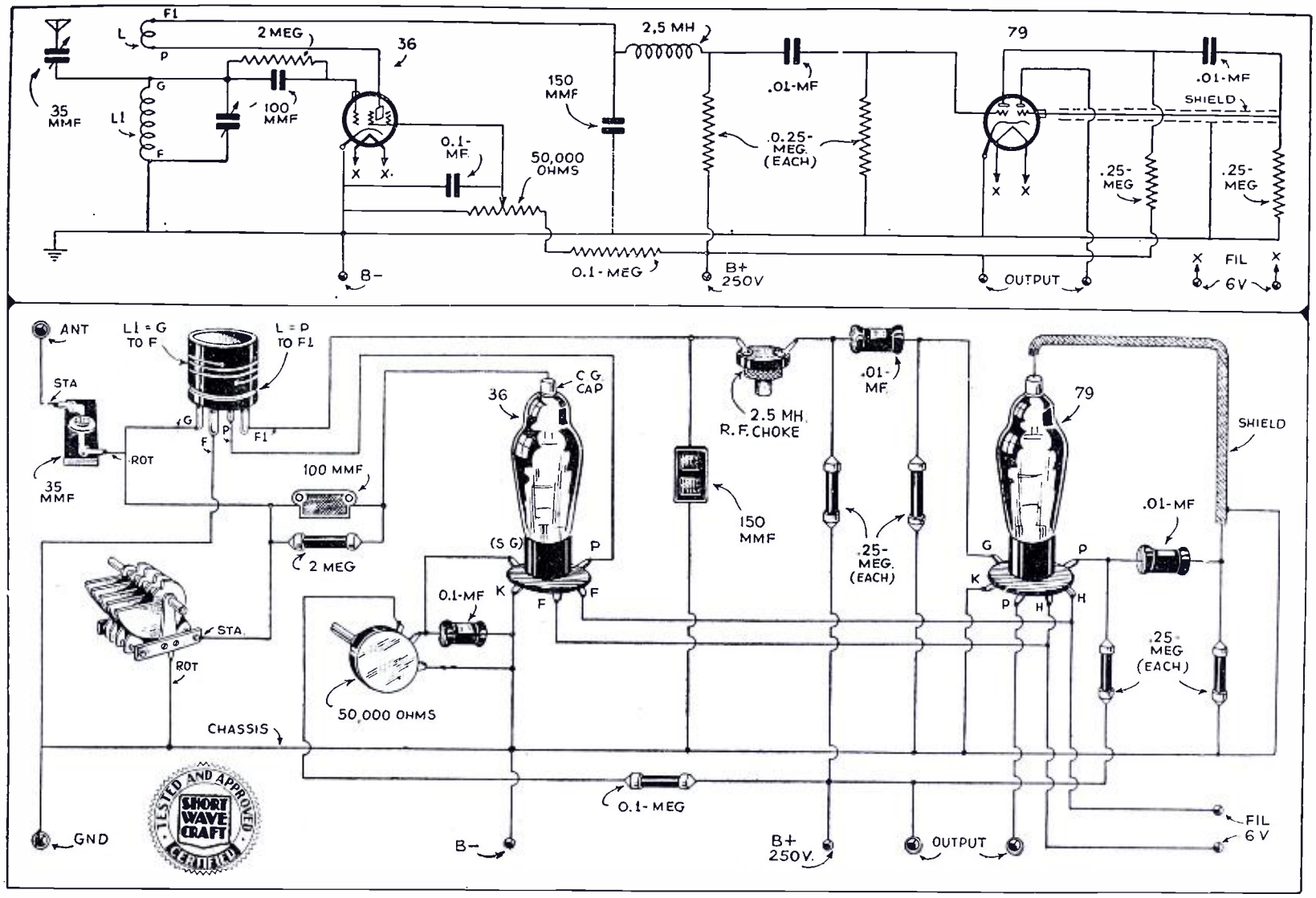
A 36 screen-grid detector was used because it is about the best detector of the 6.3 volt variety. Grid-leak detection is used with regular tickler feed-back for regeneration. Regeneration is controlled by a 50,000 ohm potentiometer which regulates the screen-grid voltage. This method has stood the "acid test" insofar as regeneration controls are concerned. A 100,000 ohm one-watt resistor connected between the potentiometer and the "B" plus 180, serves to reduce the voltage to a point where a 50,000 ohm potentiometer provides a not too critical control of feed-back.



Rear view of the "Triplex-2" receiver, which employs a 36 tube as detector and a single 79 Class-B "twin" tube for the two audio stages, together with a switch to change the wave-bands.

How Detector is Coupled

The output of the 36 works into a 250,000 ohm load resistor (a high impedance choke could be used here to provide higher audio output) and is coupled to the audio stage through a .01 mf. condenser. The first audio tube is the triode of the 79, having its grid



By the aid of the clearly drawn diagrams above, anyone can easily build the "Triplex-2," an extremely efficient and low cost S-W receiver.

at the base of the tube; the triode with its grid at the top of the envolope is the second stage.

A 250,000 ohm resistor is used for the grid leak of the first audio tube, and proved to be the optimum value; higher values gave greater gain but resulted in less stable operation, which resulted in inferior tone quality. The plate load resistor for the first audio stage which gave the best results was 250,000 ohms. A lower value in this position gave no greater gain and again instability was the result. The grid coupling condenser and grid resistor for the second audio stage are the same as in the first and again proved to be the optimum values.

Grid Lead Needs Shielding

At this point it must be stressed that it is necessary to shield the grid lead of the second stage as this lead comes out at the top of the tube and necessitates a rather long connection. With no shield on this lead there was considerable feed-back which rendered the two stages useless. No cathode bias resistor was found necessary; many values were tried without the slightest improvement.

Operated under the conditions outlined above the amplifier worked very nicely into a magnetic type loud-speaker. A dynamic speaker however, gave much better tone reproduction and slightly greater volume. With the D.C. tubes it would be necessary to use a dynamic speaker having a field coil wound for 6 volt battery operation, unless a power supply were used where the field coil could take the place of one of the filter chokes.

Layout of Parts

The lay-out of parts as shown in the photographs proved to be the most convenient and best as far as short leads are concerned. Looking at the front of the panel the control on the left operates the coil-changing device. The National vernier dial in the center controls the .00014 mf. tuning condenser and that on the right is the 50,000 ohm volume control. The chassis and front panel are of the variety used for S-W set construction and marketed by practically all the various mail-order houses.

At this point it might be well to say that standard short-wave plug-in coils such as described in former issues of SHORT WAVE CRAFT can be used if the builder does not wish to make use of the switching device used in the Triplex. Equal signal results of course can be expected from the regular plug-in coils such as National, Alden, Gen-Win, or Octocoil.

Tuning and operation of this set is exactly the same as any other short-wave set using a screen grid detector and the builder should obtain excellent results and spend many happy hours exploring the short-wave spectrum.

Care should be exercised in following the wiring diagram and *all connections should be made firm with rosin core solder, using a hot and well-tinned iron.*

Careful measurement in various radio laboratories and commercial short-wave receiving stations, have proven that the vertical type of antenna is definitely superior to any other type heretofore used, for general short-wave reception. The idea, of course, is to get it as high as possible and keep it in the clear. A good length for an antenna of this type would be about 40 feet long. If it is impossible to run the antenna directly into the receiving location either a twisted-pair, or better still a Lynch transposition block lead-in, can be used to link the antenna with the receiver. If the coupling device were used on this receiver, the best plan would be to mount a 10 turn coil directly in back of the grid coils so that as each coil was brought around into position, it would be directly in line with the antenna coil.

Parts List For Triplex

1—.00014 or .00015 mf. tuning condenser. National (Hammarlund; Cardwell).
1—50.000 ohm potentiometer. Acratest.
1—15 to 200 meter coil and switch assembly.
1—6-prong wafer socket. Na-ald.
1—5-prong wafer socket. Na-ald.
4—binding posts.
1—35 mmf. antenna trimmer condenser. National (Hammarlund).
1—.0001 mf. mica condenser.
3—.01 mf. by-pass condensers.
1—.00015 mf. mica condenser.
1—100,000 ohm (1 watt) resistor. Lynch
2—250,000 ohm (1 watt) resistor. Lynch.
2—250,000 ohm (½ watt) resistor. Lynch.
1—2 meg. (½ watt) resistor. Lynch.
1—drilled metal chassis. Try-Mo Radio.
1—National Vernier dial (small).
1—36 tube RCA Radiotron Co. (Arco).
1—79 tube RCA Radiotron Co. (Arco).

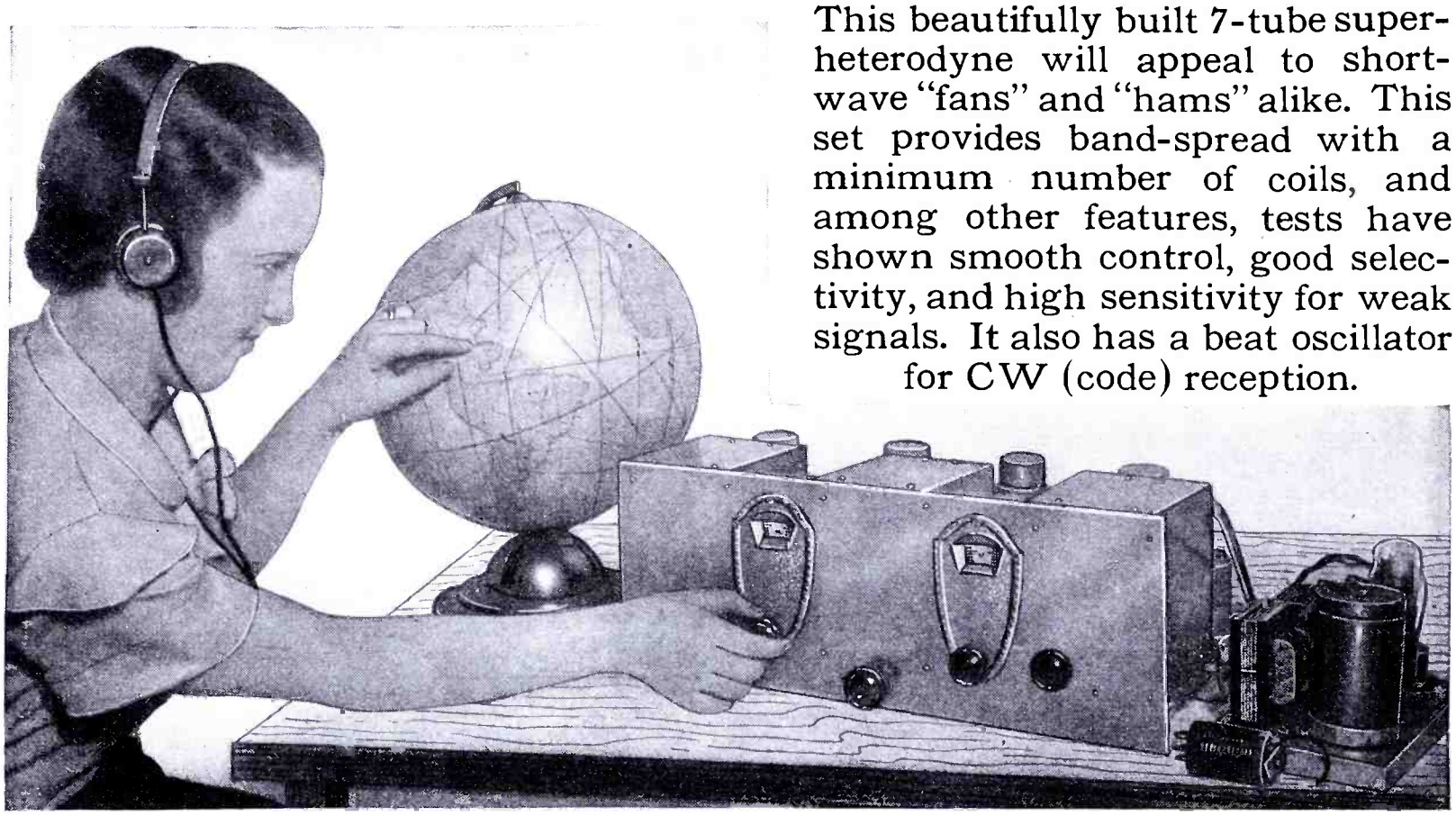
Alden 4-Pin Plug-In Coil Data

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"

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

Name and address of "Switch-Coil" Assembly manufacturer furnished upon receipt of stamped and addressed envelope.

This beautifully built 7-tube superheterodyne will appeal to short-wave "fans" and "hams" alike. This set provides band-spread with a minimum number of coils, and among other features, tests have shown smooth control, good selectivity, and high sensitivity for weak signals. It also has a beat oscillator for CW (code) reception.

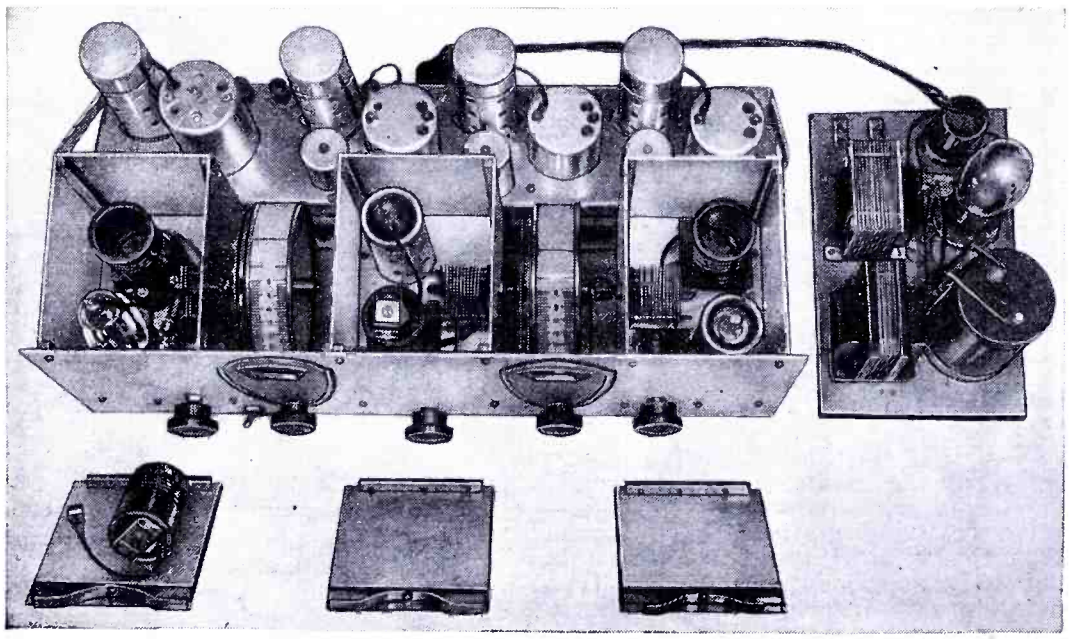


A good-sized globe is very essential as an aid in locating the stations in far parts of the world as they roll in on this 7-tube "Globe-Girdler" superhet. Yes, it has "band-spread" features and a "beat oscillator" for CW reception.

Globe-Girdler 7

By E. KAHLERT

● THE super-heterodyne receiver, long a luxury, now becomes almost a necessity for operation on the various amateur bands. Every year there has been a considerable increase in the number of amateur stations which are active on any one of the four amateur bands from 20 to 160 meters. This rapid increase in active stations has resulted in extreme crowding and calls for a very selective and sensitive receiver. It has long been the desire of the writer to possess a superheterodyne receiver that was really smooth in operation and would give a minimum of background noise. Much experimenting was done on the several sets built, in order to fulfill this desire. In each case it was found necessary to add a stage of tuned radio frequency to be operated ahead of the first detector in order to minimize the liability of image response. While image is not *absolutely* eliminated it is reduced to a value which is not at all objectionable.



With a little care you can build as fine a set as the one here shown and the highest compliments are due Mr. Kahlert for his beautiful workmanship on this 7-tube superhet.

It was found that with two stages of I.F., intermediate frequency, plenty of by-pass condensers were needed in order to reduce feed-back (regeneration) in these stages to a point where full gain of the tubes could be realized without unpleasant reaction. Due to the fact that no audio amplifier of any kind was included in this set it was necessary to have two stages of intermediate frequency amplification. However, if a stage of audio was used it is quite possible that one stage of IF would suffice, but with a somewhat lesser degree of selectivity and sensitivity.

The final set uses one 58 TRF, 57 first detector, 57 or 58 oscillator, (whichever is available), two 58 IF stages, 56 second detector (to permit "cans" without an audio stage, which could only be used by people with "cast iron" ears. The ears take a mighty walloping indeed as it is, with the volume control wide open. A 57 or 58 beat oscillator completed the picture. A 57 is the best first detector to use and will give good response to weak signals.

Capacity coupling is used between the oscillator and first detector. Condenser reactance increases as the frequency becomes higher and this raises the sensitivity of the set on the shorter wave lengths, without impairing operation on the lower "short waves" frequencies.

The oscillator is tuned by a 20 mmf. midget condenser and the 80 meter os-

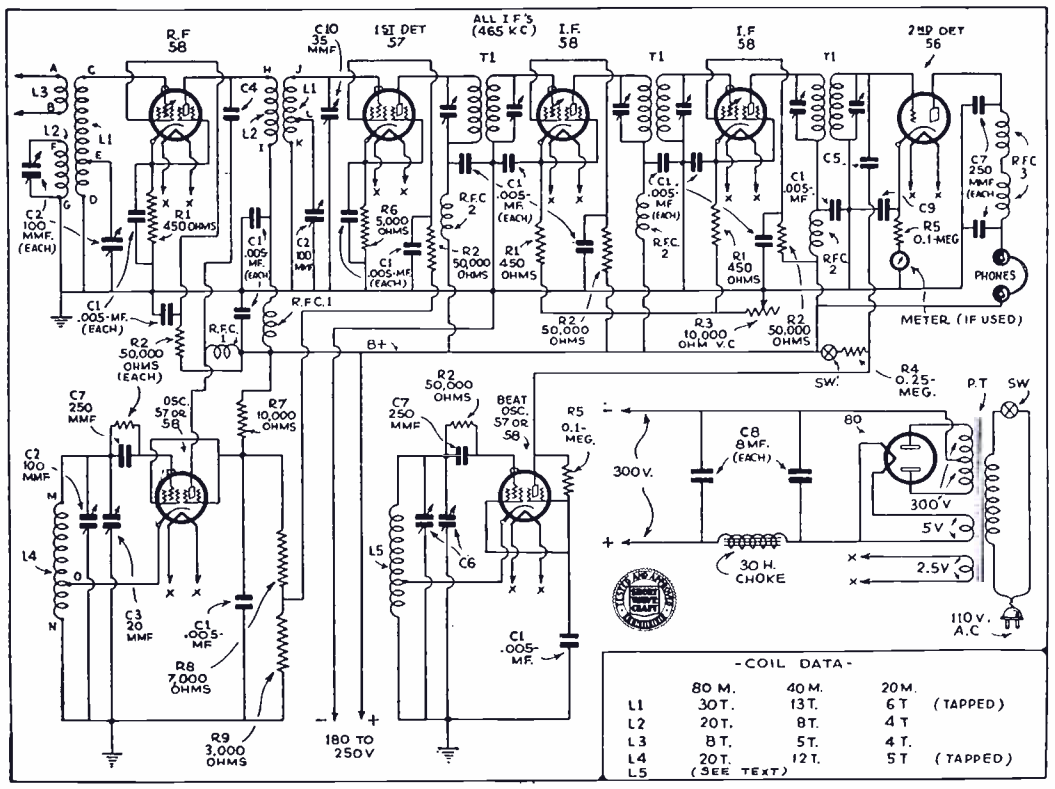
cillator coil can be used on all bands similar to frequency meter usage, but band-spread will be increased by using the fundamental of the oscillator on each band. The condenser used to couple the oscillator to the first detector is approximately 5 mmf. and consists of 5 inches of twisted push-back hook-up wire rolled up after being soldered to a wire "mount" consisting of three soldering lug terminals on a piece of fiber, one being grounded when the "mount" is fastened to the chassis by a screw.

The RF chokes and IF transformers should be good ones. The chokes arrived at were found the best possible and the IF transformers used have large coils and the smallest padding condensers conveniently possible. It is admitted that mica is inferior to air for dielectric but if one manages to use a minimum of mica in the padding condensers, i. e., two plates separated by one sheet of mica, there will be approximately one-fourth the possible variation where four plates separated by two sheets of mica are used. There is no sense in deliberately courting error by using large mica condensers. Examination of several varieties of mica tuned transformers will confirm this conclusion. The IF tubes are run at rather high plate and screen voltages with high bias to limit the plate current to normal and to provide greater gain without the liability of reaction.

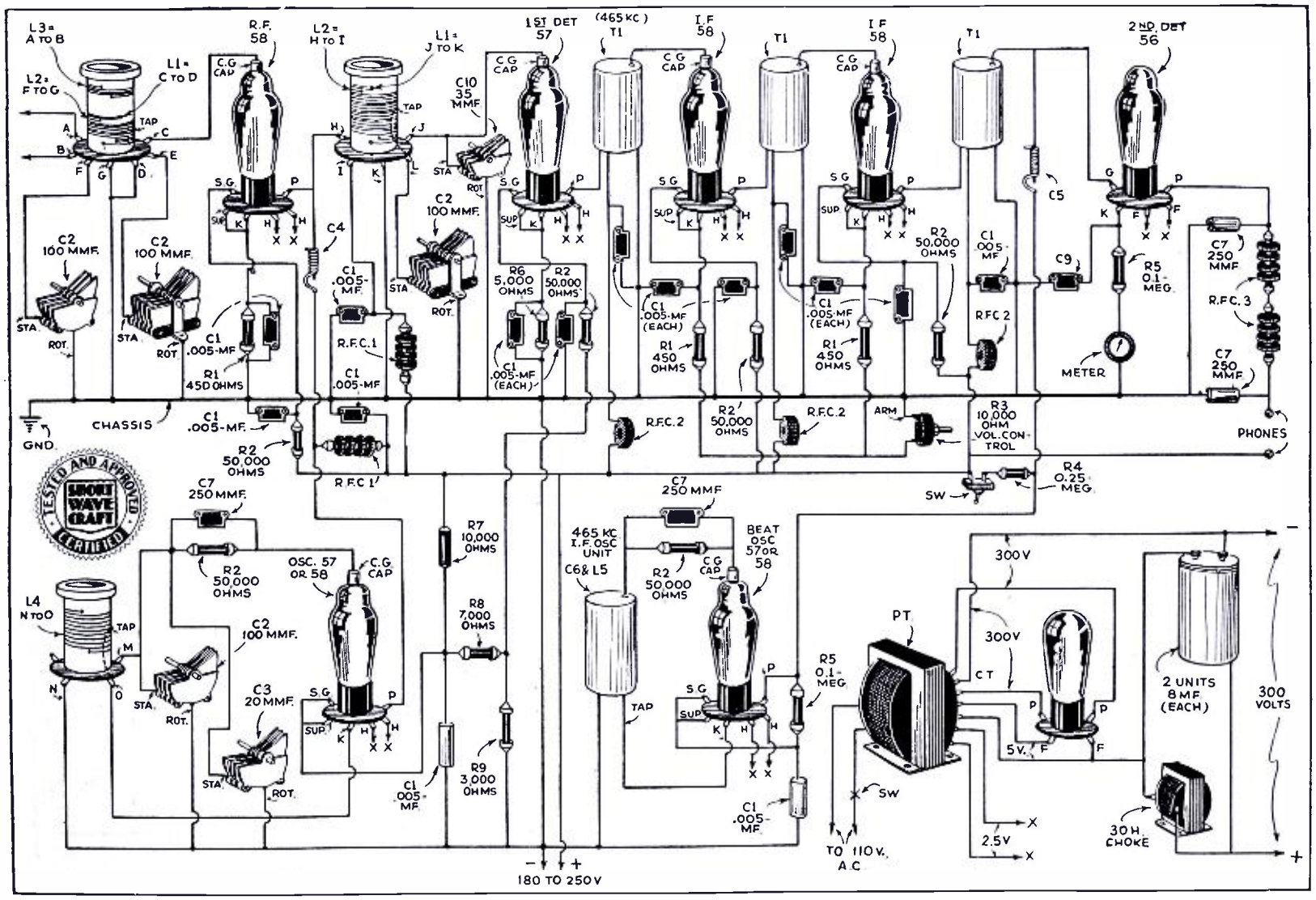
The best oscillator plate lead, shielded except for about one and one-quarter inches on one end, is coupled to the grid of the 56 detector by wrapping the unshielded portion around the grid lead of the 56 2nd detector. This method of coupling is very effective and the strongest C.W. signal can be heterodyned.

All by-pass condensers should have the shortest leads possible to make the by-passing most effective and all ground leads are connected with push-back wire. If "George Chassis" is left to do it, it will be done in poor fashion. The by-pass condensers do not necessarily have to be mica. A good grade of paper condenser .005 mf. or larger, will

(Continued on page 628)



Wiring diagram for the "Globe-Girdler 7"—a superhet with all the latest "doo-dads."



Picturized wiring diagram for the "Globe-Girdler 7"—You will experience no difficulty in building this handsome receiver by following this diagram.

Stability in Receivers

By CURTIS E. MALSBERGER

● THE problem of stability is one that requires careful thought in the design and construction of any short-wave receiver whether it be of one or ten tubes. Yet—with a clear conception of the points envolved, the solution to this problem becomes comparatively easy of attainment.

In our short-wave receivers we are dealing with signal energies that are extremely feeble, and we cannot afford to lose even the slightest amount of this energy. This means that this signal energy must be confined to that part or parts of the circuit wherein the most good is accomplished and kept out of all other portions of the receiver. Furthermore, it is important that each part of the circuit that is in the path of this radio-frequency signal energy should be really efficient in fulfilling its particular duty. Therefore it is important that each part be of good construction, have low losses, etc.

Below are listed several rules that are highly important in building a stable and efficient short-wave receiver.

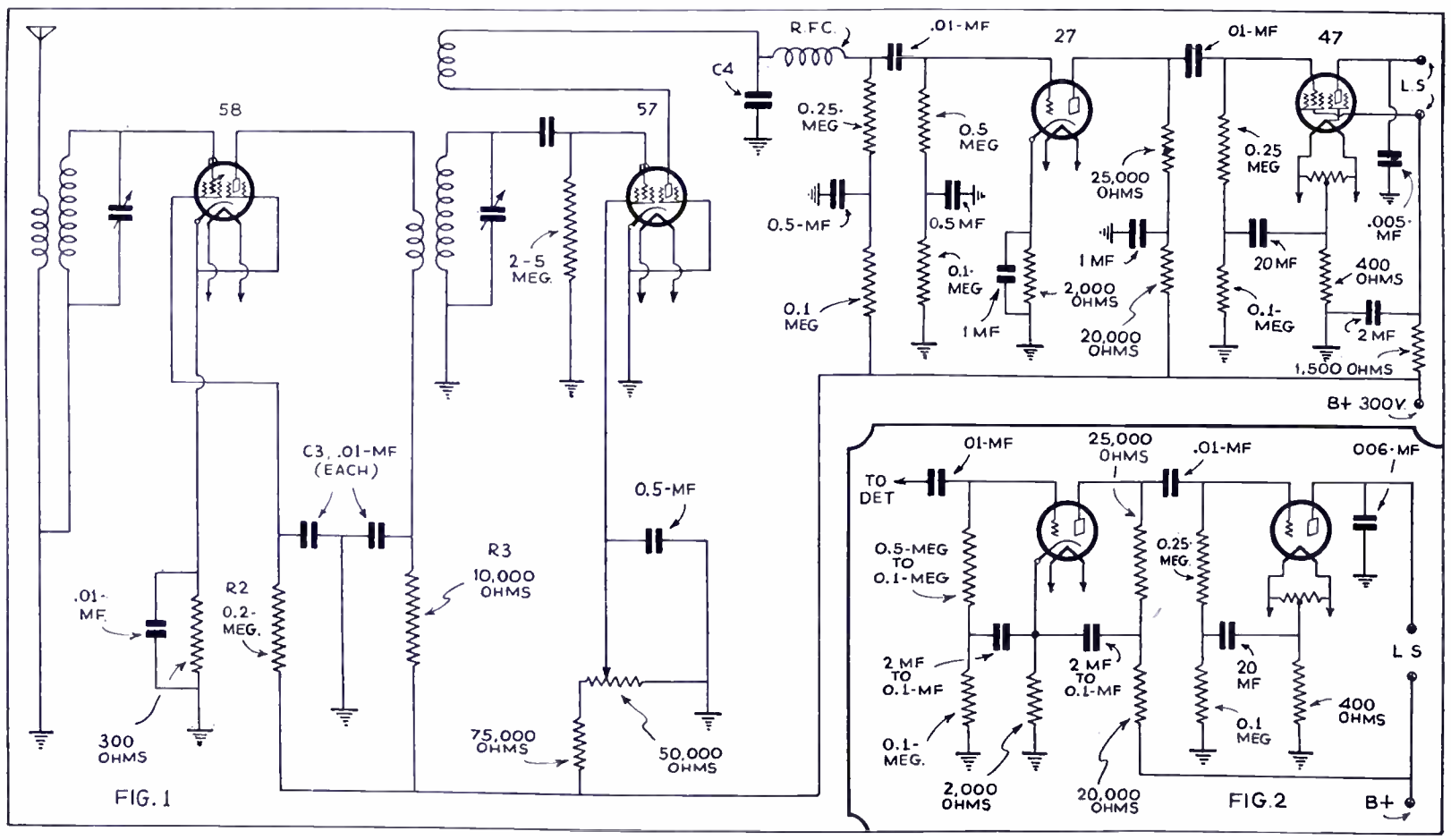
Use Best Quality Parts

First of all, use only the very best of available tubes and parts throughout. There is a decided advantage in the use of such good parts as isolantite coil-forms and sockets, isolantite insulated variable condensers, mica-type bypass condensers, etc., etc. These advantages are particularly noticeable by direct comparison when operating the receiver on the higher frequency bands below 40 meters. As an illustration of this the writer cites the case of a short-wave receiver with which satisfactory reception was to be had on anything over 20 meters. However, it was impossible to make the detector regenerate below 20 meters. Numerous ideas were tried to eliminate this defect but with only indifferent success. Finally, isolantite coil forms and sockets were substituted and thereafter the regeneration proved quite effective even on wave-lengths as low as 10 meters and less.

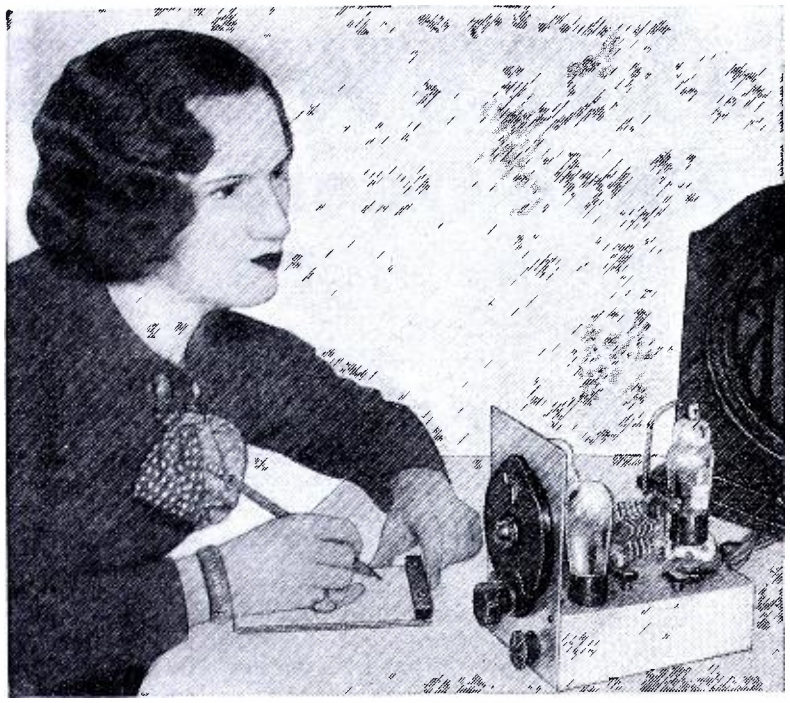
Out of thousands of experiments conducted by Mr. Malsberger he here gives you the "boiled down" essence of his extensive researches. No other subject is of more interest to short-wave "fans" than that of "Stability." No matter how cheap the parts used or how small the set, if it is "stable"—that is the important feature.

After the selection of parts, the next important problem is the proper placement of these parts on the chassis. No set rule can be given here, as the lay-out for every receiver is, of course, dependent upon the type of circuit and the size of the individual parts employed. However, a good rule to follow in all cases is that the parts should be so placed that all connecting leads, particularly all grid and plate leads, are made as short as possible. This can usually be successfully accomplished after a bit of juggling and the only difficulty that may be encountered lies in a chance that the fields about the various parts may interact with those of other parts. This can be avoided by spacing the parts affected at a greater distance, or, of course, by the use of metal shielding. However a receiver can be properly shielded and yet a great deal of inter-reaction, or feed-back, may occur. This is usually the result of some of the radio-frequency energy finding its way through the power-supply from the circuit of one tube to that of another. This form of feed-back must be eliminated if a stable receiver is desired, and there are several ways of accomplishing this. In the first place, each individual tube circuit can be completely isolated (in so far as the radio frequency energies are concerned) from the power-supply by the inclusion of suitable chokes and condensers. This method usually works out quite successfully in the radio frequency portion of the receiver; however, difficul-

(Continued on page 626)



The large diagram, above, Fig. 1, shows the complete short-wave receiver as described by Mr. Malsberger, the line-up including a tuned R.F. stage, regenerative detector, and two resistance-coupled A.F. stages. The smaller diagram shows improved resistance-coupled A. F. amplifier.



This 5 meter super-regenerative receiver is exceptionally easy to tune and on this high frequency, the signals are practically free of any background noise.

An Improved 5 Meter Super-Regenerative Receiver

By GEORGE W. SHUART, W2AMN

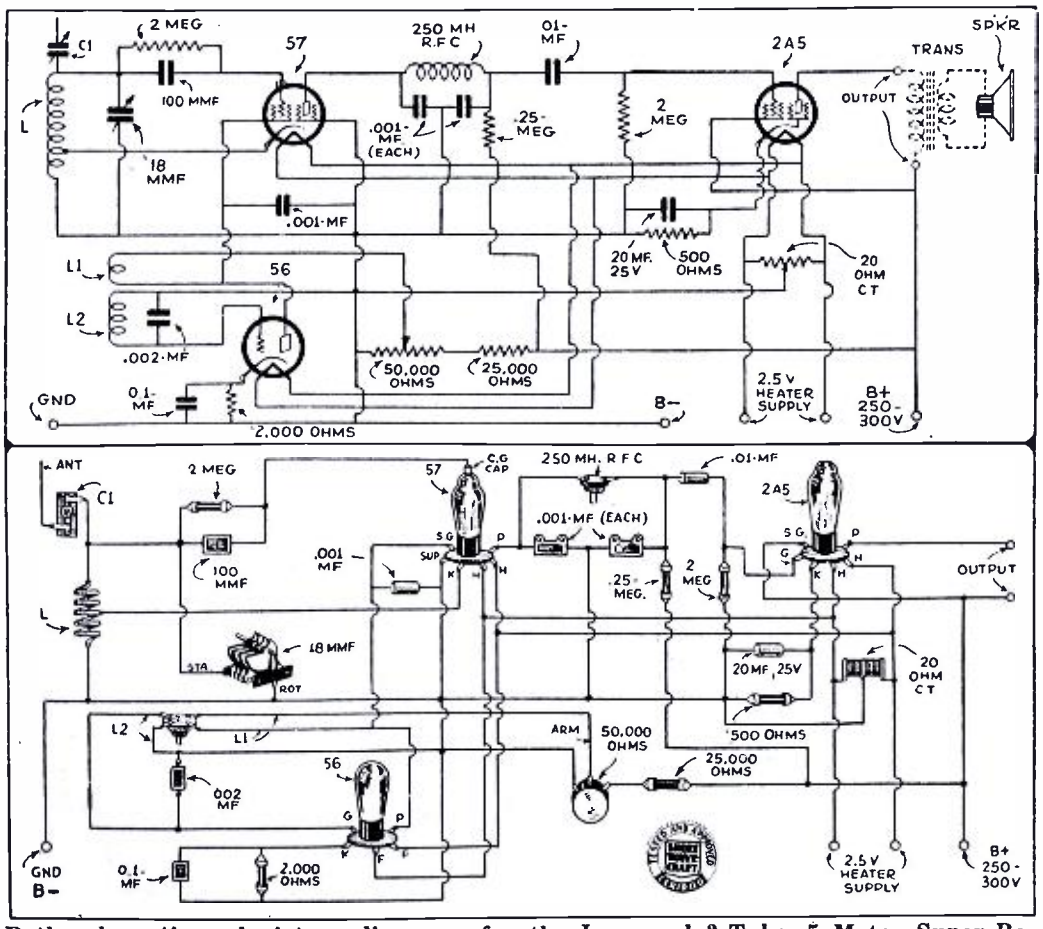
The most popular receiver for use on the 5 meter band is probably one using about three tubes and capable of giving loud-speaker results when desired. The circuit described has been thoroughly tested in practice and gave strong loud-speaker reproduction on the 5 meter signals.

● THE five meter super-regenerative receiver, as most everyone will admit, can stand plenty of improvement. It is the purpose of this article to introduce changes that can be made in our present receivers.

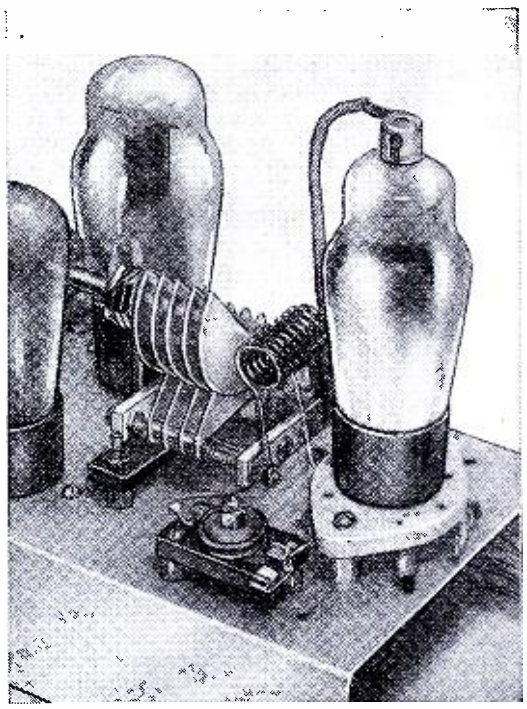
All other types of short wave receivers have been adapted to use the new style tubes and there is no reason why they should not be used in our ultra high frequency sets.

The set described here normally used a triode detector, the same as was used in the original receivers born about 3 years ago. In the first place the type 57 tube has been found to be the most satisfactory detector tube for SW receivers and it is excellent for use in electron-coupled circuits. Furthermore it oscillates in very stable fashion far below 5 meters. It is possible with this tube in the so-called electron-coupled circuit to use *parallel tuning*, which gives a very marked degree of selectivity. This is sorely needed because every evening brings new stations on the 5 meter band and it will only be a short time until there will be great difficulty in working *duplex*. And when duplex is no longer possible, the greatest pleasure of this band will have passed.

Another thing we need in 5 meter receivers is controllable regeneration in the detector. If we have a detector that operates stably enough to allow the regeneration control to be set to a point just below the oscillating point, there will be a marked increase in sensitivity and a vast decrease in the background noise caused by super-regeneration. With the circuit shown in the diagram it is possible to adjust the regeneration control to a point where the hiss is reduced to a level comparable to that produced by an ordinary tuned R.F. receiver, operated on any of the lower frequency bands. With this low hiss level it is possible to bring in and understand stations that would otherwise be completely "blanketed" by the hiss in an ordinary receiver.



