THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

Edited by
HUGO GERNSBACK

1933

January

At last! a single tube "power" short wave set

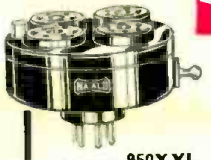
The "Overseas" 1-TUBE 110-VOLT A.C. or D.C. RECEIVER

See Page 528

NOW 25¢ IN CANADA 30¢

New! Last Minute Adapter and Analyzer Equipment

Here's what you have been looking for!



950XYL

Forty in One Tube Checking Adapter

Here's what you have been looking for—nothing like it—highgrade tube checking adapter—tests over 40 tubes. No leads—no jacks or plug—no complicated directions. Resistances and toggle switch for instant reading of both plates of dual plate tubes—beautifully and ruggedly made—a typical Na-ald product. List $6.00. Servicemen's postpaid price $3.75. Orders filled in sequence received. Do not delay—send order today. Tubes it will check in practically any checker are 19, 29, 33, 36, 37, 38, 39, 41, 42, 44, 46, 47, 49, 52, 55, 57, 58, 59, 64, 65, 67, 68, 69, 70, 80, 82, 83, 85, 88, 89, 93, 95, 985, 986, G-2, G-4, LA, PA, PZ, PZH, Wunderlich A and B.

No. 950XYL, Servicemen's price $3.75 postpaid.

For Those Who Want Individual Tube Checking Adapters Here Are Some of the Newest

975KP

975KP tests the seven prong tubes in the 27 checker socket. 975KP List Price $1.00

965KS

965KS tests the 57 and 58 in the 24 checker socket and the 89 in the 36 socket. 965KS List Price $1.00

982

982 tests the 82, 83, 88, 985 and 986 m.v. rectifiers—has protective resistance and toggle switch for testing both plates. 982 List Price $3.00

955 G2

955G-2 tests the C2, C4, G2 and G4 duodiode tubes—has protective resistance network and toggle switch for testing each plate. 955G-2 List Price $3.00

965-55

965-55 tests the 55 in 24 and the 85 in 36 checker socket. Both triode and diodes are tested. Has protective resistance network. 965-55 List Price $3.00

965 CG

965CG tests 57, 58 and PZH in 24 socket and 41, 42, 89, and PA in 36 checker socket. 965CG List Price $1.25

954 KPC

954KPC tests 33, 49; 46, 47, PZ; 52, LA in 30; 45; 71A checker sockets. 954KPC List Price $1.00

Send stamp for chart showing adapters best suited for the instruments you have. Chart includes adapters for all makes of instruments and all types of tubes.

INSIDE FACTS
Testing Seven Prong Tubes

Upon the advent of six-prong tubes, instrument manufacturers shifted almost immediately to six prong analyzer plugs.

Now that a seven-prong tube has been announced, there is the question whether there is going to be a seven-prong analyzer plug available. We have designed such a plug to have ready at such time as seven-prong sockets become the dominant socket, or when a seven-prong tube is produced with a control grid cap on the top.

In the meantime, there are some very definite disadvantages in having a seven-prong analyzer plug.

It would mean that almost invariably the analyzer plug would have to be used with an adapter. This added length would in instances be a disadvantage in closely shielded sets and others built in limited space.

In addition to this, new sets are appearing in accordance with the rules of the Board of Fire Underwriters in which there is a shield having only a 1-32 in. clearance between it and the tube base.

To meet these conditions analyzer plugs made in co-operation with the engineers of the test equipment companies have been designed so that the analyzer plugs and the associate adapters in every instance will not have a greater diameter than the smallest tube base of a given number of prongs.

The same engineering and care has been given to the design of Na-ald Adapters.

They also are the result of the combined knowledge of the leading instrument manufacturers and our own. Tube manufacturers contribute and both present and future probabilities are taken into consideration. Thus Na-ald Adapters are correct, give dependable tests, avoiding damage to tubes and delicate equipment.

Various adapters are built with current limiting resistors. Where tubes have more than one element requiring checking they are provided with toggle switches that both plates or sections of such tubes may be tested.

These points are important to you as the first cost of an adapter is long forgotten in the continued service that it must give without injury to tubes and expensive instruments.

M. ALDEN

Here Are the New Analyzer Plugs and Adapters for the New 6 and 7 Prong Tubes

906 WL

The 906WL is the last word in an analyzer plug. Its diameter and height are proportioned so that there will be no difficulty in using it in the small base tube sockets or those equipped with the new close-fitting shields. The plug has a latch actuated by a spring which locks the associated adapters to the plug so that the adapter cannot stick in an inaccessible socket.

906WL List Price...$3.50

964 DS

906WLC Above with five feet of seven wire cable with the seventh wire connected to both control-grid studs and the latch $5.50

965 DS

964DS 6 hole to 4 prong adapter with locking stud $1.25

967 SS

965DS 6 hole to 5 prong adapter with locking stud $1.25

967SGL

967SS 6 hole to 7 prong adapter with locking stud connected to control-grid prong $1.25

967SGL 6 hole to 7 prong adapter with locking stud. Control-grid prong connected to lead with clip for attaching to control-grid stud on analyzer plug. $1.50

Readrite Owners

If you have endeavored to analyze the new sets just out you have found the need of small diameter analyzer plugs and adapters. Also if you are going to use adapters with your present equipment they will need to be small space.

Change your equipment over to the Alden Analyzer Plug and Na-ald Adapters and avoid being disappointed.

Revamp the Old Set Analyzer and Tube Checker or Build a New One Using the New Na-Ald Latch-Lock Analyzer Plug and Universal Sockets

Revamp the old set analyzer and tube checker or build a new one with the new Na-ald Latch Lock Analyzer Plugs and Universal Sockets. See articles on new analyzers by Denton and Sprayberry in Radio Craft. Cisin, Gerber, Shallcross and Van Leuven in Radio News and Bernard in Radio World. Watch for coming articles using Na-ald Plugs and Universal Sockets.

456

456E

456 Four, five and six hole composite sockets 50c

456E Four, five and six hole composite sockets 60c

437

437E

437 Seven hole socket to match 456 35c

437E Seven hole socket to match 456E 40c

456 and 437 are used in new equipment or to provide six and seven prong sockets without adding additional socket holes to present equipment. 456E and 437E are a size of socket found in some of the older test equipment.

These are the fine brilliantly colored locator-ing sockets appearing in some of the newest and most advanced checkers and analyzers. 4, 5, 6, and 7 contacts.

Small Space Sockets. Holes for mounting can all be drilled with hand drill. Also used in making adaptors 4-5-6-7 contacts.

Here are real laboratory sockets—yet inexpensive—4-5-6-7 contacts.

105 984 985F 95

974P

Here are plugs of all styles and types, male or female, 4, 5, 6 or 7 contacts for speaker extensions or microphone, battery, analyzer and testing cables.

965-58

Adapters for Using the New Tubes in Your Present Set

954-47

954-47 replaces 45 tubes with 46 or 47 pentodes 50c

965-58 replaces 24 tubes with 57 or places the 58 in a 35 or 51 socket 50c

927

927 replaces Kellogg overhead heater type tubes with the 27 $1.25

419 X

419X places the 2 volt tubes in old UV sockets 35c

999

999 places any UX-base tube in a UV199 socket 75c

Here Are Adapters That Make it Possible to Use the UY Plug of Your Analyzer for 6 and 7 Prong Tubes

974

965 DW

975 DW

Here are twin adapters which make it possible to use older analyzers for pentodes, 6 and 7 pin tubes.

974 Analyzes pentode circuits with screen grid analyzers. 974 List price $2.50

965DW analyzes 6 prong tube circuit with screen grid analyzers. 965DW List price $2.50

975DW analyzes 7 prong tube circuits with screen grid analyzers. 975DW List price $2.50

If central locking stud to fit Na-ald Latch Lock plug is desired add "S" to any above numbers.

704 705 706

The genuine Makalot Coil Forms with color-code ring. Red-yellow-blue-green. List price

4 and 5 prongs 25c each

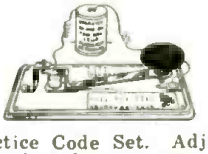
6 prongs 30c each

Precision wound shortwave coils—20 to 200 meters with .00014 mfd. condenser.

704SWS Set of four coils $2.00

Precision wound broadcast coils 100-540 meters with .00014 mfd. condenser

704SWW 704SWO Set of two coils $1.50



Practice Code Set. Adjustable pitch buzzer. Makalot base with code molded in. Alden Code Set. List price 75c

Send 10c for 26 page data sheets — 300 diagrams of adapters for every purpose—description, use and directions are given. Tube terminals of the new tubes are shown, adapters for pickups, microphones, output meters, tone control, shortwave converters etc.

Servicemen's discount 35%—if order amounts to $6.00, discount is 40%—Send for catalog.

Alden Mfg. Co., Dept. W, 715 Center St., Brockton, Mass.

NA-ALD

It's What's *BEHIND* the

SCOTT ALL-WAVE 15-550 *Deluxe* METER

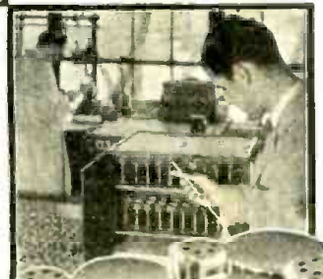
that makes it THE WORLD'S FINEST RADIO RECEIVER

This special SCOTT-designed precision instrument, found in no other laboratory, matches oscillator coils with the antenna with which they are used. So delicate that each coil is matched to its antenna within ⅛ of a single turn of wire.

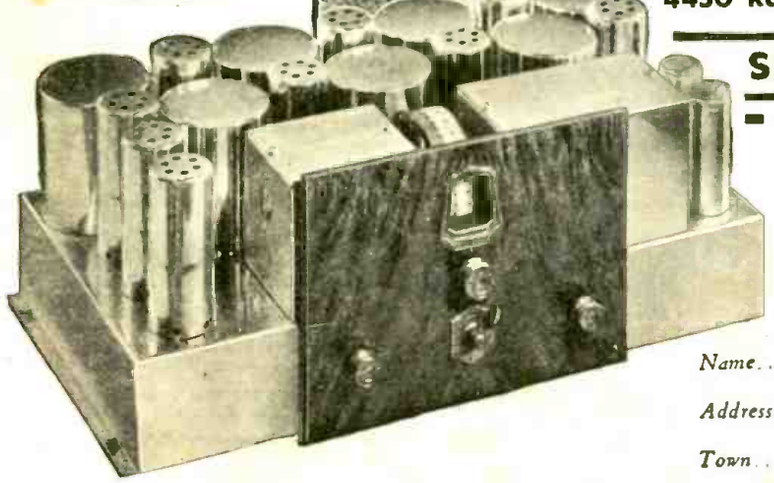
The SCOTT Research Laboratory is constantly engaged in testing and experimenting to discover new ways and means of assuring SCOTT ALL-WAVE DELUXE owners better reception, finer tone and a higher degree of satisfaction with their sets.

Within a carefully shielded room, from which all outside disturbances are excluded, SCOTT receivers are tested on signals sent within the laboratory from very latest type GR standard frequency generator and a GR audio oscillator.

Here is how resistors in SCOTT receivers are tested, to assure fine tone, fine tuning and super sensitivity. The delicacy of these testing instruments detects variations of ½ of 1% from proper ratings. The SCOTT standard for acceptance demands perfection.



In this electric oven the "climate" is baked out of SCOTT transformers. After every iota of moisture is baked out, the parts are treated so that they will always deliver perfect service in any climate from that of the Arctic to the humid heat of the Tropics.



'Round-the-world reception guarantee . . . unparalleled tone fidelity . . . super-selectivity . . . true single dial control on all reception between 15 and 550 meters . . . no plug-in or tapped coils . . . the whole radio-wise world is talking of the sensational performance of this new SCOTT ALL-WAVE DELUXE!

Perhaps *you've* wondered . . . perhaps *you*, too, have questioned *how* such performance could be secured.

To know, you must look behind the scenes. You must see the infinite care, the accuracy, the micrometer-measured exactness, with which specially trained craftsmen build these receivers in the way that all fine things are built . . . by hand!

Still farther back you'll find super-careful selection of every part that goes into every SCOTT receiver. Tested again and again . . . coils, condensers, transformers—every single part must meet the most rigid specifications by trial on delicate instruments infinitely more revealing than any human judgment.

No mass-production methods here—no slap-bang assembly of "good enough" parts. Every step in the construction of a Scott receiver is one of care and deliberation, taken by an expert.

No wonder the completed receiver is a "world-beater." No wonder more than 19,000 logs of foreign reception on Scott receivers have been sent to us since January 1st, 1932. No wonder Scott receivers have held world's record distance reception honors for more than six years. The whole story of SCOTT laboratory technique in radio receiver construction is a fascinating one. You should have it, to know how fine things are made. And the more you learn, the more you will marvel that such quality can be had at such moderate cost. Send for the whole story NOW!

Get our newly published brochures, "The Creation of a Masterpiece," and "PROOF of Consistent Foreign Reception." They will tell you what *real* radio performance is . . . and PROVE that you get it from a SCOTT ALL-WAVE DELUXE.

E. H. SCOTT RADIO LABORATORIES, INC.
4450 Ravenswood Ave., Dept. SWC-13, Chicago, Illinois

SEND THIS COUPON FOR PROOF

E. H. Scott Radio Laboratories, Inc.,
4450 Ravenswood Ave., Dept. SWC-13, Chicago, Ill.

Send me your two new brochures that tell how and why SCOTT ALL-WAVE DELUXE Receivers out-perform all others. This is not to obligate me in any respect.

Name.....

Address.....

Town.....*State*.....

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Noack • West • Reinartz • Mendelsohn • Washburne • Denton • Binneweg

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

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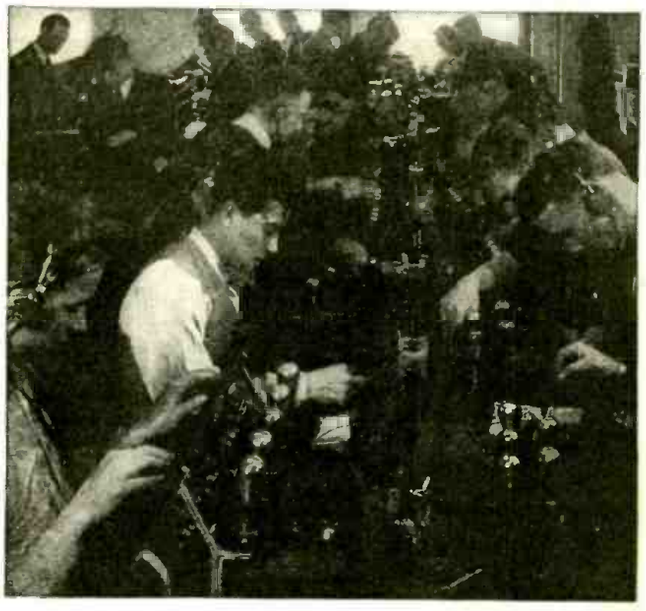
LEARN RADIO IN 10 WEEKS!