Both schematic and picture diagrams for the Improved 3-Tube, 5 Meter Super-Regenerative Receiver are shown above.



A close-up of the 5 meter super-regenerator.

The Question of Interruption Frequency

In a circuit where we have increased sensitivity, it is possible to use a much higher interruption frequency and so obtain much better quality. Using a higher frequency does not reduce the audio volume level to any great extent, so far as can be determined by the

(Continued on page 623)

Practical Answers
To Common Short-Wave Questions

By C. E. DENTON

Many of your short-wave problems can be solved by carefully studying the answers to the various questions here discussed. Mr. Denton, an outstanding short-wave expert, is well known to our readers for the many sets built and described by him in previous issues.

● IN THE light of the hundreds of letters received by the writer it seems that many simple points in short wave receiver construction are often overlooked by the set builder. These details properly carried out tend to insure the success of the short wave receiver and at no real additional cost except the effort of thought.

Connections Through Chassis Bad

A common fault in the construction and wiring of short-wave receivers will be found in the lack of connections between the rotor plates of the tuning condensers and their associated tuning coils. In Fig. 1 A, note that the circuit between the tuning coil and the tuning condenser is made through the chassis. A real loss of sensitivity and selectivity can be caused by such methods of connection. Never depend on the metal surface of a chassis for conducting high frequency currents. Note the resistance R in Fig. 1A; here losses are in the tuned circuit itself resulting in reduced efficiency, and also serving as a common coupling impedance source to other high frequency amplification circuits.

In Fig. 1B, the low potential end of the coil, the rotor plates of the condenser are connected together with the same type of wire that is used to wire the rest of the set and the lead from the tuned circuit goes to the grounded end of the cathode bias resistor, or the filament of the tube (as the case may be). This results in increased efficiency and all at the expense of a few inches of wire. Treat a metal chassis as though it were a nonconductor, the same as bakelite and always run wires for all connections.

Fringe Howl Elimination

Fringe Howl is often mentioned by set builders and as often never corrected. If your receiver is of the regenerative type and the detector tube is transformer coupled to the first audio frequency stage, note if the detector tube howls as it is thrown into oscillation. This howl is so objectionable that signals cannot be heard and the full benefit of regenerative amplification cannot be obtained. In cases such as this place a resistor having a value of 75,000 ohms or greater across the secondary of the audio transformer as shown in Fig. 2. Try different sizes across the secondary selecting a final value that will not reduce the audio amplifying ability of the transformer but still removing the blocking effect of the Fringe Howl. The resistor can be of the half watt size and with the general run of audio frequency transformers will have a value around 100,000 ohms. Resistor indicated at R.

The new 2A7 or 6A7 tube, known as a pentagrid converter is the answer to many set-builders' desire for fewer tubes. Many readers of this article will remember the story about the four tube super-het in the March issue of SHORT WAVE CRAFT; here is an ideal place for this tube and the reader will find this circuit revamped in Fig. 3.

Different values have been given to many of the parts due to the changes in the circuit altho the set-builder will have but little trouble in fitting most of the old material of the original set into the circuit.

Remember that the 2A7 and the 6A7 tubes require a small size 7 prong socket and that they will not fit into a socket that will fit the 59 type tube. The base connections of this combination type of tube will be found in Fig. 4. Much smoother and surefire results can be obtained from this tube layout as compared with the first circuit and this is due entirely to the improved operating performance of this pentagrid converter tube.

"Tracking" Superhets

Many set-builders have trouble with short-wave superhets when it comes to getting oscillator tuning coils so that they will line up and *track* with the antenna or detector tuning coils and condensers. This problem faces the constructor of the set in Fig. 3. One simple way to handle this situation, especially when the antenna and the oscillator tuning condensers are on the same shaft, follows:

Following the circuit of Fig. 5 open the oscillator tuning circuit at X and connect a condenser having the same value (140mmf) as the oscillator

(Continued on page 618)

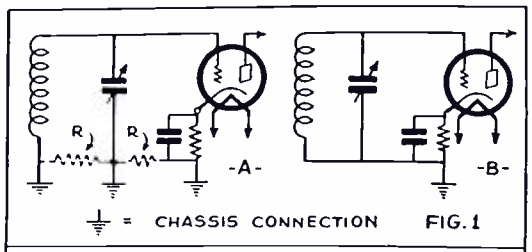


FIG. 1

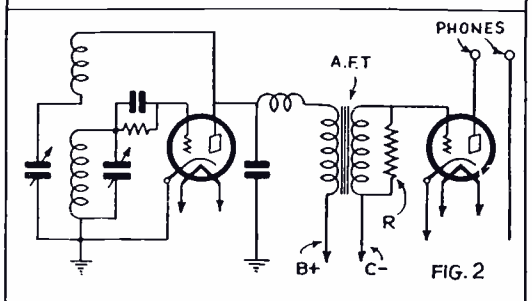


FIG. 2

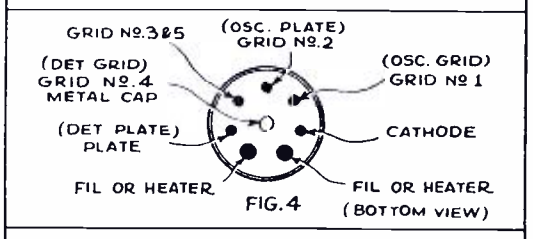


FIG. 4

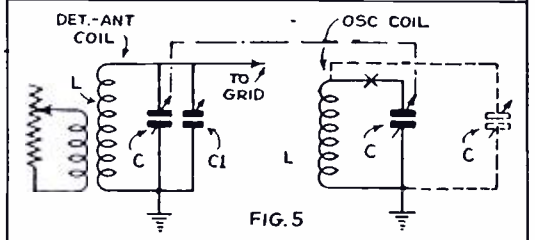


FIG. 5

L-L 80-200 METER PLUG-IN COIL
C-C 140 MMF. (.00014-MF.)
C1 = 35 MMF. (.000035-MF.)

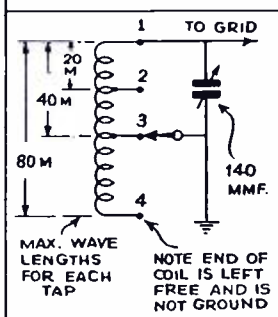


FIG 6

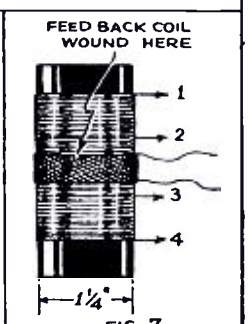


FIG. 7

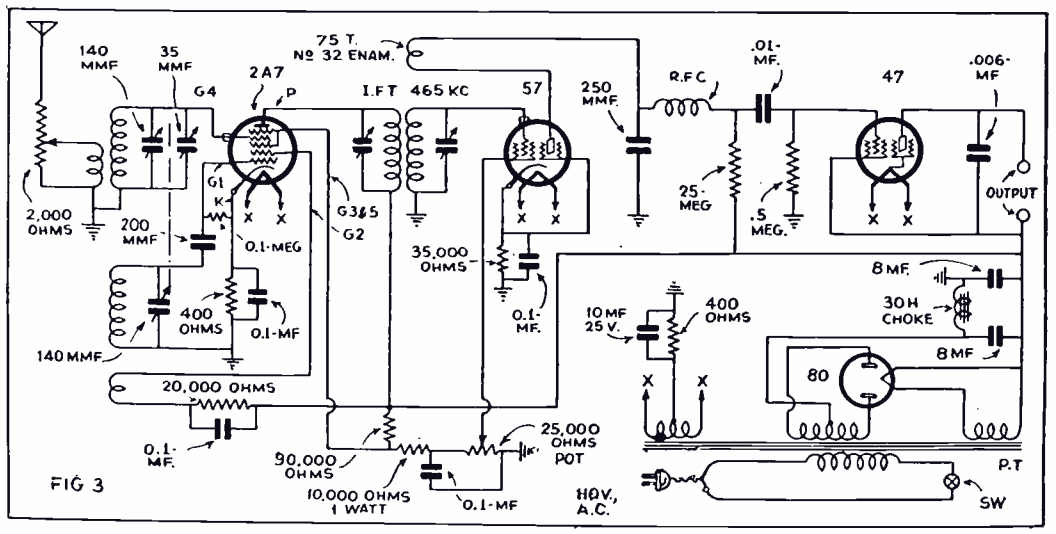
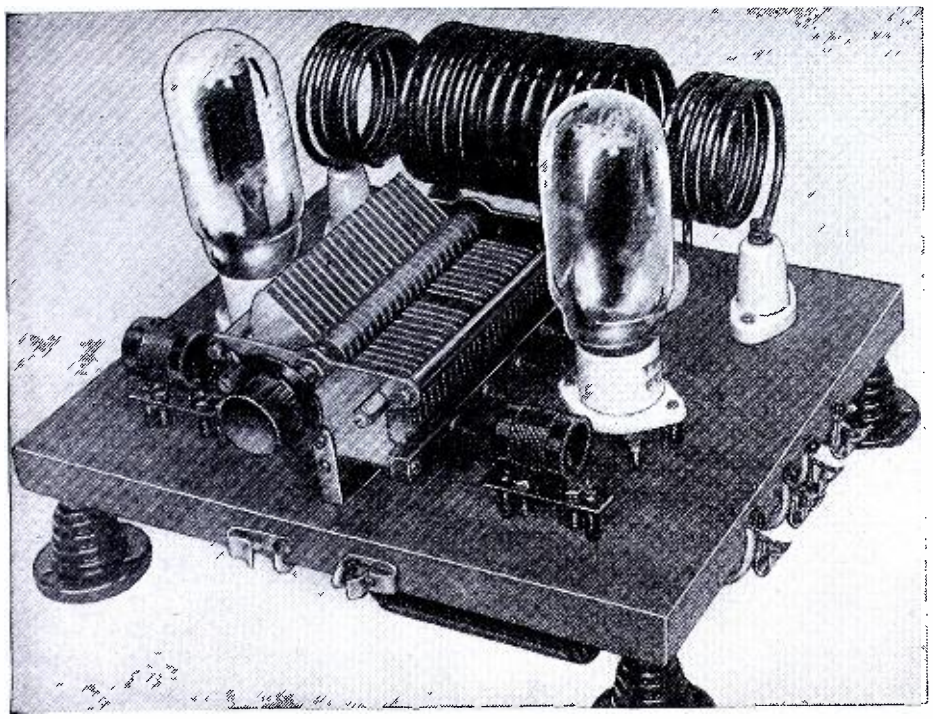
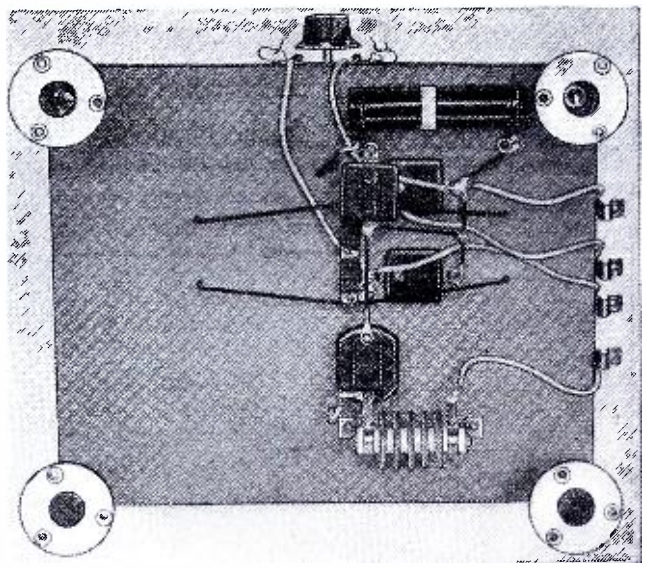


FIG 3

The diagrams, above, Figs. 1 to 7, inclusive, illustrate a number of interesting problems which Mr. Denton discusses in the accompanying article. Fig. 3 shows an improved 4-tube superhet circuit.





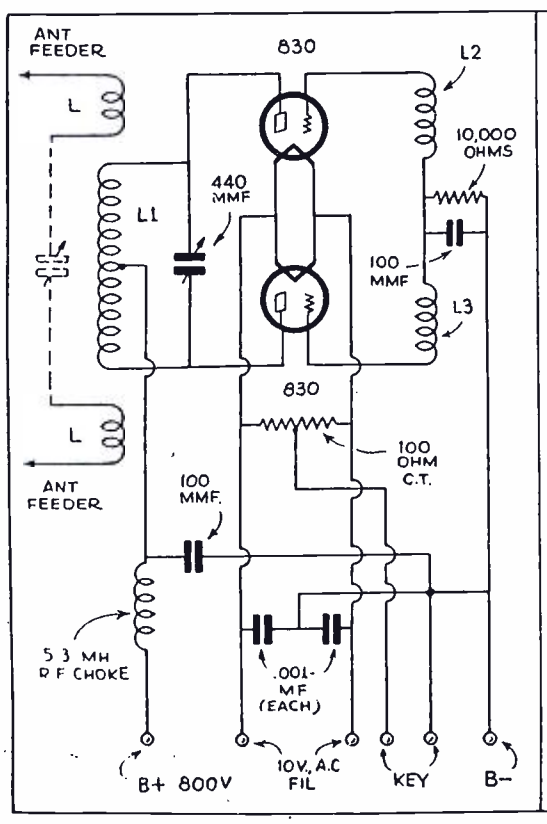
Note the unusual as well as convenient layout of parts, which permits the use of a panel arrangement.

A Medium Power Transmitter
Using New Type Tubes

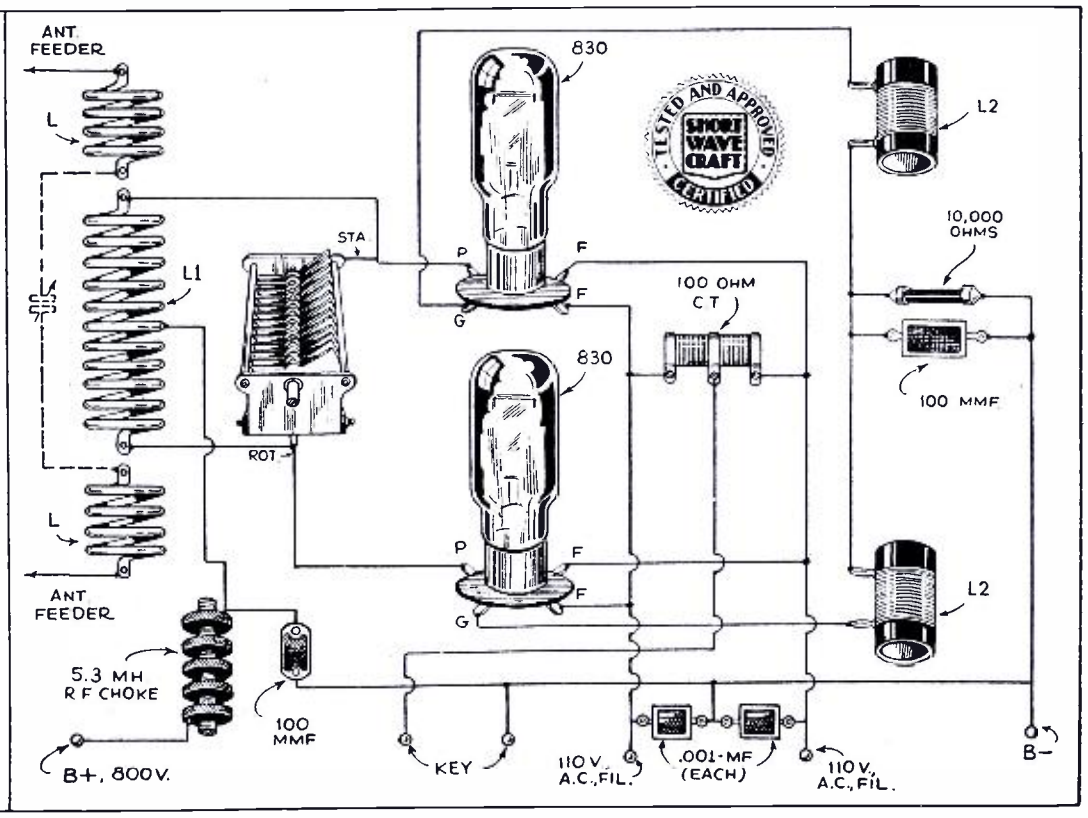
● THE average conversation between two newly acquainted amateurs starts off something like this: "How many watts do you get out of your 210's and how red do the plates get?" These words must have been ringing in the tube manufacturers ears and prompted them to put out new tubes having an output rating that is somewhere in between the 210 and the 50 watt (03A) tube. The tubes used in this transmitter are the new type 830, having an output of approximately twice that obtained from the average 210 type tube. This tube does not work with the same voltages as the 210 and therefore one would naturally expect the output to be somewhat higher. The writer has used the type 830's over a period of several months, with 800 volts on the plates, and the transmitter has emitted an extremely *steady* and *pure* signal. Due to the construction of the tube, together with its graphite plate, creeping — formerly caused by displacement of elements during changes in temperature of the tube, have been reduced to a minimum. In forming the layout used in this transmitter, a special effort was made to place the parts so that a panel could be mounted in the front of the base. The usual *push-pull* layouts do not permit the use of a front panel and still maintain a symmetrical appearance. The tuning condenser is always mounted over to one side or the other and never directly in the center of the panel. By mounting the two tubes on either side of the tuning condenser, as shown in the photograph, it was

(Continued on page 639)

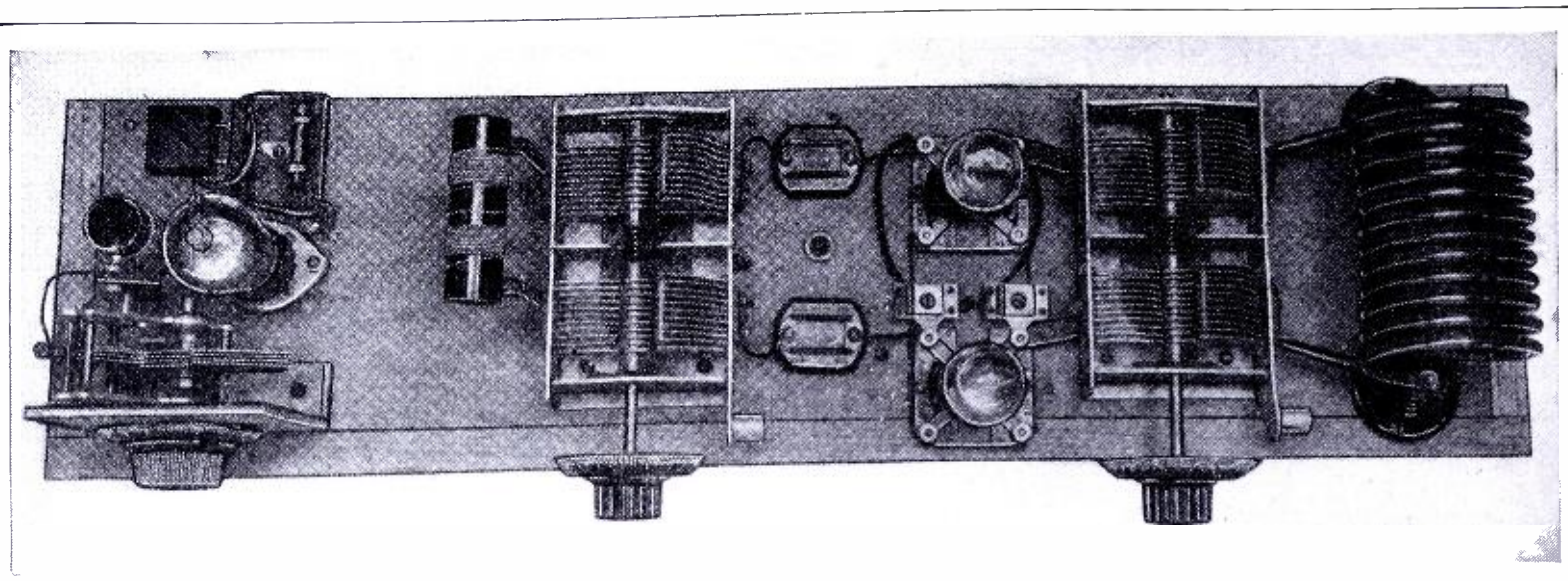
This transmitter provides all that anyone could ask for in the line of power and it is capable of producing a very clear and steady signal. Next month we will describe a suitable "power supply" for this transmitter.



The above diagram clearly shows all connections, also values of the various parts.



Pictorial diagram clearly shows the construction of the plug-in grid coils and other components.



Top View of Mr. Montgomery's "dry cell" Transmitter.

650 Miles on 1.5 Watts!

A Low-Powered Transmitter Employing the Crystal Controlled Dynatron Frequency Multiplier

$20 Prize Winner — **for November**

By BERNARD MONTGOMERY, W2AJD-W2BXS

● ONE bright morning in the early part of the summer of 1932, I sat on the porch of my cabin situated on an isolated lake in the mountains back of West Point, New York, listening to the European broadcasts on 19 meters. It was an ideal receiving location. The nearest electric light wire was two miles away. The closest telephone was one and a half miles distant. Even the road, with its automobile ignition interference was a good mile off. Combined with this freedom from man-made static was a naturally ideal spot for radio reception, seven hundred feet above sea level on the shores of a lake. So I had well-nigh perfect reception of the European short-wave stations at all times.

This morning of which I am speaking, I was interrupted by a rider on a motorcycle bringing me a telegram which he would not hand over until I had given him two dollars, which, he said, was the charge for delivering telegrams "to the top of Pike's Peak." And when I read the telegram and found my associates had been frantically trying to reach me for two days, I began to think that such isolation was not so good. As it was impossible to get any means of communication with the outside world without building a mile and a half of telephone line at my expense, my thoughts turned to amateur radio.

Could a transmitter be built from the parts available which would provide reliable communication with my home station fifty miles away? As I looked the situation over, I found plenty of parts but little in the way of a power supply. There were only four dry cells and three medium sized "B" batteries which provided power for the receiver. Could a transmitter be built around the type '30 two volt tubes? And would it cover the distance at all times?

With this question running through my mind, a push-pull tuned plate-tuned grid transmitter was hastily constructed with two of the type '30 tubes drawing two watts input on the 135 volts of "B" battery available. A trip to town was made and telegrams sent arranging "skeds" on 80 meters for that evening with W2CIF, twelve miles away, and W2BFB, at home in Westchester County.

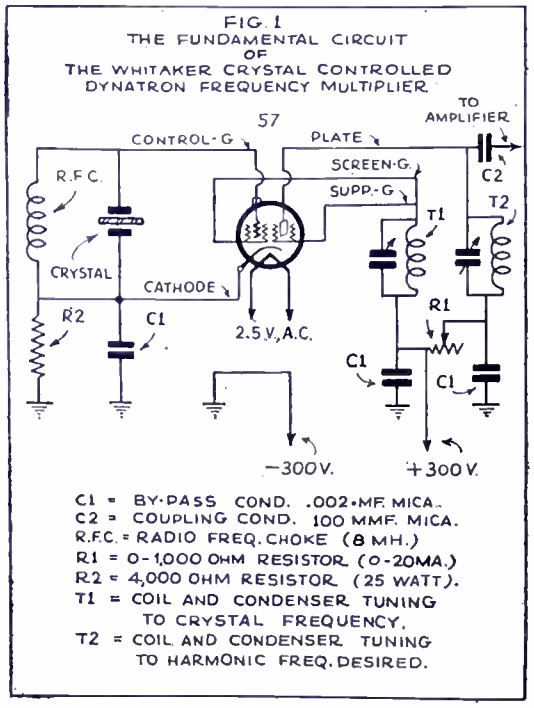


Fig. 1—The new "Whitaker" Dynatron Frequency Multiplier Circuit, as arranged for a type 57 tube.

That evening *contact* was quickly made with W2CIF and he told W2BFB exactly where to look in the crowded band for my signals. [My portable license covered the operation under the call W2BX anywhere within the State of New York.] While the signals at 50 miles were strong enough, the stability was not constant enough for W2BFB to read easily on his very selective "Hammarlund Comet Pro" receiver. Whenever a puff of wind would start the antenna swinging, the signals would be unreadable. One evening of operation convinced us that the first requirement of a "low-power" signal was *absolutely constant frequency* to enable it to be handled on high-grade modern receivers.

About this time I began to wonder if the Whitaker crystal-controlled dynatron frequency multiplier, used for quite a while at the home station with great success, could not be applied to a type '32 tube and provide the needed stability. This circuit was the result of extensive research work carried on by Mr. James N. Whitaker at his radio laboratory at W2BFB. As used with a type '57 tube, the circuit is as shown in Figure 1. The circuit is seen to be a dynatron oscillator, the frequency of which is controlled by a quartz crystal. The tank circuit, T1, is tuned to the fundamental frequency of the crystal, and the two grids, the suppressor and the screen, act as a plate to keep the crystal oscillating weakly. Because the amount of radio frequency current passing through the crystal is unusually small, practically no heat is generated in the crystal and a greater degree of stability is obtained than with the conventional oscillator. The tank circuit, T2, is now tuned to any desired harmonic of the crystal frequency and the voltage on the plate reduced by adjusting R1 until dynatron oscillation commences. It will be found that these oscillations are definitely controlled by the crystal frequency, but receive their power from

the dynatron action. Thus the output is usually greater than the same tube used as a conventional crystal oscillator. Using a 160 meter crystal, the tank, T2, can be tuned to either 80 or 40 meters and sufficient output obtained to properly excite a type '10 amplifier. The rest of the circuit is conventional. Grid bias is obtained through a cathode resistor and fed to the grid through a suitable radio frequency choke. The cathode resistor, R2, is 4000 ohms. The usual by-pass condensers are inserted. Crystals normally poor oscillators will be found to be entirely satisfactory in this circuit, since so little power is demanded from the crystal.

Two interesting observations about this circuit might be given. Because the dynatron circuit, T2, will oscillate strongly on many harmonics, great care must be taken to select the correct one. The only trouble encountered thus far with this circuit among a number of amateur users has been due to selecting the wrong harmonic. With the 160 meter crystal, for instance, the 80, 60, and 40 meter harmonics are equally strong. If the tank, T2, is tuned to 60 meters by mistake, it will excite the following tube slightly on either 80 or 40 meters; but such operation results in insufficient excitation, tubes running hot, and other troubles. The only safe way is to use an absorption type wave meter or coils and condensers of known calibration.

Mr. Montgomery here describes one of the most efficient, extremely low-power, yet far-reaching, transmitters we have ever seen. The circuit is a brand new one—the Whitaker-crystal—controlled dynatron frequency multiplier. This transmitter employs a push-pull amplifier and it is extremely easy to build and tune; instructions are given for neutralizing the push-pull amplifier.

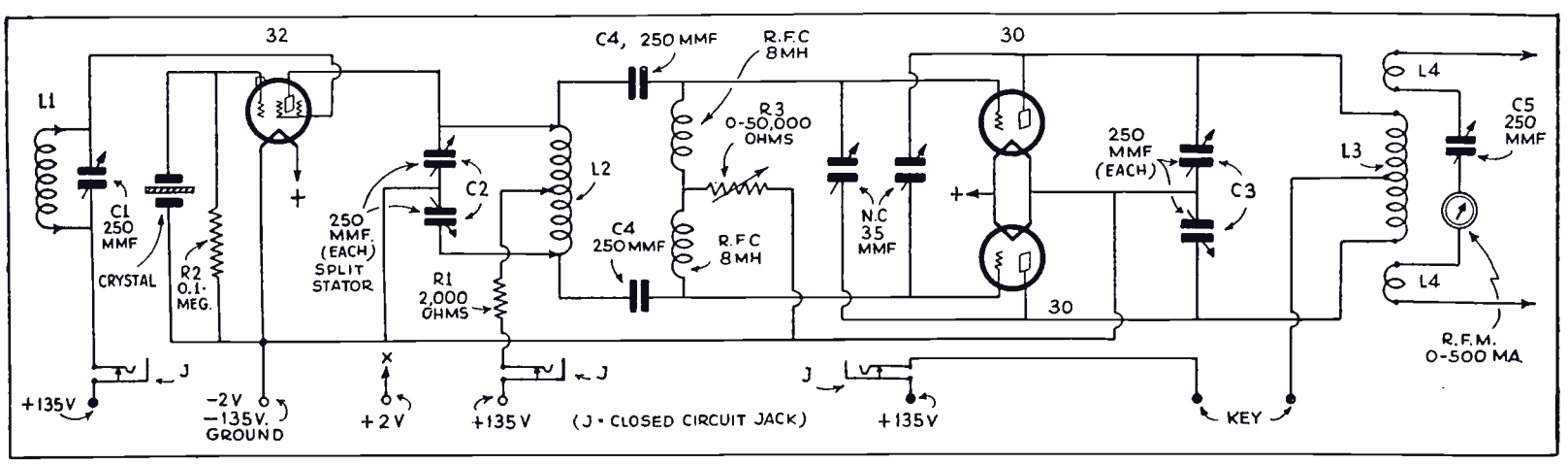
As the higher frequencies are approached, the dynatron action diminishes and the output falls off. On 20 meters the output is considerably less and on 10 meters is practically gone. The best way to operate this circuit on the higher frequencies is to use one type '59 tube as a doubler to increase the output on 20, 10 and 5 meters.

Because of the great stability of this oscillator and its greater output through dynatron action and the possibility of operating on several bands with one crystal, it was decided to incorporate it with a type '32 tube into a "low-power" set. The Whitaker oscillator was added to the original push-pull set and the result is shown in Figure 2.

There were a few changes made in the oscillator circuit to adapt it to the two volt D.C. tube, type '32. Grid bias was obtained through a 100,000 ohm grid-leak placed across the crystal [R2]. The screen-grid tank circuit, L1C1, is tuned to the crystal frequency with as low "C" as possible. A split stator condenser is used in the plate circuit, C2, and this does away with the usual by-pass condenser. The rotor is grounded, and the two stators are connected to either end of the plate coil, L2. The plate voltage is fed to the center tap of this coil through a dropping resistor, R1, to secure dynatron action. 2000 ohms was found to give good results in this circuit. In the plate circuit also, as low "C" as possible was used, winding enough turns on L2 so that resonance could be found with very little capacity.

The push-pull amplifier is conventional with certain modifications for the type '30 tubes. The grids are excited through two .00025 Mf. mica condensers, C4. The grid bias is ap-

(Continued on page 633)



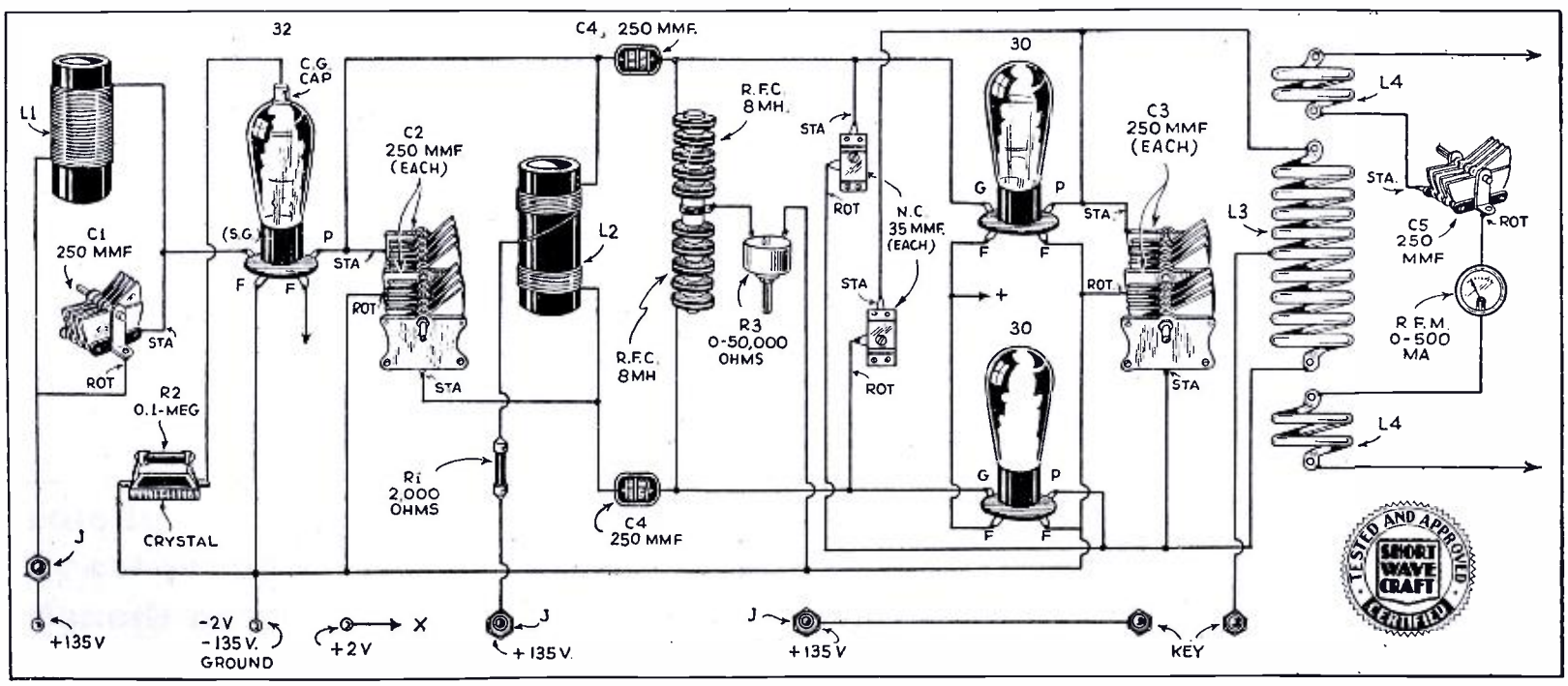
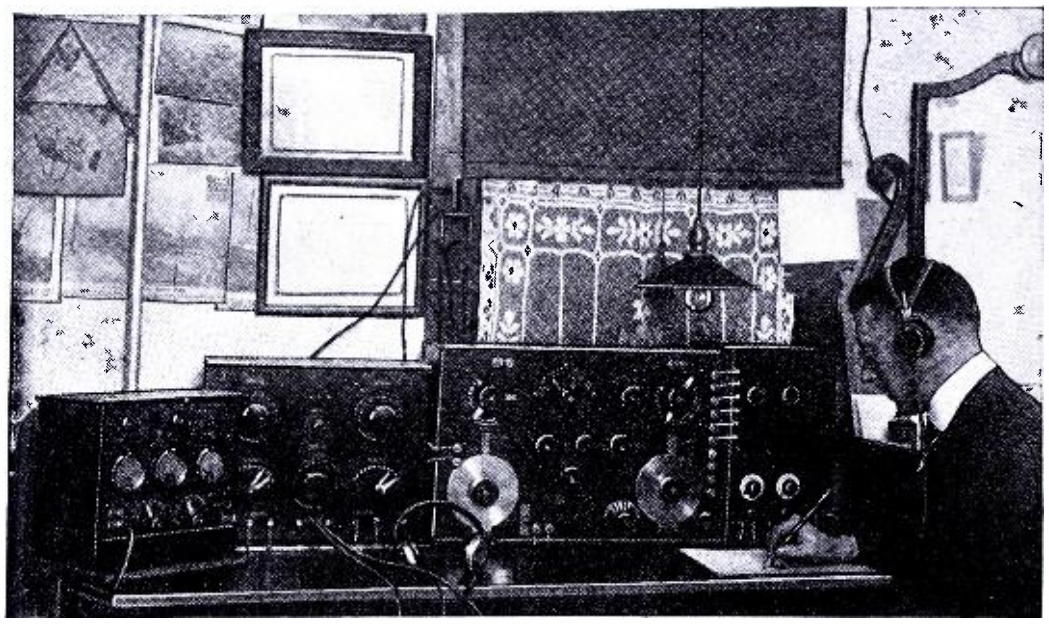


Fig. 2—Schematic wiring diagram for building Mr. Montgomery's "flea-power" transmitter, together with a picturized diagram which anyone can easily follow. Unlike many low-powered transmitter hook-ups, this one introduces a brand new circuit to "Hamdom."

SHORT WAVES and

Boy! What a Station!



Zowie! What an amateur short-wave station this turned out to be! The distinguished looking gentleman is none other than Arthur Hulfish of Wildwood, N.J., who heard the last short-wave "SOS" from the ill-fated airship AKRON.

Editor, SHORT WAVE CRAFT:

I am sure I'll enjoy receiving SHORT WAVE CRAFT and you can rest assured I'll boost it whenever I can. I am sending under separate cover the photo of my station; this is the set and operator that picked up the ill-fated *Akron's* last S.O.S. radio message.

The station apparatus as shown at the center of picture is a commercial receiver of the Navy type. Long and intermediate waves, 250 to 23,500 meters using "load" coils on primary, secondary, and tickler to reach long wave stations. It is an I. P. 500 (or the old S.E. No. 143) and a two-step amplifier. This set I use mostly for ship and coast station reception and of course long distance, long-wave commercial station, along with foreign "com." and press stations.

At the left is a short-wave outfit of the three-tube type. It will tune from about 11 meters up. This is the set I picked up the ill-fated "*Akron*" on about 33.5 meters. Of course this set is D.C. operated, using "A" battery for filament and eliminator on A.C. for plate voltage. I use about 45 volts on plate of detector and 135 volts on plate of amplifiers. I still use the Marconi system of antenna, a single lead-in with a double connection to a flat-top, two-wire antenna. The lead connection to double-feed connection is about 18 inches apart and the flat-top spreads out two wires to 12-foot spreader, sort of V-shaped. My antenna is out in the open, 35 feet high and 87 feet long; I use a three-way switch for use on short waves and long waves; the "send" position at extreme left of picture is a quenched spark gap airplane transmitter, now converted into a 75 watt C.W. The meter and control panel is the same; the other apparatus sets directly behind the central panel. With this outfit I have been able to copy most every commercial station in U. S. and ships up to and often better than 4000 miles! Many broadcast stations on loud-speaker, using only detector tube, and no trouble to copy "foreign" station on speaker. The short wave "rig" tunes in all I want to get. Amateurs in every district and most every country; 8 to 10 thousand miles is easy. Heard the "*Graf Zeppelin*" when she first came over and picked her up on 900 meters over Lyons, France, on one tube and had her on and off during the rest of the trip. (This is the only operator and station to hear the ill fated airship *Akron*.—Editor.)

ARTHUR H. HULFISH,
224 E. Montgomery Ave.
Wildwood, N. J.

(Hotcha! Arthur, what a station! As the artists say it shows "commercial" influence, but if one keeps his eyes open he can often get some of this "prof," looking apparatus at bargain prices. With a slight change in the circuit perhaps, the old "com" apparatus can be brought quite up-to-date, and it sure dresses up the station.—Editor.)

Our "Band-spread" Articles Helped Him

Editor, SHORT WAVE CRAFT:

I have wanted for some time to compliment Mr. Hugo Gernsback and his associates, on the excellent articles and diagrams, etc., to be found in SHORT WAVE CRAFT.

I used to be a "DX" hound back in the days of pre-thousand watt broadcast stations, when five or six hundred miles was quite a feat. For about a year now, the short waves are giving me the old thrill with *capital letters*.

I am using a 6-tube, A.C. Silver-Marshall short-wave set (the first type SM built) and have added "band-spread" tuning to it —thanks to articles by George Shuart which you published in previous issues of SHORT WAVE CRAFT. This makes *tuning deluxe*. I list below stations received and verifications:

EAQ, Madrid, Spain. 30 M. (As regular as KYW, Chicago.)
VK3ME, Melbourne, Australia. 31.55 M.
GBW, Daventry, England.
DJD, Zeesen (Berlin), Germany, 25.5 M. (Regular.)
XETE, Mexico City, Mexico.
VE9GW, Bowmanville, Ontario, Canada.

Amateurs, U. S. short-wavers galore, and "foreigns," but unable to get call letters; also heard conversations from the shore-to-ship stations.

I would like your Mr. Shuart to give us an article on a small set incorporating one of the new volume control tubes, if practical for short-wave receivers.

I would build a SW Transmitter tomorrow if it were not for the code requirements. (I tried learning the code some years back but didn't get very far.)

Many thanks for your splendid magazine.

GEORGE R. TIPPETT,
4421 Cedar Ave.,
Hammond, Ind.

(You certainly seem to have greatly improved the 6-tube A.C. short-wave receiver by adding the "band-spread" feature, which you were able to do with the aid of the information given in George Shuart's articles in previous issues of SHORT WAVE CRAFT. *Automatic volume control is not practical for the smaller short-wave receivers using 3 tubes and the like, but diagrams have appeared in past issues for larger sets using 7 to 9 tubes, in which the automatic volume control feature was shown.—Editor.)*

"MASTER COMPOSITE" A PIP!

Editor, SHORT WAVE CRAFT:

I just want to tell you that I lately built the 4-tube "Master Composite" by Clifford E. Denton, which appeared in the June issue. I have been building receivers from your publications since it started. They were all good, but the "Master Composite" is a PIP—the *daddy of them all*, and for a 4-tube job it had no equal, anywhere. Within five minutes after throwing the switch on for the first time, DJB from Zeesen, Germany, on 19 meters came pounding in like a local! Since then England, France, Germany and Spain are merely "locals"! I tune them in any time they are on the air, regardless of weather conditions. I haven't yet got Japan, Australia and others out there in the Pacific, for the simple reason that I just can't break loose from bed at that ungodly hour of the morning.

Mr. Denton says the antenna compensating condenser "works like a charm." I'll say it does, and how! It is possible to get both dials working perfectly with the antenna compensator. I said *both* dials —you see I used tuning condensers I had and wound my own coils. If any reader has tried short waves and become discouraged let him try the "Master Composite." Follow mechanical and electrical layout faithfully and use the parts specified and he certainly has a surprise in store.

Have just read the "editorial" in the October issue, in which you ask for information on short-wave stations. HVJ, 19.83 meters, Vatican City, Italy, is listed as being on the air from 5 to 5:15 a.m. That may be so, but they are also on the air from 10:15 to 10:30 a.m. daily, E.S.T.

THOMAS RILEY,
168 Miller Ave.,
East Paterson, N. J.

(You have certainly had very gratifying results with the "Master Composite" receiver, Thomas, and we have had some very fine testimonials in our regular correspondence concerning this set. Due to the use of the newest style tubes and a very excellent selection of specified parts, this receiver can and does undoubtedly out-perform many of the 6 and 8 tube sets of older type.—Editor.)

Send us more photos of your short-wave stations! Even though it is only a "receiving" station.

LONG RAVES . . . Our Readers Forum

THE DOERLE STARTED HIM!

Editor, SHORT WAVE CRAFT:

As you will notice from the stationery, I am employed by a railroad, in the capacity of telegraph operator. Last winter, while working at a pension job, with nothing to do, I picked up a SHORT WAVE CRAFT magazine, and started to look it over, needless to say I got bit by the SW "bug."

Immediately I started to hunt around for some radio junk, to build a SW set. I didn't have the least idea what it was a about, but, I was going to try, so, in the next town there was a fellow who was a good, radio-service man, I went to him and asked his help. He had lots of odds and ends that he had no use for, so, I carted home two boxes of stuff, and went to work. I had no idea which circuit to use, looked the "mag" over again, and the Doerle stared me in the face. Had no hook-up wire or a thing, so used what wires I had, thick wire, thin wire—it all went into the set.

When I first connected the batteries—no good, not a peep, got to sticking my fingers in the works here and there; finally I accidentally did something I still don't have any idea what I did, and bang, I heard WOO, Deal, N. J., calling GBS, London, England, Hot dog! Then I was a "fan"!

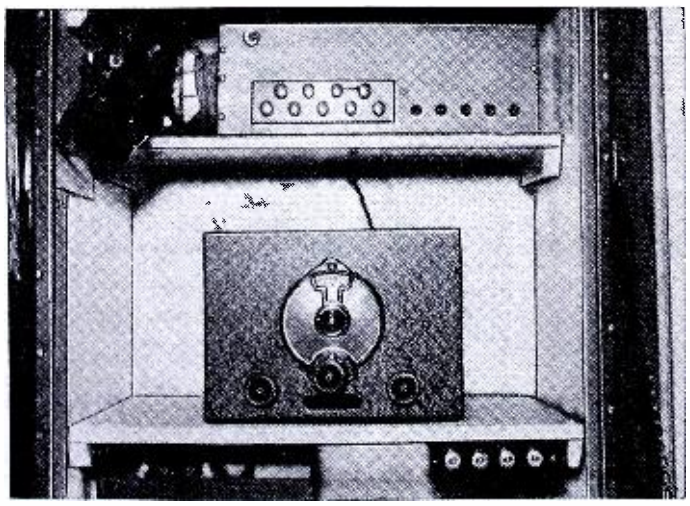
Played around with that set for a month or so, then had to leave there, as my job was done. Brought the set back with me to my headquarters and put it away. Now comes the sad part; this fall I got the fever again, hauled the old set out of the attic, but didn't like the looks of it very well. So, was going to rewire it into a "masterpiece," jerked all the wires off and mounted the different parts on another panel and base-board and rewired it, even put up a brand new aerial too. The darn thing hasn't worked since! Y%XZ¢—that's my feelings and to make matters worse friend wife burned up the "mag" that had the diagram in it, and I can't find another for "love or money." I remember reading some place that you would send back issues whenever ordered. If that is so, please advise me quick. No I haven't learned the code, yet, it is confusing with Morse, but I wouldn't think of going into radio without learning CW someday, when I have a steady job. Hope to have one of the best CW and phone stations I can get. But the way railroads have been cutting forces, I may be an old man then. If you do not have back issues please advise me where I might be able to get them, as I am impatient to "get going" again. Had just enough to get all excited over it. I am the greenest of the green, when it's about radio.

H. P. DUBBE,
Gen. Del.,
Madison, S. Dak.

Short Waves Link Father and Son Across Continents

● THE photo reproduced at right shows one of the practical aspects of "ham" radio communication service. Most of us know that ham short-wave stations relay messages across the country, but this is an exceptionally interesting piece of work. Gene Erckenbrack of Seattle, Washington, amateur station owner and operator, is seen in the accompanying photo in front of his transmitter and the camera caught him in the act of sending a message to his father, E. P. Erckenbrack (right inset) who was recently in Rio De Janeiro, South America, on a business trip. Gene communicated with his father by short-waves practically every day, through the medium of a South American "Ham" station whom he had contacted over the air. This excellent piece of work just goes to show what a fine training 40,000 young Americans are receiving.

(Tough breaks, HPD, but in spite of the fact that the copies of the original issue of SHORT WAVE CRAFT, *containing the description of the Doerle 2-tube receiver are out of print, we are glad to say that description of this famous receiver, which has opened the way to the thrills of short-waves to thousands of short-wave fans, is available in the new book, TEN MOST POPULAR SHORT WAVE RECEIVERS. —Editor.)*



Here's your chance boys to contact a real live "yl." Her name and address appear with the story at the right.

HATS OFF TO MISS SCOTT!

Editor, SHORT WAVE CRAFT:

You have been asking for photographs of amateur stations so I wonder if you would care to print one of a y.l.'s receiving station. I am enclosing one that was made for SHORT WAVE CRAFT.

The receiver is a National SW3 and is A.C. operated. The power-pack is a R.C.A.-Brunswick and has the power amplifier enclosed in the same case. The phones are Baldwin "type C" and a Frost jack box is used so four pair of phones can be used at one time.

Amateur phones from all over the United States and Canada as well as those from foreign lands come in very fine. C.W. signals from all over the world are always very strong here. The power amplifier is used very seldom as it is entirely too strong for home use.

I will be glad to trade a photo of my outfit here with any amateur or S.W.L. who cares to do this. I will send along also a blue-print comic for the "shack" wall. Every card and letter will be answered as fast as they are received.

Wishing SHORT WAVE CRAFT the best of luck, I am yours for Amateur Radio.

(Miss) HILDA F. SCOTT,
2911 Griffin Ave.,
Richmond, Virginia.

(Great, Hilda, and what a mail you're going to get! Say, we wouldn't mind having one of those comic strips ourselves.—Editor.)

Grid Leak Hint

Editor, SHORT WAVE CRAFT:

Wish to advise that Mr. Malsberger's idea of using a .00005 mf. grid condenser with 57 type tubes, and a 1 megohm leak, has produced magnificent results, especially with the higher frequencies. Receivers that had not performed well on 15 meters, after changing the condenser and leak oscillated smoothly and developed excellent volume on W3XAL, W2XAD and W8XK on 16 and 19 meters.

I take pleasure in recommending to the numerous fans who wrote about the "Falcon" that they utilize this feature.

Your very truly,
D. M. DUNSMORE,
Estate Consuelo,
San Pedro Macoris, Dom. Rep.

(Thanks for the tip, "D.M" and we are sure the boys will thank you too. The grid condenser and leak values are really very important in short wave sets. Try varying the leak and condenser values.—Editor.)

SHORT WAVE LEAGUE

HONORARY MEMBERS

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

Should the "Code Test" Be Abolished Below 6 Meters?

The International Amateur and Short Wave Society Calling

Editor, SHORT WAVE CRAFT:

It may be well that we of the I.A.S.W.S. repeat, once again, that this organization is 560 strong, this means we have, at present, 560 short-wave fans and amateurs. This society has members from all parts of the world.

Most members of this society are members of the SHORT WAVE LEAGUE. In the past six months this society has gained over 355 members through SHORT WAVE CRAFT, and we hope SHORT WAVE CRAFT will boost this society whenever they have the space available in their fine magazine.

As a finishing touch to the amateurs, there are about 5 out of every 100 amateurs who have a "clear" transmitter on the air; most of the amateurs have a tinny sounding transmitter, and it is almost impossible to listen with comfort to such a transmitter. Brush up on your transmitters boys, and the amateur field will go "sky high." We are now working on one of the fastest transmitters on the air, and it will be one of the clearest known. Listen in for our "call" some time. Here's hoping this letter will bring in a couple of hundred more members. Many thanks, Mr. Editor.

OLIVER AMLIE, Secretary,
I.A.S.W.S.
56th City Line Ave.
Overbrook, Phila., Pa.

Thinks "No Code" Test Advisable

Editor, SHORT WAVE CRAFT:

In regards to the controversy pertaining to whether or not to have the "code test" for the band below 6 meters, allow me to state my views.

I uphold the platform of the SHORT WAVE LEAGUE, viz: *no code test* for below 6 meters! My reasons are not because the code is so hard to learn, as some fellows insist. Anyone with a grain of brains would know that such an insignificant reason would not get to first base with the Federal Radio Commission. My ideas are that since the band below 6 meters is used primarily for experimental phone work, why not exempt the "would be ham" from the code test for that particular band, and give him a test on such things as the *Federal Regulations*, ability to operate all equipment that would be used at his station, and the general knowledge one must possess to successfully operate an amateur station?

Such reasons as the code being so hard to learn would be funny if the subject was not so serious. The code is not hard to learn. I learned it when I was 16 (only 2 years ago) and I found it almost simple, and I assure you that I am no extraordinary fellow, hi. Any one who is willing can learn it.

However, keep on fighting for the cause, boys. Although it may not benefit you individually, it will benefit the kids who are looking ahead to being a "real honest to goodness Ham" some day soon. 73's, everybody.

EARL RAPP,
Greggs, Pa.

He's Waiting for "No Code" License

Editor, SHORT WAVE CRAFT:

For the past three or four months I have been reading the articles on *no code test*. The best letter I have seen was in the December issue of SHORT WAVE CRAFT, the one written by Clifford O. Field, of Fair Haven, N. Y. With his idea of the one year probation scheme, I think more fellows would get into the short wave game and the more the merrier. What harm would it be to have a bunch of fellows in the same town working below 6 meters? A club would soon be started and what could be better?

With new fellows getting into this band, this will bring in new ideas, which are always needed in short waves. I am not a "ham" yet but if this "no code" test goes into effect, I'll be one of the first to join. I know of five or six other fellows who will also join.

I wish to congratulate Clifford O. Field, of Fair Haven, N. Y., for his fine letter, and hope it will mean something in the near future. If the Federal Radio Commission will take action and use this method, SHORT WAVE CRAFT will go into several thousand more homes.

A "WILL BE HAM"
WM. MOTHERWAY,
1417 So. 24th St.,
Milwaukee, Wisc.

"Code Test" below 6 Meters Not Desirable

Editor, SHORT WAVE CRAFT:

We, of the "negative," maintain that the code test below six meters is a bad thing.

As one of my fellow fans wrote, "The hot-headed amateurs are so conceited and selfish because of the fact that they think that they should have been given advantage of 'no code' test below six meters at the time they began the game." Truer words have never been spoken! Those that want the code have usually passed the test and because that they have had to do so, do not want anyone to have an advantage over them.

Another "ham" said that he liked it because his "young lady" thought that he was "smart," because he could read the code. Personally, I thought that the code was a test and not a means of making your "young lady" proud of you.

Therefore, we, of the *negative*, maintain that the code test below six meters is *not* a good thing.

PHIL O'DWYER,
524 Montgomery St.,
Montgomery, Ala.

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.

"Hub City" S. W. League News

Editor, SHORT WAVE CRAFT:

The third meeting of the Hub City Short Wave League had a large and interesting attendance. There was also a new member added to the list: Wm. Corbett, 919 Ave. C North, Saskatoon.

After being called to order and the minutes read, there was considerable discussion among which the Club has decided to give code practise five nights a week, for one hour each night, thereby hoping to enable each member to obtain their tickets in the shortest time possible.

The matter of a club room was also discussed with the possibilities of procuring a permanent one in the C.P.R. Station.

We are indeed fortunate in appointing Mr. Roy McKenzie as Hon. President of the club. He operates an amateur station and also owns and operates a television receiving set.

F. C. NEAL, Secretary,
"Hub City" S.W. League,
1143 Ave I, South,
Saskatoon, Sask., Can.

Code Easy to Learn, He Says

Editor, SHORT WAVE CRAFT:

Some of these "license-less" writers say that the "hams" are selfish and the like. That is their opinion of the amateur, but I don't think in the same channels as they do. The "hams" have a perfect right to oppose this proposition, and I hope they succeed in getting this thing out of the way.

I have been studying the code, and I think it is pretty easy to learn, but there is such a thing as *laziness* on the part of these fellows who write, agreeing with the idea of a "code-less" license.

If these fellows don't want to learn the code, what will happen if some fellow wants to get in touch with them and is using CW, they are then lost. The same will happen when their transmitter is causing QRM and they are told so. Once these fellows get on the 5-meter band they will be all over the other bands as well.

Why don't you fellows who write these letters and want a "code-less" license get down to work and learn the code; there's nothing to it, provided that you do some *brain work*.

FRANK T. OSOWIECKY,
248 Wallington Ave.,
Wallington, N. J.

P. S. I am a member of the League.

CRYSTAL CONTROL Simplified

By C. E. PEARCE*

Mr. Pearce is an expert on quartz crystals and in the present article he provides some very valuable and interesting information for the "ham" operator.

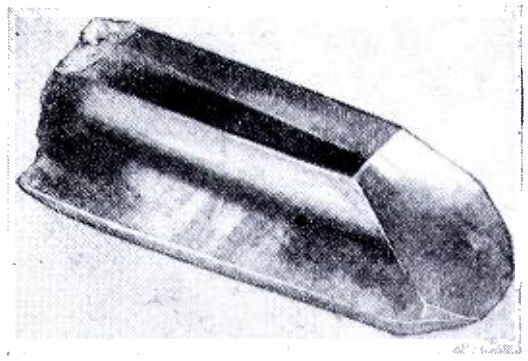


Fig. 1.—A raw quartz crystal in the natural shape before being cut into sections.

● WITH the increasing popularity of quartz crystals, it appears as if it will be only a short while before practically all amateur transmitters will be crystal controlled. Crystal control is now within the price reach of the average amateur and there is a wealth of data available on the construction and adjustment of these transmitters so that no amateur should have any great amount of difficulty in putting a crystal controlled signal on the air. Quartz crystals are no longer the expensive item that they were a few years ago.

Source of Quartz

Most of the quartz, used in this country for piezo-electric crystals, is imported from Brazil as this quartz is more suited for the purpose than most of the quartz found in this country. Fig. 1 is of a raw quartz crystal in the natural shape. This quartz is cut into sections about an inch square. The thickness, to which they are cut, depends on the frequency at which the finished crystal is to oscillate. These sections are then ground to the desired frequency. The sections must be cut out of the raw quartz with respect to certain axes. The major surfaces of the plate must be parallel to the optic axis and either perpendicular or parallel to the electric axis. The two cuts are usually designated as the X cut and Y cut. The cut, unfinished sections are known as blanks. X cut crystals are by far the more popular of the two as they are thicker for a corresponding frequency than the Y cut crystal and the X cut crystal is a more stable oscillator. A finished X cut crystal, with a frequency of 1750 kc. is approximately .064" in thickness while a Y cut crystal of the frequency is .044" thick. Crystals for 3500 kc. are just one-half of the above thicknesses. Crystals for amateur use are usually about one inch square and this is considered the standard size. Crystals are available for fundamental operation in the 40, 80 and 160 meter amateur bands.

How Crystal Is Mounted

The crystal, for use, must be mounted between two ground metal plates. These plates are usually of brass. For use in a transmitter both of the plates should contact the crystal with a slight pressure on the top plate. When a crystal is used in a frequency standard, where little power is needed, a holder is used with a small air gap between the crystal and one of the brass plates. The crystal and holder plates should be absolutely clean as any grease or dirt particles will reduce or prevent oscillation or possibly cause the crystal to crack which will make it useless. For cleaning crystals nothing has been found better than soap and water. The holder should be dust-proof so that the crystals will not have to be removed and cleaned thus preventing any chance of breaking it from handling. Fig. 2 shows a plug-in, dust-proof holder.

Temperature Control of Crystal

When the frequency of a crystal oscillator is to be maintained constant to within a few cycles, temperature control of the crystal is necessary. Temperature control of the crystal is used by some amateurs who want a real commercial type transmitter or by the amateur who wants to work at a frequency near one edge of the band. An X cut crystal will change in frequency approximately 20 cycles in a million for each degree centigrade change in temperature, while a Y cut crystal may change as much as 100 cycles in a million with each degree centigrade. The temperature coefficient of the X cut plate is negative, that is, the frequency decreases with an increase in temperature while the cofficient of the Y cut plate is positive (increase in frequency with increase in temperature). In order to maintain the temperature of the crystal as near constant as possible it must be placed in a temperature controlled oven. These ovens are usually made up of a heat insulating layer of balsa wood (or some other good heat insulating material) next a heating layer on the inside of which is a box made up of a heat distributing and attentuating layer. The crystal is placed on the inside of this box. A thermostat is placed between the heating layer and the distributing layer. This thermostat is usually of the mercury column type or of the bi-metal type. The mercury column type is the more sensitive of the two but it requires a relay to handle the heater current. In an oven for amateur use the bi-metal type is to

(Continued on page 636)

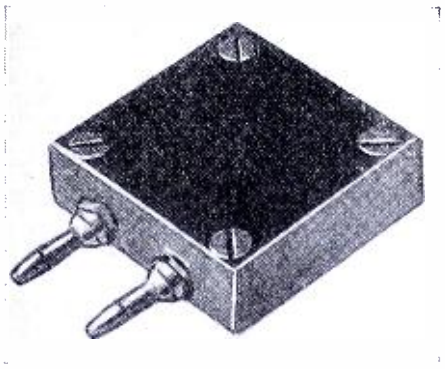


Fig. 2.—Typical quartz crystal holder, the pin contacts permitting a different crystal to be plugged into circuit quickly.

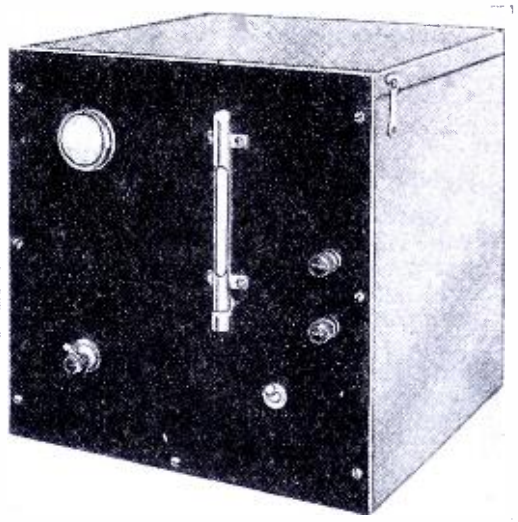


Fig. 4.—External appearance of quartz crystal oven with thermometer and control switches.

*Precision Piezo Electrical Service.

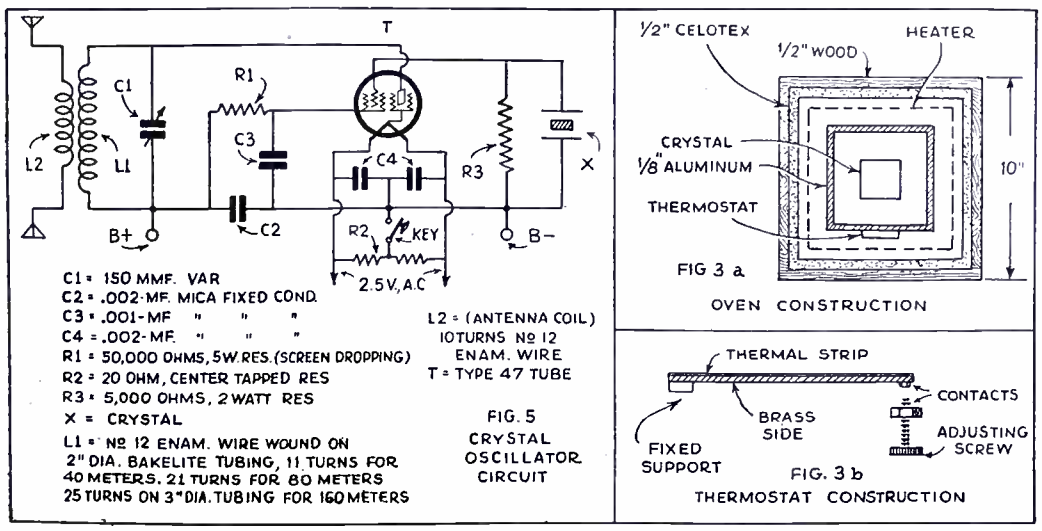
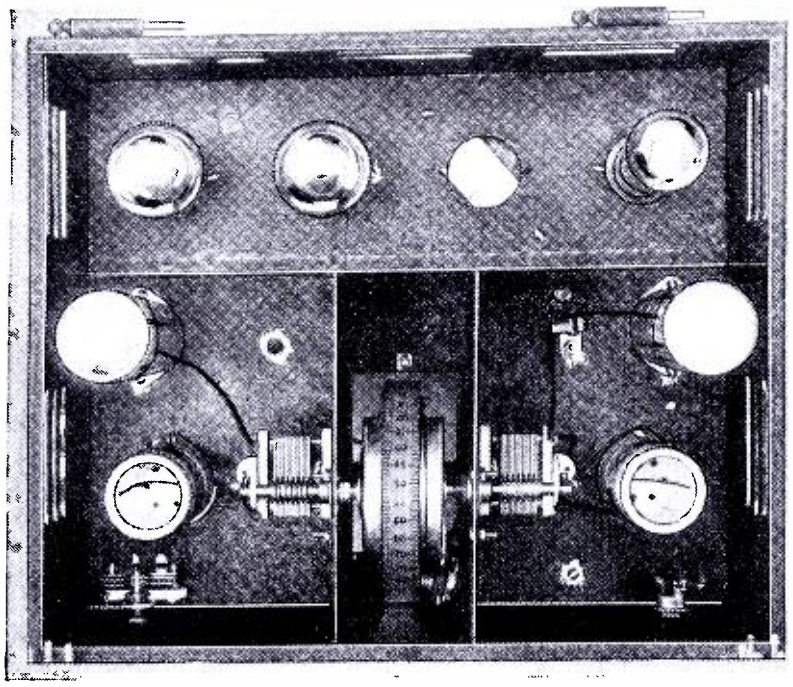
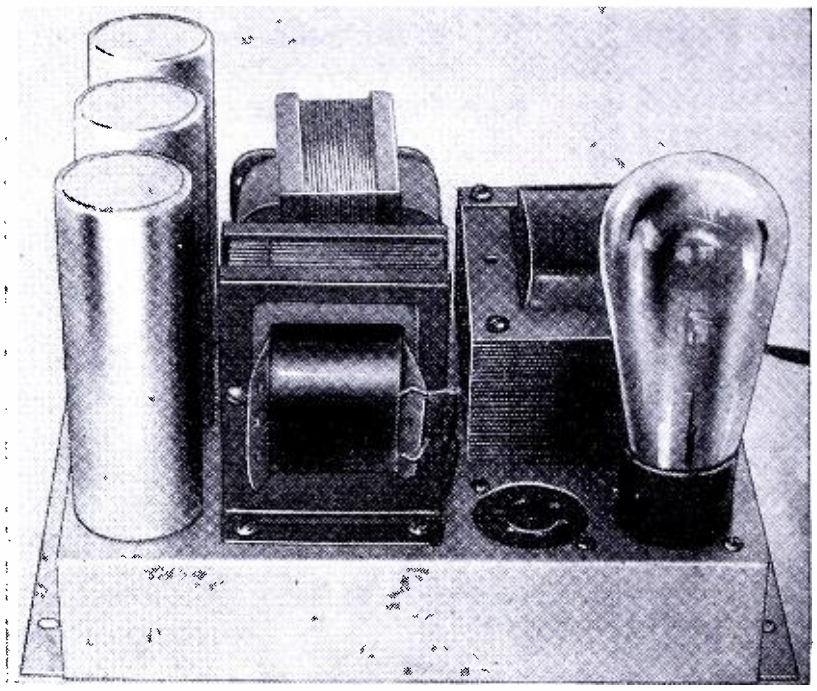


Fig. 3.—A, at right shows details of crystal oven construction; B—shows details of thermostat construction. Fig. 5, at left, shows diagram for hooking up crystal oscillator.

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.





Left—top view of the A.C. operated "Short-Wave Master 6." Right—the "power supply" unit with rectifier No. 139.

The "Short-Wave Master 6"

By HUBERT L. SHORTT and FRANK LESTER*

● A representative receiver of the new crop is the Short-Wave Master 6. This is a thoughtfully designed kit job brought out to meet the special requirements of the many people who want to enjoy the fun and thrill of building their own short-wave set, but who are not capable of or do not have the facilities for performing a great deal of tedious machine work on metal shields and chassis.

The Short-Wave Master 6 is a little different from other kit sets in that the cabinet is supplied as a completely finished unit, with all shield partitions welded in place. Accurate mechanical fitting of all the parts is thus assured. Both top and bottom are quickly removable, leaving the inside fully accessible for all the assembly and wiring operations. Measuring 12½ inches wide, 8¾ inches deep and 8½ inches high, the cabinet is finished in mark-proof black crackled enamel and presents a professional, factory-built appearance. The top, of course, is hinged to permit quick changing of plug-in coils.

The power-pack is built as a separate unit measuring 9¼ inches long, 6¾ inches wide and 5½ inches high overall. Connection between the receiver and the pack is made by a convenient plug-and-cable system. The pack was made separate from the tuner because a separation of several feet between the units contributed noticeably to the quietness and stability.

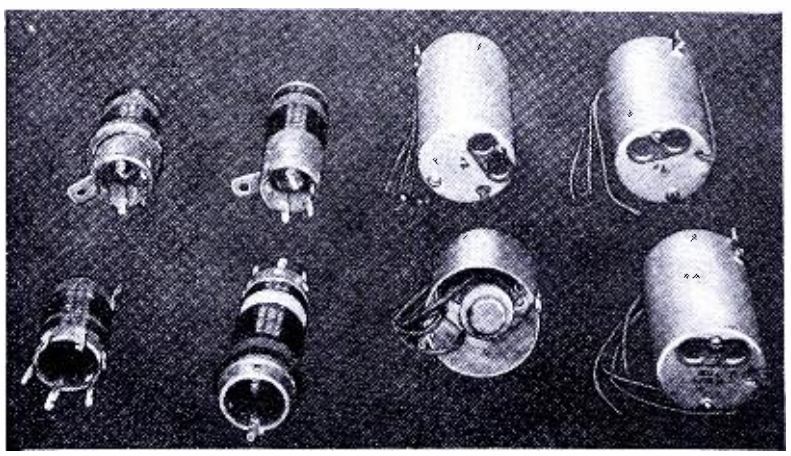
Electrically, the receiver comprises one stage of tuned radio-frequency

(Continued on page 620)

*Wholesale Radio Service Co.

Superhet Coil Kits Now Available

● FOR the short-wave "fan" who has become enthusiastic to the point where he wishes to build himself a real high-class short-wave receiver, such as the superheterodyne type, there has recently appeared on the market a very interesting proposition in the form of a superhet coil kit, complete with wiring diagram blue-print and instructions. This and other kits, as the photo shows, includes all the necessary coils, properly wound and specially insulated. The coils in the kit include those for the antenna circuit, oscillator, intermediate frequency amplifier stages, and RF stage, where it is specified. The J. W. Miller Company, who developed this very interesting line of coil-blue-print kits, deserve a lot of credit, as kits such as these are just what Mr. Average short-wave "fan" is interested in, as they make it possible to build a fine receiver at a very reasonable cost. Not only are superhet kits available for *short* and *all-wave* jobs, but also TRF receivers of the *all-wave* and *broadcast* types. This concern also supplies all the necessary trimmings, including RF chokes, trimmer and padding condensers, hardware, etc. Other kits and blue-prints with instructions are supplied for sets using as high as ten tubes with A.V.C. Another feature supplied when desired is a set of oscillator coils for beat frequency, to allow the reception of CW signals on the superhet receivers.

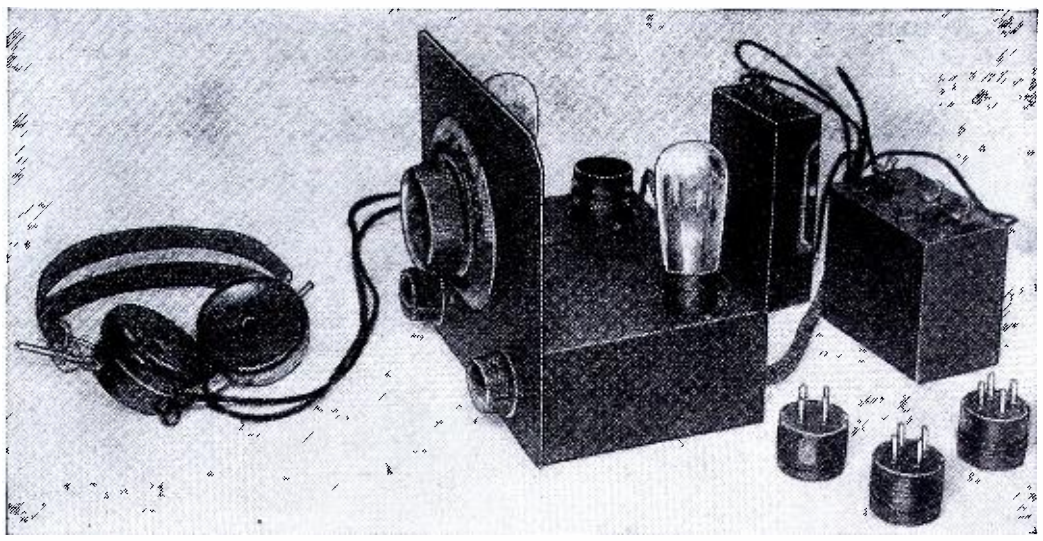


Above: Typical Miller Superhet Coil Kit No. 140.

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

New 2-TUBER Receiver Kit

By LEONARD VICTOR



A very efficient 2-tube "battery model" short-wave receiver, using plug-in coils.

● SINCE one of the claims made for this set is that even a person that has never built a set before, can complete it and get good results in a short time, I had a friend of mine who had never built a set before construct the unit. Two and a half hours after the set and parts had been placed before him, the set was completed, and worked perfectly the first time. A week's "listening" test, about two hours a day, brought some very interesting results. On 160 meters we heard police stations as far away as Chicago, and phone amateurs all over the Eastern seaboard. On the 80 meter band we listened in on "Hams" all over the U. S. and Canada, and below the band, aircraft reports came in from all over the country. The European broadcasters on 49 meters came through with surprising volume in the late afternoon and early evening. Frequently England and Spain were loud enough to put on the speaker. In the early morning, there was no difficulty in logging a half dozen or so Australian and New Zealand amateurs on 40 meters. The 29 meter broadcast band and the 20 meter band were both disappointments—however this was due to conditions, not the receiver. We did manage to log a few foreigners, but the 40 meter band was much better. Italy came through on 19 meters one afternoon however with as much "sock" as W3XAL.

Important Points in Design

The three most important points in building an effective short wave receiver are—the circuit, selection of proper parts, and correct placement of these components. The circuit employed is the reliable regenerative detector and one audio, of proven merit and reliability, and practically "fool-proof." In this circuit a part of the signal is transferred from the plate of the detector tube back to the grid of the same tube, thus reamplifying and building up the signal to a high level. This process is called *regeneration*, and is admirably suited to short-wave work. Only the best of parts are used in this set, as testified to by the excellent results obtained. Likewise great care has been taken in the placement of the parts, with resultant high efficiency.

One of the most important yet simplest pieces of apparatus used in a short-wave receiver of the type described is

(Continued on page 622)

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

SHORT WAVE SCOUTS

● PERHAPS not enough time has elapsed for you fellows to get in your verification cards. In any event, the 1st of December rolled around in time for the second contest, and sad to relate, there were no valid entries.

It is true, that a number of entries were received, but these were not in conformation with the contest rules. For that reason, we ask you to carefully read the rules printed below. Any number of contestants seem to have the idea that all they have to do is to send in a typewritten or written list of stations which they had listened to, in order to win the Trophy.

It has been stated several times, in past issues, that *verifications* must be sent with the list of stations heard in order to qualify as an entrant in the contest.

At the same time, we were also in receipt of a number of letters from prospective contestants who explained to us that it was not possible for them to always get verification cards because some of the stations paid no attention to requests for cards. Much of this is no doubt directly traceable to the fact that requests are not properly made, and for the benefit of those who write for verification cards there is appended to this article an abstract from Hugo Gernsback's editorial entitled *"Verification Cards,"* which appeared in the January, 1933, issue of this magazine.

It is also true, that not every foreign station sends out verification cards. That is an unfortunate phase, and this was borne in mind when the contest was started, and some allowance was made for this.

A number of our would-be contestants, however, seemed to think that the proportion of 90% verification cards and 10% unverified stations is out of proportion. Perhaps there is something to this, and for that reason, beginning with this month, we have amended our rules, and you will find that our rules now read:

Here is the SHORT WAVE SCOUT Trophy. It stands 22½ inches high; the diameter of the globe being 5 inches. Engraved in the globe is a SHORT WAVE SCOUT with earphones sitting in front of his radio set. The lower part of the trophy is engraved with the winner's name.

New Rules—Read Them

By HUGO GERNSBACK

Fifty percent 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

(Continued on page 621)

Admiral Byrd Has "Personal" All-Wave Set

Admiral Richard E. Byrd in his cabin aboard the good ship, Jacob Ruppert, with his "GE" All-Wave Receiver which he employs for his personal "listening in."

● FOR receiving the programs Admiral Byrd has been supplied with one of the new type of *all-wave* General Electric receivers. This apparatus will pick up signals from 16 to 550 meters, which takes in all short-wave stations now in operation, and in addition all the popular broadcasting stations. During the voyage to Little America this receiving set will be in the cabin of Admiral Byrd, on board the *Jacob Ruppert*. Upon arrival at the base station at Little America the radio receiver will be transferred to the Admiral's office.

Radio again will supply the intangible, indispensable link between the new Byrd expedition and civilization. The vast, forbidding Antarctic will be within earshot of 42nd Street, ten thousand miles away; through the ice-locked desolation surrounding Little America radio will penetrate during the long Antarctic nights. Its unseen electromagnetic waves will be the messengers between these intrepid peace-time adventurers and their folks at home.

From the historic short-wave transmitting station of the General Electric Company at Schenectady, W2XAF, radio communication will be maintained to Admiral Richard E. Byrd's base on the Bay of Whales. This is one of the stations that continually "talked" to Byrd and his men during their previous Antarctic expedition, from 1928 to 1930, and it is the station which they picked up more frequently than any other. The station sends on a wave length of 31.48 meters. It is still equipped with the directional antenna successfully employed in the broadcasts to the earlier Byrd expedition. This antenna was designed by Dr. E. F. W. Alexanderson, radio consulting engineer of the General Electric Company. Its effect is to increase the signal volume in one direction about twenty times. The normal power of this station is 20 kilowatts. During the previous expedition Admiral Byrd heard every program which W2XAF sent out.

Saturday nights from 11 to 12 o'clock will again be the time when the radio programs will be transmitted in the direction of the South Pole for the Byrd expedition to pick up. These programs started even before the expedition reached Little America.

The hour from 11 to 12 o'clock will consist of radio entertainment. After 12 o'clock the station will read letters addressed to members of the expedition from relatives and friends. This "radio mail" will be the only mail service which the expedition will possess. It is also planned to invite, on occasion, relatives and friends to talk before the microphone. The entertain-

(Continued on page 621)

National S-W Receiver Goes On Byrd Trip

● THE accompanying photograph is a very interesting one and shows one end of the radio control cabin aboard Admiral Byrd's flag-ship, the *Jacob Ruppert*. The large array of short-wave plug-in coils observed on the board mounted on the wall just above the receiver rack belong to the National AGSX receiver mounted at the lower part of the panel rack, just below the meter and control knobs observed in the picture. The four control knobs on the aluminum panel just above the meter serve to give the operator on duty accurate control of the four microphone circuits leading into the "studio" aboard the *Jacob Ruppert*, the studio being a small cabin just on the other side of the partition shown in the photo. So precious is the cabin space on the ship that, at night four men occupy bunks in the "studio" as their sleeping quarters.

A corner of the radio cabin aboard the "Jacob Ruppert."—The rack at right contains the National "AGSX" short-wave receiver —note plug-in coils on wall above rack.

In one of the recent two-way broadcasts over the Columbia Network from Admiral Byrd's flag-ship, the *Jacob Ruppert*, the AGSX receiver played an important rôle. This receiver is fitted with a crystal filter circuit with an adjustment by which the degree of selectivity or filtering can be regulated. A knob in the upper right-hand corner of the front panel of the receiver, labeled *selectivity*, permits the operator to sharpen up the tuning to the desired degree.

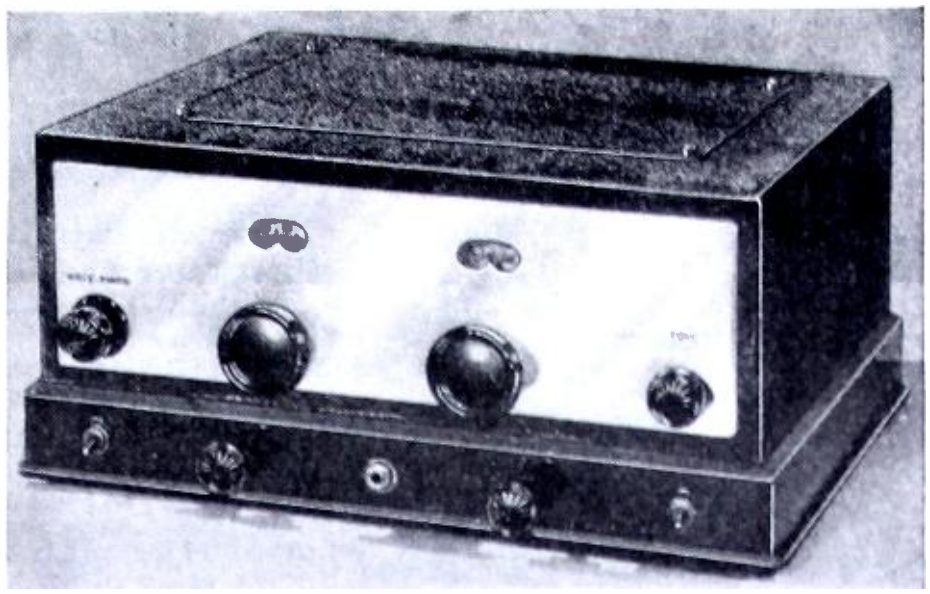
The knob in the upper right-hand corner of the receiver panel enables the operator to use the *single signal* feature at will. This switch has three points: series, off, and parallel. In the "off" position, the crystal circuit is not used and the receiver is then identical to the AGS. The crystal is used when greater selectivity is required, but is not used for reception of short-wave broadcasting.