PAY FOR YOUR TRAINING AFTER YOU GRADUATE

I am making an offer that no other school has dared to do. I'll take you here in my shops and give you this training and you **pay your tuition after you have graduated.** Two months **after you complete** my course you make your first payment, and then you have ten months to complete your payments. There are no strings to this offer. I know a lot of honest fellows haven't got a lot of money these days, but still want to prepare themselves for **a real job** so they **won't have to worry** about hard times or lay offs.

I've got enough confidence in these fellows and in my training to give them the training they need and pay me back after they have their training.

If you who read this advertisement are really interested in your future here is the chance of a life time. Mail the coupon today and I'll give you all the facts.



A scene in the big, busy Radio Shops at Coyne. Here you see fellows working on real Radios—not reading about them from books or lessons. This is THE way to prepare for the big-money field of Radio!

TELEVISION *and* TALKING PICTURES

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

PREPARE NOW and be ready for Radio's many opportunities

Forget pay-cuts—lay-offs—unemployment! Don't be tied down to an untrained man's future. You NEED TRAINING IN A FAST-GROWING MONEY-MAKING TRADE. Here's your chance of a lifetime to get it! Hundreds of opportunities now open in Radio. My seusational offer, explained below, makes it possible for you to START AT ONCE!

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

ALL PRACTICAL WORK At COYNE in Chicago

ALL ACTUAL, PRACTICAL WORK. You build radio sets, install and service them. You actually **operate** great Broadcasting equipment. You construct Television Receiving Sets and **actually transmit your own Television programs over our modern Television equipment.** You work on **real** Talking Picture machines and Sound equipment. You learn Wireless Operating on actual Code Practice apparatus. We don't waste time on useless theory. We give you the **practical training** you'll need—**in 10 short, pleasant weeks.**

MANY EARN WHILE LEARNING

You get Free Employment Service for Life. And don't let lack of money stop you. Many of our students make all or a good part of their living expenses while going to school and if you should need this help just write to me. **Coyne is 33 years old.** Coyne Training is tested—proven beyond all doubt. You can find out everything **absolutely free. Just mail coupon for my big free book!**

H. C. LEWIS, Pres. RADIO DIVISION Founded 1899

COYNE ELECTRICAL SCHOOL

500 S. Paulina St., Dept. 13-2K, Chicago, Ill.

Mail Coupon Today for All the Facts

H. C. LEWIS, President
Radio Division, Coyne Electrical School
500 S. Paulina St., Dept. 13-2K, Chicago, Ill.

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

Name.....

Address.....

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

for You in Radio

to get into Radio quickly how to get better jobs-better pay

Here's Proof

$400 Each Month

"I spent fifteen years as travelling salesman and was making good money, but could see the opportunities in Radio. Believe me, I am not sorry, for I have made more money than ever before. I have made more than $400 each month and it really was your course that brought me to this. I can't say too much for your school." J. G. Dahlstead, Radio Station KYA, San Francisco, Cal.

Radio Service Man Doubles Salary

"I spent 15 years building and repairing Radios, but felt I could refresh my memory and learn about developments I had overlooked. Upon completion, I was appointed Service Manager of Parks & Hull, and was immediately repaid for the cost and time spent in study. I give the N.R.I. full credit for my success in the Radio field—it immediately increased my earnings 100%." J. E. McLaurine, 1511 Guilford Ave., Baltimore, Md.

From $10 to $50 a week in spare time

"Besides being employed by the Power & Light Company to locate Radio interference in this district, which is a very good position, I have a service business of my own that nets me from $10 to $50 a week in spare time. I owe all my success to the National Radio Institute, as I was only a common factory worker before taking the course." H. L. Penie 812 W. High Street Piqua, Ohio.

employ testers, inspectors, foremen, engineers, service men, buyers, and managers for jobs paying up to $6,000 a year. Radio dealers and jobbers (there are over 35,000) employ service men, salesmen, buyers, managers and pay up to $100 a week. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. Talking pictures pay as much as $75 to $200 a week to men with Radio training. There are hundreds of opportunities for you to have a spare time or full time Radio business of your own—to be your own boss. I'll show you how to start your own business with practically no capital—how to do it on money made in spare time while learning. My book tells you of other opportunities. Be sure to get it at once. Just clip and mail the coupon.

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

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

Learn the secrets of Short Wave, Television, Talking Pictures, Set Servicing, Broadcasting

I'll give you more training than you need simply to get a job—I'll give you your choice, and not charge you extra either, of my Advanced Courses so that you may SPECIALIZE in these subjects—(1) Television, (2) Set Servicing and Merchandising, (3) Sound Pictures and Public Address Systems, (4) Broadcasting, Commercial and Ship Radio Stations, (5) Aircraft Radio. Advanced specialized training like this gives you a decided advantage.

Your Money Back if you are Not Satisfied

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

Find out what Radio offers you Get my book AT ONCE

One copy of my valuable 64-page book, "Rich Rewards in Radio," is free to any resident of the U. S. and Canada over 15 years old. It has started hundreds of men and young men on the road to better jobs and a bright future. It has shown hundreds of men who were in blind alley jobs, how to get into easier, more fascinating, better paying work. It tells you what my graduates are doing and making, where the good jobs are in Radio, what they pay, how you can quickly and easily fit yourself to be a Radio Expert. The Coupon will bring you a copy free. Send it at once. Your request does not obligate you in any way. ACT NOW.

J. E. SMITH, President
Dept. 3AB3, National Radio Institute
Washington, D. C.

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 when they are out of order. Training like this shows up in your pay envelope—when you graduate you have had training and experience—you're not simply looking for a job where you can get experience.

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

I have doubled and tripled the salaries of many. Find out about this tested way to BIGGER PAY

Get a Job with a Future

FILL OUT AND MAIL THIS COUPON TODAY

Mr. J. E. SMITH, President
National Radio Institute, Dept. 3AB3
Washington, D. C

Dear Mr. Smith: I want to take advantage of your Special Offer. Send me "A Bird's Eye View of Radio" and your book, "Rich Rewards in Radio," which points out the opportunities for spare time and full time jobs in Radio and your famous 50-50 method of training men to become Radio experts through home study. I understand this request places me under no obligation.

Name.....

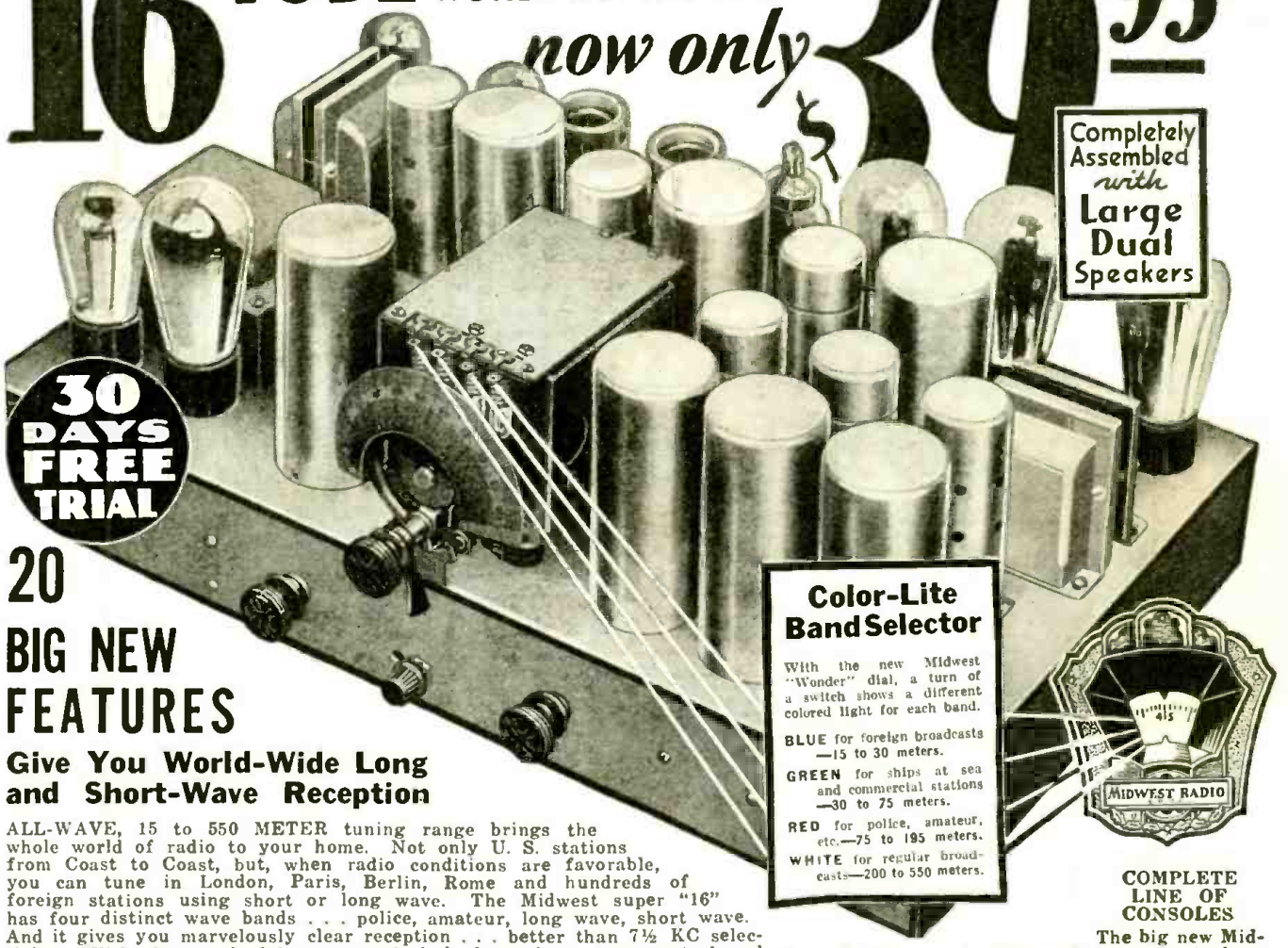
Address.....

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

"R"

The Famous Course That Pays For Itself

16 TUBE ROUND THE WORLD RADIO now only $39.95



20 BIG NEW FEATURES

Give You World-Wide Long and Short-Wave Reception

ALL-WAVE, 15 to 550 METER tuning range brings the whole world of radio to your home. Not only U. S. stations from Coast to Coast, but, when radio conditions are favorable, you can tune in London, Paris, Berlin, Rome and hundreds of foreign stations using short or long wave. The Midwest super "16" has four distinct wave bands . . . police, amateur, long wave, short wave. And it gives you marvelously clear reception . . . better than 7½ KC selectivity. With the wonderful new matched dual speakers, tone control and STAT-OMIT tuning silencer, you will enjoy sensationally clear and smooth radio reception such as you have never known. And above all, you will enjoy absolutely faithful tone reproduction. Thousands of Midwests are giving wonderful satisfaction in every State of the Union and forty-nine foreign countries as well. No radio at any price can give you better reception than this famous Midwest which you buy direct from the factory at a sensationally low price.

TERMS AS LOW AS $5 DOWN

4 Sensational New Midwest Features

Midwest 1933 ALL-WAVE radios have all the worthwhile improvements and many exclusive Midwest features. Outstanding among the important advantages of these big powerful sets are these:

STAT-OMIT Tuning Silencer
An inter-station silencer or noise suppressor that automatically omits all in-between-station noises, swishing, cracking and frying. This new method gives perfect tuning without Neon lights, visual meters or buttons formerly required.

Class "B" Amplification
Gives absolutely faithful reproduction of all tones and overtones. Enormous reserve power capable of reproducing any instrumental combination of the most powerful orchestra. Handles the full volume of the largest pipes of the grand organ.

Dual Speakers
Two full electrodynamic speakers for complete audible tone range, especially designed for the tremendous power output of the new tubes.

One Chassis—One Dial
Only one chassis for everything, 15 to 550 meters. . . . regular broadcasts, police, amateur, ships at sea, commercial stations, foreign short-wave broadcasts. No converter or other auxiliary units used. All bands controlled by one dial.

Deal Direct With Factory

Save UP TO 50%

Midwest sweeps aside the costly old-fashioned way of selling through jobbers and dealers. You buy direct from the factory. You have 30 days trial in your own home and a positive guarantee of satisfaction or money back. If you wish, you may pay for your Midwest in small monthly sums that you'll scarcely miss. Remember . . . only $10.00 down puts even the biggest and finest Midwest in your home now. Some models as low as $5.00 down. Investigate! Mail the coupon. Get the Midwest catalog. Learn the facts about Midwest 12- and 16-tube ALL-WAVE sets. Get a bigger, better, more powerful, better toned radio—at a positive saving of 30% to 50%. Mail the coupon or write us a postal right NOW!

MIDWEST RADIO CORP.
Dept. 169 (Est. 1920) **Cincinnati, O.**

Read These Letters!

"Am having good results with my 16-tube Midwest. On the short wave I have had most all of the large stations. I get several of the Airport Stations and amateur stations a plenty. Had G5SW, LEX. Buenos Aires, VK2ME. VK3ME, Sydney, VE9GW, Bowmanville, Canada, Pointoise, France and Nauen, Germany."
R. P. REYNOLDS,
P. O. Box 1125, Orlando, Fla.

"The 16-tube radio arrived yesterday, got it going today and to express myself in a few words . . . What a radio! What a tone! What a surprise! Really, it is more radio than I ever dreamed of seeing incorporated in one chassis. It's wonderful."
L. F. KIMMELL,
7324 Wakefield Ave.,
Cleveland, O.

COMPLETE LINE OF CONSOLES
The big new Midwest catalog shows gorgeous line of artistic consoles in the new six-leg designs. Mail the coupon now. Get all the facts.

RUSH THIS COUPON FOR AMAZING FREE TRIAL OFFER AND BIG BEAUTIFUL CATALOG

Midwest Radio Corp.
Dept. 169
Cincinnati, Ohio.

Without obligation on my part send me your new 1933 catalog, and complete details of your liberal 30-day free trial offer. This is NOT an order.

USER AGENTS EASY EXTRA MONEY
Check here for details. ☐

Name.....
Address.....
Town..... State.....

THIS PAGE IS DEVOTED ENTIRELY TO SHORT WAVES AND ULTRA SHORT WAVES

Here is an inexpensive **POWERFUL MODERN RECEIVER**, a set that gives **VOLUME ON DISTANCE** and four times the **DISTANCE** of any type of short-wave adapter or convertor. **SUPER-SENSITIVE!! FOUR MODERN TUBES, TUNED PENTODE INPUT AND PENTODE OUTPUT!!** Economical in operation. If other sets get distance, this set gets **MORE DISTANCE** and **GREATER VOLUME** . . . . No hand capacity; full dial-spread; easy tuning. Uses latest six-prong coil forms and sockets. Photo shows cover removed from heavily shielded R.F. compartment. A new design throughout with all modern features, and special neat, colored metal chassis.