One of the excellent features of the AGSX receiver for exacting commercial or professional service lies in the accurate single-dial tuning control. Calibration curves for the different plug-in coils are mounted on the front panel, for instant reference by the operator, and most important of all, the coils plug in from the front panel and not through the top of the cabinet. A great many receivers of this particular type are in use at commercial air-line land stations and for various other commerical installations.

This communications type receiver has a special pre-selector circuit which affords maximum selectivity. The selectivity of this receiver is further enhanced by the high input impedance of the first detector circuit and the sharp

(Continued on page 617)

The SARGENT 9-33 Receiver Uses Tapped Coils



Many new features, including tapped coils for wave band changing, are incorporated in the Sargent 9-33. It is "Single-Signal"—All-Wave.

By E. M. SARGENT

Mr. Sargent, one of the best versed experts in short waves, has evolved a distinctly new receiver circuit. Contrary to the opinion held by many short-wave experts, Mr. Sargent advocates and uses tapped coils for covering the various wave bands, and his tests have shown no unusual losses. A new "band-spreading" system is employed as well as a double shift of intermediate frequency, with improved image frequency elimination. All coil and other data is here given.

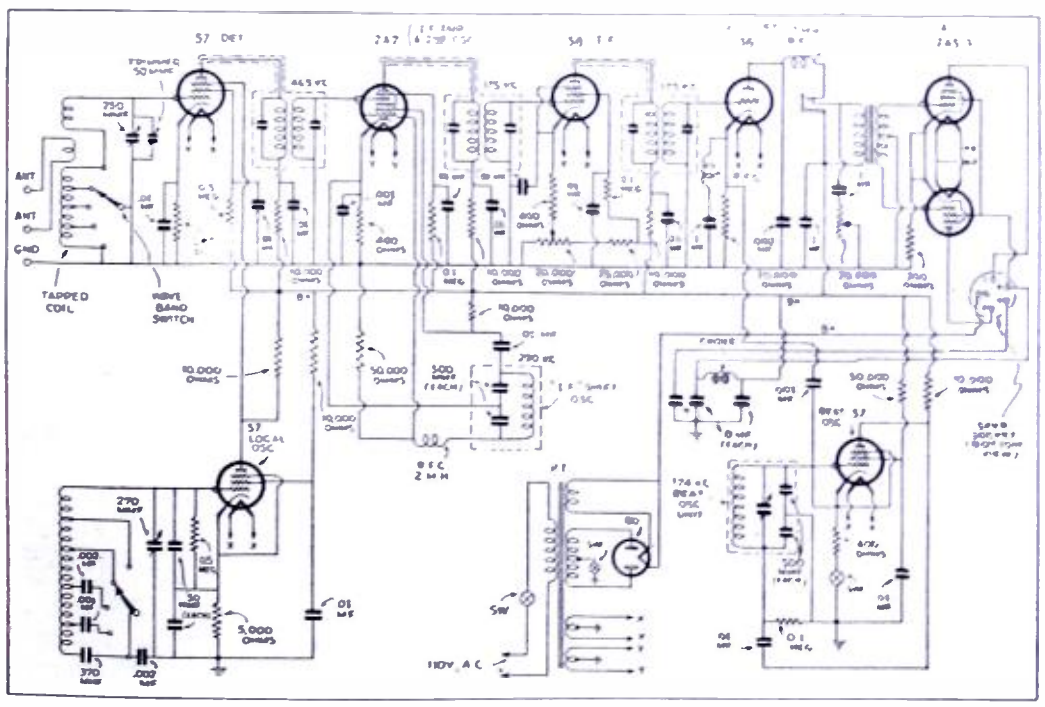
● PROBABLY the two most outstanding features of the Sargent R9-33 Receiver are the new system of *band-spreading* and the *double shift of intermediate frequency*. The former is an improvement in short-wave tuning while the latter provides for image frequency elimination without the usual loss of selectivity or complication of circuits.

Band spreading has been made vitally necessary because of the method of frequency assignment by which amateurs have been allotted small, widely separated frequency bands for their operations. For example, the frequency band of 7000 to 7300 K.C. is assigned to amateurs, also 3,500 to 4,000 K.C. A receiver that would cover both with a single coil would have only about four dial degrees for each band. On the other hand, if the entire dial were devoted to the 7000 to 7300 band, a condition greatly desired by amateurs using this band, it would be necessary to have about ten coils with the same condenser to cover the rest of the frequencies down to and including 3500 K.C. This would, of course be utterly impracticable.

A New System of "Band-Spreading"

Many band-spreading methods have been developed to overcome this difficulty and make it possible to get a large dial spread on the amateur bands, without completely sacrificing reception on the frequencies in between. One of these methods, which is limited to amateur bands only is by means of special band-spread coils, one set for each band. Another system uses a variable "tank" condenser with a small vernier condenser connected in parallel. The vernier is the band spreader while the tank is also variable for purposes of covering the non-amateur frequencies. At the lower frequencies this method is excellent but at the higher frequencies the losses due to inductance of the leads and non-concentrated capacity tend to became very serious.

The band-spreading in the 9-33 receiver is accomplished by mounting the tuning condenser in a cradle instead of connecting it solidly to the panel as is usually done. The rotor of the condenser is tuned in the usual way, left hand dial in the illustration, Fig. 1. The right hand dial swivels the stator over a small angle, and thus furnishes the vernier or band spread, the width of the band depending on the angle of the swivel. Thus the capacity is concentrated in a single unit, no special coils are necessary, the method is adaptable to either a single or gang condenser. A band spread is instantly available at any wave, amateur or otherwise, at which the left hand dial may be set. The angle of the swivel is adjustable, and thus the band spreader may be set to give exactly 100 degrees dial spread on any one amateur band. The writer has always felt that there was room for improvement in the older methods of band spreading, and unhesitatingly recommends this new way as being completely satisfactory. For those experimentally inclined who like to build their own, these cradle mounting units for band spreading are supplied separately.



Every short-wave student will be intensely interested in this diagram of the new 9-33 receiver, which represents many new features.

The Double Shift of Intermediate Frequency

Many factors, some of them conflicting, enter into the choice of intermediate frequency to be used in a superheterodyne, and it was in an effort to get a better compromise than is usually obtainable that the double shift method was developed. The two most important factors to be considered are selectivity and freedom from image interference. The number of kilocycles selectivity that it is possible to obtain depends entirely upon the frequency. Thus, the best receivers ever developed for use

(Continued on page 613)

Latest ALL-WAVE Superhet Opens Door To 2,000 Stations

Console model of new "All-Wave" receiver.

Those who operate new "All-Wave" receiver have 2000 short-wave and broadcast stations all over the world to choose from—All at the turn of a simple switch.

● HEREWITH are photos and diagram of a new 8-tube All-Wave Receiver brought out by one of the largest electrical companies in the country. Knowing that the public is desirous of convenience and comfort in tuning, the engineers have provided switch control for quickly changing the R.F. stage and oscillator coils for the different wave bands. This receiver, covering all the usual short-wave bands from 16.7 to 2000 meters, or from 18,000 to 150 kc. The type of circuit used in this receiver is a straight superheterodyne for all frequencies, with class B output stage.

The set has an undistorted power output of six watts and its power consumption from the house circuit is only 110 watts. It is available in different style cabinets and for A.C. voltages of 100 to 125 and from 200 to 250, and in frequency ratings of 25-60 (125-125 V only) and 50-60 cycles. It utilizes the following type and number of Radiotrons: 3—RCA 58, 1—2A7, 1—2B7, 1—56, 1—53, 1—80. This receiver will be supplied in two models, one including all the wave bands enumerated above, and one model with the 732 to 2,000 meter band omitted, the 2,000 meter model being particularly useful in Europe, where broadcasting is carried on over wavelengths between 600 and 2,000 meters in many cases. *(Continued on page 616)*

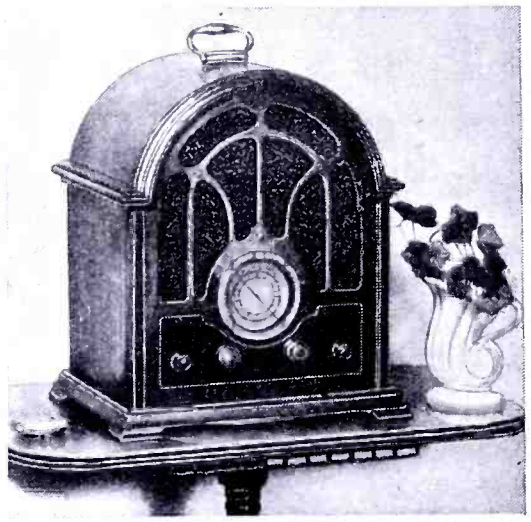
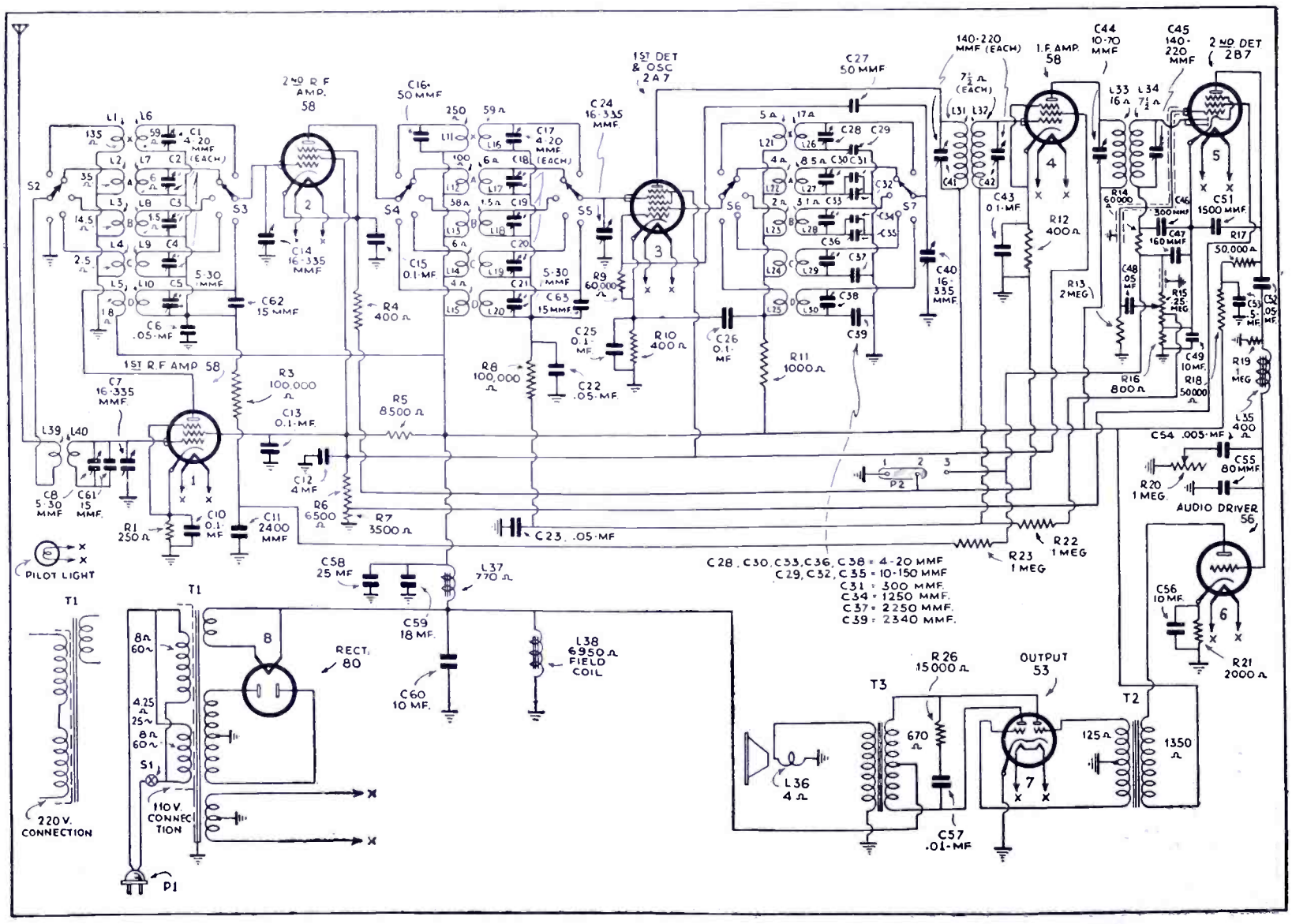


Table model of "All-Wave" receiver.



Wiring diagram of new "All-Wave" receiver; the different wave band coils are switched into circuit as diagram indicates. No. 138

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

SHORT WAVE STATIONS OF THE WORLD

SECTION ONE

As promised in the last issue, we are presenting herewith a complete, revised and combined list of the short wave broadcasting, experimental and commercial radiophone stations of the world. This is arranged according to frequency, but the wavelength figures are also given for the benefit of readers who are more accustomed to working with "meters" than with "kilocycles." All the stations in this list, with one or two exceptions of the time stations, use telephone transmission of one kind or another and can therefore be identified by the average listener.

The January, 1934, issue (copies mailed for 25c) contained a very fine list of police, airport and television stations, which was marked "Section Two." This will reappear in the March issue with the latest corrections and additions. Section One (this month's list) will be published again in the April issue, also with last minute changes. **Note: Stations marked with a star (★) are the most active and easily heard stations and transmit at fairly regular times.**

Stations are classified as follows: C—Commercial phone. B—Broadcast service. X—Experimental transmissions.

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.

27800 kc. W6XD
-X- 10.79 meters
Mackay Radio
PALO ALTO, CALIF.

21540 kc. ★W8XK
-B- 13.93 meters
WESTINGHOUSE ELECTRIC
SAXONBURG, PA.
7 a. m.-2 p. m.; relays KDKA programs

21470 kc. GSH
-B- 13.97 meters
BRITISH BROAD. CORP.
Daventry, England
British Empire programs

21420 kc. WKK
-C- 14.01 meters
A. T. & T. CO.
LAWRENCEVILLE, N. J.
Transoceanic phone

21130 kc. LSM
-C- 14.15 meters
BUENOS AIRES,
ARGENTINA
Commercial radiophone

21060 kc. WKA
-C- 14.25 meters
LAWRENCEVILLE, N. J.

21020 kc. LSN
-C- 14.27 meters
BUENOS AIRES,
ARGENTINA
Commercial radiophone

20730 kc. LSY
-C- 14.47 meters
BUENOS AIRES
ARGENTINA
Commercial radiophone

20380 kc. GAA
-C- 14.72 meters
RUGBY, ENGLAND

19900 kc. LSG
-C- 15.87 meters
BUENOS AIRES
ARGENTINA

19820 kc. WKN
-C- 15.14 meters
A. T. & T. Co.,
LAWRENCEVILLE, N. J.

19355 kc. FTM
-C- 15.50 meters
ST. ASSISE, FRANCE

19220 kc. WKF
-C- 15.60 meters
A. T. & T. Co.,
LAWRENCEVILLE, N. J.
Transoceanic radiophone

19160 kc. GAP
-C- 15.66 meters
RUGBY, ENGLAND

18970 GAQ
-C- 15.81 meters
RUGBY, ENGLAND

18830 kc. PLE
-C- 15.93 meters
BANDOENG, JAVA.

18680 GAX
-X- 16.06 meters
RUGBY, ENGLAND

18620 kc. GAU
-C- 16.11 meters
General Post Office
RUGBY, ENGLAND

18370 kc. PMC
-C- 16.33 meters
BANDOENG, JAVA.

18345 FZS
-C- 16.35 meters
Saigon,
INDO-CHINA

18340 kc. WLA
-C- 16.36 meters
LAWRENCEVILLE, N. J.

18310 kc. GAS
-C- 16.38 meters
General Post Office
RUGBY, ENGLAND

18240 kc. FRO, FRE
-C- 16.44 meters
ST. ASSISE, FRANCE

18200 kc. GAW
-C- 16.48 meters
RUGBY, ENGLAND

18040 GAB
-C- 16.63 meters
RUGBY, ENGLAND

17810 kc. PCV
-C- 16.84 meters
KOOTWIJK, HOLLAND
6:00-9:00 a. m.

17780 kc. W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
Bound Brook, N. J.
10 a. m.-4 p. m., exc. Sat.
Relays WJZ

17770 kc. ★GSG
-B- 16.88 meters
British Broad. Corp.
DAVENTRY, ENGLAND
British Empire programs

17775 kc. ★PHI
-B- 16.88 meters
HUIZEN, HOLLAND

17640 kc. Ship.
-C- 17.00 meters
SHIPS
Phones to Shore
Work on this and higher channels

17, EXP.
-X- 17.33 meters
General Experimental
Channel (U. S. A.)

17120 kc. WOO
-C- 17.52 meters
A. T. & T. Co.,
OCEAN GATE, N. J.

17120 kc. WOY
-C- 17.52 meters
LAWRENCEVILLE, N. J.

17080 kc. GBC
-C- 17.56 meters
RUGBY, ENGLAND

16270 kc. WLK
-C- 18.44 meters
A. T. & T. Co.
LAWRENCEVILLE, N. J.

16270 kc. WOG
-C- 18.44 meters
OCEAN GATE, N. J.

16233 kc. FZR
-C- 18.48 meters
SAIGON, INDO-CHINA
phone to Paris

15880 kc. FTK
-C- 18.90 meters
ST. ASSISE, FRANCE

15490 kc. J1AA
-X- 19.36 meters
Mornings
KEMIKAWOA-CHO-CHIBA-KEN, JAPAN

15330 kc. ★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
Schenectady, N. Y.
Relays WGY, Mon., Wed., Fri.,
2:30-3:30 p. m.
Sunday, 2-4 p. m.

15295 kc. CP4
-B- 19.61 meters
LA PAZ, BOLIVIA
10:30-11:30 a. m.

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
Wayne, N. J.
11 a. m.-1 p. m., Daily

15243 kc. ★FYA
-B- 19.68 meters
"RADIO COLONIAL"
Pontoise (Paris), France
Service de la Radiodiffusion,
103 Rue de Grenelle, Paris
8-11 a. m.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
Saxonburg, Pa.
10 a. m.-4:15 p. m.
Relays KDKA

15200 kc. ★DJB
-B- 19.73 meters
ZEESEN, GERMANY
8 a. m.-1:40 p. m.

15140 kc. ★GSF
-B- 19.81 meters
BRITISH BROAD. CORP.
Daventry, England
British Empire programs

15120 kc. ★HVJ
-B- 19.83 meters
VATICAN CITY
Rome, Italy
Daily except Sun., 5:00 to 5:15 a. m.
and irregularly around 10:30 a. m.

14590 kc. WMN
-C- 20.56 meters
LAWRENCEVILLE, N. J.

(Time given is Eastern Standard Time)

14470 kc. WMF
-C- 20.73 meters
LAWRENCEVILLE, N. J.

14525 kc. XDA
-C- 20.65 meters
TRANS-NEWS AGENCY
Mexico City
2:30-3 p. m.

14530 kc. LSA
-C- 20.65 meters
BUENOS AIRES, ARGENTINA

14440 kc. GBW
-C- 20.78 meters
RUGBY, ENGLAND

13990 kc. GBA
-C- 21.44 meters
RUGBY, ENGLAND

13585 kc. GBB
-C- 22.08 meters
RUGBY, ENGLAND

13465 kc. GBQ
-C- 22.28 meters
RUGBY, ENGLAND

13390 kc. WMA
-C- 22.40 meters
A. T. & T. CO.,
LAWRENCEVILLE, N. J.

13210 kc. WOO
-C- 22.71 meters
OCEAN GATE, N. J.

12863 kc. EXP
-X- 23.32 meters
General Experimental Channel (U. S. A.) and Canada

12840 WOY
-C- 23.36 meters
LAWRENCEVILLE, N. J.

12840 WOO
-C- 23.36 meters
OCEAN GATE, N. J.

12825 kc. ★CNR
-B, C- 23.39 Meters
DIRECTOR GENERAL
Telegraph and Telephone Stations, Rabat, Morocco
Sunday, 7:30-9:00 a. m.

12780 kc. GBC
-C- 23.47 meters
RUGBY, ENGLAND

12290 kc. GBU
-C- 24.41 meters
RUGBY, ENGLAND

12260 kc. FTN
-C- 24.47 meters
ST. ASSISE (PARIS), FRANCE

12150 kc. GBS
-C- 24.69 meters
RUGBY, ENGLAND

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Irregularly in the morning from about 8:30-12 noon, on the half hour for periods of 30 minutes.

11950 kc. KKQ
-X- 25.10 meters
BOLINAS, CALIF.

11880 kc. ★FYA
-B- 25.25 meters
"RADIO COLONIAL"
Pontoise, Paris, France
12:15 p. m. on

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC CO.
Saxonburg, Pa.
4:30-10:00 p. m.
Relays KDKA programs

11865 kc. ★GSE
-B- 25.28 meters
British Broad. Corp.
DAVENTRY, ENGLAND
British Empire programs

11830 kc. ★W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP., Wayne, N. J.
3-5 p. m. Relays WABC

11810 kc. ★I2RO
-B- 25.4 meters
ROME, ITALY
11:30 a. m. to 12:15 p. m. and 1:15-6 p. m.

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.

11760 kc. ★DJD
-B- 25.50 meters
ZEESEN, GERMANY
10 a. m. to 4:50 p. m.

11750 kc. ★GSD
-B- 25.53 meters
BRITISH BROAD. CORP.
Daventry, England
British Empire programs

11730 kc. ★PHI
-B- 25.57 meters
HUIZEN, HOLLAND
Mon., Thurs., Fri., 8:30-10:30 a. m.; Sat., Sun., 8:30-11 a. m.

11720 kc. ★VE9JR
-B- 25.6 meters
WINNIPEG, CANADA
Daily exc. Sun, 6-10:30 p. m.; Sun., 9-10:30 p. m.

11705 kc. ★FYA
-B- 25.63 meters
"RADIO COLONIAL"
Pontoise (Paris) France
3-5 p. m., 6-11 p. m. daily

11680 kc. KIO
-C- 25.68 meters
KAHUHU, HAWAII

11340 kc. DAN
-C- 26.44 meters
NORDEICH, GERMANY

11181 kc. ★CT3AQ
-B- 26.83 meters
FUNCHAL, MADEIRA
Tues., Thurs., 5:00-6:30 p. m.
Sunday, 10:30 a. m.-1 p. m.

10770 kc. GBP
-C- 27.85 meters
RUGBY, ENGLAND

10675 WNB
-C- 28.1 meters
LAWRENCEVILLE, N. J.

10550 kc. WOK
-C- 28.44 meters
A. T. & T. CO.,
LAWRENCEVILLE, N. J.

10530 kc. GBX
-X- 28.49 meters
RUGBY, ENGLAND

10520 kc. VLK
-C- 28.51 meters
SYDNEY, AUSTRALIA

10410 kc. PDK
-C- 28.80 meters
KOOTWIJK, HOLLAND
7:30-9:40 a. m.

10410 kc. KES
-X- 28.80 meters
BOLINAS, CALIF.

10350 kc. LSX
-X- 28.98 meters
BUENOS AIRES, ARGENTINA

10300 kc. LSL
-C- 29.13 meters
BUENOS AIRES

10055 kc. ZFB-VRT
-C- 29.84 meters
HAMILTON, BERMUDA

9950 kc. GCU
-C- 30.15 meters
RUGBY, ENGLAND

9890 kc. LSN
-C- 30.30 meters
BUENOS AIRES
Phone to Europe

9870 kc. WON
-C- 30.4 meters
LAWRENCEVILLE, N. J.

9870 kc. J1AA
-X- 30.4 meters
KEMIKAWOA-CHO-CHIBA-KEN, JAPAN
4-7 a. m., irregularly

9860 kc. ★EAQ
-B- 30.43 meters
MADRID, SPAIN
Daily, 5:30-7:30 p. m.
Sat., also 1-3 p. m.

9790 kc. GCW
-C- 30.64 meters
RUGBY, ENGLAND

9750 kc. WOF
-C- 30.77 meters
LAWRENCEVILLE, N. J.

9675 kc ★TI4NRH
-B- 31 meters
HEREDIA, COSTA RICA,
10-11 p. m.
Daily and 6 p. m. on Sun.

9710 kc. GCA
-C- 30.89 meters
RUGBY, ENGLAND

9600 kc. ★CT1AA
-B- 31.25 meters
LISBON, PORTUGAL
Tues. and Friday, 4:30-6:00 p. m.

9600 kc. ★XETE
-B- 31.25 meters
MEXICO CITY, MEX.
2:30-5:30 p. m., 6:30 p. m.-12 midnight

9595 kc. ★HBL
-B- 31.27 meters
LEAGUE OF NATIONS
Geneva, Switzerland
Saturdays, 5:30-6:15 p. m.

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, Ltd., Sydney, Australia
Sunday, 1-3 a. m., 5-9 a. m., 9-11 a. m.

9590 kc. ★W3XAU
-B- 31.28 meters
BYBERRY, PA.
relays WCAU

9585 kc. ★GSC
-B- 31.29 meters
BRITISH BROAD. CORP.
Daventry, England
British Empire programs

9570 kc. ★W1XAZ
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
Springfield, Mass.
7 a. m.-1 a. m. daily

9560 kc. ★DJA
-B- 31.38 meters
ZEESEN, GERMANY
2-6 or 7:30 p. m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
Schenectady, N. Y.
Relays WGY programs
7:45-11 p. m.
Also from 11 p. m., Midnight on Saturday

9510 kc. ★GSB
-B- 31.55 meters
BRITISH BROAD. CORP.
Daventry, England
British Empire programs

9510 kc. ★VK3ME
-B- 31.55 meters
AMALGAMATED WIRELESS, Ltd.
G. P. O. Box 1272L, Melbourne, Australia
Wed., 5:00-6:30 a. m., Saturday, 5:00-7:00 a. m.

9490 kc. SR1
-B- 31.6 meters
POZNAN, POLAND

9330 kc. CGA
-C- 32.15 meters
DRUMMONDVILLE, CANADA

9280 kc. GCB
-C- 32.33 meters
RUGBY, ENGLAND

9020 kc. GCS
-C- 33.26 meters
RUGBY, ENGLAND

8928 kc. TGX
-C- 33.50 meters
GUATEMALA CITY, C. A.

8920 kc. GCX
-X- 33.63 meters
RUGBY, ENGLAND

8760 kc. GCQ
-C- 34.25 meters
RUGBY, ENGLAND

8680 kc. GBC
-C- 34.56 meters
RUGBY, ENGLAND

8650 kc. EXP
-X- 34.68 meters
General Experimental Channel (U. S. and Canada)

8560 kc. WOO
-C- 35.05 meters
OCEAN GATE, N. J.

8560 kc. WOY
-C- 35.05 meters
LAWRENCEVILLE, N. J.

8450 kc. PRBA
-C- 35.50 meters
PORTO ALEGRE, BRAZIL

8185 kc. ★PSK
-C- 36.65 meters
RIO DE JANIERO, BRAZIL
Irregular, 6:30-7:30 p. m.

8036 kc. CNR
-B- 37.33 meters
RABAT, MOROCCO
Sunday, 3-5 p. m.

7920 kc. GCP
-C- 37.88 meters
RUGBY, ENGLAND

7880 kc. J1AA
-C- 38.07 meters
KEMIKAWOA-CHO-CHIBA-KEN, JAPAN

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

7799 kc. ★HBP
-B- 38.47 meters
LEAGUE OF NATIONS, GENEVA, SWITZERLAND
5:30-6:15 p. m., Saturday

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

7480 kc. GDW
-C- 40.11 meters
RUGBY, ENGLAND

7444 kc. HBQ
-B- 40.3 meters
LEAGUE OF NATIONS, GENEVA, SWITZERLAND

7150 kc. HJ4ABB
-B- 41.6 meters
MANIZALES, COLOMBIA
Various times during evening

6990 kc. LCL
-B- 42.92 meters
JELOY, NORWAY
Relays Oslo 1-5 p. m.

6976 kc. EAR110
-B- 43 meters
MADRID, SPAIN
Tues., Sat., 5:30 p. m.

6905 kc. GDS
-C- 43.45 meters
RUGBY, ENGLAND

6860 kc. KEL
-C- 43.70 meters
BOLINAS, CALIF.
Transpacific Radiophone

6840 kc. CFA
-C- 43.80 meters
DRUMMONDVILLE, CANADA

6795 kc. GDB
-C- 44.15 meters
RUGBY, ENGLAND

6753 kc. WOA
-C- 44.40 meters
LAWRENCEVILLE, N. J.

6668 kc. HC2RL
-B- 45.00 meters
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

6660 kc. F8KR
-B- 45.00 meters
CONSTANTINE, ALGERIA

6610 kc. REN
-B- 45.38 meters
MOSCOW, U. S. S. R.
1 p. m.

6447 kc. HJ1ABB
-B- 46.50 meters
BARRANQUILLA, COL., S. A.
11:30 a. m.-1 p. m. and 5-10 p. m. daily
Thurs., 5-11 p. m.

6425 kc. ★W3XL
-X- 46.70 meters
NATIONAL BROADCASTING CO.
Bound Brook, N. J.

6425 kc. VE9BY
-B- 46.7 meters
LONDON, ONTARIO, CANADA

6382 kc. HC1DR
-B- 47.00 meters
QUITO, ECUADOR
8-10 p. m.

6335 kc. VE9AP
-B- 47.35 meters
DRUMMONDVILLE, CANADA

6272 kc. HI1A
-B- 47.8 meters
DOMINICAN REP.

6270 kc. HJ3ABF
-B- 47.81 meters
BOGOTA, COLOMBIA
7-11 p. m.

6167 kc. XIF
-X- 48.65 meters
MEXICO CITY, MEXICO

6150 kc. YV3BC
-B- 48.78 meters
CARACAS, VENEZUELA
Generally 5:30-10:00 p. m.

6140 kc. ★W8XK
-B- 48.86 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
Saxonburg, Pa.
Relays KDKA programs, 4:30 p. m.- midnight

6130 kc. ZGE
-B- 49.1 meters
KUALA LUMPUR, Fed. Malay States
Tue. and Fri., 6:40-8:40 a. m.
Sun., 7-9 a. m.

6125 kc. VE9HX
-B- 48.98 meters
HALIFAX, NOVA SCOTIA
5-10 p. m.

6122 kc. ZTJ
-B- 49 meters
JOHANNESBURG, SOUTH AFRICA
Daily except Sat. and Sun., 11:45 p. m.-12:30 a. m., 4-7 a. m., 9 a. m.-3:30 p. m.
Sat., only, 4-7 a. m., 9 a. m.-4:45 p. m.
Sun., only, 11:45 p. m.-12:30 a. m., 8-10:30 a. m. and 12:30-3 p. m.

6120 kc. ★W2XE
-B- 49.02 meters
Atlantic Broadcasting Corp.
Wayne, N. J., 6:00-11:00 p. m.

6120 kc. ★YV1BC
-B- 49.02 meters
CARACAS, VENEZUELA
10:30 a. m.-1 p. m.; 5:15-10 p. m.

6110 kc. VE9CG
-B- 49.10 meters
CALGARY, ALTA., CANADA

6110 kc. VUC
-B- 49.1 meters
CALCUTTA, INDIA
Tues., Wed., Thurs., 9:24-10:04 a. m.
Fri., 8:54-10:24 a. m.
Mon., Wed., Fri., 10:24-10:54 a. m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
Bound Brook, N. J.
Relays WJZ programs
Saturday, 5 p. m.-1 a. m.

6100 kc. ★W9XF
-B- 49.18 meters
DOWNERS GROVE, ILL.
Relays WENR, Chicago

6095 kc. ★VE9GW
-B- 49.22 meters
BOWMANVILLE, ONTARIO, CANADA
Mon., Thurs., 3 p. m.-midnight.
Fri., Sat., 8 a. m.-midnight.
Sun., 12 noon-9 p. m.

6090 kc. VE9BJ
-B- 49.26 meters
SAINT JOHN, N. B., CAN.
Around 7 or 8 p. m.

6085 kc. CP5
-B- 49.3 meters
LAPAZ, BOLIVIA
6-6:30 p. m., 9-10:30 p. m.

6080 kc. ★W9XAA
-B- 49.31 meters
CHICAGO FEDERATION OF LABOR
Chicago, Ill.
Relays WCFL

6075 kc. OXY
-B- 49.4 meters
SKAMLEBOAEK, DENMARK
Irregular, 1-6 p. m.

6072 kc. UOR2
-X- 49.41 meters
VIENNA, AUSTRIA
Tues. and Thurs., 8:30 a. m.-4 p. m.

6069 kc. VE9CS
-B- 49.43 meters
VANCOUVER, B. C., CANADA
Fri., 12:30-1:45 a. m.; Sun., 12 noon-12 midnight

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
Cincinnati, O.
Relays WLW

6060 kc. VQ7LO
-B- 49.50 meters
IMPERIAL AND INTERNATIONAL COMMUNICATIONS Ltd.
Nairobi, Kenya, Africa
Mon., Wed., Fri., 5:45-6:15 a. m., 11 a. m.-2 p. m.
Tues., 3-4 a. m., 11 a. m.-2 p. m., Thurs, 8-9 a. m., 11 a. m.-2 p. m., Sat., 11 a. m.-3 p. m., Sun., 10:50 a. m.-2 p. m.

6060 kc. ★W3XAU
-B- 49.50 meters
BYBERRY, PA.
Relays WCAU, Philadelphia

6050 kc. ★GSA
-B- 49.58 meters
BRITISH BROAD. CORP.
Daventry, England
British Empire programs

6040 kc. W1XAL
-B- 49.67 meters
BOSTON, MASS.

6030 kc. VE9CA
-B- 49.75 meters
CALGARY, ALTA., CANADA

6023 kc. XEW
-C- 49.8 meters
MEXICO CITY, MEXICO

6020 kc. DJC
-B- 49.83 meters
ZEESEN, GERMANY

6005 kc. VE9DR
-B- 49.96 meters
CANADIAN MARCONI CO.
Drummondville, Quebec
7 a. m.-11 p. m., daily, exc. Sun.; 11 a. m.-10 p. m., Sun.

6005 kc. VE9CU
-B- CALGARY, CANADA
Irregular

6000 kc. EAJ25
-B- 50 meters
BARCELONA RADIO CLUB, BARCELONA, SPAIN
3:30-4:30 p. m., Saturday

6000 kc. RW59
-B- 50 meters
MOSCOW, U. S. S. R.
4-6 p. m. daily

5970 kc. ★HVJ
-B- 50.26 meters
VATICAN CITY (ROME)
2-2:15 p. m., daily. Sun., 5-5:30 a. m.

5952 kc. HIX
-B- 50.4 meters
SANTO DOMINGO, DOMINICAN REP.
Tues. and Fri., 8-10 p. m.; Sun., 7:45-10:40 a. m., 3-5 p. m.

5930 kc. HJ4ABE
-B- 50.6 meters
MEDELLIN, COLOMBIA
Mon., 7-11 p. m.; Tues., Thurs., Sat., 6:30-8:00 p. m.; Wed. and Fri., 7:30-11:00 p. m.

5857 kc. XDA
-C- 51.22 meters
MEXICO CITY, MEXICO

5710 kc. VE9CL
-B- 52.50 meters
WINNIPEG, CANADA

5690 kc. FIQA
-B- 52.7 meters
ADMINISTRATION DES P. T. T.
Tananarive, Madagascar
Tues., Wed., Thurs., Fri., 9:30-11:30 a. m. Sat. and Sun., 1-3 p. m.

5170 kc. PMY
-C- 58.00 meters
BANDOENG, JAVA

5714 kc. HCK
-B- 52.5 meters
QUITO, ECUADOR, S. A.

5145 kc. OK1MPT
-X- 58.31 meters
PRAGUE, CZECHOSLOVAKIA

4975 kc. GBC
-C- 60.30 meters
RUGBY, ENGLAND

4820 kc. GDW
-C- 62.24 meters
RUGBY, ENGLAND

4820 kc. GCRX
-X- 62.24 meters
RUGBY, ENGLAND

4795 kc. EXP
-X- 62.57 meters
General Experimental Channel (U. S. and Canada)

4752 kc. WOO
-C- 63.1 meters
OCEAN GATE, N. J.

4751 kc. WOY
-C- 63.1 meters
LAWRENCEVILLE, N. J.

4700 kc. W1XAB
-X- 63.79 meters
PORTLAND, ME.

4328 kc. GDB
-C- 69.44 meters
RUGBY, ENGLAND

4328 kc. ★G6RX
-X- 69.44 meters
RUGBY, ENGLAND
Tests, 8-10 p. m.

4273 kc. ★RW15
-B- 70.20 meters
FAR EAST RADIO STATION
Khabarovsk
Daily, 3-9 a. m.

4272 kc. WOO
-C- 70.22 meters
OCEAN GATE, N. J.

4271 kc. WOY
-C- 70.22 meters
LAWRENCEVILLE, N. J.

4000 kc. HC-JB
-B- 73 meters
QUITO, ECUADOR
8:00-10:00 p. m. except Monday

3560 kc. OZ7RL
-C- 84.24 meters
COPENHAGEN, DENMARK

A Word of Explanation About S. W. Schedules

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

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

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

When To Listen In

By M. HARVEY GERNSBACK

● OUR new friend the new Russian station, RNE, on 25 meters, seems to have created quite a stir in this country, and is now reported by many short-wave listeners. The exact schedule is still unknown but is apparently about 8:30 a.m. to 2 p.m. It broadcasts for ½ hour, starting on the half hour and continuing for 30 minutes. Then it is silent for 30 minutes before starting the next half hour transmission. This information should not be relied on too implicitly. The address of the station is believed to be: Radio Station RNE, Gorki St., No. 17, Moscow, U. S. S. R.

After making a careful check over a period of several weeks, it has been determined that EAQ, Madrid, operates on 9860 kc. instead of our old listing of 10,000 kc.

* * *

How many listeners heard the broadcast of the President of Argentina through LSN and LSL of Buenos Aires on November 16? The program commenced at about 6:45 p. m. and at 7:00 the bells of a church or public building pealed forth the hour. Announcements were given in English and Spanish and an English translation of the speech was given after the president's address. Ernest Black of Glenside, Pa., sent in a report of this program and "yours truly" also heard it.

* * *

Many listeners report reception of G6RX of Rugby, England, broadcasting phonograph records from 8 to 10 in the evening on 4,820 kc., and also 4,320 kc. These stations are normally used for commercial telephony with the U. S. and Canada. When engaged in commercial traffic the calls used are GDW and GDB respectively. John R. Wainman of St. Louis, Mo., reports that on one day the call G6I is used and on the next day G6RX.