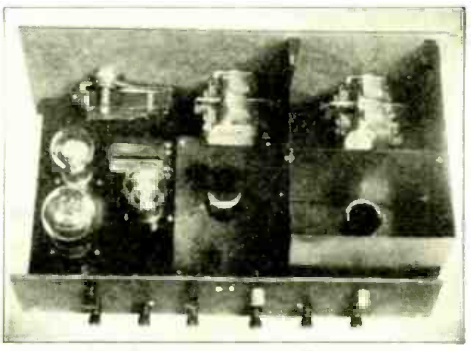
A powerful set at a reasonable price! Available in AC and DC Models. Tunes from 14 to 550 meters ("all wave"). **Full broadcast band coverage with but one coil.** . . . We manufacture them. Note special two-gang condensers! Remember! This set has **TUNED RADIO-FREQUENCY AMPLIFICATION!!** Inferior sets may boast of an R.F. stage, but only **TUNED** R.F. amplification is of any use at short waves! . . . Kits come complete with all coils for the 14 to 200-Meter range as shown in photo and need only to be wired to complete them. Broadcast coils (200 to 550 meters) 85c extra.

DELFT INTERNATIONAL FOUR-TUBE DC KIT. $23.00. Complete Simplified Wiring Instructions furnished. Uses any desired style of DC tubes, including two-volt tubes. 50% Discount on Standard tubes if ordered with the Kit.

DELFT INTERNATIONAL FOUR-TUBE AC KIT, $27.00. Includes filament transformer and all instructions. Tubes, $2.50 extra, saving you at least 50%.

These sets are much more sensitive than ordinary superheterodynes! Use ordinary loudspeakers. **Magnavox Dynamic Speakers, $4.00 extra.** AC Kit uses any standard power pack having a variable detector voltage, or your own B-eliminator. Several pages of instructions furnished, so that anyone with little or no experience can build and tune one of these fine sets! Tubes can be sent safely, and will save you plenty! You can't buy the parts for the price of these Kits!

The price of a set ready to operate is the Kit price plus the Wiring and Testing charge ($8.00). On special order (you can even make these yourself), we can furnish coils that will allow this set to tune to wavelengths higher than 600 meters. **A real all-wave set!**



Delft "International" Powerful DX Receiver

IF YOU WANT THE LATEST AT THE LOWEST PRICES, HERE THEY ARE!! ELECTRIC SETS ALSO!!

We are conservative. Yet **we guarantee International Reception.** Here's what **users** receive with headphones on our sets (and many of these Stations **on the loudspeaker!**) **Packs** of U. S. Stations (Music, Police Stations, Airplane Stations, Amateur Conversations, etc.) **Canada, Indo-China, Siberia, Java, Australia, Mexico, Madrid, Spain, Argentina, etc. ONE TUBE SET COMPLETE (DC) $7.95.** Can be used as is, as a one-tube separate S.W. set, or as convertor for **either an AC or DC broadcast receiver.** Build a simple oscillator to it, and make it a **superheterodyne convertor** of the latest design. **Kit of Parts, $6.45. One-Tube AC Kit, $7.45. COMPLETE TWO-TUBE DC PENTODE SET, $12.00.** High-gain Detector and stage of High-gain audio. Set of tested tubes, **$2.00.** Pentode tubes give more distance than screen-grid tubes! Set uses the **popular Type '34 pentode tube** also the **Type '33 pentode tube.** The latest! Kit of Parts for this set, **$9.95. COMPLETE TWO-TUBE ELECTRIC SET, $13.00.** Requires a power pack for its operation. Will operate with a $3.45 filament transformer and two B Batteries temporarily; buy the power pack later, thus completely Electrifying it. Set uses latest high-gain **Type '56 tube. Kit, $10.85. less transformer. COMPLETE DC THREE-TUBE PENTODE SET, $14.00.** Sensitive detector, high-gain audio, plus a **powerful pentode tube.** Gives results equal to **any three tube set.** Set of tested tubes, **$2.50.** This set gives somewhat more volume on distance than a set having one R. F. stage, detector and one audio! **Kit of Parts with instructions $12.95.**

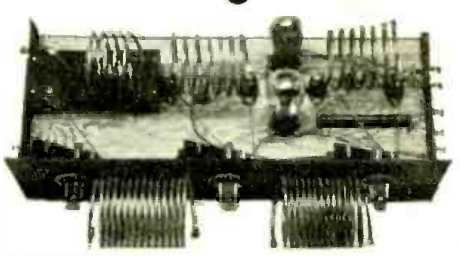
COMPLETE THREE-TUBE ELECTRIC SET, $15.00. Requires a power pack for its operation. Will operate with a $3.45 filament transformer and two B Batteries temporarily; buy the power pack later and thus completely electrify it. Set uses the latest **Type '56 high-gain tube. Kit, $13.95.**

Don't fail to order tubes with your set: you save about 50¢! Set of good dry batteries for **complete operation of any DELFT DC set $4.50.**

All of our sets use the latest circuits and tubes. They get anything on short waves as well as on ordinary broadcast reception (users report **more distance** on these sets than on standard sets, even in the broadcast band!). Modern tubes! Don't fail to read every word of this ad, there's a set for **your purse!** Our completed sets are not furnished with cabinets because these are troublesome anyway when changing coils. Extremely high ratio vernier dials are unnecessary with our sets because they tune so easily.

INEXPENSIVE MODERN KITS! (See also bottom of this page.) **TWO-TUBE KIT (Pentode in Audio), DC, $7.95. AC, $8.45. THREE-TUBE KIT (Pentode in Audio): DC, $9.95. AC, $10.45.** AC Sets or Kits need a $3.45 filament transformer, also a B-eliminator or power pack to complete them. AC Sets can be operated temporarily on B Batteries; buy the power pack later. The DC sets are **very economical with 2-volt tubes** which use only two dry cells and two B-battery blocks, which are very cheap now. Ordinary B-eliminators, aerial and ground connections can be used. We believe in showing you what you need. Our Prices are below as good merchandise will allow. All Kits are complete to the last washer, and come complete with a set of plug-in coils. Also a good set of Instructions; show where to put each wire. Simple! Sets Easy to build! Of course, they **are as good as any and better than most!** State kind of tubes to be used, or current supply when ordering. Better order tubes with your Kit or Set; **will save you 50% or more! Can be sent safely!**

SEND FEW STAMPS FOR OUR WHOLESALE CATALOG!!



DELFT TRANSMITTERS.

We know how to build Transmitters!! Here's the Dope: Our Transmitter Kits furnish **all necessary parts and hardware** to build them. **Full Instructions** are furnished with each and every Kit or Set. Assembling one of these sets, and reading the instructions which explain the operation of each part, will greatly help in passing the "EX" if you haven't done so already!! Will operate on AC or DC! Will use **any ordinary tubes,** operating from batteries or ordinary B-eliminators, **even from the power now used with your receiver.** Any power from zero to 50 watts, depending upon the tube you use! All parts will stand up on high power. Range at low power 500 to 1000 miles. With a pair of '45's or 210's, range is 10,000 miles or more. **Copper tubbing coils** furnished for any one band at prices quoted. All sets will operate at 100 meters as well as in **all other bands.**

MODEL A TRANSMITTER: Hartley Circuit. Easy to adjust and operate. **Price Complete $14.00. Kit, $8.95.**

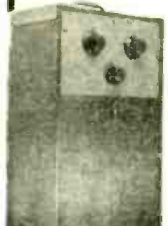
MODEL B TRANSMITTER: TP-TG circuit. **Complete, $15.00. Kit, $9.45.**

MODEL C TRANSMITTER: A High-grade push-pull set. Can be used at any wavelength at high power if desired. Great stability. **High efficiency. Complete, $16.00. Kit, $10.95.** Extra high Grade Push-Pull set, supplied with wall-insulator mountings for coils, extra long tuned, and all antenna equipment. **$18.00. Kit, $12.95.**

TRANSMITTING CRYSTALS: For 80 or 160-meter bands, **$3.95.** For 40-Meter Band, **$4.95.** Crystal Holder, **$1.00.**

ULTRA-SHORT WAVE SETS. Developed by A. Hinneweg. Super-regenerative 4 to 7 meter Receiver Kit, **$12.00.** Push-Pull Five-Meter Transmitter Kit, **$13.00.**

HERE'S YOUR PORTABLE SET



Takes up minimum space and easy to move around. All complete as shown. **GIVES FINE LOUD HEADSET VOLUME ON ANY SHORT WAVELENGTH!** Will also get ordinary broadcast reception. Light in weight; very popular for airplane, auto and yacht use. 1000 miles on small aerial. Extras slip inside case. Uses two, two-volt tubes, with a PENTODE tube (works like a three-tube set!)

Size: 9"x18"x7" deep. The small set at top of the case is completely enclosed by itself, and can be slipped out like a drawer for **separate table use with any kind of tubes and batteries. Complete Kit, including assembled case and tubes, with coils covering 15 to 200 meters. $19.90. Full Instructions furnished. Completely assembled and tested Set with all coils, tubes, and a set of set-up Instructions, $26.00.**

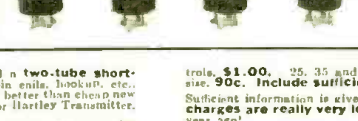
DELFT WAVEMETERS

A WAVEMETER will check the ranges of coils, condensers, Transmitters, and the operation of **any regenerative short-wave receiver!!** If you do any set building or experimenting, you can't afford to be without an accurate Wavemeter. Will also locate those elusive foreign stations on the dials of your short-wave receiver! W.H.C. of Cincinnati says: **"Your Wavemeter is just what Short-Wave Fans need to locate distant stations."** Hundreds of other users. Will also serve as a Wavetrap to eliminate interference on **any short wavelength.** Nothing else necessary to use with it. Tunes from 14 to 250 meters, thus covering **all short-wave and broadcast** stations. Each instrument is **individually calibrated** and supplied with an **accurate chart.** Shielded. Works with any Short-Wave Regenerative Receiving Set; also checks Transmitters. Works with AC or DC receivers. **Complete Wavemeter with three accurate coils, large, accurate calibration chart and Full Operating Instructions. Your Money Saving Price, $8.95.** (Regular $15.00 value.) (We manufacture a special Wavemeter for Superheterodynes and Superhet. Converters. Ask for descriptive leaflet.)

HAM BAND WAVEMETER. Looks like above meter. ¼ of 1% accuracy. Supplied with accurate, spacewound, low-loss coils wound on heavy, genuine bakelite coil forms as in photo. Supplied with calibrated coil for any one Ham Band at **$7.95.** For each extra Ham Band desired add $2.00 for calibrated Coil. Calibration chart and Instructions furnished.

FLASH: We can supply a complete Kit of quality parts to build the "Binneweg Receiver" for $10.95. Set of quality parts for the "Globe Trotter," $10.95. Set of R. F. Coils for the "Signal Gripper," $2.00, range 15 to 125 meters; extra coil for the 100 to 200-meter range, 85c. High quality merchandise! (See photo of coils to the right). Coils for the Detector circuit same price as the R. F. coils.

DELFT High Grade plug-in Coils. Set of four, for 15 to 200 meters, wound on high-grade forms. For .0001, .00014 or .00015 tuning condensers. For four-prong plug-in. Your



Special Holiday Price, $2.50 per set of four. Supplied for either Detector or Tuned Radio-Frequency Amplifier Use. (Retail Price $4.50!)

We would like to receive letters from fans stating the kind of receiving sets they are most interested in. For example, would you be interested in a short-wave super? In Kit form? Completely Assembled? Our four-tube regenerative set will get practically everything of any importance on the Globe; nevertheless, some expression would be appreciated.

Send us $2.00, and we will send you enough circuits, diagrams, and set-building instructions to keep you busy for a long time. All practical and easier to follow than magazine articles.

GET STARTED NOW!!

SLIGHTLY USED PARTS SAVE YOU MONEY!! All parts to build a **two-tube short-wave receiving set,** including panel, tuning condensers, set of Plug-in coils, hookup, etc., **$3.95.** All Parts for a **three-tube set, $4.95.** Good used parts are better than cheap new ones!! No taxes on used parts! Parts for a **four-tube set, $8.75.** For Hartley Transmitter, **$4.75.** For TP-TG Transmitter, **$5.95.** All in good shape.

NEW PARTS AND ACCESSORIES. Special Plug-in coils for 15 to 125 meter range, for four-prong plug-in. Set of 3, for Detector Use, **$1.20 postpaid** with hookup diagrams. Extra Coil for 100 to 200 meter range, 69c. For R. F. Amplifier Use, 15 to 125 Meters. Set of 3, match above Detector Coils, **$1.15 Postpaid.** Extra R. F. Coil for 100 to 200 meter range, **59c.** (These coils all for .00014 or .00015 condensers.) .00014 or .00015 short-wave tuning condensers, **$1.35.** Regeneration Condenser, **$1.10.** .00015 ganged condensers, with individual trimmers, two-gang, **$2.25.** Three-gang, **$3.00.** Four-gang, **$4.00.** Fine quality. Four-Position Coil-Changing switch, **$2.60.** Complete Short-wave Superhet. Coil Assembly (includes above switch), **$5.50.** (Includes first detector and oscillator coils) 50,000-ohm regeneration controls, **$1.00.** 25, 35 and '50 mmfd., midget variable condensers, **|80c each.** 100 mmfd. size, **90c. Include sufficient postage on Smallorders.**

Sufficient information is given in this ad so that you can order intelligently. **Transportation charges are really very low;** to send an average size package costs less today than it did a year ago!

SEND A FEW STAMPS FOR OUR WHOLESALE CATALOG (DEVOTED ENTIRELY TO SHORT WAVES AND ULTRA SHORT WAVES. ANSWERS YOUR QUESTIONS. INSTRUCTIVE!) The prices will surprise you! There are Receivers and Kits, Transmitters and Kits, Fine Coils, and Coil Winding Sets, Wavemeters, Radio-Frequency Amplifiers and Kits, Code Practice Sets and Complete lines of inexpensive Sets, Parts and Set-Building Instructions.

TERMS: 2% off for cash in Full. Send Money in Bills, Stamps, or Money Order. Register letter if much cash enclosed. If C. O. D., send about 15% deposit pay rest to Postman when delivered.

PRICES WILL NEVER BE LOWER!!

SHORT WAVES AND ULTRA SHORT WAVES

• DELFT •

Send $2.00 in Bills and we will send you parts for any set, C. O. D. for balance!

Phone: Higate 0748

Delft Radio Mfg. Co., 524 W. Fairbanks Avenue, Oakland, California

HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

VERIFICATION CARDS

An Editorial by HUGO GERNSBACK

● THERE is an indescribable thrill in logging foreign stations, listening to their programs, and logging the various call letters. But there is just as much satisfaction in having proof *in writing* that you actually listened to them. It is one thing to tell your friends that you have pulled in stations from Europe and Australia, but it is quite a different thing to display a number of verification letters or postal cards from the same foreign stations acknowledging your letter and stating in black and white that you received the call.

It is always thrilling to us when we visit one of our friends who has his entire shack walls plastered with verification cards and letters from stations all over the world, and in cases where the walls cannot be defaced, we get the same thrill by leafing through bulky albums or scrapbooks, in which the cards and letters are neatly pasted for our inspection.

In the very nature of things, it is impossible to tell your friends to call at a certain specified time and that you will, at the twist of a wrist, tune in various foreign stations. Radio as yet has not progressed this far, and it may be some years before it is an accomplished fact, although sooner or later it will be done.

At the present stage of the art, too many things are essential to absolute reception, as every short wave listener knows. There may be local interference; there may be excessive static; another foreign station near the particular wavelength may "drown out" the station which we wish to get at a given moment. The station itself may not be transmitting, for various reasons, and very often we are disappointed when we are not in a position to tune in this or that foreign station at any given time. For that reason, many of our serious short wave fans are going in for verifications and these *verification cards* and *letters* are collected by them just as the stamp collector collects stamps.

As to this verification business itself, there are various obstacles to overcome which makes the game even more interesting. Certain rules must be followed in this game the same as any other, and if you do not play the game according to the rules, you will fail to obtain many verifications.

To begin with, you must, of course, be sure of your ground. In other words, you must know that you actually received the call letters and have interpreted it correctly. This, in itself, is of educational nature because your ear must become accustomed to the foreign languages; thus, when you are a short wave listener you will also soon acquire a knowledge, even if rudimentary, of some of the foreign languages.

In such a short space, it is impossible to give all the various characteristics of the foreign stations, but we will, from time to time, give you the correct phonetic interpretation of the foreign call letters and their characteristics, so that you will know for a certainty that you are listening to a given station.

Just to mention a few:

When FYA comes on the air, they usually say ICI PARIS (the English equivalent for the French annunciation is *EESSI PAREE).*

When Berlin, Germany, comes on the air the announcer will say HIER BERLIN (English equivalent *HERE BERLEEN)* and so on, for other stations. After your ear has become accustomed to the foreign announcements, you are then in a position to send a letter for verification, and this is how you MUST proceed; don't do it any other way, because it will not get you anywhere.

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; if instrumental music, state so; if a talk, do likewise, etc.

Be sure to thank the station manager for giving you the program, and how much pleasure you received by listening to his station.

Next, ask them to be kind enough to send you a verification card or letter, and don't be peremptory in your demand. Remember, that the station *is doing you a favor* because they have to answer thousands of such letters, and they are not obliged to do it in the first place.

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. I 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!* The reason for this, of course, is that a number of stations do not wish to lay out their own postage to send you verifications, while if you send them the International Postage Coupon they feel morally bound to answer your letter for verification.

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.

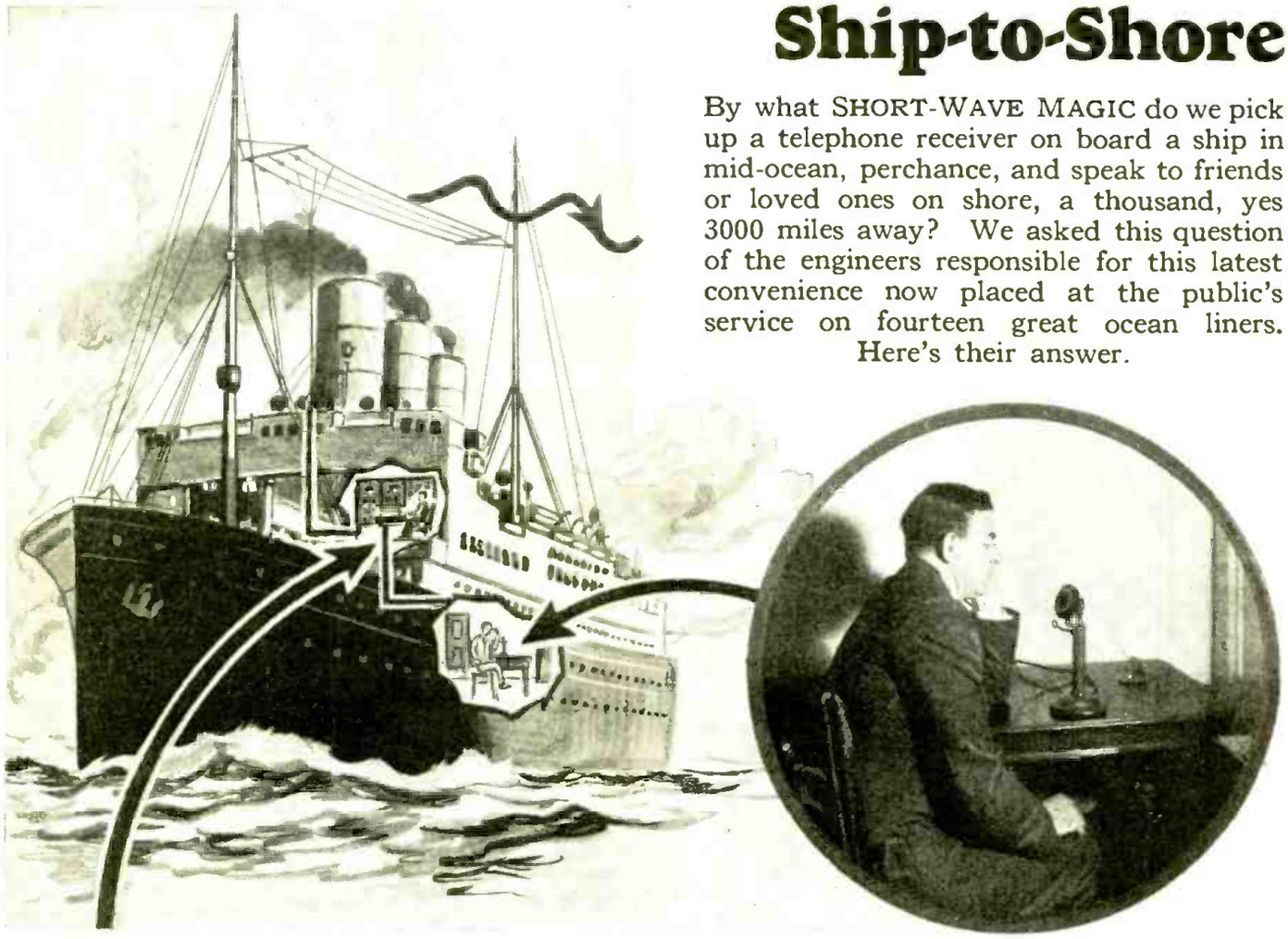
SHORT-WAVE CRAFT IS PUBLISHED ON THE 15th OF EVERY MONTH

This is the January, 1932, Issue - Vol. III, No. 9. The Next Issue Comes Out January 15th

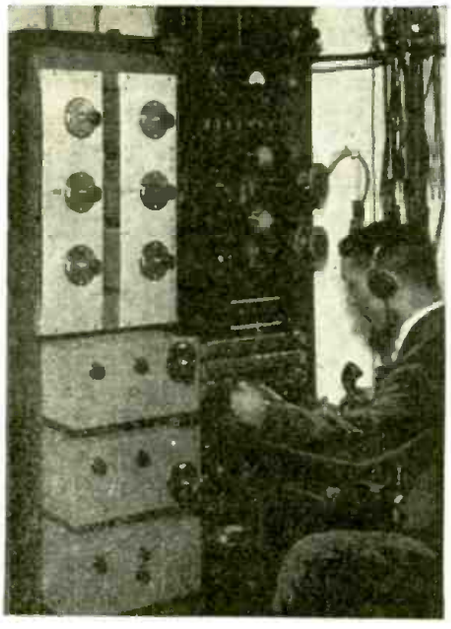
Editorial and Advertising Offices - 96-98 *Park Place, New York City*

Ship-to-Shore

By what SHORT-WAVE MAGIC do we pick up a telephone receiver on board a ship in mid-ocean, perchance, and speak to friends or loved ones on shore, a thousand, yes 3000 miles away? We asked this question of the engineers responsible for this latest convenience now placed at the public's service on fourteen great ocean liners. Here's their answer.



Fourteen greyhounds of the deep, including the "Rex" and "Conte di Savoia," now provide public short-wave "phone" service to either shore, all the way across the Atlantic. Above—passenger shown talking to shore from the "Leviathan."

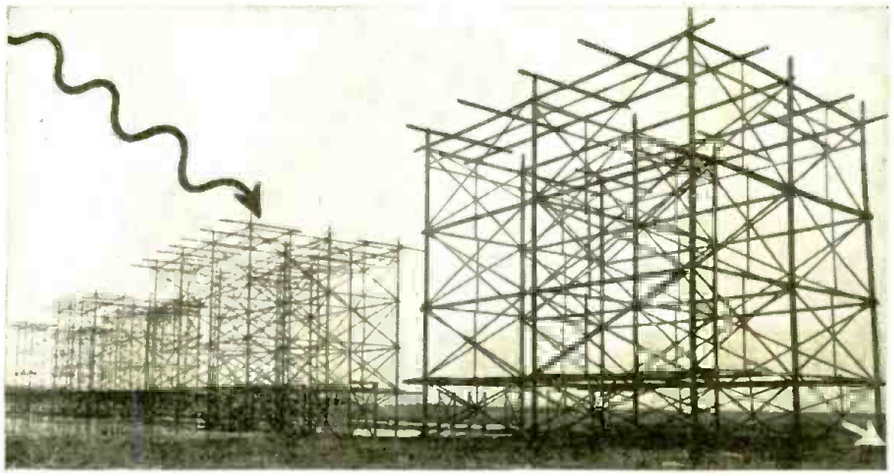


Interior of the deck house on the "Leviathan," which houses the short-wave radio telephone equipment. Above: the receiving set where voices from shore telephones are received by radio from the Ocean Gate, N. J., transmitting station.

● TELEPHONE service to ships was established December 8, 1929, with a connection to the *S. S. Leviathan*, Commodore Cunningham officiating, 200 miles at sea. The short wave transmitting station was located at the experimental radio station of the Bell Telephone Laboratories at Deal Beach, N. J., and the receiver at Forked River, N. J. During the following year the steamships *Majestic*, *Olympic*, and *Homeric* were added to the service. On January 15, 1931, the permanent *ship-to-shore* transmitting center was opened at Ocean Gate, N. J., taking over the duties of the Deal Beach station. The *Empress of Britain* and the *Monarch of Bermuda* were added to the service in 1931. Other ships to which the service has been extended include the *S. S. Deutschland*, *Bremen*, *Europa*, *Albert Ballin*, *Hamburg*, *New York* and *Rex*. If tests prove successful the *Conte di Savoia* will be connected to the service on its maiden trip in November and will then be the fourteenth ship utilizing this facility.

S. S. "Empress of Britain"—Radio phone transmitting equipment used for service with shore telephone systems. On right, transmitter, high-power stage in center, low-power stages on either side. On left—power panel, rectifier and switchboard.

Phone A Success on Short Waves



64.8 meter antenna showing details of construction. Receiving station located at Forked River, N. J.

Ship-to-shore telephony differs from transoceanic telephony in that one of the terminals—the ship—is moving. Short waves were chosen for this service after extensive transmission observations on transatlantic vessels, and a survey of the available channels. Of the two paths which such waves may take between stations the "ground wave" promised greater utility, at short distances. Reflected "space waves" must, however, be used at greater distances.

Short waves are amenable to directive transmission and reception, but the use of directive antennas on shore is complicated by the changing position of the ship.

As it was not feasible to "aim" the shore station antennas at a ship throughout a voyage, the antennas at transmitting and receiving stations were so set up that they covered the usual steamer lanes. One antenna was provided for each of the frequencies to be employed, each array being aimed at the midpoint of that particular part of the ship's track where that frequency would give the best results.

While there is considerable variation among the ships using this service the general features of the *Leviathan's* equipment and method of operation are similar to those of other ships.

8 Carrier Frequencies Used

Eight carrier frequencies are used. They are grouped in pairs, one in each pair for working the American stations and one for working the British stations. These range between 4,300 and 20,000 kilocycles, corresponding to 70 to 15 meters. The frequencies used by the ship are slightly different from those used by the shore stations.

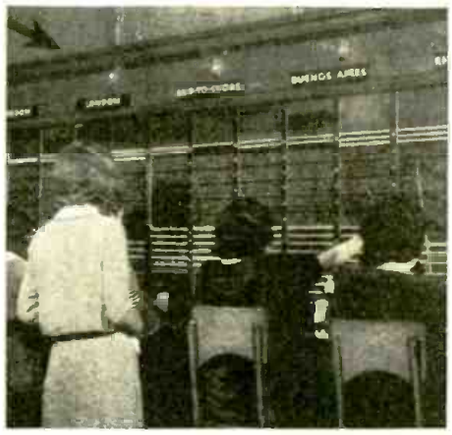
In the transmitters the output of a crystal oscillator is amplified and modulated by the voice currents. The carrier and both sidebands are radiated. In the receivers the incoming signals are demodulated in two steps, and between these steps they are amplified and filtered of extraneous frequencies.

A single transmitter is used for all frequencies. A basic frequency is generated by a crystal controlled oscillator. The output of this oscillator is fed into harmonic-producing circuits or frequency-doublers until it reaches the required carrier frequency. For the higher frequencies two frequency-doublers are used and for the lower frequencies a single frequency-doubler. The new high frequency current is blended with the voice in a modulator consisting of two 250-watt tubes.

The radio-frequency signals pass out, for radiation by the antenna, through an antenna-tuning circuit which offers low impedance to the carrier and sidebands and high impedance to currents of other frequencies.