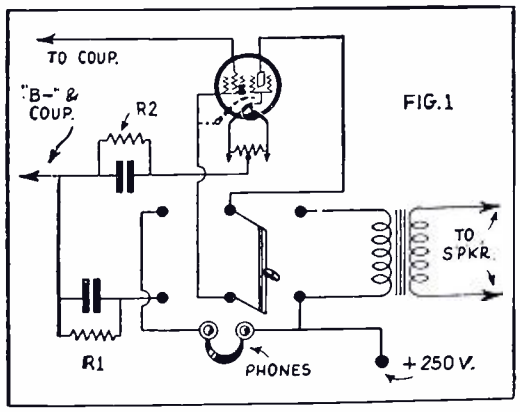


Fig. 1. How D.P.D.T. switch is arranged to connect phones when thrown to left and speaker when thrown to the right, a 56 or 27 tube being used for phones, and a 47 for speaker operation.

Composite Output System for PHONES or SPEAKER

Optional operation of "phones" or "speaker" is provided for by means of a switch, and one 5-prong socket accommodating a 56 or 27 tube for "phone" operation, or a 47 tube for "speaker" reception.

Tube requisites, be they physical or electrical, are important items in the construction of any radio apparatus. They are doubly so in this circuit where one socket serves as the connecting medium for two tubes of such dissimilar capacities. Let's look at the record of the 56 and 247. (Either the 56 or the 27 may be used for phone operation with this system. Do not use them interchangeably, however, as their bias requirements are different with 250 plate voltage.) Both the 56 and 47 have five-prong bases, therefore one socket will accept either tube. The plate and filament voltage requirements, being identical, need no more consideration with this arrangement than they do in an ordinary single output set-up. (The plate current differences should be considered in plate supply provisions.) The real difference in the two tubes lies in their bias and output specifications and in their fifth terminal (cathode in 56, screen grid in 47) circuit assignments. To quickly and surely arrange for the efficient operation of either tube from the one socket, regardless of these differences, is the purpose of the switch shown in all the figures.

Figure 1 shows a composite tube symbol and contains the preferred output and grid bias arrangement for the 47. The switch, when thrown to phone position, completes the bias circuit from the 56 cathode to "B" minus through bias resistor R1 and at the same time completes the output circuit from the 56 plate to "B" plus through the phones. The direct connection of the phones in the 56 plate circuit is permissible and safe because of this tube's low plate current consumption.

Upon insertion of a cathode-type tube (56 or 27) for phone operation, the 47 grid bias circuit from R3 through R2 is removed from the plate return circuit and thus becomes inoperative as a bias conductor. The output transformer is excluded from the plate circuit when the switch is in phone position. Thrown to speaker position, the switch completes the screen-grid circuit from "B" plus and lower side of transformer primary to the 47 screen grid and at the same time com-

(Continued on page 616)

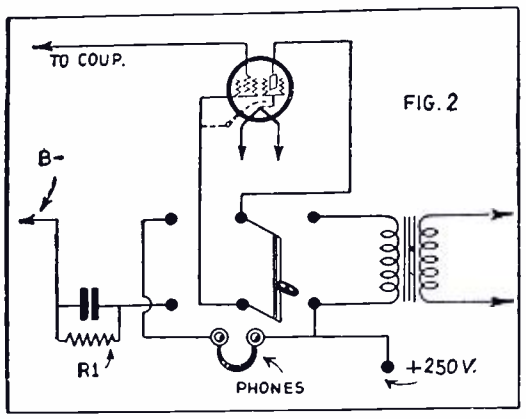


Fig. 2. Connections necessary when the 47 tube bias is provided in the power supply section of the receiver.

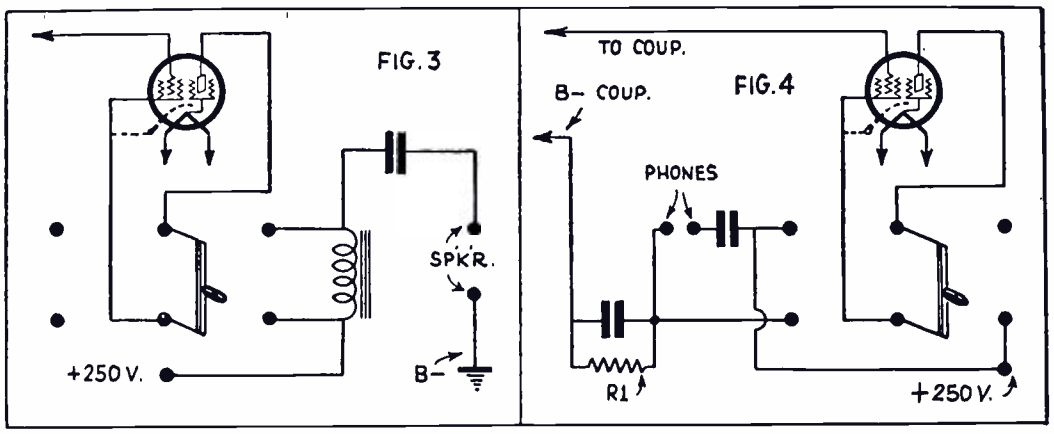


Fig. 3. How switching circuit is arranged for "choke" output. Fig. 4. Alternative phone hook-up, whereby the high plate voltage is kept out of the phones.

● WITH the unique output system outlined in the accompanying illustrations, optional operation of phones or speaker is realized in a novel and efficient manner. It is unique in that the one five-prong socket in the circuit does dual duty, accommodating the 56 (or 27) tube for phone operation and taking the 47 tube when speaker reception is desired. The advisability of the alternation of these types of tubes with change of reproducing units is universally recognized. Besides the actual substitution of the tubes, this composite output system requires but one manual movement—the throwing of a small toggle switch! This switch is the double-pole, double-throw kind. It should preferably have a "stop" or "dead" center and may, of course, be mounted on the front panel of the receiver. Knife or other type switches could be utilized as substitutes.

A Simple S-W Converter for a Super-Het

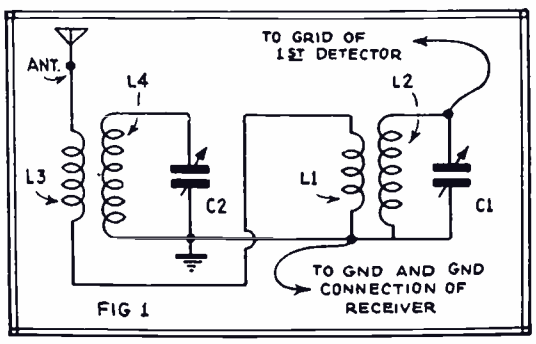
● THE author, desiring a means of listening in on the 160 meter and 80 meter amateur bands, police bands, etc., and not wanting to purchase a short wave converter hit upon the following plan of using his super-het receiver on short waves.

The converter described is simple and inexpensive to construct, and will work very well on any super-het receiver using a screen grid tube for the first detector. To use the converter you must be able to get at the control grid of the first detector and since the control grid terminal comes out the top of the screen grid tubes it is a simple matter when this type of tube is used.

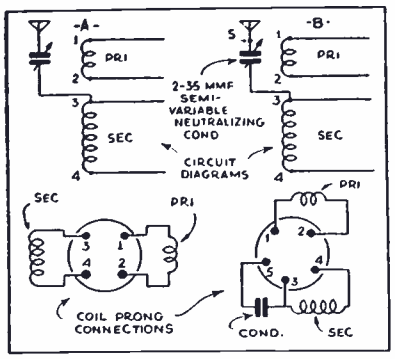
Fig. 1 is the schemetic diagram of the converter. The coil and condenser units used were out of an old broadcast receiver. The only altering of the units was of coil L2 and condenser C1. L1, L2 and C1 make up the short wave tuning unit. The primary L1 consists of fifteen turns on a 1¾ inch tube and is inside the secondary L2. L2 is twenty-two turns on a two inch tube. C1 was originally a .00035 mfd. condenser. Two rotor plates were removed for use in the converter. This L2, C1 combination tunes from about 1,500 to 4,000 K. C. This will include the 80 meter amateur phone band.

Since the L1, L2, C1 combination takes the place of all tuned stages ahead of the first detector there will be some broadcast interference if something isn't done about it. To prevent this an absorption wave trap was used. This is L3, L4 and C2 on the diagram. This coil and condenser unit is the same as it was when used in the broad-

(Continued on page 616)



A Clever S-W Converter Circuit.



$5.00 For Best Short Wave Kink

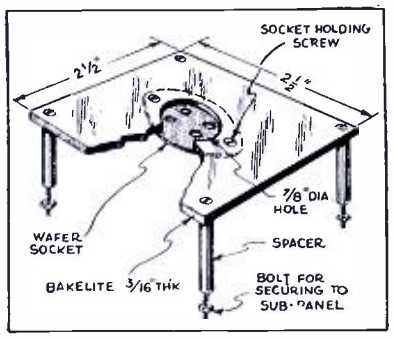
The Editor will award a five dollar prize each month for the best short-wave kink submitted by our readers. All other kinks accepted and published will be paid for at regular space rates. Look over these "kinks" and they will give you some idea of what the editors are looking for. Send a typewritten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

$5.00 Prize

ELIMINATING "DEAD-SPOTS"

As everyone knows "dead-spots" are generally caused by antenna absorption and can only be removed by adjusting the antenna condenser for each individual plug-in coil. Such troublesome adjustments can be elimnated by changing the coil from 4 to 5 prong and having a separate antenna condenser in each coil which is adjusted when the coil is made and left permanently in that position.—Elmer Schroeder.

▼ ▼ ▼

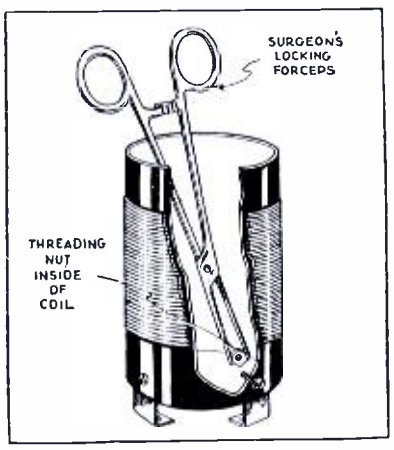


IMPROVISED COIL SOCKET

A very nice appearing and efficient coil socket can be made by using a wafer type socket and a 2½" bakelite or fibre square.

Cut a ⅞" circular hole in the center of the bakelite square, then mount the wafer socket. A hole drilled in each corner for bolts and spacers will keep the socket up from the sub-panel.—W. L. Williams.

▼ ▼ ▼



HOLDING SMALL NUTS

Set-builders will find a pair of surgeons' locking forceps a very useful tool. I have found them of particular help in starting nuts in places inaccessible to the fingers, under sub-panels, inside coils, etc. They are also of use as a "third" hand for holding small parts and wires when soldering. These forceps may be obtained from doctors, surgeons, and hospitals, who frequently discard them, as a slight rusting renders them unfit for surgical purposes.—K. Kreps.

▼ ▼ ▼

EMERGENCY R. F. CHOKE

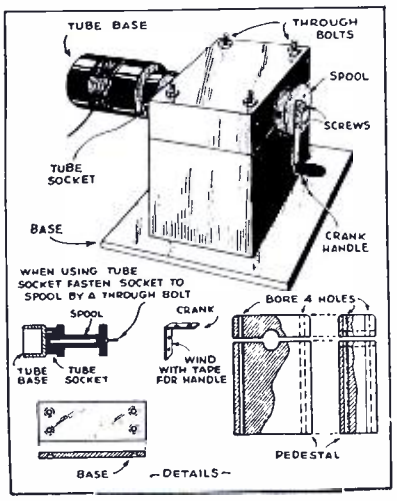
When I need a R.F. choke in a hurry and can't go out and buy one, here is one that works FB. I use the small coil of wire from an old ear phone; two of them in series if necessary.—Nat Sander.

▼ ▼ ▼

COIL WINDER

Here is an easily built coil-winder especially suited for winding tube base coils.

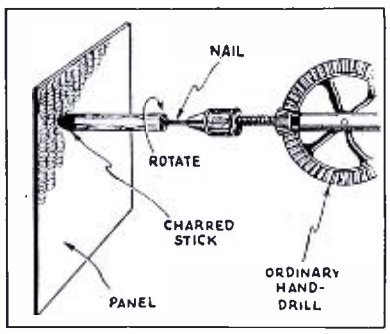
The coil-winder illustrated is made from a block of wood, a small angle bracket and an old spool (one which carried ¼ lb. of any size wire). Take a block of wood 6"x2"x1½" and cut out as shown, bore the holes and attach lower half to base. Bore the holes in the spool to fit the tube base and assemble. If it is not desired to bore the holes in the tube-base, an old socket may be used.—S. Woolman.



▼ ▼ ▼

WAVE-EFFECT ON PANEL

Many set-builders desire a "waved" effect on aluminum panels. These can be made at home as follows: Secure a short soft-wood stick (pine is best) and hold one end in a flame until it becomes slightly charred. Drive a nail or drill point in the other end as shown. Place the unit

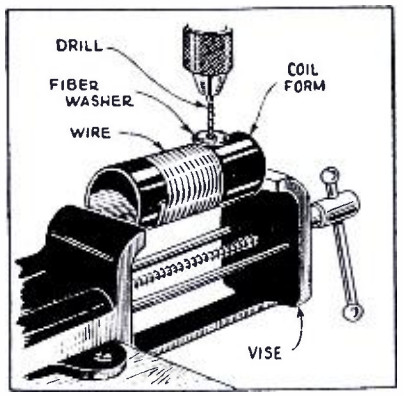


in a hand-drill and, holding the charred end against the panel, rotate the drill at a rather brisk speed. As the drill is rotated move the stick along the panel until the entire front surface is completely "waved." If the charcoal has a tendency to scratch the aluminum, rub the charred portion with an old cloth.—Harry D. Hooton.

▼ ▼ ▼

DRILLING COIL FORMS

Often while drilling the coil form to make connections for the wire, the drill comes down with a sudden impact as it goes through. In most cases the coil is partly wound and the impact on silk, cotton, or enameled covered wire often causes disaster, as the covering either chips or unravels, leaving the wire bare, which not infrequently causes a "short." To remedy this I found that by placing a fibre washer over the hole, which I first

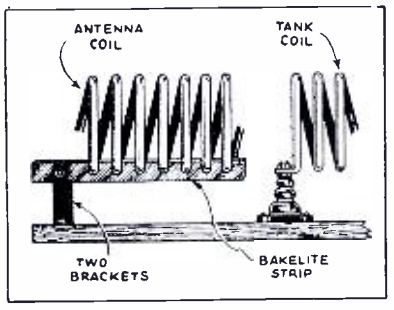


had started without the washer, my troubles were at an end as I had not to fear the ruining of the coil by chipping or unraveling the covering.—Charles Bartels.

▼ ▼ ▼

MOUNTING TRANSMITTER COILS

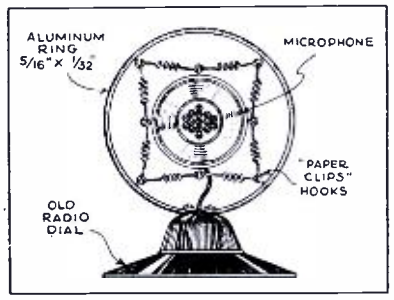
The sketch shows a good method for mounting the antenna coil or coils. This method is very satisfactory for the low-power transmitter because of its simple construction and because the coupling can easily be varied by moving the coil up or down. The coil is first wound in the usual manner and then threaded, through the hole in the bakelite strip.—Duffy Sasser.



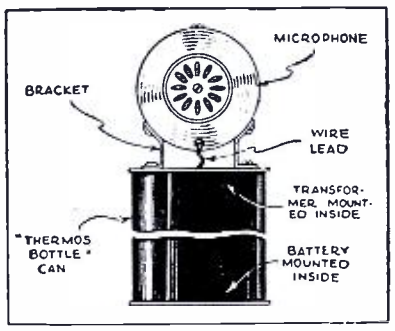
▼ ▼ ▼

CHEAP MIKE STAND

I took a strip of aluminum which was secured from the light plant, with the idea in mind of making some transmitter coils from it. This strip was wound around the edge of the dial and then mounted on top of the dial, the ring had previously been provided with hooks for the springs made from paper clips and forced into holes slightly smaller that the diameter of the wire. A hole was bored



in the top of the dial and the wire passed through the hole and through the hole used for the set screw. The flange bearing the numerals can be broken off and filed down. Four lugs were soldered on the microphone to receive the springs. The springs were made from small steel wire bought at a 5-and-10 store.—Duffy Sasser.



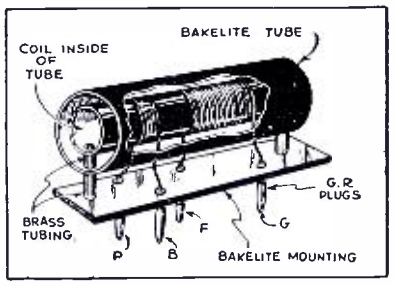
MIKE BATTERY CASE

This method of mounting the mike, battery, and transformer has proved to be neat, convenient, and time-saving.

The parts were removed from a Thermos bottle, the can turned upside down and the mike mounted on the can as shown. The two lower brads which held the mike together and screws were placed in their places. The transformer was mounted on a piece of bakelite and fixed to the top of the can with a few brackets, leaving enough space at the bottom for the battery. A piece of bakelite or prestwood is then placed on the bottom to hold the battery in the can. A switch may be placed on the top to switch the battery in and out of the circuit. The output wire may be brought out the back of the can.—Duffy Sasser.

▼ ▼ ▼

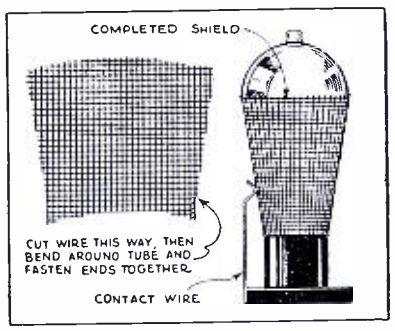
COIL PROTECTOR



Pulling tube base coils out of the sockets often dislocates the windings and spoils calbration of the set. I had this happen to me a number of times and so I tried the following kink.

The bakelite tube inside is the same diameter as a tube base (1⅜ in.) and the outer one is 2 in. Their length depends on the coil windings. Gummed paper labels with each coil's wave are glued on top.—Eugene Czap.

▼ ▼ ▼



NOVEL TUBE SHIELD

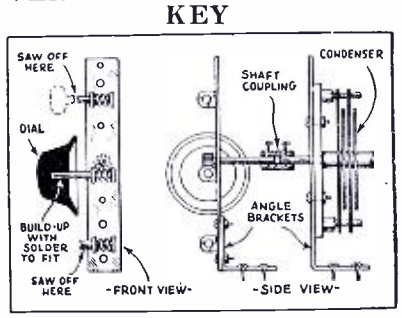
An effective tube shield can be made from a piece of copper screen. The screen wire is first cut, as illustrated, then wrapped around the tube. It is held in place by fastening the ends of the wire together.

A bit of experimenting may be necessary in order to make the shield a good fit.

Contact with the shield is made from the chassis, and can be arranged by means of a wire to contact the shield as it is mounted in the socket.—Roland C. Nowrey, (W3APD).

▼ ▼ ▼

VERNIER FROM GUITAR KEY



Here is a way to make a low cost vernier dial from an old set of guitar keys, which can be bought from music stores at small cost. I obtained a pair of these keys for 25c. A pair makes 2 vernier dials. The ratio is 12 to 1.—Forest Dodson.

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.

"TOY TRANSFORMER" FOR FILAMENTS

Robert E. Look, Andover, Mass.

(Q) Is it possible to use a toy train step down transformer with a rheostat, to provide filament voltages for the "*Depression Transmitter*" described in the May issue of SHORT WAVE CRAFT?

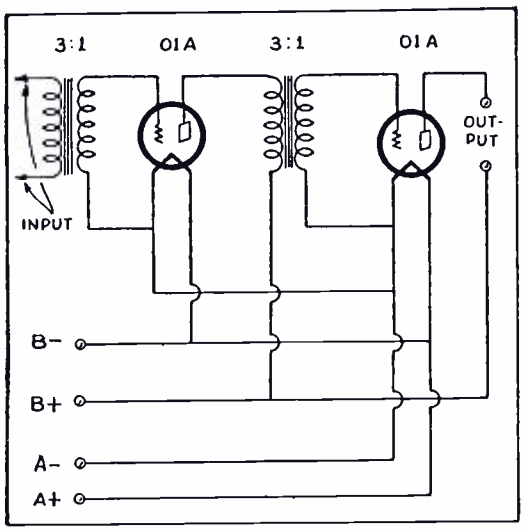
(A) Your toy transformer will serve very nicely to supply the filament voltages for the "*Depression Transmitter*", described in the May issue of SHORT WAVE CRAFT. We recommend that you use some sort of voltmeter in conjunction with the transformer, in order to keep a constant check on the voltage.

AMPLIFIER FOR 1-TUBE SET

J. M. Anderson, Centerview, Mo.

(Q) Will you please print the diagram of an amplifier to be used with the "one-tube" short-wave receiver that will operate a loud speaker.

(A) A schematic drawing of the two-stage amplifier to be used with your one-tube set is shown on this page and you should experience no difficulty in receiving stations on the loud speaker.



2 stage Audio Amplifier for a one-tube set

ELIMINATING INTERFERENCE FROM TRANSMITTERS

Richard F. Morgan, Worcester, Mass.

(Q) My friend and I have transmitting stations which are located so close that the transmitting antennas cross each other. It is practically impossible for either one of us to receive while the other is operating. Can you make any suggestions as to the elimination of this interference?

(A) There is practically no method of eliminating the interference caused by your receivers and transmitters due to the fact that they are so very close to each other. The only logical thing to do would be to separate the two transmitting antennas as far as possible and improve the selectivity of your receivers.

"B" ELIMINATOR

Milton E. LaPorte, Jackson, Mich.

(Q) I have an Exide radio power unit which I should like to rewire to use a tube as rectifier. Can you provide this information?

(A) Most of the eliminators of the type you mention utilize the half-wave type rectifier, and it is very difficult to obtain good results with this type of rectifier in short-wave work as *hum* is invariably encountered. We suggest that you construct an entirely new eliminator, using as many parts as possible from the old unit and using as a transformer one delivering 300 volts each side of center tap in the secondary, one 2.5 volt and one 5 volt filament windings.

3-TUBE BAND SPREAD SET

Louis Abraham, Cleveland, Ohio

(Q) I have built the 3-tube receiver shown in the June, 1933 issue of SHORT WAVE CRAFT and I am experiencing trouble in obtaining smooth regeneration.

(A) On the 3-tube "band-spread" receiver it is necessary that a .00025 mf. fixed condenser be shunted from the plate of the 57 detector tube to ground or "B" negative. This was not shown in the original diagram. We feel sure that if you add this condenser you will experience no further difficulties in obtaining excellent results with your receiver.

2-TUBE ELECTRIFIED DOERLE

R. F. McLeer, Duluth, Minn.

(Q) Where can I obtain the diagram of the *2-Tube 12,500 Mile Doerle Short Wave Receiver*, using types of tubes intended for A.C. operation, making use of the power transformer, etc., as I have quite an assortment of parts which could be used for this purpose.

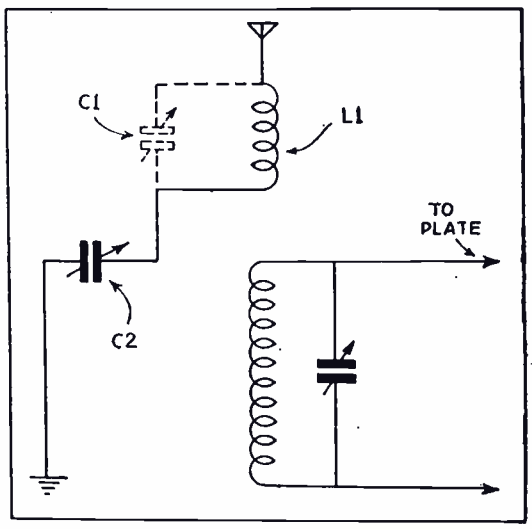
(A) In the July, 1933, issue of SHORT WAVE CRAFT, you will find on page 148, complete constructional data regarding the construction of the "2-tube Doerle" receiver, intended for 110-volt A.C. operation, and using the *latest type tubes*. A suitable *power supply*, of course, will be necessary to operate this receiver.

DIAGRAM FOR MR. VICTOR'S SET

Oscar A. Neumer, Jr., Chicago, Ill.

(Q) In the September issue of SHORT WAVE CRAFT, diagram and instructions were published on the construction of a *Beginner's Transmitter* by Leonard Victor, but there was no schematic diagram included in the article. Would you please print this diagram?

(A) If you will turn to page 272 of the September issue of SHORT WAVE CRAFT you will find complete pictorial and schematic diagrams fully explaining the construction of Mr. Victor's short-wave transmitter.



Method of coupling a Marconi antenna to the Victor transmitter

POLICE CALL ADAPTER

Forrest Blanding, Oak Park, Ill.

(Q) Would you please be kind enough to publish a diagram of a simple short-wave "adapter" which will enable me to receive *police calls* in the neighborhood of 175 meters. This is to be used in conjunction with a 24 type detector on my broadcast receiver.

(A) We give herewith a diagram of about the most simple short-wave adapter to be used in conjunction with a 24 detector in a broadcast receiver. Remove the 24 detector from its socket, insert it in the adapter, putting the plug of the adapter into the 24 socket of the broadcast receiver.

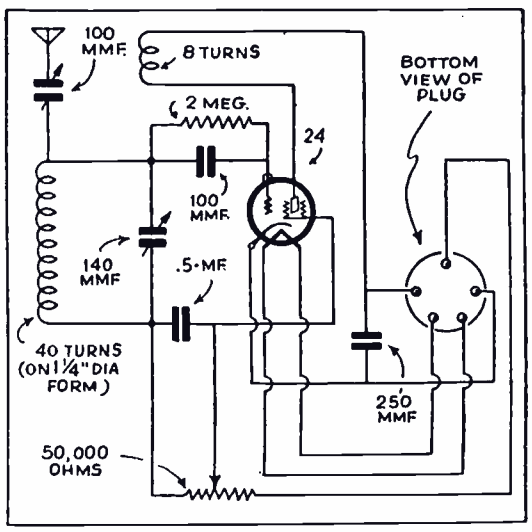


Diagram of a police adapter using '24 tube

ANTENNA COUPLING CONDENSER

Clurin Martin, Naples, Tex.

(Q) I built one of your "2-tube Doerle" sets and I can't get the antenna to work just right. I am using an antenna coupling condenser with a capacity of 70-140 mmf. When I connect my antenna, which is about 85 feet long to the antenna post the set stops oscillating, but when I remove the antenna entirely there seems to be ample regeneration and with a small antenna I can get W8, W9, W4, and W2 stations with good volume. How can I overcome this difficulty?

(A) Evidently the minimum capacity of your present condenser is too high. We recommend that you use one having a capacity from 15 to 30 mmf. (.000015 to .000030 mf.) which should entirely eliminate the trouble you are having.

ANTENNA FOR MR. VICTOR'S TRANSMITTER

W. Sckeineel, Pontiac Mich.

(Q) I am unable to erect the type of antenna suggested by Mr. Victor to be used with his transmitter. What suggestions have you?

(A) We are printing a diagram of the Marconi type antenna which does not have a "feeder" system. The length of the antenna should be the same as that specified by Mr. Victor. We believe an antenna of this type can be erected in almost any location.

The Sargent 9-33 Receiver

· *(Continued from page 605)*

on 1000 KC (300 meters) would give a cutoff of approximately 10 KC on each side of a powerful carrier. Stating it otherwise, a change of 1% in frequency was necessary for eliminating a powerful carrier. It so happens that due to practical limitations in wire resistance, inductance and capacity values available, etc., that this ratio of 1% holds approximately the same at any frequency. Thus while a well designed tuned r.f. receiver on 1000 KC could, at best, be expected to give 10 KC selectivity, the same care in designing a tuned r.f. receiver for 10,000 KC (30 meters) would result in a cutoff of 100 KC on a station of power equal to the one tested at the lower frequency. A powerful amateur station at this frequency would then cover approximately 100 KC, or one-third the width of a 300 KC band on a tuned r.f. receiver, and due to engineering limitations there is no way in which this selectivity could be greatly increased. Going in the other direction, 5 KC selectivity (1%) could be expected on 500 KC, and 1.75 KC selectivity on 175 KC with equal care in circuit engineering.

Super-hets Superior Selectivity

In a superheterodyne the incoming frequency is changed by means of a *local* oscillator to what is known as the *intermediate frequency*, the latter lying usually somewhere between the limits of 175 to 525 KC. The signals are then amplified at this intermediate frequency. This important point for this discussion is that the characteristics of the intermediate frequency determine the amount of selectivity obtainable, so that in a super the obtainable selectivity is 1% of the I.F. (not of the incoming frequency.) This explains why supers are inherently many times more selective than any other type of receiver. A 465 KC super, for example would have approximately eight times the selectivity of a tuned r.f. receiver operating in the 3500-4000 KC band, or about 15 times the selectivity of the same receiver in the 7000-7300 band!

Speculating upon this raises the question of why we do not really go to extremes in the matter and select some such frequency as 50 KC, or even 10 KC for our I.F. We would except for a most important consideration,—*image interference.*

What is image interference? To properly explain this it is necessary to refer to the fundamental principle upon which a super operates. In a superheterodyne the incoming frequency is mixed, or heterodyned in the first detector with the frequency of the local h.f. oscillator, and the difference or beat between these two is the resulting intermediate frequency of the super. Suppose for example the incoming frequency is 4000 KC, and that to receive it the h.f. oscillator is set at 4175 KC. Thus the difference between the two is 175 KC, and it is to that frequency that the intermediate amplifier of the super would have to be adjusted for amplification. Now suppose there is a powerful transmitter nearby operating on a frequency of 4350 KC. The difference between that frequency and the oscillator setting of 4175 is also 175 KC, or in other words the oscillator while set at 4175 renders reception possible on frequencies of 4000 and 4350 KC. Unless the antenna circuit is sufficiently selective to completely eliminate the 4350 while tuned to the 4000, both stations will be heard at this setting. The one to which the antenna is tuned is of course the *desired frequency* while the other is known as the *image.* In this case the frequency cutoff for complete elimination of the image would be 350 KC, less than 9% of the 4000 KC frequency, and impossible to obtain without the very best type of sharply peaked r.f. stage ahead of the first detector.

Selection of an I.F. of 465 KC makes the matter of *image elimination* much easier. The image would then be separated from the desired frequency by twice the I.F., in this case 930 KC, and a good antenna input circuit to the first detector should be capable of this amount of frequency discrimination in most cases. Going the other way, an I.F. of 50 KC would make necessary an antenna circuit discrimination of a frequency difference of 100 KC,—impossible at incoming frequencies in the neighborhood of 4000 KC without going into a complicated multiplicity of highly peaked circuits that would be utterly useless for an all-wave receiver.

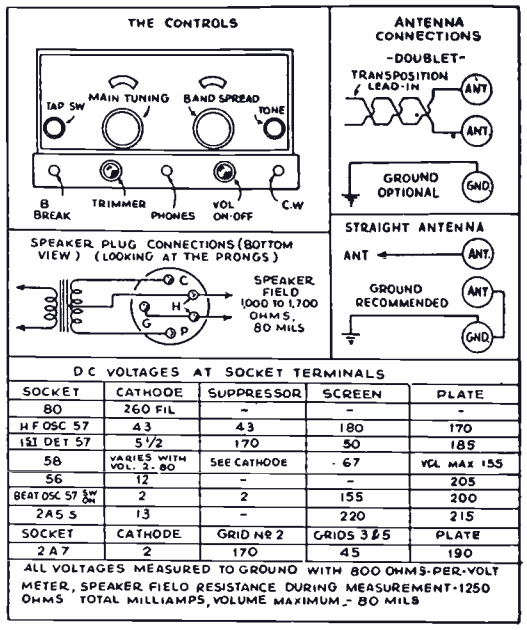
Final I.F. Frequency Choice

Thus the choice of I.F. simmers down to a compromise between *image elimination* and *selectivity*. In many receivers now on the market 465 KC as an intermediate frequency has been proven to be satisfactory, insofar as *image suppression* is concerned. However, for selectivity there is still room for improvement, as is amply demonstrated by attempt to incorporate crystal filters in the intermediates of such receivers. The amount of selectivity that may reasonably be expected from a super with a 465 KC intermediate may be easily judged by reference to that with which we are already familiar, namely what can be obtained at the 550 end of the broadcast band, with a tuned r.f. receiver. 550 KC is near enough to 465 so as to give a fairly accurate comparison and experience tells us here that anything better than 10 KC selectivity is extremely good. Compared with this a selectivity of approximately 3.3 KC could correspondingly be expected from an intermediate of 175 KC.

In the 9-33 receiver the first stage of I.F. is on 465 KC, this for the purpose of *image suppression*, then there is a fixed oscillator adjusted to 290 KC which beats with the 465 to form a second I.F. of 175 KC. This combination gives practical results even better than expected. Selectivity is of course greatly increased due to the lowering of the frequency. Gain from the 175 stage is noticeably greater than that obtainable on 465, this being due to an inherent characteristic in tubes to give more amplification at lower frequencies. In addition there is a degree of stability that was entirely unexpected. It is due to the fact that the two I.F. stages, being on different frequencies, have absolutely no tendency for interlocking, with consequent inter-regeneration between stages. This effect of inter-regeneration even in the best isolated two stage I.F. supers makes adjustment of the I.F. transformers super critical and tends to create an abnormally high roar and hiss of background noise with the volume fully advanced. In the 9-33 the background is correspondingly low and compares with that of the best crystal filter receivers.

New Tubes Used

The receiver uses the new tubes, the 57 for H.F. oscillator, first detector and CW beat-note oscillator, the 58 for the 175 KC I.F. stage, the 2 A 7 for the 465 stage and 290 KC fixed oscillator, 56 for second detector and 2 A 5s in push-pull for the audio. A jack is connected into the plate circuit of the 56 for headphone reception. Complete circuit diagram with all resistance and capacity values is shown in Fig. 2. Features that will appeal to the amateur are the "B" circuit breaking switch for cutting the set off during transmission, beat frequency oscillator for CW reception, and the convenience of *tap-switch changing of frequency bands*. The receiver is thoroughly shielded, having a metal plate below the chassis and a box shield (removed for photo) over coils and tap switch. Leads to all r.f. and detector sockets are bypassed with individual non-inductive condensers and isolated with resistors, and the receiver is so "tight" that it can be used as a "monitor." Single spot grounding for each set of circuits is used throughout thus eliminating interstage feed-back via chassis currents. The h.f. oscillator is electron-coupled, and is further made stable by the complete absence of any adjustment such as a variable padding condenser. The only adjustment in the circuit is the single unit tuning condenser. There is therefore no way in which this most important circuit can change calibration. To insure its lining up with the antenna tuning there is a trimmer, but the trimmer is placed in the *antenna* circuit which is much less critical and does not in any way affect the frequency calibration of the set.

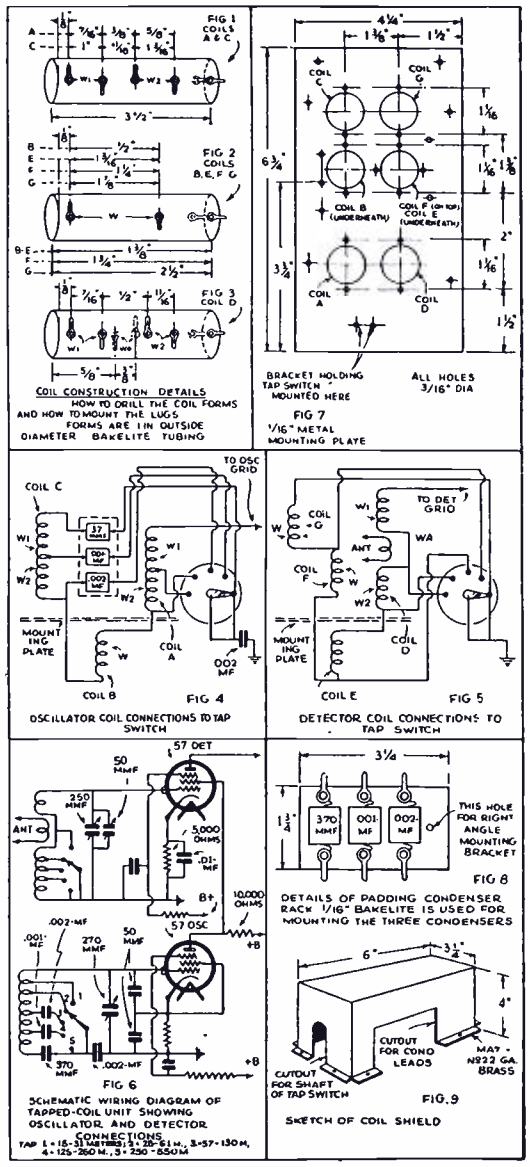


DC VOLTAGES AT SOCKET TERMINALS

SOCKET	CATHODE	SUPPRESSOR	SCREEN	PLATE
80	260 FIL	-	-	-
H.F OSC 57	43	43	180	170
1ST DET 57	5 1/2	170	50	185
58	VARIES WITH VOL. 2-80	SEE CATHODE	67	VOL MAX 155
56	12	-	-	205
BEAT OSC 57 SW ON	2	2	155	200
2A5 S	13	-	220	215
SOCKET	CATHODE	GRID No 2	GRIDS 3 & 5	PLATE
2 A 7	2	170	45	190

ALL VOLTAGES MEASURED TO GROUND WITH 800 OHMS-PER-VOLT METER, SPEAKER FIELD RESISTANCE DURING MEASUREMENT-1250 OHMS TOTAL MILLIAMPS, VOLUME MAXIMUM - 80 MILS

Drawing, above, shows arrangement of antenna and ground terminals on the Sargent receiver, as well as D.C. voltages at socket terminals.



Details of Sargent coils, padding condensers and switch connections.

The 290 KC fixed oscillator uses a "high C" circuit, meaning high capacity to inductance ratio, thus insuring its stability and making it entirely immune to any small capacity changes such as might be caused by humidity or temperature. The same is true of the CW beat-note oscillator. The 9-33 receiver has a wavelength range of 15 to 550 meters or a frequency range of 550 to 20,000 KC. Five taps are used.

The Tapped Coils—How Losses Are Eliminated

Perhaps a few words regarding the merits of *tapped coils* versus *plug-ins* might not be out of place. This is recognized as controversial ground with opinion about equally divided each way. Both systems have their disadvantages, plug-ins having losses due to metal contacts being right in the field of the coils, also possibilities of trouble in the several slipping contacts employed. Tapped coils on the other hand tend to have losses from dead-end effect of unused turns. As regards convenience, there is absolutely no question and the advantage lies all in favor of the tapped coils. In the 9-33 receiver the coil sections are all connected in series and each section is spaced from all others in such a way that there is practically zero coupling with other sections that could cause a dead-end loss. In addition unused turns are "shorted out." The set has been carefully checked for possible *dead-end* losses by plotting tuning curves of all bands, and it can be positively stated that if such losses do exist they are too small to cause a "hump" in the tuning curve, and are therefore entirely negligible. Of especial interest is the hookup used in the h.f. oscillator circuit. This is a capacity-coupled, electron-coupled oscillator circuit and has the advantage of permitting band-switching with a single tap switch, one side of which may be grounded. The feed-back coupling is through the two .00005 mf. condensers and this remains constant regardless of the position of the variable condenser. This is a powerful oscillator circuit and seems especially good at 20 meters and below, at which wavelengths inductively coupled circuits frequently give trouble.

Coil Winding Data for Sargent Receiver

Coil A. W-1, 4 turns No. 24 D.S.C.; W-2 9 turns No. 24 D.S.C. Note: Forms for coils A and D should be threaded, 24 turns per inch, for a distance of 2 inches from upper end; turns are wound in the threads. All other coils are "close-wound" with size wire specified.
Coil B. W 18 turns No. 28 D.S.C.
Coil C. W-1, 82 turns No. 32 D.S.C. W-2, 42 turns No. 28 D.S.C.
Coil D. See note under coil A. W-1, 5 turns No. 24 D.S.C. W-2, 11 turns No. 24 D.S.C. W-A 4 turns No. 24 D.S.C.
Coil E. W 25 turns No. 24 D.S.C.
Coil F. W 61 turns No. 28 D.S.C.
Coil G. W. 140 turns No. 32 D.S.C.