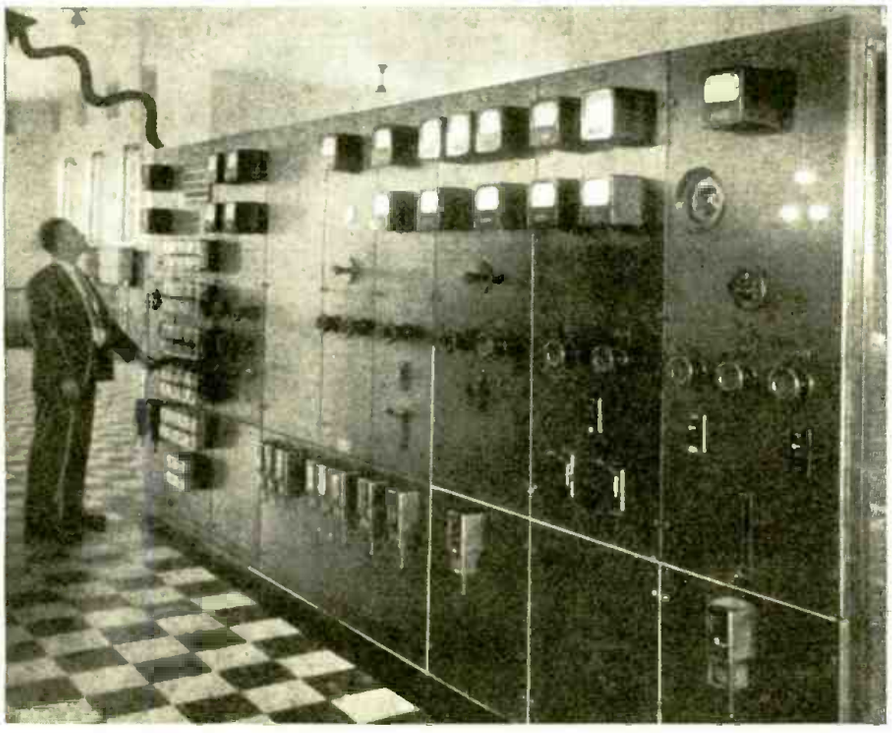
Signals from the shore are received by an antenna located well toward the ship's stern; through circuits at the foot of the antenna and in the receiver, any signals picked up from the simultaneously operating transmitters on the ship are attenuated far below

(Continued on page 568)



At this switchboard a specially trained group of operators handles all calls between points in North America and Europe, South America and the Far East, as well as to Bermuda and to "ships-at-sea."

A "land" subscriber hears the voice from aboard ship at practically any distance, thanks to short waves.

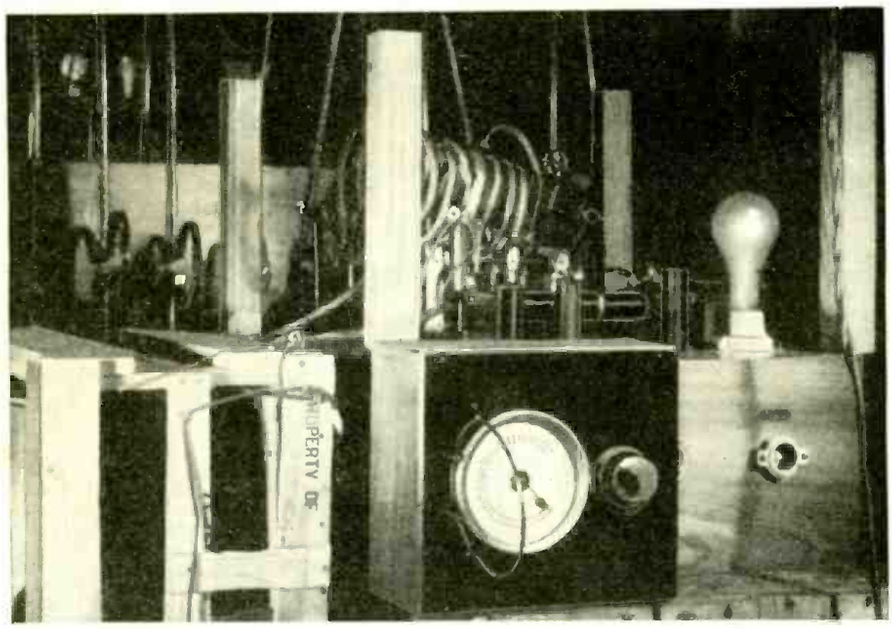


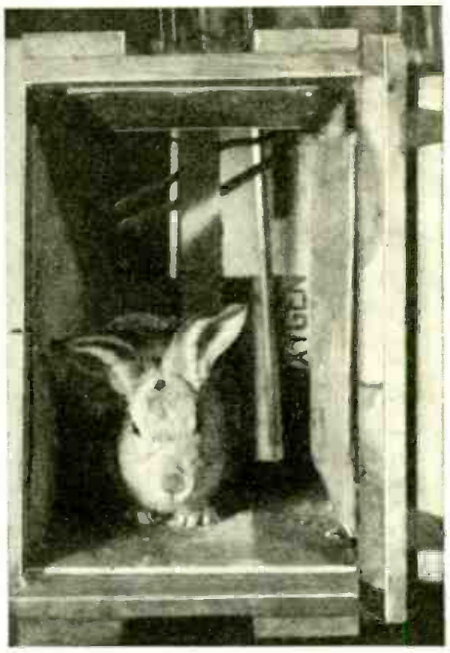
The power switch-board in the transmitting station at Ocean Gate, N. J.

Medical Aspects of Ultra Short Waves

By C. H. West
U. S. Public Health Service

Mr. West here describes some of the effects and also some of the dangers of subjecting the human body to powerful ultra short wave fields





Photos courtesy J. G. Francis, U. S. Public Health Service. Member R. P. S.

Above—A rabbit about to be exposed to a powerful ultra short wave field; the sides as well as the top and bottom linings of the cabinet are of metal.

At left—The appearance of the ultra short-wave apparatus built and tested by Mr. West in his experiments.

● IT SEEMS that the general public is once again taking to radio and the art of building as a pastime. The amateurs are busy developing the five meter band, while the engineers are devoting a goodly portion of their time to dabbling in the mysteries that the ultra short waves have created.

On the other hand, medical-scientific personages are making use of their medical knowledge, plus a large portion of electronics, in efforts to make the world a better place to live in with less aches and pains to bother us.

Many engineers employed in large electrical laboratories have made valuable use of their knowledge pertaining to the ultra short waves, and have constructed oscillators of high power for the purpose of producing fever in the human body at will. It is a known fact that fever is nature's doctor to a certain degree. If it can be produced in cases where there is no cause for a high fever, the patient's chance for recovery and cure is far better than combatting disease by injection of malaria germs, etc., which may produce reactions worse than the disease itself

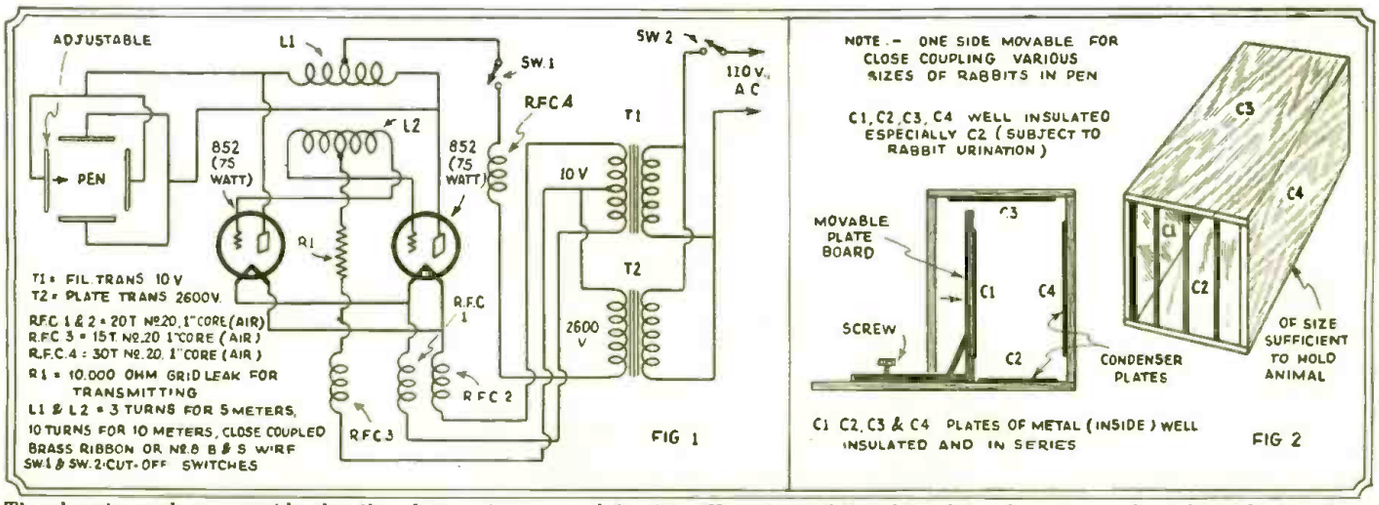
Unknown Qualities

However, the production of fever by an oscillator is a simple procedure, but the application of these high wave speeds to the human body is an entirely different matter. Secondly, the output or radiation of an ultra high frequency oscillator has never been completely identified.

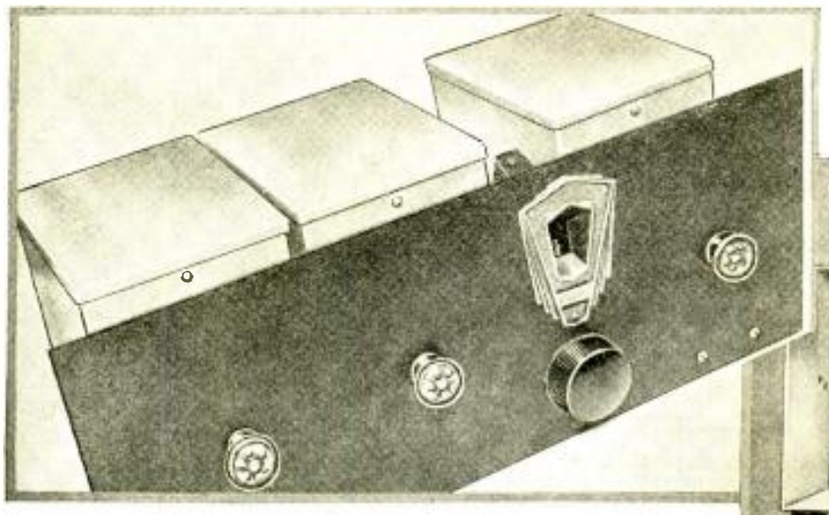
It seems that for every known element discovered there are many others within—undiscovered. An illustration of this fact was brought to light very recently, in which the writer witnessed a demonstration of photo-electric cell work.

A double-cell apparatus manufactured by the Weston Electrical Instrument Corporation produced readings in foot-candles from the output of a

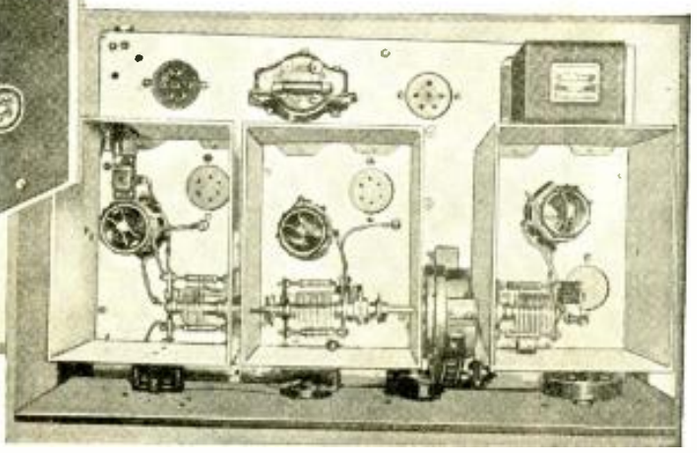
(Continued on page 564)



The drawings above provide details of the circuit used by Mr. West in building his ultra short-wave physiological apparatus, together with details of the apparatus itself.



Left:—Note the handsome appearance and excellent layout of the 5-tube T. R. F. short wave receiver here described by Mr. Currie. We have been looking for a receiver of this type for some time and we feel sure that our readers will be "tickled pink" to have this description.



Right:—Top view of Mr. Currie's excellent design of T. R. F. short-wave receiver, which "sports" two tuned R.F. stages with the new 58 pentodes. Boy, what a wallop this detector gets from those weak signals!

A DeLuxe T. R. F. Receiver

By BURTON CURRIE W6CHJ

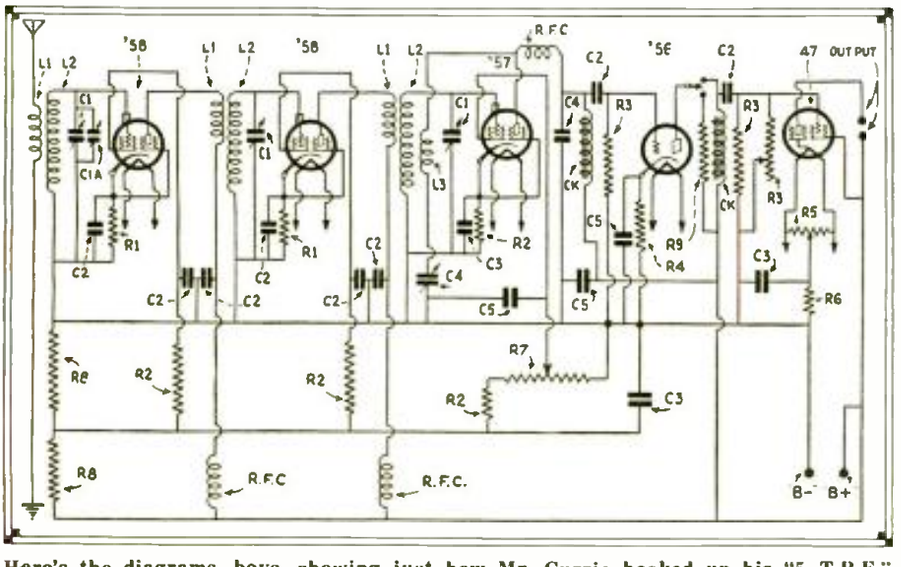
With the modern high-mu tubes now available one of the most interesting types of receivers is the T. R. F. or tuned radio frequency design. Mr. Currie gives us a new angle on short wave receivers which usually either run to superhets or else to "single stage" R. F. jobs. Go to it, Boys—she's a winner!

● HERE is a set that will more than satisfy the most exacting short-wave enthusiast. It embodies the latest in tube, electrical and mechanical layout. Personal pride in amateur station equipment and the desire to build and operate the best short-wave receiver known gave rise to the following set, the final form of which is illustrated in the pictures and diagrams.

Virtues of Tuned Radio Frequency

Tuned radio frequency was decided upon as being the best all round circuit. This decision was based upon two years experimentation with short-wave superheterodynes and converters. The deciding features were not only simplicity and economy in operation, but also the ease with which foreign stations could be brought in *with low noise-level.*

For example, Khabarovsk, Siberia, can be brought in on both the T.R.F. and superheterodyne sets, but the "super" also amplifies static disorders so much, along with the signal, that the entertainment value is practically nil. With this set, however, the same station is received clearly and distinctly at a *surprisingly low noise-level.* Again, two-way conversation has been held, using this receiver, with Japanese amateurs, but with a twelve tube superheterodyne, *built especially for amateur work,* the same stations could not be distinguished through the noise of an early California city morning.



Here's the diagrams, boys, showing just how Mr. Currie hooked up his "5 T.R.F." short wave receiver job. Two "high duty" R.F. amplifier stages build up the weak signals and feed them to the detector. Note the clever audio stage design.

New Tubes Cut Down Noise

In order that a set have a high order of selectivity, it is necessary that the antenna be short! To maintain sensitivity the receiver must therefore have *more than ordinary* gain in the radio frequency end. This high gain is realalized through the use of the new tubes. These new tubes, the 58's, provide high gain, with but little internal feed-back and *practically no "tube noise."* The signals are highly amplified in the radio frequency stages and are then fed into a sensitively biased detector. With the ordinary triode, plate detection is impractical, due to relative insensitivity, but the advent of the new type 57 tube gives us a tube which overcomes this disadvantage, when used with a low bias, and gives as sensitive a detector as is usually had in triode grid detection.

The circuit is simplicity itself, but a few pointers may not be amiss. Do not *ground* the chassis. Use a pack well filtered and bypass the main line to ground but not the negative output to set. Ground the lower half of antenna coil only. This ground, however, may take the form of a counterpoise, with the antenna connected to the upper half of the coil.

Biasing resistors are used separately in order that each stage will be a separate and wholly distinct unit. The bypass condensers as shown on diagram are the smallest size allowable. Not one of these condensers may be left out of the set. Use the best grade condenser obtainable, as a cheap, leaking condenser is a prolific source of noise and will nullify the important feature of this set, viz: *quietness in operation!*

Radio frequency chokes must be used in the plate circuits as shown, but *decoupling* resistors are used in the screen

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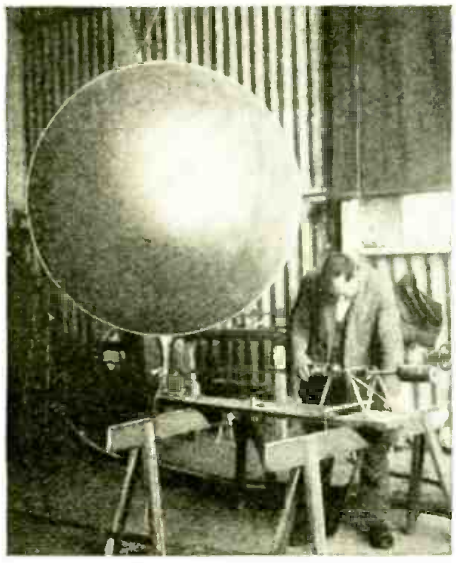
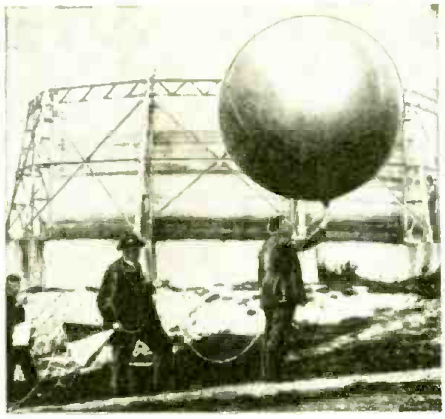
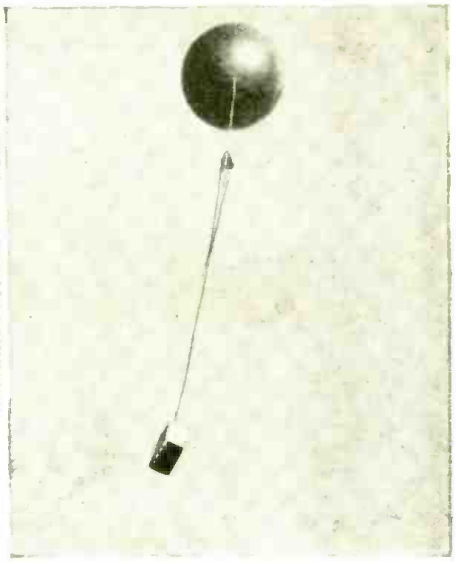






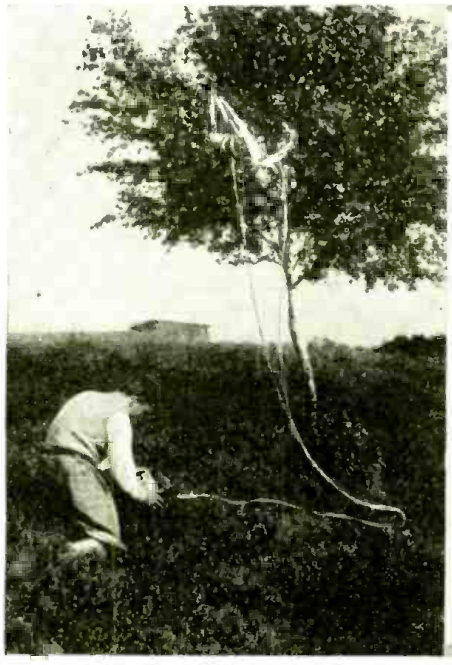
Above—Meteorological Balloon, parachute and miniature radio transmitter about to be released. The balloon is inflated with some lighter-than-air gas. Left—One of the balloons being weighed. Up she goes! Note the folded parachute between the balloon and the radio transmitter in the square-shaped box.

Radio Signals from the Stratosphere!

By HANNS MENDELSOHN, Berlin

● RADIO technology almost daily brings forth such wonderful performances that all the dreams of a Jules Verne are far surpassed. Already the most incredible things no longer appear improbable. But would you believe it, if someone told you that an automatically operated short-wave transmitter no larger than a cigar box and weighing but a few pounds can rise on a balloon high into the stratosphere and during its course continuously telegraph down by radio, for meteorological purposes, exact temperature and height measurements? You would certainly consider that unduly fanciful, would you not? And yet the use of such radio "sounding" balloons is today no longer unusual. The famous Lindenberg Observatory (Germany) has recently sent up a considerable number of such "radio sounders," and the work accomplished by this novel apparatus is actually amazing. The temperature measurements, whose exactness is very important, are actually determined to within 1/100 of a degree, by having a metal thermometer control, by an ingenious transmission, a very small condenser, which influences the transmitting frequency of the miniature trans-

Imagine a tiny radio transmitting set built into a glass tube, which a balloon carries to altitudes as great as 13 miles, the transmitter being salvaged after each flight by descending to earth with a parachute. The exact temperatures and altitudes are transmitted continuously by the short-wave transmitter attached to the balloon, the signals being recorded at a ground station.



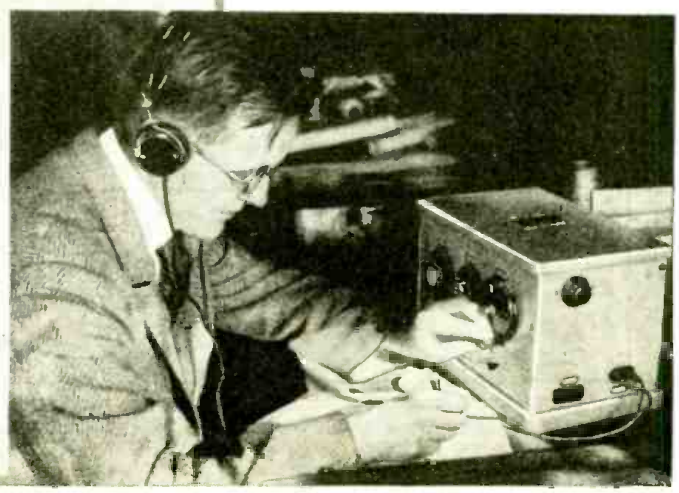
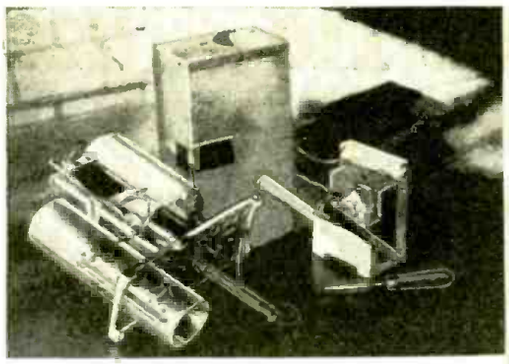
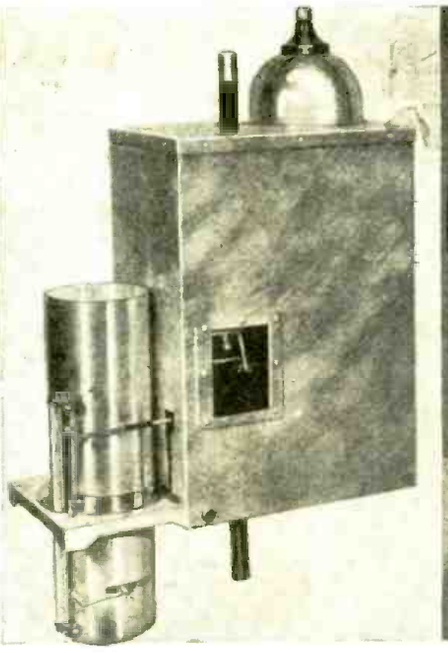


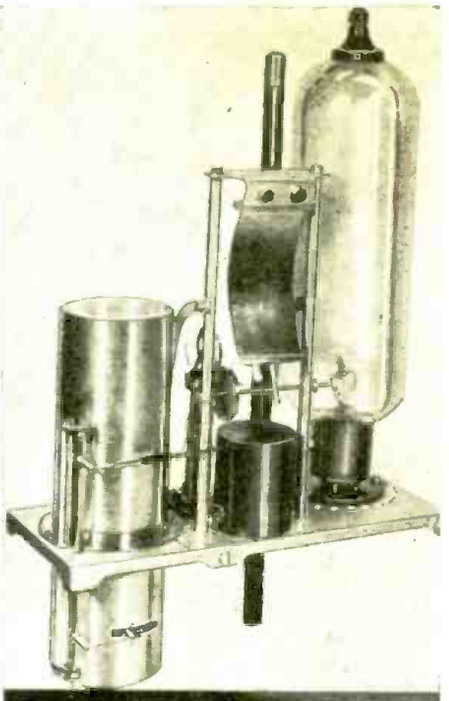
Photo at left—one of the balloon radio transmitters has just landed safely—thanks to the parachute, which can be seen in the limbs of the tree. Center—tower and radio antenna at ground receiving station. Below—Listening for short-wave signals from balloon transmitter.

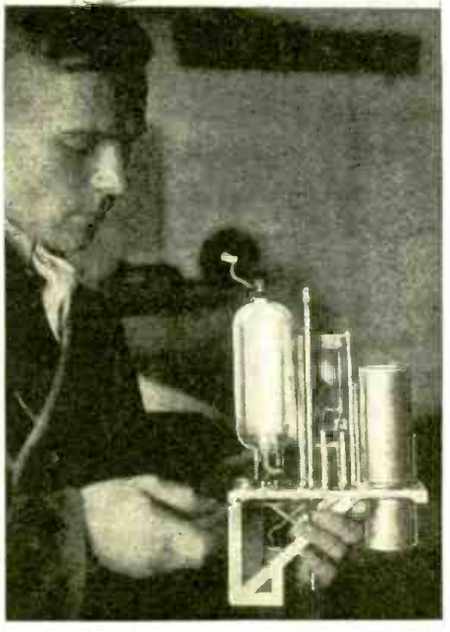




Above—External view of the tiny radio "sending station" with cover removed; battery box at right. Center photo shows radio transmitter; thermometer tube at left, with antenna carrier tube running through the center.

Top right photo shows transmitter being placed in protective basket with "disposition" notice on it. Second photo from the top shows close-up of the transmitter; movements of the metal thermometer lever change variable condenser at center. Metal barometer appears in upper center; below at left, contact wheels for sending "altitude" code signals; the glass tube at right contains the complete "short wave sender," glass-wool protecting the apparatus against strong vibration. Lower photo shows complete "radio sender" with protection cover removed and battery cabinet attached below at left.





mitter. If the receiving set is correspondingly calibrated, one can determine the temperature changes to a hair.

Radioes Barometric Changes to Earth

The height is measured barometrically, a small contact wheel (which as in the case of the commutator of an electric motor, contains alternately conducting and non-conducting segments) automatically sending down telegraphic code signals and accurately reporting the height at successive instants.

As a support or carrier for the radio transmitter, there is used a rubber balloon which is filled with hydrogen; on starting from the earth it has a content of about 5 cubic meters, corresponding to a diameter of about 2 meters (about 6½ ft). When this balloon rises into the stratosphere, its volume increases corresponding to the diminishing air pressure, in fact to such an extent that at 20 kilometers (12 miles) height the balloon has a volume of about 90 cubic meters. It is then quite a sizeable object! The maximum height is finally limited by the fact that the balloon, on further expansion bursts. At this moment a small parachute unfolds, which brings the transmitter safely back to earth in a gentle descent. Most of the transmitters are found and sent back to the observatory, for which purpose there is a suitable inscription on the transmitter case. The antenna consists of two ordinary antenna wires which are attached above and below to a small rod and act as a vertical dipole antenna.

Signals Heard During Parachute Descent

The signals of the transmitter are observed also in the parachute *descent*. Indeed, one often continues to hear the transmitter after it has landed on the ground, until the signals suddenly cease, which is an indication that someone has found and touched it.

In the case of the greatest height attained the total flight duration is about 2 hours, and the guaranteed operating time of the tiny batteries is established for 2 hours, though in practice they generally give 4½ hours of operation.

Two tiny storage batteries serve as heater batteries with glass-wool filling, which together are not much bigger than a match box. The plate "B" battery, which furnishes 30 volts, is about as large as a package of cigarettes! The range of the transmitter is 60 kilometers, (36 miles), which gives a comfortable reserve for practical operation.

The height of ascent is not the same each time, because one balloon always bursts somewhat later than another. The minimum height is about 16½ kilometers, (about 10 miles). One balloon rose to 22,500 meters (about 13 miles)! There it did not burst but developed a small hole and in this way returned safe and sound. It was possible to use it again, and in this case it rose to 20 kilometers (12 miles), once more developed a hole, and was to have been used still again. This time indeed it met its fate—it burst while being inflated.

The filling of the balloons on the ground is determined, among other things, by the need of having such an inflation as will give the requisite ascension speed of 5 meters (16½ feet) a second, which is needed, so that enough air will go through the thermometer tube to indicate the exact temperature.

The Radio Transmitter

The real radio part, i. e., the *transmitter*, is fused into a glass tube, which is about as large as an ordinary power amplifier tube. In this transmitting tube itself the coil and condenser are contained in a vacuum, and in order to make it safe against rough shaking the whole tube is packed with glass wool for shock absorption. From this tube the terminals run in the usual

(Continued on page 569)

The "OVERSEAS" 1-Tube 110 or 220 Volt A.C. or D.C. Receiver

By R. D. Washburne and F. R. Harris

There has been a wide-spread demand for a portable "all-wave" receiver which can be plugged into any 110 volt A.C. or D.C. light socket, so as to make the set handy for traveling folks, vacationists, etc. Here it is!