BOOK REVIEW

The Radio Handbook—Including Television and Sound Motion Pictures, by James A. Moyer, S. B., A. M., and John F. Wostrel. Size, 5¼ by 7½, 886 pages, profusely illustrated with halftones and line drawings; flexible leatherette covers with title stamped in gold. Published by McGraw-Hill Book Company.

Short-Wave receivers, as well as every conceivable kind of transmitter and receiver of the regular broadcast type are discussed exhaustively with diagrams, curves, etc., so that the student, as well as the practical service man and operator will be able to make use of the very complete text provided in this hand-book. The opening section of the book gives an up-to-date concise treatment of fundamental units and definitions; symbols used in radio diagrams; a wavelength-frequency—product of C and L table, etc.

Vacuum tubes and their many circuits are allotted a liberal portion of the book and next we come to transmitting circuits and how they work. In the chapters dealing with transmitters, we note that marine type commercial transmitters are included, which makes the book very valuable indeed to all students of radio who have to understand commercial transmitters, their operation and circuits, in order to pass their examination for a license.

We find such vital new subjects as sound movies, radio range and beacon systems for aircraft, automobile radio sets, television circuits and photo-electric cell applications, all of which are given adequate and valuable coverage.

Latest All-Wave Superhet

(Continued from page 606)

The 8-tube receiver has first and second R.F. stages, first detector and oscillator stage, I.F. amplifier stage, second detector stage, audio driver, and A.F. output stage and finally the rectifier, utilizing the 80 type full-wave Radiotron.

The sets are supplied in beautifully finished hardwood cabinets and all in all they represent some of the very highest class engineering design yet seen in "all-wave" receivers. Special graphic tuning charts are furnished with these sets to facilitate tuning in European and other "DX" short-wave stations.

Composite Output System for Phones or Speakers

(Continued from page 610)

pletes the output circuit from the 47 plate to "B" plus through the primary of the output transformer. With the insertion of the 47 tube for speaker operation, the filament wiring becomes the plate return circuit and the 47 bias is provided through R3 and R2. The 56 bias circuit is isolated by action of the switch.

Figure 2 shows the connections necessary when the 47 bias is taken care of in the power supply section of the receiver. The above bias explanation applies here also. Figure 3 shows the wiring with choke output. This choke is excluded from the plate circuit when the switch is thrown to phone position. Figure 4 shows an alternative phone hook-up whereby the high plate voltage is routed away from the phones and the A. C. signal is permitted to pass through their windings.—Cecil A. Haase, 421 Dale Ave. S. E., Roanoke, Va.

A Simple S-W Converter for A Superhet

(Continued from page 610)

cast receiver. The primary L3 is fifteen turns on 1¾ inch tube inside the secondary L4. L4 is 72 turns on a two inch tube. C2 is .00035 mf. If this does not clear up all broadcast interference, shielding of the coils L1 and L2 and of the lead from L2 to the detector tube will.

To use the converter, connect aerial and ground as indicated on the diagram, remove the lead from the control grid terminal on top of the first detector tube and clip on the lead from L2. You now have a short wave superhet. You have two tuning controls, the one on C1 and the dial of the receiver. The dial of the receiver now only controls the frequency of the oscillator in the receiver. To beat the incoming signals you will now be using harmonics of this oscillator.

The easiest way to tune the set is to set C1 anyplace desired and tune the dial of the receiver until a resonance point is reached. This is noted by an increase in background noise. You can then keep them tracking. If the end of the dial on the receiver is reached another resonance point can be found using another harmonic of the oscillator. There will always be some harmonic of the oscillator that will fit any frequency that L2, C1 is tuned to. It is really quite simple to operate and you have all the selectivity of a super-het.

The converter can be built up inside the receiver if there is room, or it can be a separate unit. Keep the lead from L2 to the detector tube as short as possible. It is best to have it and L1, L2 shielded, but unnecesary. The one the author is using is not shielded.—Harry D. Pickett, Federal Radio Commission, Monitoring Station, Grand Island, Neb.

Don't Fail to Read

"How to Make the Beginner's 1 Tube Short-Wave Set"

- This is the title of an interesting article appearing in the February, 1934, issue of RADIO-CRAFT. A single, "2 volt" battery tube is used.
- The receiver has been designed for the tyro who doesn't know a binding post from a condenser. Large photographs, a picture diagram and, for the more technically-minded, a schematic circuit are given, together with detailed directions and a complete "List of Parts." Plug-in coils provide complete coverage from 16 to 545 meters. Worldwide reception is provided, under suitable conditions.

National S-W Receiver Goes on Byrd Trip

(Continued from page 604)

peaked curve of the I. F. amplifier. Still further selectivity is obtained in the beat frequency reception of code signals through the asymmetrical action of the beat frequency phenomenon which approaches single signal response. Another feature of this receiver is the unusual signal to noise ratio, the true criterion of sensitivity, here greatly increased by the pre-selector circuit employed which militates against low frequency background noise, which might otherwise reach the intermediate amplifier and be considerably intensified. The principal gain in this receiver is contributed by the I.F. amplifier; the I.F. transformers are peaked at 500 kc. by special tuning condensers, having negligible R.F. losses, and connected across the primaries and secondaries; the coils in these transformers are wound with Litz wire. With all the careful design and high selectivity obtained from this receiver, its sensitivity over the entire tuning range from 1.5 mc. to 20 mc. is practically constant with an over-all voltage amplification of approximately 20,000,000 or a gain of 146 decibels. This would indicate a maximum output sensitivity of a small fraction of one microvolt per meter.

Both the AGS receiver and the AGSX (the X indicating the *crystal filter* type set) are designed for use with the Lynch noise-elimination type short-wave antenna. Other features of the receiver fitting it for such exacting and rugged service as that encountered on the Byrd Antarctic Expedition II, are the substantial size and strength of the parts used in building the receiver, including the heavy front panel; the fact that *band-spread* coils are available, permitting any desired bands to be spread over the dial for easy tuning, and also the fact that due to the powerful line-up of tubes in the superheterodyne circuit employed in the receiver, a very strong signal results in the output stage, so that loud-speaker reception is always available when wanted.

Official information from the radio advisor to the Byrd Expedition II is to the effect that a National AGS receiver will be on duty for broadcast pick-up and general communication purposes at the "main base"; at this location there will also be in service one National FB-7 receiver for reception from the "forward" base and sledge parties; also one National SW-58 emergency receiver.

At the "forward" base there will be located one National AGS receiver; one model FB-7 receiver and one type SW-58 receiver. With regard to the aircraft to be used on the Byrd Expedition, these will be fitted with National type SW-3 receivers.

Practical Answers to Common S-W Questions

(Continued from page 594)

tuning condenser in place of the ganged unit. Tune the detector circuit to 200 meters. Using the plug in coils covering the band from 80 to 200 meters. Now tune the external oscillator condenser until a signal on the 200 meter band is heard. Note just where the setting of the oscillator tuning condenser rests in comparison to the setting of the detector tuning condenser. In general the oscillator tuning condenser will be about 60 on a 100 point dial. This means that turns will have to be removed from the oscillator tuning coil until the two circuits track. In most cases about 15 turns at a minimum must be removed to bring the oscillator tuning condenser so that it will track with the detector for this wave band. In some cases it will be necessary to remove more turns from the oscillator coil due to different electrical circuit conditions but with coil forms having a diameter of *one and one quarter inches* the turns that will be ultimately removed will be 15 or more. Where the coil diameter is greater than *one and one half to two inches* then it will be necessary to start with less turns removed and only remove 9 turns at the start.

On the 40-80 meter oscillator coil it will be wise to start with three turns removed and on the 20-40 meter oscillator coils one turn to start. On the wavelengths below 20 meters it will not be necessary to remove any turns and the antenna and oscillator coils can be identical as far as the number of turns is concerned. This is due to the fact that as the frequency is increased the percentage difference between the detector frequency and the oscillator frequency decreases and the electrical characteristics of the two circuits approximate each other to a high degree. Certain types of two gang condensers are so constructed that the oscillator rotor plates can be slipped around the tuning condenser shaft thus doing away with the use of the additional condenser. In that case just tune in a 200 meter signal with the antenna or detector section of the condenser and slip the oscillator rotor plates around until a 200 meter signal is heard. Then remove turns from the oscillator tuning coil until the two condenser sections track.

Switches Versus Plug-In Coils

With the trend to switches instead of plug-in coils some interesting points can be taken into consideration that will surely help in obtaining the maximum results.

One sure rule for success is to limit the total overall tuning range as much as possible. Most of the important short wave broadcasting will be found between 16 and 75 meters and this makes a reasonable band to cover with fairly low losses. Note that the short wavelength end of the coil is at the top near the grid end of the coil and that the low or the grid return end of the winding is not connected to the ground except under the condition wherein the tuning condenser and the coil work at the highest wavelength. See Fig. 6.

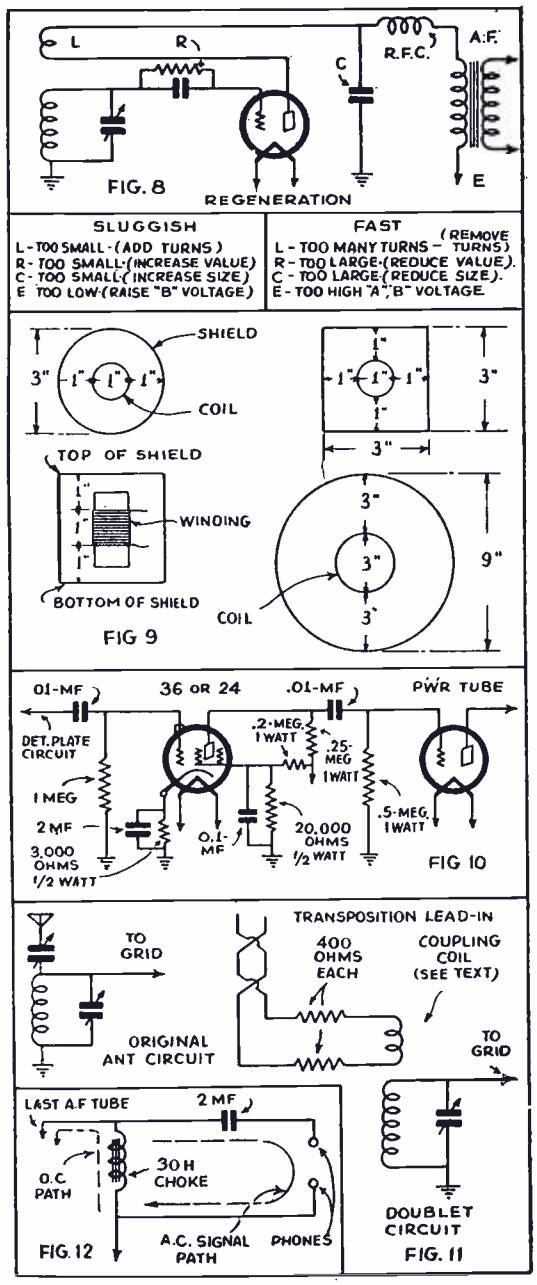
By leaving the end of the coil open less absorption of the signal energy will take place when the coil selector switch is connected to the smaller windings. The same considerations must be exercised here in the case of super-het oscillator tuning coils as were taken in the case of the plug-in coils.

Feed-Back Control

Proper feedback control is always important and in the case of *tapped coils* some experimentation must be done if satisfactory operation is to be obtained. Note that in Fig. 7 where the feed back coil is wound on the second section of the tuning coil. The number of turns on this coil will depend on the circuit, method of feedback control, type of tube and voltages used. The coil will have more turns than the lowest wavelength tuning coil and less turns than the middle wavelength coil. Eight turns of number 30 wire seems to work well in most cases altho actual tests will give the final answer. Try to have enough turns in the feed back winding so that the regeneration control is not sluggish on any band and still not too critical on any band. This condition can be obtained with a little work but it is well worth while.

Smooth regeneration in a regenerative receiver is one of the most important necessities and a study of Fig. 8 will show just where changes can be made to improve the regenerative action. Every receiver is really capable of improvement in the matter of smooth regeneration control and the set builder should not spare effort in this matter to obtain the best results. Because it means more distance and greater useable amplification from weak signals.

Of course it is not necessary to do every thing indicated in Fig. 8. Try one thing at a time and study the effect on all tuning ranges. Some times an increase in C to improve oscillation of the 40 meter band will cause the 80 meter coil to go into oscillation too quickly. In that case it would be wise to remove turns from the winding L on the 80 meter coil so that smooth operation will be had on both tuning ranges. Consideration must be given to all of the tuning ranges covered by the receiver and each plug in or tapped coil must work



Diagrams above indicate effects of wrong number of tickler turns, how to shield coils, transposition lead-ins, etc.

smoothly. This means work and experimentation and cannot be done in a few minutes. Time spent on this phase of short wave receiver construction always repays the builder in increased sensitivity and smoother performance.

How to Shield Coils

One of the most common questions has to do with shielding circuits at short waves particularly coils. Tests conducted by many laboratories indicate that satisfactory results can be obtained with both aluminum and steel shields, providing that the coil is removed its own diameter from the shield as shown in Fig. 9. Thus, a coil having a diameter of one inch can be mounted in a shield can having a diameter of three inches if circular and the same size also holds if the can is square. If the actual winding of the coil is one inch long then the coil shield can have a height of three inches also. Note the case of the three inch coil diameter form. Here the shield will have to be nine inches in diameter. Some size for the modern short wave set. Two coils and shields would occupy over 18 inches of chassis space.

Taking all things into consideration coils with diameters falling between 1¼ inches and 2 inches are the best for any practical set today. It is the thought of the author that 1 inch diameter forms will be used more than ever due to the trend to single control short wave receivers with two or more tuned circuits manually operated.

Small diameter forms give the coil builder better control over the inductance as the inductance per turn of a small diameter form is smaller than the inductance per turn of a larger diameter form. This statement will be better understood if one realizes that for a given inductance change a greater number of turns will have to be added to a small diameter form while a large diameter form will require less turns for the same result. Thus the small form will permit the coil winder to work to closer specifications with a resultant greater ease in matching coils for single control circuits.

How to Increase "Gain"

Many times it is desired to increase the *gain* of a short-wave receiver in the audio frequency circuit. Here the use of a screen-grid tube connected as shown in Fig. 10 will give excellent results. If plate and screen voltage readings are made with a voltmeter having a sensitivity of 1000 ohms per volt the effective plate voltage will be approx. 100 volts and the screen voltage will be about 27 volts. In this case the bias voltage will be between 2½ and 3½ volts. The voltage gain will be well over 40 volts and coupled to a regenerative detector of the grid condenser-leak type, will give real output to a tube of the 45 type and will readily overload tubes such as the 47, 59, 2A5, etc. If your short-wave receiver lacks "pep" in the audio end, try this circuit and note the improvement in operation. If the detector output is transformer-coupled to the audio amplifier load the secondary with a 100,000 ohm resistor to eliminate *fringe howl* as indicated in Fig. 2.

More gain will be obtained with the 24 type tube when compared to the 36 type tube and the 57 will give the highest gain per stage of them all, with the lowest value of distortion.

Another angle that causes many questions is the method to use in coupling doublet antennas to the simpler type of short wave receivers without going to great expense and altering the circuits. Circuit is shown in Fig. 11. Take a small piece of bakelite tubing that will either fit inside of the tuning coil or large enough so that it can be slipped over the coil wind about 10 turns of number 28 silk covered wire on the form and connect the two ends of the winding to the two resistors and thence to the doublet. If the receiver lacks selectivity try this stunt and notice how well it works permitting separation of that bunch of S.W. B.C. stations on the 49 meter band. While this will not cure all of the interference it will help a great deal. Vary the distance between the small pick-up coil and the main tuning coil and adjust for the maximum volume, and maximum selectivity. The maximum selectivity will not be at the point of maximum volume but a satisfactory compromise can be obtained that will justify the use of this gadget.

Every short wave fan should have at least one sensitive set of head phones. Try and buy the best phones possible because poor phones are discouraging when you are after real distance and the set is of the smaller two or three tube type. High impedance phones should be used as they are the most sensitive and be careful to keep the direct current out of the phone windings lest you decrease their efficiency. It is well worth while to go to the expense of the circuit of Fig. 12. This keeps the direct current out of the phone windings but permits the signal current to flow into the phones.

Beginner's Code and Theory Class

● **PROVIDED sufficient inquiries are received, Mr. L. Victor, operator of amateur station, W2DHN, and author of the "Beginner's Transmitter" series in SHORT WAVE CRAFT, has offered to conduct a class over the air to help beginners obtain their radio operator's license. Those interested should write a letter to Mr. Victor, in care of SHORT WAVE CRAFT, enclosing a stamped addressed postal. If there is sufficient interest manifested notification will be given in the pages of this magazine when and on what frequency these classes will be held. Suggestions are requested in regard to the time at which the class should be held. Those located outside the zone mentioned above should write to Mr. Victor and if sufficient interest is shown, other transmitting stations will be scheduled for code classes.**

The "Short-Wave Master 6"

(Continued from page 602)

amplification, employing a type -58 tube, V1. This tube, the antenna plug-in coil L1, the tuning condenser C2 and the trimmer C1, occupy the left-hand compartment of the cabinet. The r.f. tube works into a regenerative detector V2, another type -58. This tube, the detector plug-in coil L2, the tuning condenser C3 and the regeneration control potentiometer R5, occupy the right-hand compartment. The detector is resistance-capacity coupled to a type-56 first audio stage, V3, which in turn feeds into a push-pull Class A output stage using two type 2A5's, V4, V5. The power pack is of orthodox construction and uses the reliable type-80 rectifier, V6, in a full-wave circuit, with plenty of filter action supplied by the chokes T3 and T4 and the filter condensers C13, C14, C15. Resistor R12 is merely a 12,500-ohm bleeder put there to protect the electrolytic filter condensers while the tubes are warming up.

In addition to the detector regeneration control R5, there is a separate r.f. gain control in the form of R1, which is a 50,000-ohm variable resistor that determines the control grid bias of the r.f. tube, V1. This control is combined with a 110-volt switch, which is snapped to "off" when the knob is turned to the zero or minimum volume setting.

Four pairs of plug-in coils, using Isolantite six-prong forms, give the Master Short-Wave 6 a wavelength range of 14 to 115 meters. Extra coils to reach the broadcast band are also available separately. It is an interesting fact that the two coils of each pair are identical, obviating the care usually required in seeing that the r.f. coil is plugged into the r.f. socket, etc. The four pairs of coils supplied with the set tune as follows with the 90 mmf. variable condensers C2 and C3: red dot coils, 14-24 meters; blue, 23-41 meters; black, 38-70 meters; yellow, 65-115 meters. *A check showed plenty of allowance for overlap, the exact coil ranges being 13.8-25.2, 22.5-42.0, 36.2-69.1 and 61.3-117.5 meters.*

In and around New York, where conditions are by no means good, excellent loudspeaker results are enjoyed on such stations as EAQ, Madrid; I2RO, Rome; the various GS-British Empire stations at Daventry; "Radio Colonial," near Paris; the new Garman stations at Konigswusterhausen, whole flocks of Central and South Americans, the various transoceanic radiophones and even a few antipodal stations such as VK2ME in Sydney and VK3ME in Melbourne, if the operator cares to stay up late enough and watch the sun come over the horizon.

Parts List

The following list of "Lafayette" parts constitutes the complete kit for this receiver.

C1—35 mmf. midget condenser
C2, C3—90 mmf. midget condensers
C4—.1 mf. mica condenser
C5, C6, C8—1 mf. electrolytic condensers
C7—.0001 mf. mica condenser
C9—.01 mf. mica condenser
C10—1 mf. electrolytic condenser
C11—25 mf. electrolytic condenser
C12—.5 mf. electrolytic condenser
C13, C14, C15—8 mf. each electrolytic condensers
C16—.00025 mf. mica condenser
J—Double closed-circuit 'phone jack
L1, L2—Plug-in coils (set of 8 coils)
R1—50,000-ohm resistor
R2—300-ohm resistor
R3—100,000-ohm resistor
R4—5-megohm resistor
R5, R6—50,000-ohm resistors
R7—75000-ohm resistor
R8—100,000-ohm resistor
R9—500,000-ohm resistor
R10—300-ohm resistor
R11—200-ohm resistor
R12—12,500-ohm resistor
RF1, RF2, RF3—2½ mh. r.f. chokes
SW—Power switch on R1
T1—Push-pull input transformer
T2—Power transformer
T3, T4—30-henry, 100-ohm chokes
V1, V2—Type-58 tubes
V3—Type-56 tubes
V4, V5—Type 2A5 tubes
V6—Type-80 rectifier
1 metal cabinet, crackle finish
2 coil sockets, 6 prongs
5 wafer sockets, 6 prongs
1 wafer socket, 5 prongs
1 wafer socket, 4 prongs
2 tube shields (VT1, VT2)
1 6-prong plug
1 8-wire cable
1 double-tip jack
1 vernier illuminated drum dial
2 2-gang binding-post strips
1 2-gang binding-post strip
1 power pack chassis, cadmium-plated steel
1 power cord and plug
1 8-inch dynamic speaker, 450-ohm field, equipped with input transformer for 2A5 tube

Coil Data

The coils used on the "Champion" short wave receiver are identical. Coil data follows: **14 to 24 meters.**

3 turns of No. 26 double silk wire in slot at the bottom. This is the primary.
6 turns of No. 24 enamel interwound with the secondary. This is the tickler.
6 turns of No. 14 enamel. This is the secondary.

23 to 41 meters

3 turns No. 26 double silk—primary.
10 turns No. 24 enamel—tickler.
12 turns No. 14 enamel—secondary.

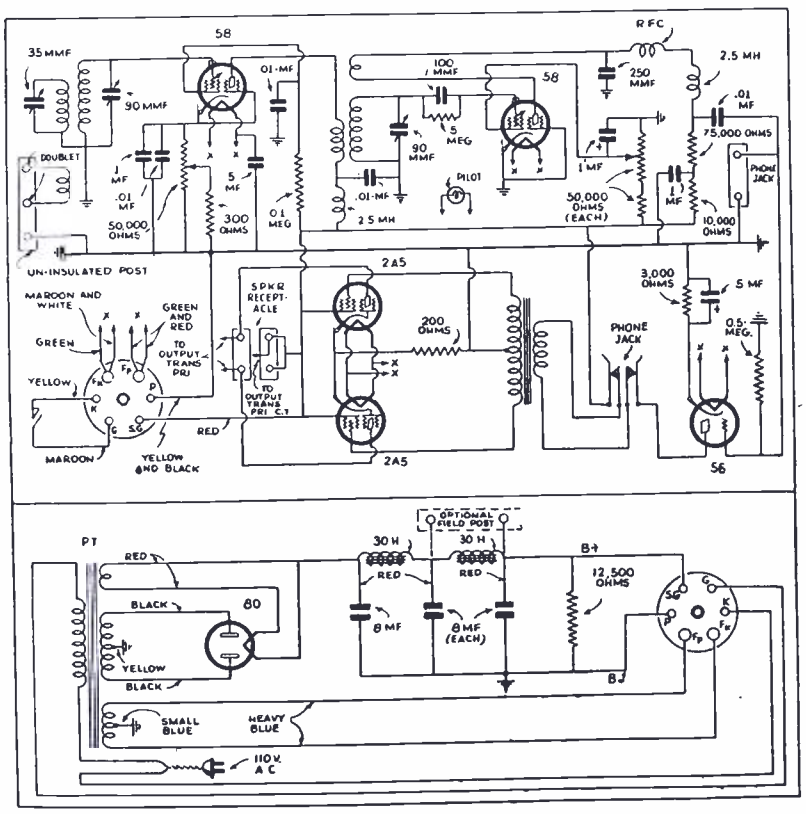
38 to 70 meters

3 turns No. 26 double silk—primary.
13 turns No. 32 double silk—tickler.
20 turns No. 18 enamel—secondary.

65-115 meters

4 turns No. 25 double silk—primary.
22 turns No. 26 double cotton—tickler.
35 turns No. 20 enamel—secondary.

Coil Forms, 6-pin, threaded (or smooth) Isolantite (or other insulating material, 1½ in. dia. x 2½ in. long).



Circuit of the "Short-Wave Master 6"

New S-W Medical Applications

(Continued from page 582)

and the patient is cured within three days.

Moreover, the construction of the new short-wave oscillator is very simple. The entire apparatus, which has a power output of about 600 watts, is built into a small rolling desk or control cabinet. The apparatus is connected to the A. C. lighting circuit with a plug, like an electric cooking utensil, and is immediately ready for operation. It is then connected to wires which direct the short-wave energy into the body. The wires are supported on a special stand, which permits their use whether the patient is in a sitting or in a prone position.

If it is desired to use a single electrode only, then it is connected to a special feed line, which is a particular type of an antenna, invented by Mr. Tomberg. Any required point on the patient's body can be acted on by the high frequency field from this antenna. In order to avoid uncalled for (by-phenomena) by-effects, care must be taken to have the treatment bed, on which the patient is lying, made of some good insulating material.

Short Wave Scouts

(Continued from page 603)

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 tying.

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

(Continued on page 637)

Admiral Byrd's "Personal" Receiver

(Continued from page 604)

ment programs will originate not only at Schenectady but also in various centers of the east, such as Boston, New York, Washington, Richmond, Va. (Byrd's home city), Albany, Rochester, and other points.

The General Electric Company will again cooperate with the National Broadcasting Company in the arranging and sending of the programs, the first of which was broadcast from the new studios of the NBC in Rockefeller Center on Saturday night, Nov. 11. A coast-to-coast chain of stations carried this and will carry all succeeding programs to the expedition.

The first program to the Byrd Antarctic expedition, sent from the new NBC studios in Rockefeller Center, New York, on November 11, was received and much enjoyed by Admiral R. E. Byrd and his men, according to a radiogram received by General Electric whose *short-wave* transmitter, W2XAF, carried the program to him. His ship, the S. S. Jacob Ruppert, was then four days out of Panama enroute to Dunedin, New Zealand.

In his radiogram, Byrd stated the personal messages to the men of his expedition, sent by short wave only immediately following the broadcast program, were greatly appreciated. This *short wave service* will be their "mail-bag" until they return and friends and relatives, desiring to send word may do so by forwarding their messages to General Electric in Schenectady addressed to W2XAF.

New 2-Tuber Receiver Kit

(Continued from page 603)

the antenna coupling condenser (1). The purpose of this condenser is to vary the degree of coupling between the antenna and the grid of the detector tube. Its proper manipulation may often spell the difference between losing a station and bringing it in full and clear. As it is in the antenna circuit, its insulation must be watched very carefully to minimize losses. The condenser used has a bakelite base, with mica insulation between the plates. The capacity is varied by the screw adjustment, which provides sure control. A smooth means of controlling regeneration must be used to be able to hang onto the exact spot which brings best results, hence a very good quiet resistor is used in this set. The audio transformer was selected with the thought in mind that the higher the grade and the larger and heavier it is, the better the results will be.

Coils

The coils are wound on polished bakelite forms similar to tube bases, and come ready with the kit. They have a standard 4 prong arrangement, and thus it is an easy matter to change coils to cover the desired wavelength band. After winding, the coils are painted with clear lacquer, which holds the turns of wire firmly in place, but does not in any way affect their electrical characteristics. (The coil data given on page 589, for use with .00014 mf. variable condenser is OK.—Editor.)

Construction

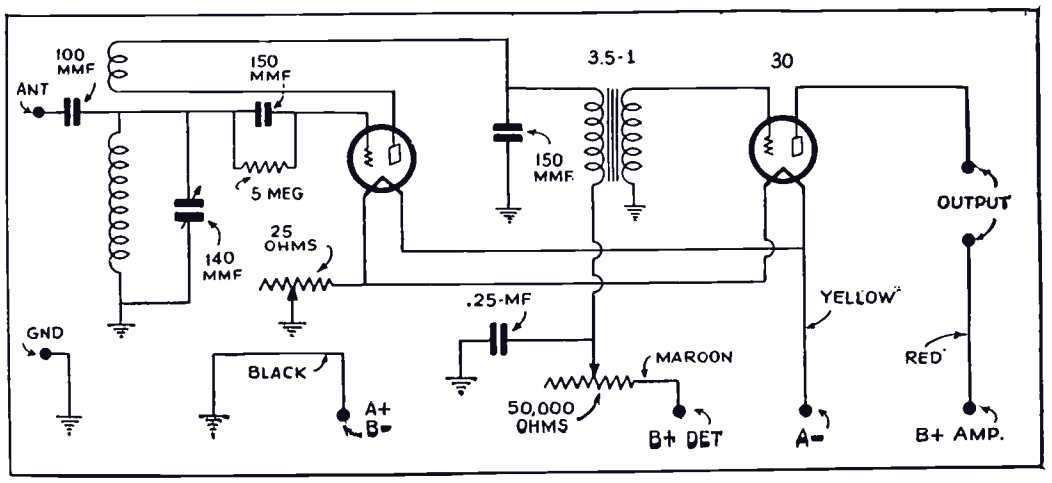
The instructions given with the kit are so simple and explicit that the veriest novice can assemble and wire the set without any trouble. Provided the schematic and pictorial diagrams that are given with the set are followed carefully, not a trace of trouble should be found in getting the set to "perk" properly. One of the most important things in making any set is to give care to the soldering of the parts. Clean the tip of the iron with a file or sandpaper, and tin the point by dipping it into soldering flux and then applying solder. If the iron is not hot enough, poor connections, known as cold joints, result. This is one of the greatest sources of noisy and scratchy reception. Before soldering a connection, apply a little flux to the joint. A caution might be added about ground connections. Always remember to scrape the paint carefully from the chassis wherever a ground connection is indicated.

At slight additional cost a metal cabinet is supplied for the set, which helps materially in electrically shielding the chassis and besides it keeps dust out.

Tubes and Batteries

Two type 01A or 30 tubes may be used, the only difference being in the filament voltage required. The 01A's may be lighted by four dry cells in series or a six volt storage battery and as they are rated at 5 volts the rheostat must drop the extra volt. Type 30 tubes are much more economical as they operate at only 2 volts and in addition draw ¼ the current of the 01A's. The two volts can be obtained from 2 1½ volt dry cells in series (the rheostat being used to dissipate the extra volt) or from a two volt cell of a storage battery. It is very important that the tubes used be the finest obtainable as the use of inferior or cheap tubes will result in poor operation.

One or more 45 volt B batteries are required. They are connected as shown in figure 4. The detector plate voltage should be determined by trial and may be 22½, 45, or 67½ volts. The amplifier plate voltage may be from 45 to 135 volts. The higher this voltage generally the greater the volume will be.



Wiring diagram for the Harrison 2-Tuber, short-wave receiver.

Blan Long-Wave Plug-in Coil—New!

● HERE is something we have all been waiting for, especially the experimenter who has a receiver with plug-in coils. Many fans have expressed the desire of obtaining a coil that could be used to cover the ranges between 450 to 2000 meters in order to enable them to receive commercial long wave stations, ship-to-shore communication, and the various aviation messages that are being handled around the 800 to 900 meter band. This coil plugs directly into the socket which ordinarily accommodates the short-wave plug-in coil and—presto—you have a "long wave" receiver. The coil is bank wound with Litz wire and with the various condenser combinations shown in the accompanying table, it will provide lots of entertainment for the radio "fan." Don't forget that you may hear European broadcast stations many of which use waves between 600 and 1500 meters.

Just to mention a few "long-wave broadcast" stations. There are: Warsaw, Poland on 1,411 meters and 120 kw. (120,000 watts); Huizen, Holland, on 1,875 meters; Moscow, USSR on 1,481 meters; Oslo, Norway, on 1,083 meters and 60 kw. (60,000 watts); Eiffel Tower Station (FLE) Paris, France, on 1,445.7 meters, 13,000 watts; time signals on 2,650 meters.

From 450 M. to	950 M.	.0001	mf. variable tuning cond.
1050	1330	.0001	mf. plus 1 fixed capacitor
1390	1640	.0001	mf. plus 2 fixed capacitor
475	1150	.00014	mf. var. tuning cond.
1070	1500	.00014	mf. plus 1 fixed capacitor
1410	1780	.00014	mf. plus 2 fixed capacitor
490	1640	.00032	mf. var. tun. cond.
1080	1880	.00032	mf. plus 1 fixed capacitor
1430	2140	.00032	mf. plus 2 fixed capacitor

An "Improved" 5 Meter Super-regenerative Receiver

(Continued from page 593)

ear; the improved quality alone would be worth a slight decrease in volume. To obtain a higher interruption frequency it is necessary to remove about one-third of the turns from the transformer primary and secondary, assuming that the original has 800 turns in the primary and 1200 to 1400 for the secondary.

The writer has found that the sizes of the tuning condensers shunted across the interruption frequency coils has a decided effect on the receiver's ability to perform during duplex QSO's.

Antenna Coupling Critical

One of the most critical points of the 57 detector is the antenna coupling. Extremely loose coupling was found necessary and surprising as it may seem loose coupling does not reduce the sensitivity of the receiver. The best antenna system used was a vertical wire three half-waves in length, or 24 feet. Other types of antennas may be found to work better in different locations; it seems that no set rule can be given on antennas. At some stations a four foot vertical rod outperformed all others, while in other locations nothing could be heard on this small collector system.

One must also be careful not to have too much capacity across the grid coil of the receiver; eight turns of No. 12 solid enameled antenna wire are used, having an inside diameter of one-half inch. This is tuned with an 18 mmf. National ultra frequency condenser, having plates cut to give a 270 degree tuning range. With this coil and condenser, the 5 meter band is spread over 60 degrees on the dial.

Cathode Tap

The cathode tap is taken off the grid coil three turns from the *ground* end. Oscillation can be obtained with the tap at the second turn, but the screen voltage will have to be turned up too high and results in less sensitivity to weak signals and a very high hiss level.

A 2A5 pentode is used as the audio amplifier and gives ample volume to operate a full-sized dynamic speaker. Care must be taken to prevent any of the RF voltage of the interruption frequency oscillator from getting to the grid of the pentode. Otherwise the level of the noise will be extremely high and only the strongest stations will come through. The RF filter in the plate circuit of the 57 is used to prevent this from happening. The condenser on the plate side of this filter is the most critical and various sizes should be tried; although a .001 or .002 mf. seems to be about the right size.

In this set it was found that a .01 mf. condenser connected across the primary of the input transformer to the speaker reduced the background noises from automobiles, etc., to a very low value.

Parts List for 5 Meter Receiver

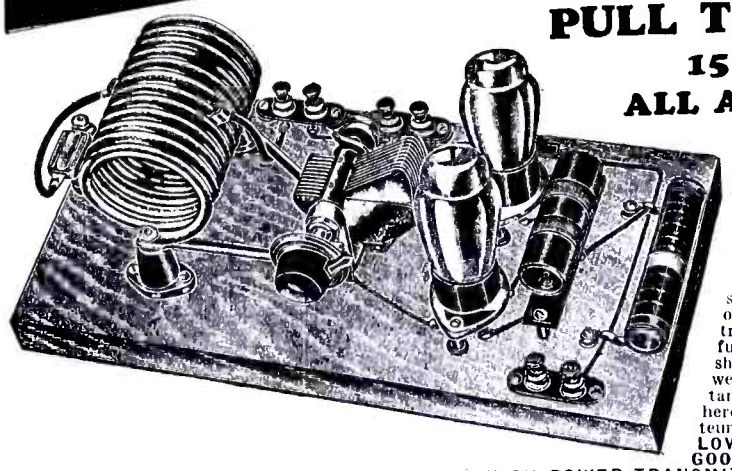
1—grid coil (see text)
1—18 mmf. tuning condenser. National
1—interruption frequency coil. Gen-Win
1—250 M.H. Rf choke. Gen-Win
1—.0001 mf. mica condenser
3—.001 mf. mica condenser
1—.002 mf. mica condenser
1—.1 mf. Bypass condenser
1—.01 mf. Bypass condenser
1—20 mf, 25 volt electrolytic condenser
2—2 meg. ½ watt resistor. Lynch.
1—2,000 ohm 1 watt resistor. Lynch.
1—250,000 ohm 1 watt resistor. Lynch.
1—25,000 ohm 1 watt resistor. Lynch.
1—500 ohm 1 watt resistor. Lynch.
1—50,000 ohm potentiometer. Acratest
1—20 ohm C.T. resistor. R. T. Co.
1—6 prong isolantite socket. National (Hammarlund)
1—6 prong laminated socket. Na-ald
1—5 prong laminated socket. Na-ald
1—Type "B" 270 degree dial. National
1—57 tube R.C.A. Radiotron Co. (Arco)
1—56 tube R.C.A. Radiotron Co. (Arco)
1 2A5 tube R.C.A. Radiotron Co. (Arco)

Come On Fellows! LET'S FRATERNIZE

MR. SHORT WAVE AMATEUR—Meet

"R. T." AMATEUR C. W. PUSH-PULL TRANSMITTER

15 to 30 WATTS
ALL AMATEUR BANDS



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.

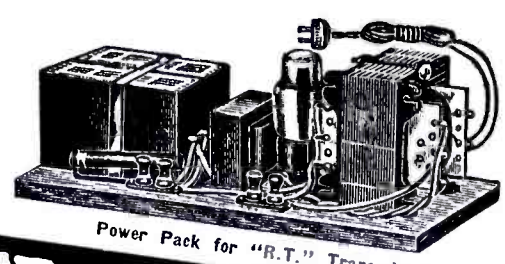
No. 2121 "R.T." Push-Pull Transmitter, complete with 160 meter coils, but less tubes.
YOUR PRICE $5.95

No. 2122 Power Pack for R.T. Transmitter, less tube.
YOUR PRICE 8.00

No. 2123-A Plug-In Coils for 20 Meter Band,
YOUR PRICE 1.80

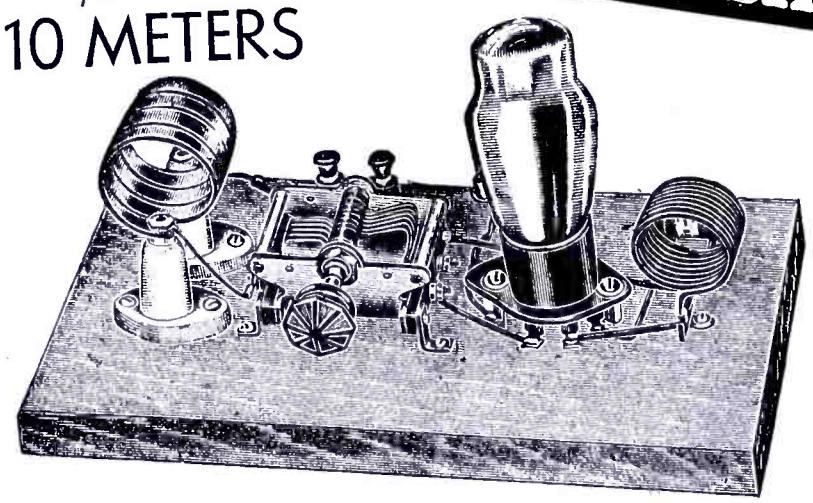
No. 2123-B Plug-In Coils for 40 Meter Band.
YOUR PRICE 1.80

No. 2123-C Plug-In Coils for 80 Meter Band.
YOUR PRICE 1.80



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 6¼" 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..... $4.50

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.

Order From These Pages

Send money order or certified check. C. O. D. only, if 20% remittance accompanies all orders. Order NOW—TODAY.

FREE 108 Page Radio and Short Wave Treatise. 1934 Edition. Send 4c postage. Treatise by Return Mail.

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.

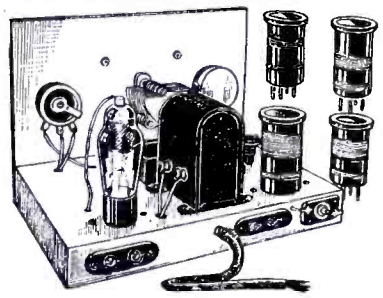
This unit has a two-section filter circuit, employing two heavy-duty 30 Henry chokes and a tremendous amount of capacity. This assures PURE D. C. with practically no ripple at all.

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 7½" long x 4" wide x 4¼" high overall. *Sold complete with 280 tube.* Ship. wt. 10 lbs. **No. 2149** Short-Wave Power Pack, **including 280 tube**
YOUR PRICE **$7.26**

RADIO TRADING COMPANY, 100A Park Place, New York City

GET ACQUAINTED via Short Waves
MR. SHORT WAVE LISTENER

The Twinplex One Tube "Double-Action" Receiver



SPECIFICATIONS

No. 2115 Twinplex 1 Tube Short Wave Receiver Wired, but less tubes and accessories. Ship. wt. 9 lbs.
YOUR PRICE $9.50

No. 2116 Twinplex 1 Tube Short Wave Receiver in Kit Form Including Instructions. Ship. wt. 10 lbs.
YOUR PRICE $8.50

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.
YOUR PRICE $10.35

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 $6.25

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"

The OSCILLODYNE 1-Tube Wonder Set

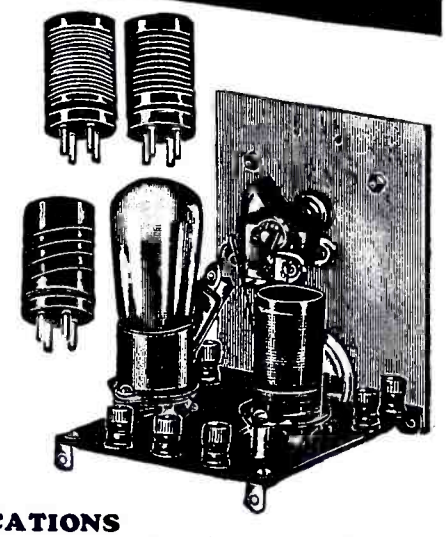
ABSOLUTELY FOOL-PROOF

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 **$7.21**

No. 2147. Official One-Tube Wonder Set, but not wired, with blueprint connections and instructions for operation, complete shipping weight 3 lbs. YOUR PRICE **$6.36**

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 **$5.51**

THE WORLD FAMOUS DOERLE RECEIVERS

Rear View of Battery 2-Tube Set

Both A. C. and 2-Volt Battery Sets

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

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. 830

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 $9.90

No. 2141. Same as above in kit form, with blueprint connections and instructions. Shipping wt.. 5 lbs.
YOUR PRICE $8.70

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 $5.40

No. 2143. THREE TUBE 2-VOLT DOERLE SET, completely wired, ready for use.
YOUR PRICE $12.85

No. 2144. THREE TUBE 2-VOLT DOERLE SET IN KIT FORM, with blueprint connections and instructions. Shipping wt., 7 lbs.
YOUR PRICE $11.50

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 $11.50

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 $10.45

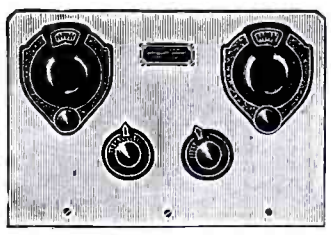
No. 2175. Same as above in kit form, less tubes, but including blueprints and instructions. Shp. wt. 5 lbs.
YOUR PRICE $9.25

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 $1.60

No. 2177. Electrified 3 Tube Doerle Signal Gripper, completely wired and tested; less tubes. Shipping wt. 7 lbs.
YOUR PRICE $15.20

No. 2178. Same as above in kit form, including blueprints and instructions; less tubes. Ship. wt.. 7 lbs.
YOUR PRICE $13.75

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 $2.50



Front View of all 3-Tube Doerle Receivers

RADIO TRADING COMPANY, 100A Park Place, New York City

Stability in Receivers

(Continued from page 592)

ties are encountered when this method is used in the audio amplifier because of the fact that the chokes, to be efficient here, are usually of such size as to prohibit their use in a receiver of convenient proportions. Furthermore, the cost of these chokes are usually out of proportion to their advantages, and a cheaper, more efficient and much more compact filter can be made by the use of resistors in place of the chokes formerly mentioned.

Resistance-Capacity Filtering

In figure 1 is given a diagram of a simple short-wave receiver circuit employing a stage of tuned R.F., a regenerative detector and a 2 stage A.F. amplifier. In this circuit due precautions have been taken to eliminate all the various forms of feed-back, and, as will be noticed, resistance-capacity filters have been used throughout. Due to the fact that radio-frequency chokes are usually more efficient at one frequency than another, and hence cannot be equally efficient over the entire range of a short-wave receiver, the resistance-capacity method of filtering has also been included in the R.F. amplifier circuit here.

No set rules can be given for the value of either the resistance or the capacity when employed in this manner. However, in practise it has been found advisable to so proportion the two that the ohmic value of the resistor will be ten times the reactance of the condenser at the lowest frequency handled by that portion of the circuit. Thus in the audio amplifier stages the lowest frequency handled will be assumed as 50 cycles, and in the radio frequency stage of the average S-W receiver the lowest frequency within its range is assumed as being 1500 kilocycles.

Resistor Choice Important

Care must be exercised in the selection of the resistors employed here, otherwise the voltage drop across it will be too great and the over-all efficiency will suffer, due to the reduced voltages on the tube constants. For instance, in the plate circuit of the R.F. tube, (assuming that tube to be a type 58) we will have a current flow of about 5 ma. at a potential of 250 volts. Further assuming that the power-supply will deliver 300 volts, it is easily possible to figure the maximum permissible value of the resistor R3 by Ohm's law—E/I equals R, or substituting, we have 50 volts ÷ .005 ampere equals 10,000 ohms, the value of R3. The reactance of a 0.01 mf. condenser at 1,500 kc. is 10.6 ohms and this value may be successfully used at C3. Hence our proportion of 10 to 1 has been greatly exceeded and the plate circuit of this tube may be considered as being properly filtered.

In the screen-grid (S.G.) circuit of this tube the current is considerably less, and furthermore the S.G. potential desired is but 100 volts. Hence the resistor R2 must dissipate 200 volts at a current of approximately 1 ma. (milliampere). By Ohm's law again we find that the value of R2 should be 200,000 ohms, and here again a condenser of 0.01 mf. value may be used to bypass the R.F. (radio-frequency) energy back to ground.

In the audio and detector portions of the circuit these resistance and condenser values can be calculated in exactly the same manner, remembering, of course, that the lowest frequency handled here is about 50 cycles instead of 1,500 kilocycles.

Filtering Out the Audio Frequencies

These filters completely isolate the tube circuits, carrying the signal energy, from the power-supply, and there is little chance of *feed-back* here, but there is still another weak link in the receiver, and that is in the plate circuit of the detector tube. Here audio as well as radio frequencies are handled and extreme care must be taken

to separate the two—allowing only the audio frequencies to enter the audio amplifier stages. This calls for another filter system, and, as will be seen in the diagram, a radio frequency choke RFC and its associated condenser C4 is used. The value of the choke should be such as to offer a high impedance to the flow of all radio frequency currents within the range of the receiver. Also the choke must have a low distributed capacity, otherwise this capacity, if too high, tends to nullify the choking action of the RF choke.

The condenser C4 must be so chosen that it offers an easy path to ground for the RF energies and at the same time effectively blocks the higher audio frequencies. If the choke is efficient, a good value for the condenser used here is .0001 mf. capacity. This value of capacity has a reactance of only 1,060 ohms at 1,500 kc, while at 5000 cycles, (the highest audio freqency) the reactance increases to 318,470 ohms, and thus the audio frequency energy is effectively blocked and passed on through the choke, RFC, to the audio amplifier stages.

Stability at Audio Frequencies is also very important. Motor-boating, squealing, fringe-howl and blasting are all forms of A.F. oscillation and must be prevented in a stable receiver.

It is poor policy to try to stabilize an audio amplifier by the use of larger bypass condensers across the individual resistors, etc. Rather *(Fig. 2)* the values should be reduced to *radio frequency* proportions of not more than 0.1 or 0.25 mf. This rule also applies to the detector plate and screen-grid circuits as audio as well as radio frequencies are handled here.

In some cases the complete omission of bypass condensers from the bias resistors in the A.F. amplifiers may help materially.

Stability can sometimes be achieved by reducing the value of the resistors used in the grid and plate circuits of the resistance-coupled amplifier. It is advisable to try this method in only one stage at a time. It is also advisable to bypass the "B" plus return from each of the audio plate circuits.

A Novel Ultra S-W Receiver

(Continued from page 586)

condenser and by mounting the plates for the rotor on an 8-32 screw. The tuning condenser has two plates in the stator and one rotor plate. Anyone, who has an old neutralizing condenser with a divided stator, can use it as a tuner. The condenser C2 has an approximate value of 50-100 mmf. It should not exceed 100 mmf. In one of our models this condenser was built of 6 stator and 5 rotor plates, while in another model 5 fixed and 4 rotating plates were used. A variable condenser built for short-wave reception in the size of 50-100 mmf. fits very well for this purpose, because it insures a good contact on account of its flexible lead. Extension shafts of about 11-12 cms. (5") are absolutely necessary. In order to reduce the influence of the "hand-capacity," it is advisable to cover the front panel with thin copper foil, or to make it entirely of aluminum. We made our coils from a pure copper wire 3 mm in diameter; about No. 9 B. & S. The feed-back (tickler) and also the grid coil each are 12 cms. diameter (about 5") and have only one turn each. The antenna coil has two turns and has 8 cm. in diameter (slightly over 3"). In no way should these coils be made of a wire thinner than 3mm. (0.12 inch). The grid and the feed-back (tickler) coil are connected with a sliding and flexible lead. The position of the slider on the grid coil is of the utmost importance, a slight displacement may sometimes cause the complete disappearance of reception. Less critical is the adjustment of the slider on the tickler coil. The grid and the tickler coils *should not be coupled.*

The heating of the filament is controlled by a rheostat, which should not be omitted on account of esthetic considerations. We made the observation that for a certain heating value, strange as it may seem, no reception could be obtained; while for lower or higher values, the operation was satisfactory again.

The most satisfactory choke coil for the plate circuit, used during our tests, is an ordinary coil of 25 turns of fine wire wound on a ½ inch dia. wood or other rod.* It is regularly plugged in the place, where a short-circuiting hook is seen in Fig. 3 (extreme left) also here care has to be taken, that the choke coil should not be directly coupled to any of two other coils.

The value of the grid condenser is, as customary, about 200 to 300 mmf.; that of the grid-leak is about 1.25 megohms.

The assembly can be made in the usual manner; nevertheless in each case consideration should be given to provide the "shortest" connections. This results from the plain fact, that in devices operating on *ultra short waves*, the *capacity of the conductors* plays quite an important rôle. Care must be taken to avoid too many parallel wires; only *heavy* wire is to be used for the wiring. When extension shafts of sufficient length are used, the operation is not more difficult, than that of handling an ordinary broadcast receiver, although an ultra short wave receiver is still characterized by being more critical in the adjustment. Therefore we use, as shown in Fig. 4, a vernier dial for the tuning condenser. The knob of the rheostat (below) and that of the variable resistor (above) can be seen clearly on the front panel between the vernier dial and the ordinary dial. Any available arrangement can be used for amplification. A small transformer amplifier will give the best service and will naturally facilitate reception on account of increased loudness.—*Radiowelt.*

List of Parts

1 variable tuning condenser approx. 20 mmf. National (Hammarlund, Cardwell).
1 variable condenser approx. 50-100 mmf. National (Hammarlund, Cardwell).
1 blocking condenser approx. 200-300 mmf.
1 fixed condenser approx. .005 mf. for the antenna coupling.
1 fixed condenser approx. .005 mf.
1 fixed resistor approx. 1.25 megohms. Lynch (International). Use nearest standard size.
1 variable resistor approx. 1 megohm. Acratest (R. T. Co.)
1 rheostat (heating). R. T. Co.
1 coil, 25 turns on ½ dia. insulator's core, as R.F. choke coil.
1 radio tube of good quality to suit voltage, your power supply. RCA Radiotron. (Arco.)
Miscellaneous parts.

Correction Notice

Mr. C. F. Hadlock, the author of "A Simple Ten Meter Transmitter," which appeared in the December issue of SHORT WAVE CRAFT has a correction to make.

The taps for the cathodes on the oscillator circuit (30 meters) should have been given as from 1½ to 2 turns from the center of the coil. The bias on the 46's should be 22½ volts and not 45, as stated.

SEE PAGE 630
for Contents of New
Winter Edition of
SHORT WAVE LOG AND CALL MAGAZINE

Globe-Girdler 7

(Continued from page 591)

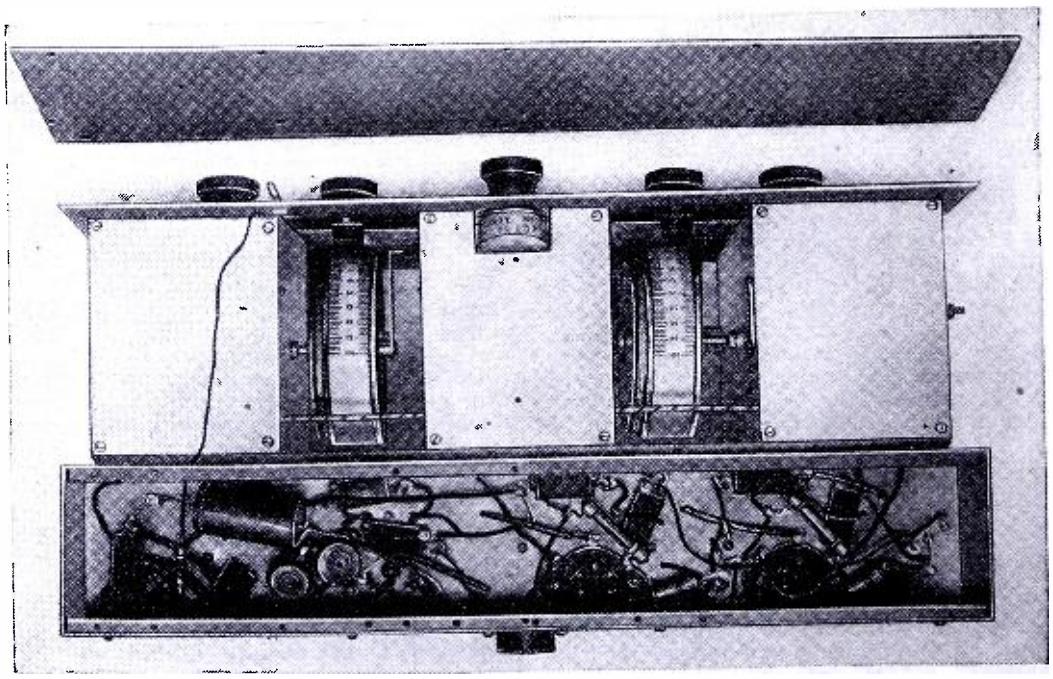
suffice; mica condensers were used in this set because they were gotten as cheaply as paper could have been purchased.

In constructing the set, there are several ways of arriving at the completed aluminum work. The writer bought a large sheet of one-sixteenth aluminum and sawed it into the necessary sizes. It would be possible to have all the pieces cut and folded to order but this would increase the cost. The aluminum can also be broken. Sawing and filing result in a neater job but is more laborious. A steel ruler or square is used, being held firmly to the aluminum while the aluminum is marked for sawing, or else heavily scored on both sides for breaking or folding. A knife with a small sharp pointed blade and rigid handle is best for this purpose. After sawing, which naturally should be carefully done, the edges should be filed. A large file, the larger the better, is necessary if the edges are to be made straight; push the file along the edge parallel to it so the file cuts all parts at once and therefore cuts evenly. After the aluminum has been scored for breaking or folding, it should be laid on a table with a sharp edge, the line in the aluminum coinciding with the table edge and then the free piece bent back and forth in small arcs till it breaks. Obstinate or large pieces, where the hands are not strong enough, will require the use of the vise.

The tap necessary in making the brass or aluminum pieces may be obtained in the 5 and 10 cent store. The hole that is drilled before tapping should be the size of the tap minus the threads.

The first three tubes of this set make a fine short-wave converter and after these were wired up and prior to finishing the wiring the set was tried out ahead of a seven-tube BC (broadcast) superhet, acting as an intermediate amplifier. The lead from the first detector plate was coupled to the antenna post of the "super-het" by a piece of hook-up wire broken by a .00025 mfd. condenser to prevent the first detector plate voltage from being "shorted" when the ground connection to the "BC" set was grounded. The plate voltage to the first detector was then fed through a choke of somewhere between 400 and 800 turns, to keep the RF where it belonged. The "BC" set was tuned to a clear frequency around 550 meters, where no interference could be picked up by the lead from the converter, and the 80 meter coils were placed in their sockets. Things worked O. K. and everything was brought in with satisfying volume, to say the least. Hooking up the front end of the set as described, is desirable as it boils down the field for "trouble shooting" in case the set is inoperative when the whole job is finished. It should be mentioned here that all the parts put in the set were tested before doing so, tubes included, as even new components may be defective and it is a real job to find blown or leaky condensers after they are wired in.

In tuning up the IF stages a 0-1 or 1.5 M.A. milliammeter and an oscillator covering the IF transformer range is very helpful to the exact peaking of all stages but not a necessity. If the meter is not available, the screws of the IF transformer should all be turned clock-wise as far as possible, giving maximum capacity to each condenser. Each should then be backed off 2 turns. Then the capacity of the plate and grid leads of each tube has to be considered; if they were all the same length, the IF stages would be in approximate resonance, but in this set they are not. These capacities from lead to shield are in effect parallel with the tuning capacities and consequently influence the tuning. If one of these capacities is greater than all the rest, i. e., one shielded lead is greater than all the others, compensation must be made for this by backing off the IF tuning condenser on this lead to a degree depending upon the difference in length or capacity between this lead and the others. After this is done, the 80 meter coils are placed in their sockets and a station tuned in. The IF trimmer condensers can then be varied for greatest response. If the IF trimmers are not taken care of as suggested it might seem as though the set were absolutely dead, as the IF tuning is rather sharp and they must be tuned very near resonance in order to have anything come through. In tuning with the meter a lead from the plate of the external oscillator or one from the plate of the oscillator in the set, should be loosely coupled to the grid of the second IF tube, and the trimmers of the third and grid trimmer of the second IF transformers should be varied for maximum meter reading. (Most precise tuning will be had using the least possible input.) The lead from the oscillator should then be coupled to the grid of the first IF tube and two more trimmers varied for maximum meter response. The lead should then be transferred to the first



Bottom View of the Kahlert Receiver

detector grid and the last trimmer adjusted. This can be done in far less time than it takes to tell. A process of this sort can also be used to "line up" the first detector and RF stage, using an antenna instead of the oscillator and without necessity of the meter. Needless to say, the tuning of the first detector and RF stage is rather broad.

This set performs very well on 40 and 80 and fair on 20 meters. Using a 20 ft. antenna stretched around the room, VK's (Australian stations) have been heard on 40 in the afternoon about 4 P. M. and one ZT (African stations) was heard.

Parts List

15 (C1) .005 mf. fixed condensers
3 (C2) .0001 mf. midget variable condensers, National, (Hammarlund)
2 (C3) 20 mmf. variable midget condensers, National, (Hammarlund)
C4, (C5) Special condensers—see text
1 (C6) padding condensers of I.F. transformer
4 (C7) .00025 mf. mica condensers
2 (C8) 8 mf. electrolytic condensers
1 (C9) 1 mf. paper by-pass condenser
1 (C10) 35 mmf. I Hammarlund No. 35 condenser, 35 mf.
3 (R1) 450 ohm, 1 watt resistors (R1), Lynch, (International)
6 (R2) 50,000 ohm, 1 watt resistors, Lynch, (International)
1 (R3) 10,000 ohm volume control, Acratest, (R. T. Co.)
1 (R4) 250,000 ohm ½ watt, Lynch, (International)
2 (R5) 100,000 ohm, ½ watt resistors, Lynch, (International)
1 (R6) 5000 ohm, ½ watt, Lynch, (International)
1 (R7) 10,000 ohm, 1 watt resistor
1 (R8) 7000 ohm, 1 watt resistor, Lynch, (International)
1 (R9) 3000 ohm, Lynch, (International)
1 (RFC1) National R.F. Choke, 2.5 M.H.
3 (RFC2) Hammarlund SPC. 10 M.H.
2 (RFC3) 800 turn "universal" wound, 85 MH.
3 (T1) 465 kc. I.F. transformers, National, (Hammarlund), Gen-Win.
2 National drum dials
6 Coil forms, National
6 6-prong sockets, National
1 5-prong socket, National
6 Tube shields, National
2 Coil sockets 6 prong, National
1 Coil socket, 5 prong
1 Power transformer 300-0-300, 5V, 2.5 V., National, (R. T. Co.)
1 4-prong socket for 280, National
1 30 henry filter choke (60 ma.), National, (R. T. Co.)
4 Type 58 tubes, R. C. A. (Arco)
2 Type 57 tubes, R. C. A., (Arco)
1 Type 56 tube, R. C. A., (Arco)
1 Type 80 tube, R. C. A., (Arco)

L1—is tapped for band spread; as the tap is taken off nearer the *ground* end of the grid coil, the band-spreading increases. About ⅓ distance from the *ground* end gives best results. L4, the local oscillator coil, is tapped to obtain oscillation; this tap should be taken off ⅛ the distance from the *ground* end of the coil. L5 is made from one of the coils removed from old 465 KC. I.F. transformer. Remove about 30 turns; solder on a tap at this point and wind back the wire previously removed. This coil should be connected into the circuit so that the tap at 30 turns is brought next to the *grounded* end of the coil.

NOTICE!!

The Editors are looking for GOOD Set Construction articles! Let's see what you've got! Send articles or synopsis describing set to Editor for quick decision.

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.

A New "Collector" Rod Receiving Antenna

(Continued from page 583)

system as a whole L, C and R "tracks" together with the operating wavelength of L and C functioning as the bandpass filter circuit. Now if R is too long for the working wavelength it will load the antenna system to a considerably higher value than the fundamental of the filter circuit and since the filter is then tuned to a different wavelength than that of the incoming signal to which the antenna system itself is tuned, the filter will tend to oppose the passage of the signal. This naturally lowers the signal level and broadening of tuning and a consequent loss of selectivity will be noticed. If R is too small the signal pick-up ability of the collector rod will be poorer,

FIGURE 1

COMPARISON OF STATIONS RECEIVED ON NEW AND OLD ANTENNAS

Call Letters, Frequency and Class of Station	REMARKS	
	Collector Rod Antenna	Outside 40 Ft. Single Wire Antenna
W9XF, 6100 Kcs. Chicago, Illinois. Shortwave Broadcast.	Good signal strength. No static or background noticeable. Strength R7. Readability QSA 5.	Good Signal strength. Static and other noises noticeable—enough to disturb program at times. Strength R8. Readability QSA 5 to 4.
W8XK, 6140 Kcs. Pittsburgh, Penn. Shortwave Broadcast.	Pronounced fade. Fair signal strength. No background or static. No image interference. Strength R4 to 7. Readability QSA 5.	Pronounced fade. Fair signal strength. Heavy background and some static. Bad image interference from code station. Strength R5 to 8. Readability QSA 5 to 4.
X1G, approx. 3895 Kcs. Mexico City, Mexico. Amateur Radiophone.	No fading. Good signal strength. No interference noticeable. No image interference. Strength R6 Readability QSA 5.	No fading. Signals loud. Severe interference from 9th district highpower phone and CW interference. Slight ICW image interference. Strength R7. Readability QSA 3 to 4.
KGPE, 2422 Kcs. Kansas City, Missouri. Police Radio Station. (Local)	Loud signals. Signals sharp. No interference or static noticeable. Strength R9. Readability QSA 5.	Loud signals. Broad tuning. No interference but some static noticeable. Strength R9. Readability QSA 5.
KGPC, 1712 Kcs. St. Louis, Missouri. Police Radio Station.	Good signal level. No static or interference. Strength R7. Readability QSA 5.	Good signal level. No interference. Bad static. Strength R7. Readability QSA 4 to 5.

Note: Although the coil of the Collector Rod Antenna did not quite reach the broadcast band several of the higher frequency stations on this band were tuned in with 100% readability and good signal strength. The outside antenna gave signals as loud but static and other interfering noises made reception all but pleasant to listen to. All tests were made during unsettled weather when the static level was quite high.

FIGURE 4

Approximate Frequency Range Covered By Each Coil	Description of L (all coils close wound—no spacing between turns)	Capacity of Variable Condenser(C)	Length of Collector Rod (R)
1700-2000 Kcs.	210 turns of No. 28. DSC on form 1½" in diameter.	.000375 mf.	four feet
2000-2500 Kcs.	140 turns of No. 28. DSC on form 1½" in diameter.	.000375 mf.	four feet
3500-4200 Kcs.	120 turns of No. 22. SCC on form 1¼" in diameter.	.000375 mf.	three feet
4200-5300 Kcs.	90 turns of No. 22. SCC on form 1¼" in diameter.	.000375 mf.	three feet
5000-6500 Kcs. 46.1 meters	83 turns of No. 22. SCC on form 1¼" in diameter.	.000375 mf.	22 inches

Note: The frequency range to be covered will depend not only on the maximum capacity of the condenser but also on the minimum capacity. Because of this fact and differences in the antenna coupling circuits of different receivers the above values may have to be changed slightly to match the particular receiver being used.

and even though the "tracking" action of the antenna and filter circuits will be closer with a gain in selectivity the loss of signal strength will be detrimental. From this it appears that there is a critical relation and size for the value of R with regard to the band of wavelengths to be received, and so far as the writer has been able to ascertain this holds true in actual practice.

A simple test will clearly show when the antenna is functioning as it should. When properly tuned there will be an enormous gain in *signal level* at one setting of the variable condenser—this is the point where the antenna is tuned to resonance with the incoming signal. Now if the hand of the operator is placed near the Collector Rod the *signal will fade completely out.* This is contrary to the usual experience when using the short untuned three and four foot antennas, sometimes used for listening during the crowded periods of the day and evening as well as in periods of heavy static and other interference. Placing the hand of the operator near such an untuned affair will always increase the signal level, due to the added signal pick-up afforded by the body of the operator. When placing the hand near the antenna causes a loss in signal strength, you may be sure that the aerial is working as a tuned antenna.

Conditions for Best Signals

Best signals and sharpest tuning are noticed when the variable condenser is set at minimum capacities and the coils given in Figure 4 are so designed that the most active part of each band falls in the lower capacity tuning range of the condenser. These were the coils used on the "Comet-Pro" and it is possible that slight alteration might be necessary when used on other types of receivers employing different means of coupling the antenna to the receiver. The antenna was connected directly to the antenna post of the receiver and the ground terminal was connected to ground in the usual manner.

It may seem to the reader that the use of a .000375 mf. variable condenser is quite large for the wavelength range covered, but this size is necessary due to the fact that series tuning is employed. In fact if the antenna is to be used on frequencies entirely below 2000 kilocycles (above 150 meters) better results will be secured with a .0005 mf. condenser. While no special listening was done in the broadcast band of 550-1500 kilocycles, a few stations were logged on the higher broadcast frequencies with exceptional signal strength and a very low value of static even during local thunder storms. For those readers who would like to experiment in the broadcast band we suggest that the collector rod be increased to around six feet in length. A .0005 mf. condenser as mentioned above will be best and it will be necessary to increase the inductance of the coil considerably over the values given for the 1700-2000 kilocycle coil given in Figure 4. This may be done either by adding more turns, by increasing the diameter of the coil, or by adding turns and increasing the diameter at the same time.

Other means of construction from those given in the article will no doubt suggest themselves—the numerous coils necessary for a wide coverage of wavelengths being particularly awkward. The variometer method as shown in Figure 5 is shown as a possible alternative. The variable tuning element is now L instead of C, and by a careful selection of the circuit values wide coverage should be possible. Again C can be made a convenient small value which will increase the selectivity and give best signal strength. Some kind of a telescoping arrangement whereby R could be adjusted to the proper length would also be an improvement over the experimental model we have given.

However, the constructional details given will make a good start for those interested in this new type of antenna and the trouble and time spent in building one will be more than repaid with good "interference free" reception, even though the "local" opens up a few blocks away, or Old Man Static is doing his best to ruin good reception.

650 Miles on 1.5 Watts!

(Continued from page 597)

plied through two Hammarlund radio frequency chokes, type CH8. (8 M.H.) The bias is obtained through a viariable resistor, R3. The plate circuit also incorporated a split stator condenser and eliminated the usual by-pass condenser. The rotor is grounded. The plate voltage is fed through the center tap of the coil, L3. Due to the battery power supply, the amplifier had to be keyed in the *positive* high voltage lead. Jacks are included in each high voltage lead to facilitate reading the current with a milliammeter.

The neutralization of the amplifier is accomplished by two 35 mmf. Hammarlund receiving neutralizing condensers of the postage stamp type. The antenna tuning arrangement can be designed to match the type of antenna used. At W2BXS a 135 foot flat-top Zeppelin, with two-wire feeders separated three inches and 66 feet long was used. For this antenna, two coils were used at either end of the ampifier tank coil, and the antenna condenser, C5, and radio frequency milliammeter connected between them as shown in the diagram. Other details are given in the Figure 2.

The tuning of this "low-power" transmitter is not difficult, but a monitor or short-wave receiver and an absorption type wavemeter are necessary. Start with the oscillator: Remove the plate coil, insert the crystal and the proper coil for that crystal in the screen-grid circuit [L1]. Apply the voltage to the filaments, making sure it does not exceed 2 volts for the type '30 and type '32 tubes. If dry cells are used, a voltmeter and rheostat are necessary. If a storage battery is handy, a single cell of it will give the desired voltage with no rheostat. Apply the 135 volts to the screen circuit, leaving the plate circuit open and its coil, L2, removed. By listening on the monitor, or a receiver tuned to crystal frequency or a harmonic of it, oscillation should be heard when the tank circuit, LC1, is tuned to the crystal frequency. If a low range, [0-25] milliammeter is plugged into the screen-grid jack, the current will show a sharp drop when the crystal starts oscillating. When this is working smoothly, the plate coil can be inserted and the condenser C2 can be tuned to bring the circuit into resonance with the desired harmonic frequency of the crystal. Let me again warn that you make sure, by using an absorption type wavemeter, that you have the correct harmonic, as most likely two will be found. If the milliammeter is plugged into the plate circuit and the wavemeter coupled closely to the plate coil, a slight jump will show when the wavemeter is tuned to resonance with the plate coil. Notice that tuning the plate circuit in and out of resonance has practically no effect upon the frequency of the oscillator when listening to it on the monitor; the only effect being a slightly louder signal when the plate is tuned to a harmonic.

Neutralizing the Amplifier

The push-pull amplifier may now be neutralized. An easy way is to listen in the monitor to the oscillator while tuning the amplifier plate condenser, C3, through its whole range. At resonance there will be a very slight change of pitch in the signal heard if the amplifier is out of neutralization. Adjust the two neutralizing condensers, C4, keeping the same capacity in each until tuning the plate condenser, C3, has the least effect upon the note of the oscillator in the monitor. An equally good method is to remove the crystal from the oscillator circuit, and then tune condenser C3 throughout its whole range with the key pressed down, and listen for self oscillation in the monitor. The usual methods of neutralizing cannot be used because of the small amount of radio frequency current present. The amplifier is very easy to neutralize and is not at all critical if the parts are laid out symmetrically. You are now ready to tune the amplifier. The milliammeter can be shifted to the jack in the push-pull tubes plate circuit. With the oscillator tuned and working, the amplifier tubes should draw from 10 to 20 MA. with the key down. *Retune* the oscillator screen and plate condensers [C1 & C2] slightly until the amplifier tubes draw the greatest amount of current. Now tune C3 for a dip in plate current at resonance. Adjust the variable resistance R3 [grid bias resistor] for the value which will give the greatest change or dip in the meter as C3 is tuned through resonance.

The antenna coils can be put in place now and the antenna condenser tuned until the antenna meter or a small flash-light bulb shows signs of R.F. current in the antenna system. Tune for maximum radio frequency current in the feeders. Retune C3 slightly if necessary.

At W2BXS, an 0-500 MA. Thermo-couple RF meter was the only meter used after the initial adjustments were made. It showed a current of from 100 to 250 MA. (RF.) with the antenna used. It was a simple and quick job to slightly retune all the condensers for the maximum reading on this meter and provided a check to show that the transmitter was operating as it should.

From the moment this set was placed in operation on the 80 meter band, its signals were able to be read consistently through the peak of the evening QRM at W2BFB, and later at W2UL, a distance of about fifty miles. Daily schedules have been kept during two summers. Hundreds of messages were handled, as soon as other campers at the lake found it a reliable link with Westchester County and through W2BFB, who works there, with New York City. During the summer of 1932, the set was operated about 80 days. In 1933 the set was operated about 70 days. Through rain and heat waves, through fog and thunderstorms, under every kind of condition, the schedules were kept without a single miss. During August, 1933, the peak of the lake traffic season for campers, this low-powered station made the *Brass Pounders League* of the A. R. R. L. using an "input" which never exceeded two watts!

The three original "B" batteries completed the second year successfully even though their total voltage dropped to 80 volts which gave the transmitter an input of 1.5 watts.

Practically no other work was done with the transmitter except the "skeds" (schedules) on the 80 meter band. A great deal of joking was leveled at the "flea" power transmitter by W2UL, W2BFB, and W2CIF, who described the set as a "couple of flashlight bulbs excited by a fire-fly." After protesting that the only reason no DX had been worked was that I had never tried to work any, and getting a good deal of kidding in return, it was decided to try the set on the 80 meter band one afternoon just to see what could be worked. Starting right after lunch, with no trouble at all and with good signal strength, the first, second, third and eighth districts were worked! That evening just before the "sked," messages were exchanged with VE1ER at Chester, Nova Scotia.

Parts List

2—(C1-C5) .00025 M.F. variable receiving type condensers.
2—(C2-C3) 2-gang .00025 M.F. variable receiving type condensers.
2—(C4) mica fixed condensers, .00025 M.F.
2—(NC) 35 mmf. compression type neutralizing condensers, Hammarlund.
2—(RFC) 8 millihenry RF chokes. (From 2½ to 10 M.H. is OK.)
1—(R3) 0-50,000 ohm variable resistor. (Acratest.)

(Continued on page 635)

JAPANESE ROSE BUSHES

The Wonder of the World

Japanese Rose Bushes **bloom all the year round.** Just think of it. Six weeks after planting the seed, the plants will be in **full bloom.** It may not seem possible, but we positively **guarantee it to be so.** They will **bloom every ten weeks,** Summer or Winter, and when three years old the bush will be a **mass of roses,** bearing from five hundred to a thousand roses on each bush. The flowers are in three shades —white, pink, and crimson. The plants will do well both in and out doors. We guarantee at least three bushes to grow from each packet of seed. **Price, 10c** packet, 3 pkts. for **25c** postpaid.

Chinese Fragrant Tree Fern

Just introduced; noted for its rapid growth. An exceptionally pretty ornamental plant. Foliage is rich dark green. Forms grand pyramidal bushes about 5 feet high. Branches very desirable for decorative purposes, wreaths, etc. **Seeds 15c pkt., 3 for 40c.**

Weather Plant

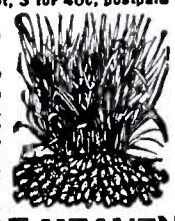
NATURE'S WEATHER PROPHET

By mysterious changes that take place, this remarkable plant accurately forecasts the weather many hours in advance. Will grow anywhere all the year around. An interesting house plant. Bears large, fragrant, pink, butterfly shape flowers.

Seeds, 15c packet, 3 for 40c, postpaid

GROUND ALMONDS

Amazingly Prolific—Easily Grown From Seed



The Ground Almond has a flavor that is MOST EXCELLENT, resembling the cocoanut. The meat is snow white, covered with a shell or skin of brown color. It grows close to the surface and anything from 200 to 300 Almonds may be expected from a single nut. There is no trouble whatever in growing anywhere and in any kind of soil. May be planted any time, and in eight or ten weeks from time of planting you will have an ENORMOUS CROP of the MOST DELICIOUS ALMONDS YOU EVER TASTED. **Seeds 15c Pkt.**

Chinese Cabbage

Novelty from China and should be grown in every garden. Seems to be a cross between Celery and Cos Lettuce. Flavor is more mild than any other cabbage. **Can be served on the table** and eaten raw or cooked like cabbage, spinach or lettuce or made into salad. Grows very rapidly, easy to cultivate. You can create quite a sensation by cultivating this remarkable novelty. **Seeds, 15c packet, 3 pkts. for 40c.**

TREE OF HEAVEN

This splendid ornamental tree is a native of China; and is called the Tree of Heaven, on account of its great beauty. Very hardy, thrives in any soil, no matter how poor, and grows from 6 to 10 feet high from seed the first summer. The leaves are from 3 to 6 feet in any length, giving it a grand appearance. Nothing outside the tropics can rival it for lawn decoration. Large panicles of bloom, followed in season by great clusters of colored seed pods, make the tree a continual thing of beauty. **Packet, 15c; 3 packets 40c**

THE REMARKABLE FIREFLY PLANT — A Vine that Blooms at Night

Fills the Atmosphere with Fragrant Aroma

One of the most rapid growing vines known. Under favorable conditions this vine has been known to grow OVER 25 FEET IN A SINGLE WEEK. In a very short space of time indeed the Vine has climbed to a great height, and is covered with IMMENSE FLOWERS, from 5 to 7 inches in diameter. It is, indeed, a great novelty, for, unlike other plants, the flowers OPEN IN THE EVENING, and remain open until about noon the following day. In dull weather they will remain open all day. It is a most INTERESTING SIGHT to watch the opening and closing of the flowers as the clouds appear and disperse. As the flowers open they give forth the most DELIGHTFUL AROMA and the whole atmosphere around is full of scented fragrance. It is always the object of favorable comment, and much curiosity is aroused by people passing at night time as to the cause of the charming aroma, frequently stopping in an endeavor to satisfy their curiosity. **PRICE, 59 CENTS packet, two packets for 35 CENTS, POSTPAID.** JOHNSON SMITH & CO.

TheGreatWonderberry

A luscious berry that may be grown and ripened from seed in any soil or climate in 8 months. The flavor is fine and unsurpassed for eating raw, cooked, canned or preserved in any form. The fruit is blue-black in color, and tastes like a luscious, rich blueberry. One bush will produce an enormous amount of fruit, yielding great masses of rich fruit all Summer and Fall.

Packet, 10c, 3 pkts. for 25c, postpaid.

Shoo Fly Plant

A very remarkable Botanical curiosity you should have. Though quite odorless it is said flies will not remain in a room where it is grown. Bears very pretty blossoms; blooms summer and winter. Grows rapidly from seed.

SEEDS 15c pkt.; 3 for 40c, postpaid.