Fig. A.

This interesting receiver was designed to operate within the limitations imposed by the following conditions:

1. **One tube;**
2. **All line frequencies and D. C.;**
3. **Either polarity on D. C.;**
4. **Line potentials from 90 to 240 volts;**
5. **Line voltage fluctuations;**
6. **All-wavelength reception;**
7. **An antenna but no ground connection;**
8. **Headphone operation;**
9. **Self-contained;**
10. **Compact and portable.**

● STARTING with the premise that certain specified conditions must be met, the authors developed a radio receiver which is presented to the short-wave enthusiast as something a bit "different." A front view of the completed set is shown in Fig. A; an inside "shot" showing the "works" is Fig. B. The schematic circuit is Fig. 1. For the point-to-point wireman who likes to take his circuits wire-by-wire, there is supplied a perspective view of the apparatus, Fig. 2, showing just where each wire is connected. (This takes all the hard work out of it!)

Having become imbued with the idea that there should be developed a portable and *really* ONE-TUBE electric set, suitable for use in hotel, hospital, home or boat, we proceeded to design such an instrument and then (what a headache!) to construct it. Although the "breadboard" model seemed to be just one pain after another, perseverance finally resulted in ironing out each one.

Power Supply Polarity

One-tube operation demanded that some means be found to obtain direct current for the plate circuit of the tube without recourse to the second or rectifier tube required by all previous set designs operating on an A.C. line supply; besides, a tube rectifier has a high voltage drop and also cannot be used in bridge connection.

Investigation of the possibilities of the electrolytic condenser as a rectifier (see the article, "An Electrolytic-Condenser Rectifier," in the December, 1931, issue of RADIO-CRAFT), disclosed that the present types of dry-electrolytic units being manufactured are designed to avoid the factors which would enable these condensers to function as rectifiers. Since the wet-electrolytic units were too difficult to obtain and were bulky, and since they soon overheated, due partly to the lack of suitable provisions for ventilation, these too were considered "out."

The solution of the problem was found in the use of the dry-disc or copper-oxide type of rectifier. The husky units selected for the job were designed to supply about 60 ma., continuously, to the field coils of dynamic reproducers, and as the grid-leak detector consumed only 6 ma., the rectifier, over long periods of operation, heated only slightly (in other words, the "life-expectancy" of the rectifier units was greatly increased).

"All line frequencies and D.C.," read our "specs." Imagine—the set had to work equally well on D.C. in New York City, many parts of Canada, and elsewhere, 25 cycles in the Niagara Falls territory, 50 cycles in Southern California, and 60 cycles in the rest of the civilized world! Obviously, a transformer could not be used as it would not function on D.C., and would have to be designed for 25 cycles in order to operate on 50 and 60 cycles, since a 60-cycle transformer probably would burn out on 25 cycles.

The answer to this problem, and two others, was found in the use of two of the dry-rectifier units in a bridge-type or full-wave connection. In addition to operating (without any circuit changes whatsoever) on D.C. or A.C. and, in the latter instance, without the use of a transformer, the following advantages were secured: (a), full-wave output (this made it convenient to use the smallest possible filter system), and; (b), reversed-polarity D.C. operation (immediate reception with either position of the light-line plug). Of these three results, the latter is the most interesting, as all previous designs of D.C. receivers have been "as dead as a door-knob" in the reversed position of the light-line plug.

The manner in which this is accomplished—in fact, the entire theory of the full-wave rectifier—is clearly shown in Fig. 3A. Let's make believe that we are looking at the current con-

(Continued on second page following)

● At last we present to our readers a "real 1-tube" universal 110-220 V. A.C. or D.C. All-Wave Receiver. We have received thousands of letters in the past few months asking for a receiver of this type, BUT our readers insisted that it must be a 1-tube set only and not have another tube for rectifying. So here it is—an honest-to-goodness 1-tube receiver; all rectification being taken care of by a dry-disc copper-oxide type rectifier.

● Travelers, vacationists, experimenters, and short-wave fans in general, will be highly pleased to obtain details on such a receiver, the editors feel certain. We commissioned Messrs. Washburne and Harris to develop this set and it really exceeded our expectations. Not only were short waves, as well as the broadcast station waves, tuned in satisfactorily, but the reception was surprisingly free from noise and hum.

● This is the first time, to the editors' knowledge, that such a set has been built and all credit is due to the authors who here describe their "brain-child" in complete detail.

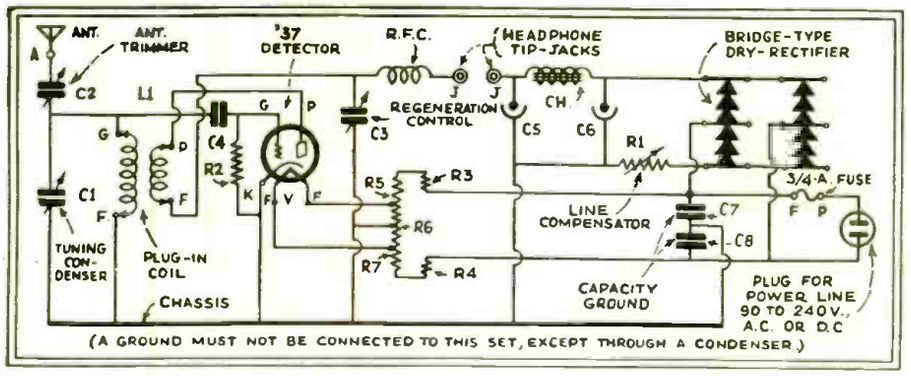


Fig. 1—Schematic circuit of the "portable" 110-220 V. A.C. or D.C. Universal 1-Tube All-Wave Receiver is shown above. Various wave bands up to and including the broadcast band, are accommodated by changing the plug-in coils at L-1.

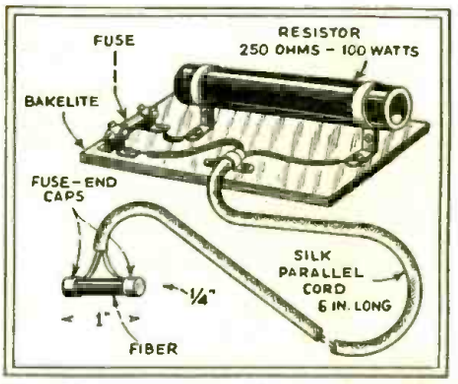


Fig. 3B—Adapter for using the "portable" on 220 volts. When the fiber adapter is snapped into the fuse terminals, the 250 ohm resistor is in series with the circuit.

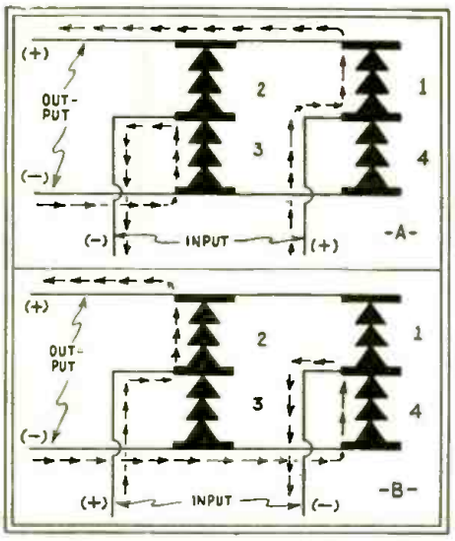


Fig. 3A—Analysis of rectifying action taking place in dry-disc rectifier at two successive alternations or halves of a cycle.

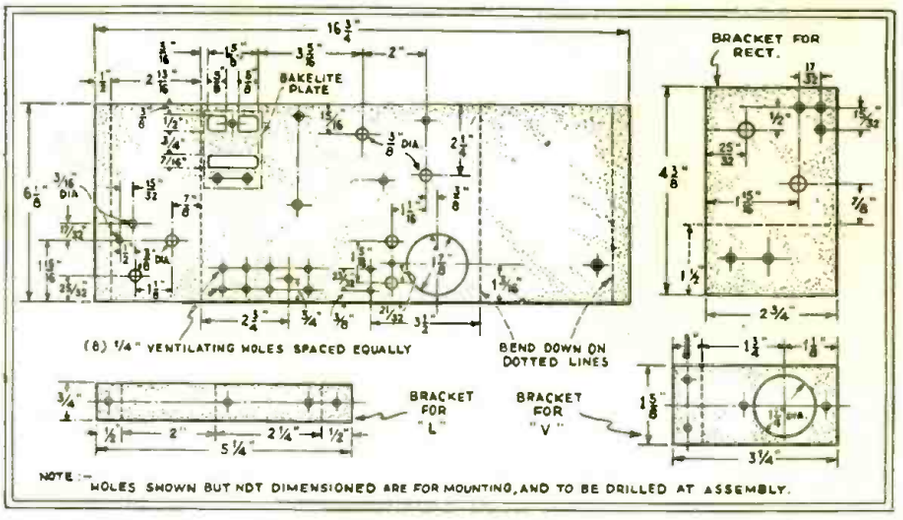


Fig. 3-C—Dimensions and general layout, as well as directions for drilling the aluminum chassis are given in the drawing above. The chassis may be made of brass, copper, or other non-magnetic metal. Don't forget to drill the ventilating holes as shown.

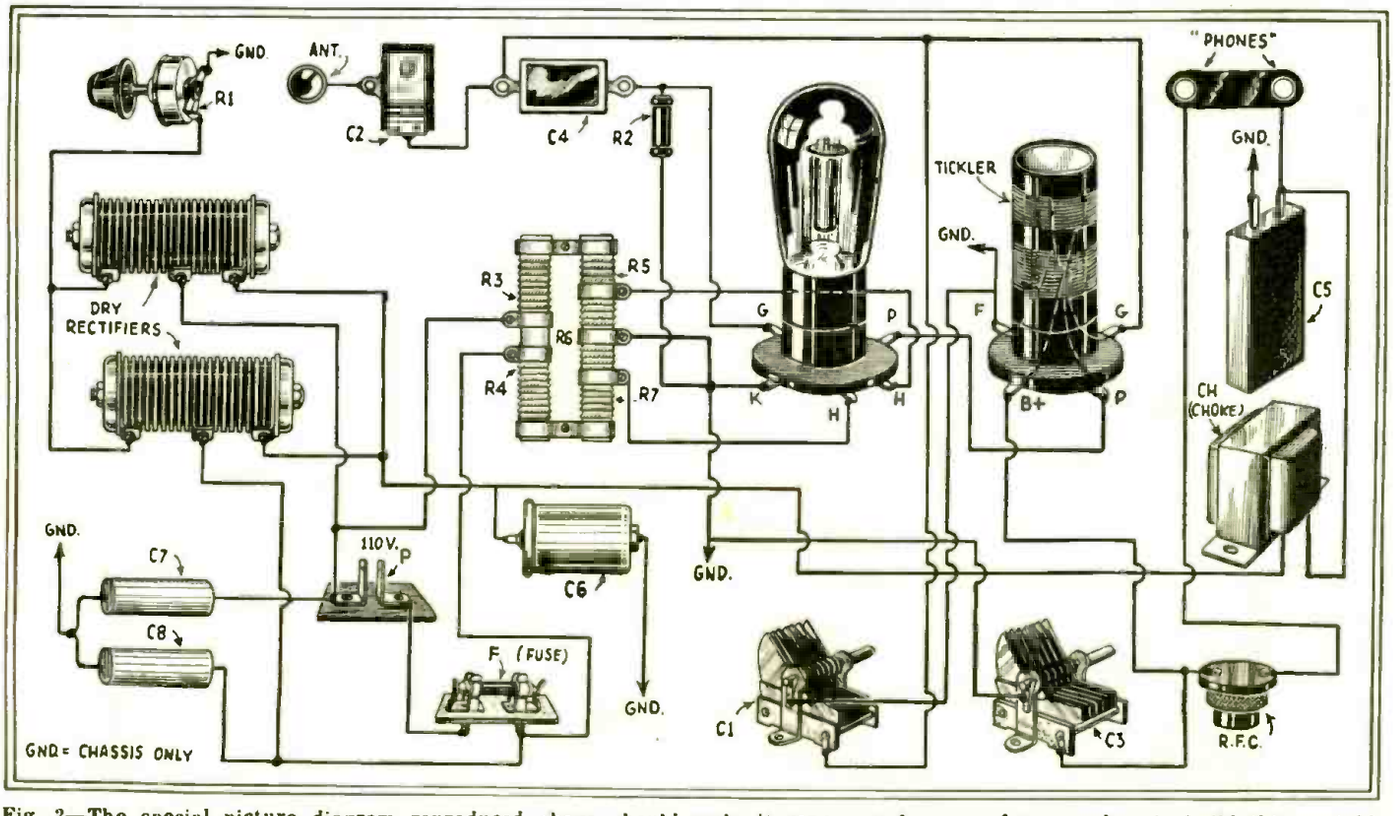
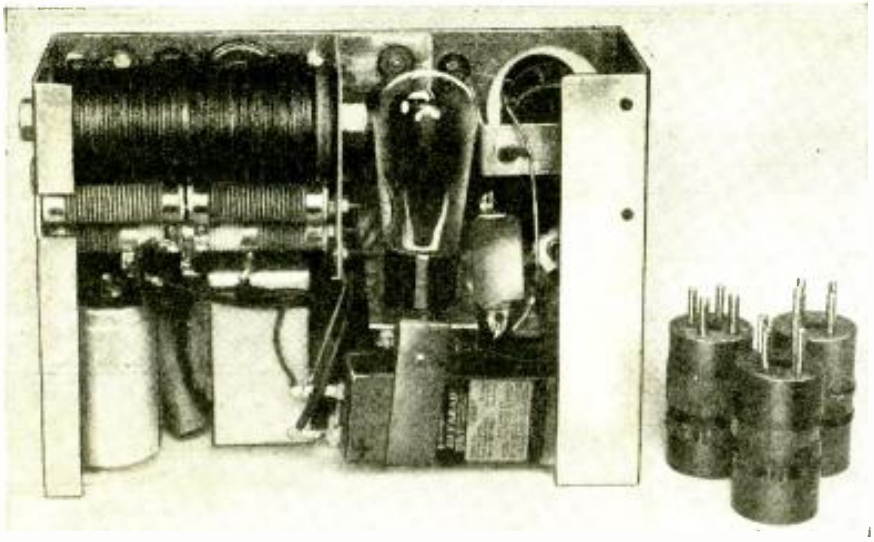


Fig. 2—The special picture diagram reproduced above should make it very easy for any of our readers to build this portable "really" 1-tube short and broadcast wave receiver. The parts for this receiver may be on hand or if not they will only cost a nominal sum. It might be a good idea to build this set up on a bread-board before assembling it in its final compact form.