Banana Musk Melon

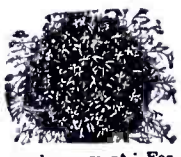
Quite a curiosity. Looks and smells like a banana. Peculiar shape and its delicious flavor make it well worth your while cultivating. Flesh is deep and of exquisite flavor. Very high prices are obtained in choice city markets, as high as a dollar sometimes being demanded for one single specimen. **Seeds 10c, 3 pkts. for 25c.**

The Great Japanese Umbrella Palm — A Graceful House or Conservatory Plant

Easily Grown From Seed Winter or Summer

The Japanese Umbrella Palm is a semi-aquatic plant. It is easily grown from seed either in a bowl of water or in very damp soil. Probably the most usual, as well as the most interesting method, is to cultivate the plant in a bowl or jardiniere filled with water, with two or three inches of good garden soil at the bottom. The seeds soon commence to germinate, and the plant shoots up stems two to three feet high and rapidly assumes a most pretty palm-like appearance, as shown in the engraving. The tops of the stems are surmounted by a whorl of umbrella-shaped leaves, of a waxy appearance. We will send a package of this seed, with full instructions for culture, **for only 15c or three packets for 40c postpaid.**

Perfume Plant



Blooms only at night, giving forth the most delightful scented fragrance for quite a distance. Causes much comment. For house or garden. Also valuable because of rare perfume made from it. **SEEDS, 10c pkt., 3 for 25c.**

CACTUS FROM SEED

Very curious, odd looking, strange species of plants; will thrive anywhere with little or no care. Flowers are of exquisite beauty and delightfully fragrant. You will be astonished at the odd looks of the Cacti just sprouting. **Packet, 10 cents, three packets for 25 cents, postpaid.**

NEW GUINEA BUTTER BEANS — GIGANTIC

THE NEW EDIBLE VEGETABLE WONDER

Grows to an astonishing size, the Beans measuring from 3 to 6 feet long, and weighing anything from 10 to 16 lbs. and even more. One Bean is sufficient for a family for several meals. Very palatable and rich in nutritious materials. The delicate Buttery Flavor is much appreciated. The Vines are easily grown, very prolific, and a most welcome and valuable adjunct to your garden. Try them; you will find them the **most delicious vegetable you have ever tasted.** Imported direct. Unobtainable elsewhere. Sample package of Seeds with full directions for cultivating and cooking. **25c, postpaid.**

Kudzu Vine

Most rapid growing vine known. Will grow 20 feet in one week. Luxuriant foliage, lovely purple flowers, very fragrant. Nothing to equal it for shade purposes and quick growth.

Seeds 15c packet. 3 for 40c.

Yard Long Bean

Produces enormous crop of long, slender, round pods, of excellent quality for snap beans. Pods grow from 2 to 5 feet in length. Very tender and fine flavor. The vines are rampant growers; an interesting curiosity. **Seeds 15c pkt., 3 for 40c**

Address all Orders to **JOHNSON SMITH & CO., Dept. 969,, RACINE, WIS**

Blank Cartridge Pistol

REVOLVER STYLE

.22 CAL.

MADE IN 3 SIZES

25c

50c

$1.00

Three new models now out **25c, 50c and $1.00.** Well made and effective. Modelled on pattern of latest type of Revolver. Appearance alone enough to scare a burglar. Takes 22 Cal. Blank Cartridges obtainable everywhere. Great protection against burglars, tramps, dogs. Have it lying around without the danger attached to other revolvers. Fine for 4th July, New Years, for stage work, starting pistol, etc. **SMALL SIZE 4 in. long 25c. MEDIUM SIZE 5 in. long 50c. LARGE SIZE 6in. long $1.00. BLANK CARTRIDGES 50c per 100. HOLSTER (Cowboy type) 50c. Shipped by Express only, not prepaid.** *710 page catalog of other pistols, sporting goods, etc. 10c*

BOYS! THROW YOUR VOICE

Into a trunk, under the bed or anywhere. Lots of fun fooling teacher, policeman or friends.

THE VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. **Never fails. A 16-page course on Ventriloquism together with the Ventrilo. All for 10c postpaid.**

PLAY PIANO IN ONE HOUR

With this new VAMPING BOARD. No teacher needed. Surprisingly simple. Place the Vamping Board upright over the piano keys, and vamp away to thousands of songs, ballads, waltzes, fox trots, rag time, etc. No knowledge of music required. After using it a few times, the Board may be dispensed with entirely. **Price 15c postpaid.**

Novelty French Photo Ring

Here is a very great novelty in Rings, that is selling in thousands. It is a nicely made ring, finished in imitation platinum, and set with a large imitation diamond. It looks just like an ordinary ring, but in the shank of the ring is a small microscopic picture almost invisible to the naked eye, yet is magnified to an almost incredible degree and with astonishing clearness. There is quite an assortment of pictures that should suit all tastes. Some are pictures of bathing girl beauties, pretty French Actresses, etc., others are views of places of interest in France, Panama Canal and elsewhere; others show the Lord's Prayer in type, every word of which can be read by persons with normal eyesight. They are interesting without being in any way objectionable. **PRICE 25c, 3 for 65c, or $2.25 per doz. postpaid.** *770 page Catalog 10c.*

TELL YOUR OWN FORTUNE

With the aid of this dream book and fortune-teller. The key to your future. Will you be lucky in love? Successful in business? Will you be wealthy? Complete with dictionary of dreams with descriptions and correct interpretations, with lucky numbers, fortunate days, oracles, divination, palmistry, etc. **Price 10c postpaid.**

Learn to Hypnotize

This book tells how. Explains all about Hypnotism, how to hypnotize, how to produce sleep, how to awaken a subject, medical hypnotism, hypnotism in diseases, how to hypnotize animals, illusions etc. 27 chapters. **ONLY 10c ppd.**

PISTOL CIGARETTE CASE

It looks like a deadly weapon, but it is merely a novel Cigarette Case. This clever contrivance has proved itself better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest it might be loaded. Pull the trigger and the slide flies open disclosing the cigarettes. Well made, light and compact. Weight only 2 ounces.

Send at once and have all the FUN before everybody has one

PRICE POSTPAID 25c

SEX INDICATOR

An amusing and entertaining novelty. Hold it over a woman's hand and it is supposed to describe a complete and continuous circle. Hold it over a man's hand and watch it move back and forth like a pendulum. We have made innumerable tests, and while we have never been able to figure out how it's done, we have never seen it fail. Many novel and interesting experiments may be performed with it. Try it for testing the sex of animals, cats, dogs, rabbits, butterflies, etc. Sold as a patent egg tester in Europe. **PRICE 10c, 3 for 25c, 75c per doz. p-p.**

MAKE YOUR OWN RADIO RECEIVING SET

Enjoy the concerts, baseball games, market reports, latest news, etc. This copyrighted book "EFFICIENT RADIO SETS" shows how to make and operate inexpensive Radio Sets, the materials for which can be purchased for a mere trifle. Also tells how to build a short-wave Receiver for bringing in foreign stations, police calls, ships at sea, etc. **ONLY 15c. postpaid.**

SILENT DEFENDER

Used by police officers, detectives, sheriffs, night watchmen and others as a means of self-protection. Very effective. Easily fits the hand, the fingers being grasped in the four holes. Very useful in an emergency. Made of aluminum they are very light, weighing less than 2 ounces. Handy pocket size always ready for instant use. **PRICE 25c each, 2 for 45c postpaid.**

BIG ENTERTAINER

180 Jokes and Riddles. 34 Magic Tricks; 54 Parlor Games. 73 Toasts. 15 Tricks with Cards. 50 Money-making Secrets. 10 Funny Readings. 3 Monologues. 21 Puzzles and Problems. 5 Comic Recitations. Cut-outs for Checkers and Chess. Dominoes; Fox and Geese, 9 Men Morris. Spanish Prison Puzzle, Game of Anagrams, etc. **All for 15c postpaid.**

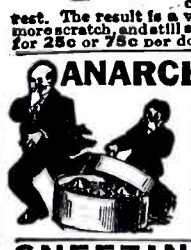
WONDERFUL X-RAY TUBE

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers; the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. **Price 10c; 3 for 25c.**

ITCHING Powder

This is another good practical joke; the intense discomfiture of your victims to everyone, but themselves is thoroughly enjoyable. All that is necessary to start the ball rolling is to deposit a little of the powder on a person's hand and the powder can be relied upon to do the rest. The result is a vigorous scratch, then some more scratch, and still some more. **10c box, 3 boxes for 25c or 75c per dozen. Shipped by Express.**

ANARCHIST BOMBS



One of these glass vials dropped in a room full of people will cause more consternation than a limburger cheese. The smell entirely disappears in a short time. **10c per Box, 3 Boxes for 25c., 75c per doz. Boxes, or $7.50 per gross Boxes. Shipped by Express. Not Prepaid.**

SNEEZING POWDER

Place a very small amount of this powder on the back of your hand and blow it into the air, and watch them sneeze without knowing the reason why. It is most amazing to hear their remarks, as they never suspect the real source, but think they have caught it one from another. Between the laughing and sneezing you yourself will be having the time of your life. For *parties, political meetings, car rides,* or any place at all where there is a gathering of people, it is the *greatest joke out.*

PRICE 10c, 3 for 25c, 75c per dozen. Shipped by Express. Not Prepaid.

COMICAL MOTTO RINGS

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. **Price 25c. ea. Postpaid.**

Good Luck RING

Very striking, quaint and uncommon. Oxidized gunmetal finish; skull and crossbones design; two brilliant flashing imitation rubies or emeralds sparkle out of the eyes. Said to bring good luck to the wearer.

PRICE 25c Postpaid

FORTUNE TELLING BY CARDS

Dice, dominoes, crystal, etc. Tells meaning of every card. Different methods explained. Crammed full with complete information. **PRICE 10c postpaid.**

ADDRESS ORDERS FOR GOODS ON THIS PAGE TO

JOHNSON SMITH & CO.

DEPT. 969 — **RACINE, WIS.**

Our complete Catalog sent on receipt of 10c., or the De Luxe Cloth Bound Edition for 25c. Bigger and better than ever. Only book of its kind in existence. Nearly 800 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Coin, Money Order, Check or unused U. S., Canadian and Foreign Stamps for all articles listed above.

650 Miles on 1.5 Watts!

(Continued from page 633)

3—(J) closed circuit jacks.
1—(R1) 2000 ohm 5 watt fixed resistor.
3—4 prong sockets. (National, Hammarlund, Isolantite, OK.)
1—crystal and holder. Bliley (Precision Piezo Service).
2—type 30 tubes. RCA Radiotron (Arco).
1—type 32 tube. RCA Radiotron (Arco).

Montgomery Transmitter Coil Data

	160 M.	80 M.	40 M.
L1	1" dia. x 2" long. 150 turns No. 28 DCC	60 turns No. 28 DCC	15 turns No. 28 DCC
L2	1" dia. x 3" in. long, "center-tapped."	60 turns No. 28 DCC	16 turns No. 28 DCC
L3	2¾" dia. x 5" long, "center-tapped."	22 turns No. 18 DCC	12 turns ¼" copper tubing
L4	2¾" dia. x 1" long.	7 turns No. 18 DCC	4 turns No. 18 DCC

National or Hammerlund midget coil forms can be used with any standard tube sockets.

A Portable Trans-Ceiver

(Continued from page 587)

The antenna is cut to the wave-length desired and tightly coupled to the secondary circuit. This results in its response to any tuning of the secondary and eliminates an antenna tuning condenser. Forty meter operation has been done here (at Cincinnati, Ohio) using a 25 feet antenna and similar counterpoise coupled to the outfit through a five turn antenna coil. Resonance was indicated by a small flashlight bulb.

Excellent local contacts have been made on 40 and 80 meters, while signals have been "heard" from *both coasts* on 20, 40, and 80 meters.

Operation is quite simple as there are no switches to throw to change from transmitting to receiving. It is only necessary to return C2 to zero mesh to *transmit*.

Coil Data

L1

Band	*Lg*	*Lp*	
1750 kc	70 turns	10 turns	No. 32 scc
3500	36	7	
7000	20	4	No. 30 scc
14000	8	6	

All coils are close wound except the 14000 kc coil. The spacing on this coil is varied until the band is covered. Spacing is approximately half the diameter of the wire. Tube bases are used as forms, with the exception of the 1750 kc coil which is wound on a 1½" coil and then attached to a tube base for plug-in purposes.

Parts List

1. Aluminum can 6"x5"x8" (one screen door handle to be used as carrying grip).
2. C1—50 mmf. midget variable condenser. National (Hammarlund, Cardwell).
3. C2—7 mmf. midget variable condenser. National (Hammarlund, Cardwell).
4. C3—2000 mmf. fixed condenser. Flechtheim.
5. C4—2000 mmf. fixed condenser. Flechtheim.
6. R1—Filament rheostat. R. T. Co.
7. R2—0-50,000 ohm variable resistor. Acratest. (R. T. Co.).
8. L1 approximately five turns of No. 18 wire, wound on 1" dia. form for 40 meter operation.
9. L2 approximately 16 turns of No. 20 wire, wound on 1" dia. form for same band (ratio of G/P should be ½).
10. For 40 meters the RFC should be one of 80 turns, wound on a lead-pencil form.

Crystal Control Simplified

(Continued from page 601)

be recommended as one can be made by the average amateur. The bi-metal strip is usually made up of one side brass and the other side steel. Due to the difference in expansion of the two metals the strip bends when the temperature changes. A piece of this material may be obtained from an automobile junk yard as it is used in the water cooling system thermo-regulator of quite a few automobiles. It is also used in the thermal unit of the type used in automobile generators to limit the charging rate. A strip of this material ¼" wide and about 4" in length will be satisfactory for the thermostat of the crystal oven. One end of the strip is fixed while the other end, with the contact on it, is free. The contacts can be made of silver or can be of the old Ford spark coil type. A .1 mf. condenser should be connected across the contacts to prevent sparking.

Fig. 3 illustrates the construction of a crystal oven and the thermostat. The heaters are made of nichrome resistance wire wound on asbestos cards. However, small light bulbs can be used instead, but the heat is not distributed as evenly as when the pads are used. The light bulbs are good enough for an amateur oven though if you do not want to make the heating cards. The heating elements should draw about 25 watts. The thermostat is shielded from direct heat radiation by an aluminum cover. The thermometer should be of the right angle type if one is available, a straight thermometer can be used but is not as well suited for the purpose. These thermometers can be purchased from a laboratory supply house or a drug supply store. The heater current should be adjusted so that the heat is on one-half the time and off the other half. A pilot light is connected in parallel with the heaters to indicate the operation of the thermostat. The temperature of the oven should be adjusted so that it will always be higher than the outside temperature. Most ovens are adjusted for 50 degrees Centigrade (122 degrees F.). The oven described can be built for about six dollars if all of the material has to be purchased. Fig. 4 is of a manufactured type crystal oven. However, as said before, a crystal oven is not needed unless one wants to work his transmitter at a frequency very near one edge of the band, or unless you want a transmitter of the "commercial" type. The small frequency drift of a good crystal is hardly noticeable at the receiving station.

Most amateur beginners select a Hartley, TNT or some other self-excited circuit for their transmitters and face the danger of operating out of the amateur band. They will usually stay away from crystal control because it is their belief that it is too complicated and expensive for them to start out with. However, this is not true as a crystal transmitter can be made as simple or elaborate as one may desire. It may consist of a one-tube crystal oscillator or a multi-stage transmitter. A very effective crystal transmitter for the beginner is a simple crystal oscillator. A crystal oscillator will emit a much better signal than the usual 245's in push-pull or the 210 tube in a self-excited transmitter with approximately the same power input.

A crystal oscillator is very simple to construct and adjust. Fig. 5 shows the circuit diagram for a transmitter of this type. The transmitter is wired with No. 12 wire. The key is placed in the filament center tap. The antenna coupling coil is of the same construction as the plate coil and should be spaced about two inches from the plate end of the tank inductance.

The tone of the crystal will be much better and the signal is more easily copied through QRM. With the crystal oscillator, using a good crystal, there is no danger of *Off-frequency* operation as the transmitter will only oscillate at the frequency of the crystal.

Short Wave Scouts

(Continued from page 621)

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 Feb. 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!*

If you do not have the exact address, most of your letters will reach their destination by just addressing them as per example:

Radio Station XXXYZ, Bangkok, Siam. This, in most cases, is sufficient, as the local post office authorities usually know the station and deliver your letter.

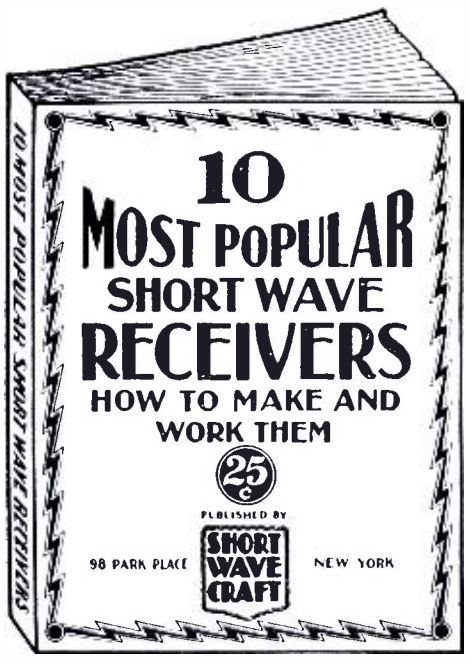
The 4 ESSENTIAL SHORT WAVE BOOKS

'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



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.

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

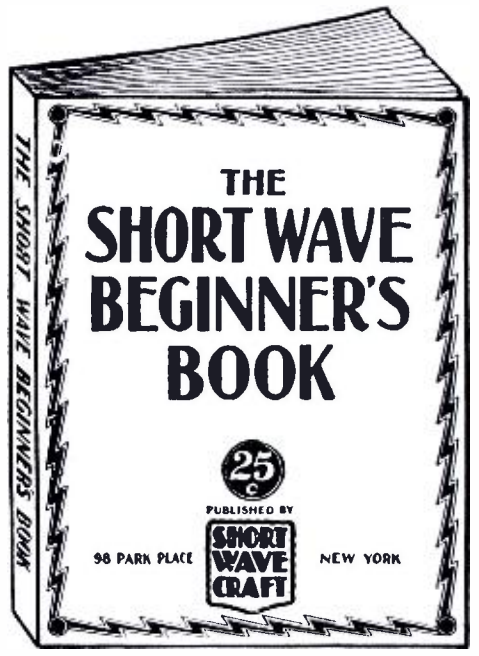
25c

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 stage 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 tremendou-amount of very important informa tion 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

40 PAGES
OVER 75 ILLUSTRATIONS

25c

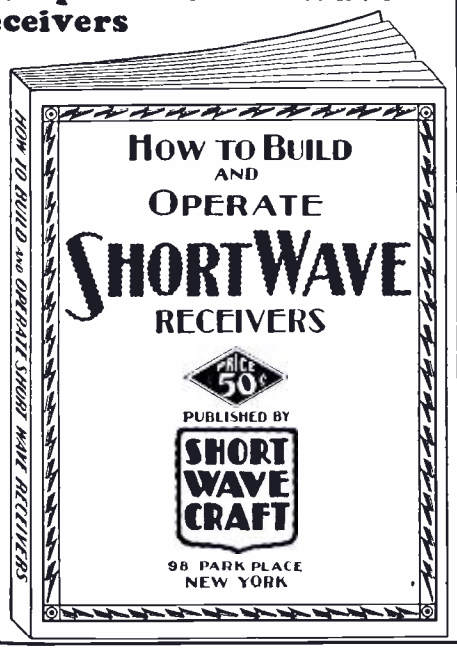
How to Build and Operate Short Wave Receivers

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.

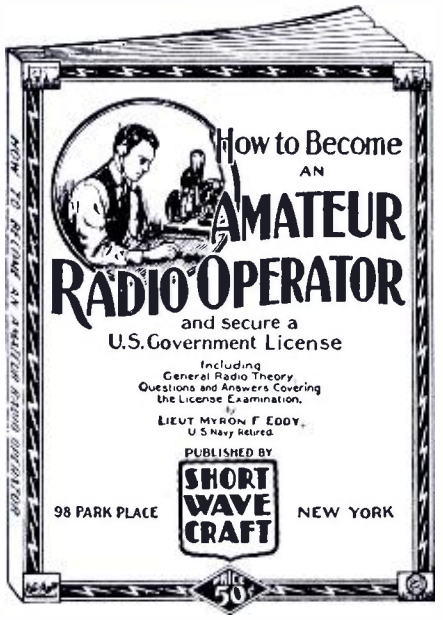
We know that if you are at all interested in short waves you will not wish to do without this book. It is a most important and timely radio publication.



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

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-2-34
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!

• 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.)

A Medium Power Transmitter

(Continued from page 595)

possible to obtain a perfectly symmetrical layout which facilitates the use of a front panel.

The stand-off insulators supporting the plate tank coil are equipped with jacks to accommodate the bananna type plugs, which are attached to each end of the plate coil. This allows easy changing of coils without the application of a pair of pliers. The antenna coils, of course, do not need to be changed and are not of the plug-in type. They are spaced about one inch from the plate tank coil and may be turned at various angles relative to the plate tank, in order to obtain a proper degree of coupling. Looking at the bottom of this transmitter, we will see that the R.F. plate choke, plate by-pass condenser, grid-leak, together with the filament by-pass condenser and center-tapped filament resistors have been mounted on the underside of the board.

Referring to the circuit diagram it will be seen that a 10,000 ohm grid-leak is used and this proved to be the optimum value. Filament by-pass condensers are shown, although in many cases they may not be necessary. In this particular transmitter it was found that .001 mf. condensers gave a decidedly improved signal.

After this transmitter is completely wired and the coils are constructed as shown in the attached coil table, the plate tank condenser should be adjusted for a minimum of plate current. At this point a monitor should be used in checking the frequency. If the frequency is too low it is permissible to detune the plate-tank condenser to the high frequency side of resonance with the grid coil. *Never* tune the plate tuning condenser to the low frequency side of resonance with the grid coil, or a "poor quality" signal, with instability, will result! In other words the grid coil should be constructed so that resonance with a plate coil is at a lower frequency than the frequency on which one desires to work. After the transmitter has been adjusted to the approximate frequency at which you wish to work, attach the antenna feeder to the antenna coils. Tune the antenna condenser or condensers, whichever the case may be, until the plate current rises to a value of about 100 mils. (M.A.). Now loosen the coupling between the antenna and plate coils until the antenna condenser can be rotated through resonance with the plate current reaching a value not higher than about 125 milliamperes. With the transmitter adjusted as outlined above, you should obtain a pure D.C. signal, very closely approaching the stability of the crystal. In fact "crystal" reports have been obtained with this transmitter.—George W. Shuart, W2AMN.

Coil Table for Transmitter

Grid coils "close wound" on 1 inch dia. bakelite tube.

20 meters 7 turns No. 28 D.S.C. each coil
40 meters 18 turns No. 28 D.S.C. each coil
80 meters 35 turns No. 28 D.S.C. each coil

Plate coils.

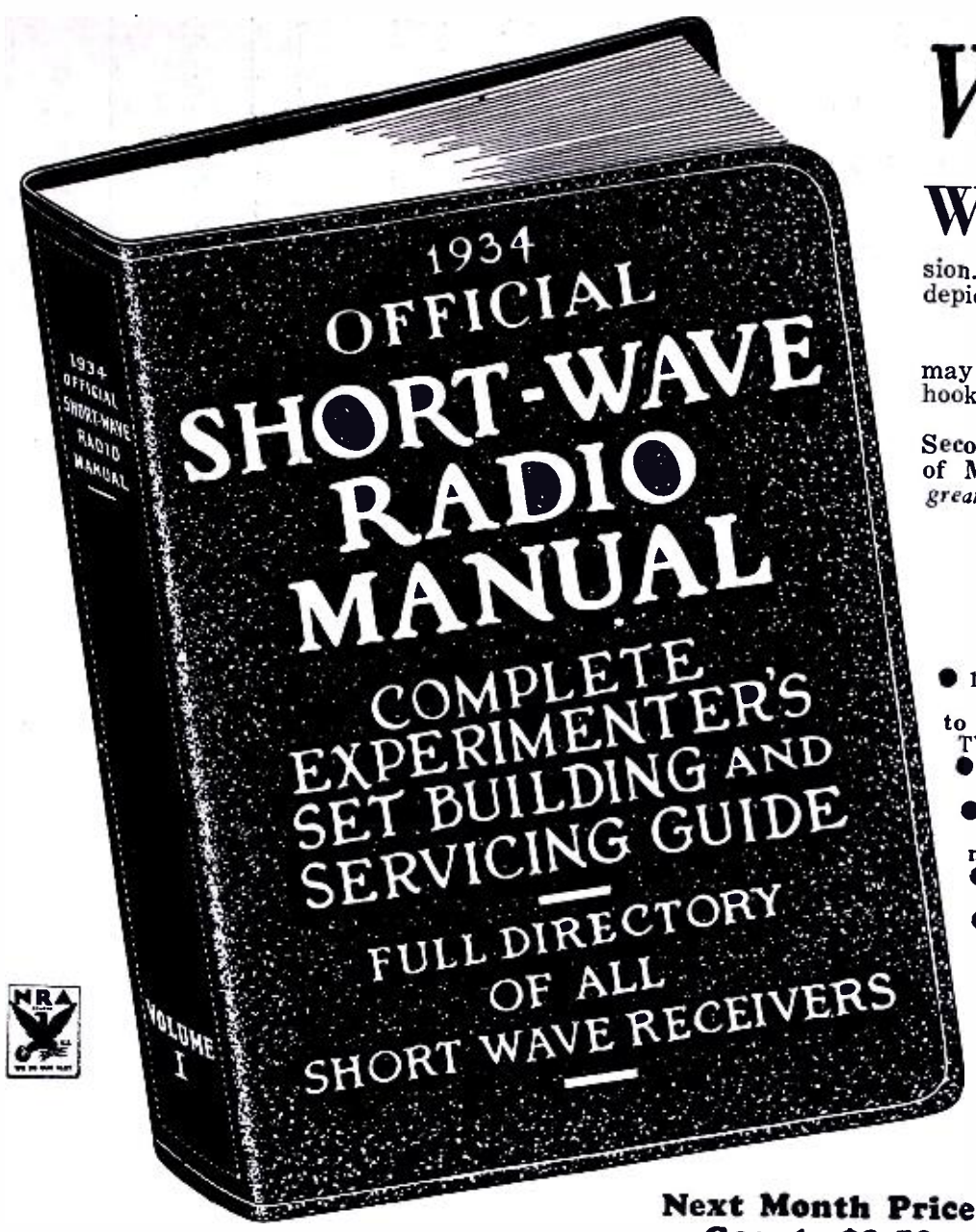
20 meters 4 turns
40 meters 6 turns
80 meters 12 turns

Antenna coils have 4 turns each of $\frac{3}{16}$ copper tubing wound with an inside diameter of 2¼ inches.

Plate coils made of ¼ inch copper tubing inside diameter of coil is 2½ inches.

Parts for Transmitter

L—set of coils (see coil table)
1—.00044 to .0005 mf. transmitting condenser. National (Hammarlund; Cardwell)
2—.0001 mf. fixed (mica) transmitting condensers (2,000 vt.)
2—.001 mf. fixed (mica) transmitting condensers (2,000 vt.)
1—100 ohm C.T. resistor. R. T. Co.
1—10,000 ohm 20 watt grid-leak.
2—4 prong isolantite sockets. National (Hammarlund)
2—type 830 tubes. Sylvania.



World's Greatest SHORT WAVE *Book!*

WE are pleased and proud to announce the greatest and most complete work on *SHORT WAVES* which has ever appeared in print.

There has been a big boom in short waves during the past two years in spite of the depression. Tremendous progress has been made, yet up to now there has not been an adequate book depicting ALL the progress that has been made.

THE OFFICIAL SHORT-WAVE RADIO MANUAL now fills this need completely.

It is a big book in which you will find EVERYTHING in short waves, no matter what it may be. It is not only a complete manual, but it is a veritable encyclopedia of facts, information, hookups, illustrations. It is impossible to explain the entire volume in a few sentences.

The book has been edited by Hugo Gernsback, Editor of SHORT WAVE CRAFT, and H. W. Secor, Managing Editor, and if you are a reader of SHORT WAVE CRAFT and have seen some of Mr. Gernsback's other publications, you know just about what you may expect from this, *his greatest effort in the short-wave field.*

Here are the contents of the book:

14 VALUABLE FEATURES

- **1. THE LARGEST SECTION, featuring the most important short-wave receivers and how to build them, EVER ASSEMBLED BETWEEN TWO COVERS.**
- **2. Short wave amateur transmitters in all their phases.**
- **3. A complete Ultra Short Wave section featuring construction of 1, 3, 5 and 10 meter receivers.**
- **4. A complete Short Wave beginner's section.**
- **5. A large section devoted exclusively to short wave coil winding and all about it.**
- **6. The most complete section of commercial short wave receivers in print. Every important commercial Short Wave receiver (this includes all wave receivers) is represented WITH FULL SERVICING data. *Invaluable for Service Men.***
- **7. A large section devoted to A. C. short wave power packs and how to build them, from 1 to 7 tube receivers.**
- **8. A big section for the Short Wave experimenter on short-wave kinks—hundreds of them.**
- **9. A section on the important new art of short-wave therapy (treatment of diseases by short waves).**
- **10. A section devoted exclusively to Short wave converters. This includes how to build them, as well as commercial models with FULL SERVICING DATA.**
- **11. An important section on Short Wave antennae and noise eliminating procedures.**
- **12. The most complete section of Short Wave Superheterodynes in print. This section includes both how to build as well as commercial models of receivers. The latter with full service data.**
- **13. A section on amateur 'phone transmitters and how to build them.**
- **14. A Short Wave Physics section on theoretical Short Wave data for the advanced experimenter, as well as student.**

THE OFFICIAL SHORT-WAVE RADIO MANUAL contains hundreds upon hundreds of illustrations and hookups that are invaluable to you as a short-wave enthusiast. It contains a veritable "gold-mine" of information.

Over 200 big pages
Over 1,000 illustrations
Size 9x12 inches
Flexible, loose-leaf binder

Next Month Price Goes to $2.50

SPECIAL PRE-PUBLICATION OFFER: You now have the opportunity to order this book before it comes off the press and save money. The price of the new OFFICIAL SHORT-WAVE RADIO MANUAL will be $2.50 as soon as it comes off the press (late in October). No reduction in price will be made later. To you who order this book before publication the price is $2.00.

As soon as the OFFICIAL SHORT-WAVE RADIO MANUAL is published the pre-publication price will be immediately withdrawn. It is to your advantage to order your copy today.

IMPORTANT!

Inasmuch as this is the first time that such a monumental work in short waves has been published, Mr. Hugo Gernsback has consented to personally autograph the first one thousand copies, all of which are numbered. If you wish an autographed copy of the Manual, place your order immediately.

Clip—Mail This Coupon Today!

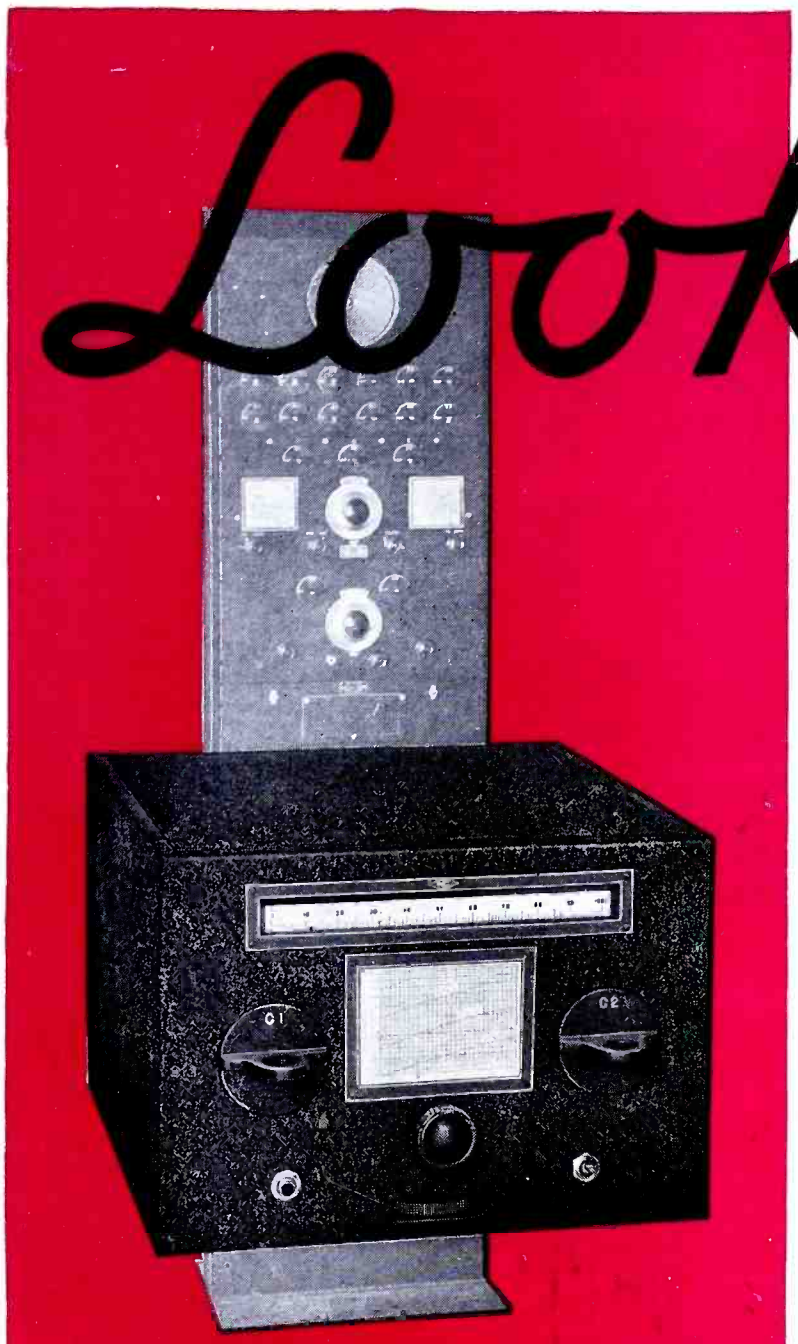
MONEY SAVING COUPON
SHORT WAVE CRAFT, 2-34
96-98 Park Place,
New York, N. Y.

Gentlemen: I enclose herewith my remittance of $2.00 for which please send me one copy of the 1934 OFFICIAL SHORT-WAVE RADIO MANUAL, at the pre-publication price of $2.00. I understand that the price of the book will be $2.50 as soon as it is published. (Send remittance, check or money order. Register letter if it contains cash or currency.)

Name .....

Address .....

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



Look!

INSPECT, COMPARE

We are confident of your approval

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

TRUE TRACKING

True Tracking is absolutely necessary for maximum image suppression and sensitivity in precise, single control tuning of short wave superheterodyne receivers. Only by advanced circuit engineering, and the proper coordination of such specially developed components as shielded R-39 inductances with individual air-dielectric padding capacitances, can permanent "drift-free" true tracking be obtained. Permanent True Tracking is just one of many exclusive features of the NATIONAL FB-7A.

AIR TUNED I. F.

The new National air-dielectric-tuned intermediate frequency transformers are standard equipment in the FB-7A receiver.

MADE FOR AC POWER-SUPPLY

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

FB-7A SPECIFICATIONS

THE CIRCUIT . . . 7 tubes: one 57, two 24's, two 58's, one 56, and one 59 . . . Electron Coupled Oscillators . . . Separate Oscillator for CW beat frequency giving "semi-single signal" or "offset" tuning . . . High efficiency Litz wound air-dielectric tuned IF Transformers . . . Class A Power Pentode Output . . . R-39 Coil Forms with grounded metal shield handles . . . Band Spread Coils available for 20, 40, 80 and 160 meter amateur bands, each covering 100 full dial divisions . . . Standard coils for continuous coverage from 34 MC to 800 KC . . . No frequency drift . . . Double Shielding . . . May be used with either conventional antenna or "doublet" with transposed transmission-line lead in.

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

NEW NATIONAL FB-7A SHORT-WAVE RECEIVER

NC

NATIONAL COMPANY, INC.
61 Sherman Street, Malden, Mass.

NRA

Gentlemen:—

Please send me your new catalogue sheets giving full description of the new FB-7A Short-Wave Super and your new Short-Wave Parts. I enclose 6c in stamps to cover mailing costs.

Name .....

Address .....

SWC-2-34

I saved ½ by buying direct from the Midwest Laboratories

Yes, and it gives you WORLD-WIDE Reception!

Amazing New SUPER Deluxe 16-TUBE ALL-WAVE Radio

9 TO 2,000 METERS

30 DAYS FREE TRIAL

BEFORE you buy any radio, write for this big new FREE Midwest catalog... printed in four colors. It has helped thousands of satisfied customers save from ⅓ to ½ on their radios... by buying *direct* from the Midwest Laboratories. You, too, can make a positive saving of 30% to 50% by buying a Midwest 16-tube de luxe ALL-WAVE radio at sensationally low direct-from-laboratory prices. You'll be amazed and delighted with its super performance! Broadcasts from stations 10,000 miles and more away are brought in... "clear as locals". You get complete wave length coverage of 9 to 2,000 meters (33 megocycles to 150 KC). Now, you can enjoy the new DX-ing hobby... and secure verifications from world's most distant stations.

These bigger, better, more powerful, clearer-toned, super-selective radios have FIVE distinct wave bands: ultra-short, short, medium, broadcast and long... putting the whole world of radio at your finger tips. Now listen in on all U. S. programs... Canadian, police, amateur, commercial, airplane and ship broadcasts... and programs from the four corners of the earth. Thrill to the chimes of Big Ben from GSB, at Daventry, England—tune in on the "Marseillaise" from FYA, Pointoise, France—hear sparkling music from EAQ, Madrid, Spain—listen to the call of the Kookaburra bird from VK2ME, Sydney, Australia—etc. Never before so much radio for so little money! Write for FREE catalog.

• • • 40 NEW 1934 FEATURES • • •

Try this Midwest radio... in your own home... for thirty days before you decide. See for yourself the 40 new 1934 features that insure amazing performance. Other features include: Automatic Select-O-Band, Amplified Automatic Volume Control, 16 New Type Tubes, Balanced Unit Superheterodyne Circuit, Velvety Action Tuning, Super-Power Class "A" Amplifier, 29 Tuned Circuits, New Duplex-Diode-High Mu Pentode Tubes, No-Image Heterodynes, Full Rubber Floated Chassis, Variable Tone Blender, Centralized Tuning, 7 KC Selectivity, New Thermionic Rectifier, Automatic Tone Compensation, Auditorium Type Speaker, etc. These features are usually found only in sets selling from $100 to $150.

AMAZING FOREIGN RECEPTION

AKRON, OHIO—My Midwest-16 is a real go-getter for distance. Received 205 stations on regular wave band... including U. S., Canadian, Mexican, Cuban and Hawaiian stations. Also many police, airport and "ham" stations from all over the country. Have logged England, France, Germany, Madrid, Rome, on 15-30 meter band. South American stations include Venezuela, Colombia, Brazil, Yucatan.—L. H. MOELLER, 793 N. South St.

DEAL DIRECT WITH LABORATORIES

Increasing costs are sure to result in higher radio prices soon. Buy before the big advance...NOW, while you can take advantage of Midwest's amazingly low prices. No middlemen's profits to pay! You save from 30% to 50% when you buy direct from Midwest Laboratories... you get 30 days FREE trial—as little as $5.00 down puts a Midwest radio in your home. Satisfaction guaranteed or your money back! FREE catalog shows sensational radio values. Write TODAY!

SAVE UP TO 50%

MIDWEST RADIO CORP.

DEPT. 422 — CINCINNATI, OHIO, U. S. A.

Established 1920 Cable Address Miraco ABC 5th Edition

WORLD'S GREATEST RADIO VALUE

$49.50 with New Deluxe Auditorium Type SPEAKER

TERMS AS LOW AS $5.00 DOWN

NEW STYLE CONSOLES

Write quickly for your FREE copy of the new Midwest catalog. It pictures a complete line of beautiful, artistic de luxe consoles and chassis... in four colors! Sensational low prices save you 30% to 50%. Also shows performance curves that prove Midwest radios out-perform most of the $150 sets. You can order your Midwest radio from this catalog with as much certainty of satisfaction as if you were to select it personally at our great radio laboratories. Write TODAY!

MAIL COUPON TODAY! FOR AMAZING 30-DAY FREE TRIAL OFFER AND NEW 1934 CATALOG

MIDWEST RADIO CORP.,
Dept. 422
Cincinnati, Ohio.

AGENTS! Make Easy Extra Money
Check Here for Details ☐

Without obligation on my part send me your new FREE 1934 catalog, and complete details of your liberal 30-day FREE trial offer. This is NOT an order.

Name.....

Address.....

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