Rear view of the "universal" 110-220 V. A.C. or D.C. 1-tube receiver, with plug-in coils at the right for changing the wave bands. Note the dry-disc rectifier at the top-left of the set. Fig. B.

(Continued from page 528)

ditions in an A.C. light-line at the particular instant in the 1/120-second when the polarity at the input terminals of the rectifier is as indicated at A, in Fig. 3A (or in the case of a D.C. power supply, that the input polarities are as shown).

Tracing a path from the input positive line lead we follow the arrows through rectifier section 1 to the "B+" or positive output terminal. As each section of the rectifier will pass current in but one direction (uni-lateral conductivity), the current cannot pass through sections 2 or 4 since their path of conductivity is only in the opposite direction. The circuit is completed by following the arrow line from "B—" or the negative output terminal, through section 3 to the input negative line lead. So much for the first half of the A.C. cycle (or one position of the D.C. line plug).

Now let's see what happens in the next 1/120-second of the A.C. cycle (or a reversed connection of the D.C. line plug). Again starting from the input positive line lead and following the path of least resistance, the line of arrows, the current path is through rectifier section 2 to "B+" or the positive output terminal; from "B—" or the negative output terminal the course is completed through section 4 to the input negative line lead. Note that even though the negative line polarity in the second half of the A.C. cycle (or reversed D.C. line plug) was reversed, the output or "B" supply polarity remained unchanged.

Power Supply Voltage

Next on the "menu" was the matter of line voltage—how to take care of line potentials from 90 to 240 volts. Ordinarily, this would not be possible, without the use of a special transformer and ballast resistor, or else a tapped transformer. Even then, the practical range would only be about 95 to 130 volts—and transformers, it was decided, were out of the question.

By referring to the diagram of the complete receiver, Fig. 1, it will be seen that resistor R1 permits the plate potential to be adjusted to exactly the correct value for best operation of the tube, regardless of the line potential. Also, this resistor affords a convenient means of compensating for the peak potential which develops when the set is taken from an 110 volt D.C. line and connected to an 110 volt A.C. supply. Our V.T. voltmeter indicated that the D.C. output of the filter system when the latter connection was made, in a particular instance, reached 125 volts (condenser C6 is charged to the peak potential of the A.C. line, about 157 V., less the drop through the rectifier, and since it cannot completely discharge before the next ½-cycle impulse comes along, its potential is added).

Many hotels generate their own power and supply guest rooms with 220 or 240 volts. (Your senior author once lost a perfectly good 110 volt soldering iron that way, being unaware of this little joker in the hotel's power system!) To drop the line voltage to the "mean" for which the filament circuit has been designed, an adapter will be required; its construction is illustrated in Fig. 3B. Where this value of line potential is known or suspected, remove fuse F from the set and snap it into the clips on the adapter, and snap the adapter plug into the fuse clips on the set. As the wiring of this adapter is "alive," care must be taken in its construction and use to prevent shocks or grounds.

If the power line is crossed with a high-tension line, fuse F will blow; otherwise, the set either will work or it won't work. The former result indicates a line of about 220 volts and the latter, a probable 110 volt circuit. The rating of the fuse F is such that if the set should be accidentally plugged into a 220 volt circuit without the adapter in series, the fuse would blow, thus protecting the set and the house fuses.

Tube Considerations

Early in the preliminary design of this set it became evident that only a triode could be used as the detector, V, since screen-grid and pentode tubes would necessitate drawing through the rectifier the additional current required by the screen-grid. This would result in undue heating of the rectifier, as previously mentioned; (one result would be erratic operation on the shorter wavelengths).

The next step was to find suitable filament characteristics. Obviously, any direct-heater type of tube would not function in the set, since it did not permit the filament circuit to be isolated; again, the type 27 indirect-heater tube would draw far too much current. Consequently, the choice became the type 37 or 6.3 volt indirect-heater type shown in Fig. 1; it draws only 0.3 ampere and is designed to operate satisfactorily under extreme variations in filament potential. The use of an indirect-heater type tube, due to its heating inertia, has the advantage of entirely eliminating rapid fading caused by rapid fluctuations in line voltage.

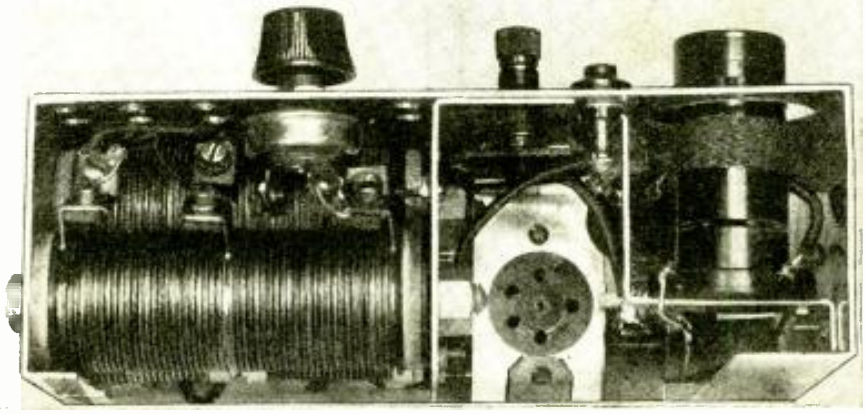
Although grid-bias rectification would enable the detector to be operated at about 0.5-ma. at the maximum available plate potential, this connection lacks the sensitivity obtainable with grid-leak operation, which consumes about 4 ma. at the lowered plate potential. In addition, the latter circuit reduces the possibility of introducing hum into the circuit through the bias-potential tap.

"Hum" Considerations

While on the subject of *hum* and, let us say, *noise*, it should be noted that the filament of the tube *must* be electrically grounded. This may seem to be contradictory to previous remarks, but—wait 'till we get through talking.

As we are not permitted to directly ground the filament (and only in rare instances, where the power line is not supplied with its own ground, through a condenser), since it connects directly to the light-line, we are forced to resort

(Continued on page 562)



Top view of the universal A.C. or D.C. portable 1-tube receiver for short or broadcast wave reception, showing the "dry-disc" rectifier clearly at the left. Fig. C.

WHAT ARE "NEAR ECHOES?"

By DR. F. NOACK

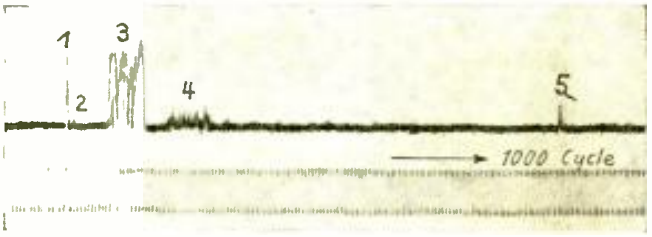


Fig. 1—Oscillogram showing echo effects on Nauen short-wave signal received at Geltow. 1—ground wave; 2—distant echo from the Heaviside stratum; 3—first "near echo;" 4—second "near echo;" 5—first signal received from around the world.

Dr. Noack here presents some very valuable data on the "near echo," that signal corresponding to the wave reflected at a short distance from the transmitting station, in contradistinction to the well-known long-distance echo, caused by the sky-wave reaching the receiver by a longer path than the direct route.

● FOR a number of years it has been known that in the reception of short waves in a circuit located up to some 50 miles from a short wave transmitting station there are received, aside from the ground waves (the waves transmitted along the ground), also signals arriving about .01 to .02 of a second later. There is accordingly formed a so-called "echo," which, however, is not to be confused with the generally known "distant echo," which shows a greater difference in time, and which is explained in either of two ways: one, that a wave leaving a short wave transmitter does not reach the receiver on the *direct path*, but instead encircles the earth one or more times, thus reaching the receiving antenna several times; or, two, by the fact that at a very great height above the earth an electron stratum is supposed to exist, from which the waves are reflected to the earth again. In contrast to this *distant echo* one calls the first mentioned echo "near echo."

The *near echoes* correspond to reflections at distances of about 900 to 1800 miles. The reflecting stratum must be at these distances.

Both *near* and *distant* echoes under certain conditions very perceptibly disturb short wave reception. There is the possibility that the echo effect may be suppressed by using so-called "directional antennas" in both transmitter and receiver, which receive the waves only from one direction and hence operate contrary to the direction from which the near echoes evidently come.

There are in short wave transmission cases in which a directional antenna cannot be used. This is so, for example, when a short wave broadcast is to be sent uniformly in all directions. There is therefore much interest in knowing how the echo effects occur, mainly, at what stratum the near echo is reflected.

As is well known, the short wave is mainly transmitted not as a ground wave but as a space wave. It travels from the transmitting antenna obliquely into the air and is reflected back to earth by the Heaviside layer. The distance of the striking point of the reflected waves from the transmitter is called the *jump distance*. The Englishman, Eckersley, assumes on the basis of his directional studies that the *reflection strata* of the *near echo* lie at the inner end of the jump distance. Van der Pohl explains the *near echo* phenomena through the reflection of the waves on the Heaviside layer and the reduction of their transmission speed. *Transradio* found by detailed experiments and directional work on the *near echo* that these reach the receiver perpendicularly from above or else at very steep angles. Only the first *near echo* (actually several echoes may arise, one after the other) still shows a small lateral effect. *Transradio*, however, almost always made the observation that echoes from the Heaviside layer were not demonstrable, when the near echoes occurred multiply and with great amplitude. Likewise the reverse was the case. The assumption of Van der Pohl seems therefore to be dubious. It is remarkable that the near echoes in general are demonstrable only at short distances from the station.

Figure 1 shows an oscillograph taken in Geltow, showing echoes from one of the Nauen short wave stations. Signal 1 is the direct ground wave signal; signal 2 represents an echo from the Heaviside layer; signals 3 and 4 are the first and second *near echoes*, while signal 5 arose through a *distant echo*, i.e., through a wave which went around the earth. The oscillogram shows that echo signal 2 is very weak. The echo time gives a reflection distance of 180 miles. Thus this distance agrees with the hitherto always assumed height of the Heaviside layer. Signal 3, the first *near echo* signal, appears very much widened, likewise signal 4. The widening apparently comes about through the fact that the rays strike the receiving antenna coming from above, in conical fashion, on different paths, and thereby produce an interference effect. If one measures the time of the first near echo, there results a distance of the reflection stratum from the receiver of 1500 miles. Likewise the second near

(Continued on page 567)

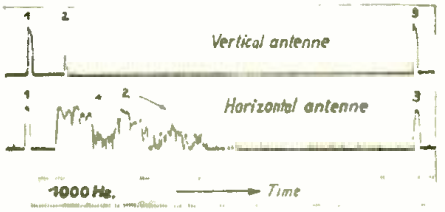


Fig. 2 above—Signals received with a vertical or a horizontal antenna; wavelength 15.6 meters. 1—ground wave; 2—"near echo;" 3—signals from around the earth.

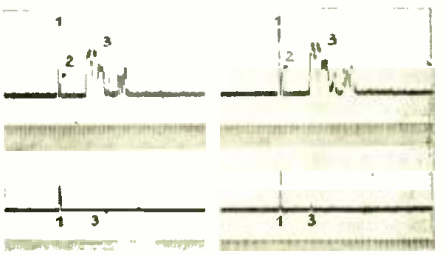


Fig. 3—Signals received with a horizontal antenna (above) and with a vertical antenna (below) of dipole form; wavelength 15.6 meters. 1—ground wave; 2—small direct echo; 3—first "near echo."

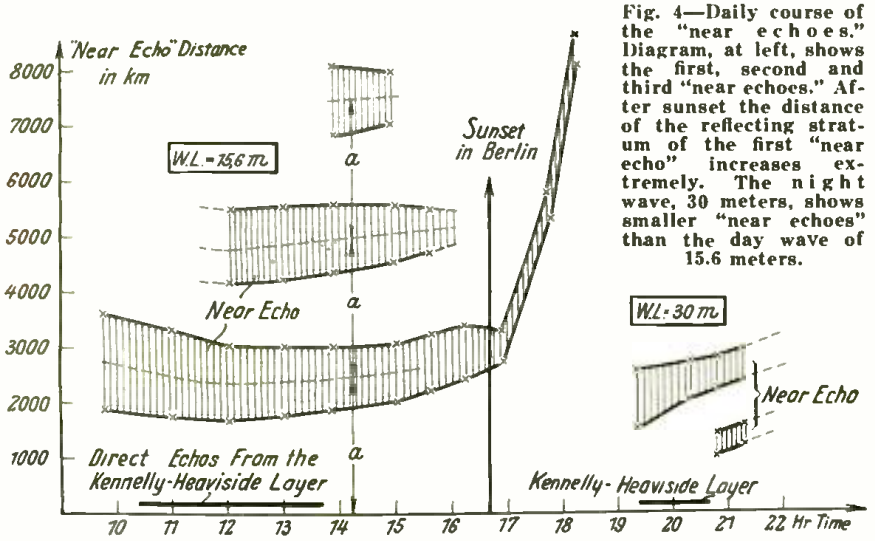
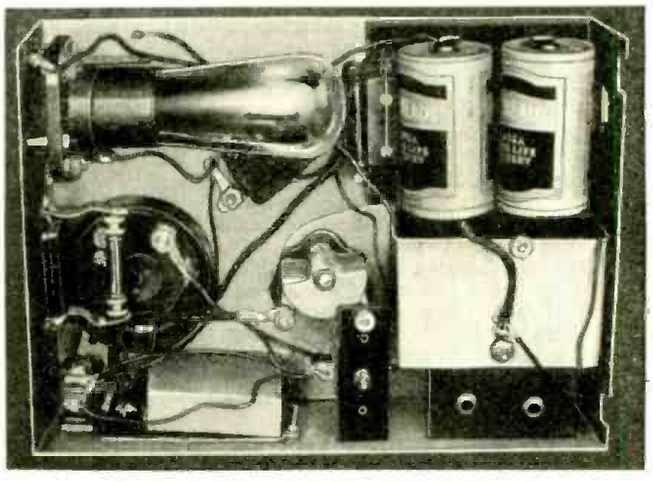


Fig. 4—Daily course of the "near echoes." Diagram, at left, shows the first, second and third "near echoes." After sunset the distance of the reflecting stratum of the first "near echo" increases extremely. The night wave, 30 meters, shows smaller "near echoes" than the day wave of 15.6 meters.

$20.00 Prize Winner

October Prize Awarded to Richard Klebs, Rochester, Minn.



Portable S-W Receiver and "Adapter"

Mr. Klebs' prize-winning set in the October contest is a dandy little portable. The "A" battery comprises a couple of flashlight cells mounted under the sub-panel along with the tube, condenser and other parts. The "B" battery is enclosed in an aluminum shield inside the cover; the current is carried to the chassis through the hinges. This set can also be used as a short-wave "adapter."

● THIS set was designed to be used as a portable short wave set or an A. C. adapter; a description of each follows:

Portable Short Wave Set: This set has all accessories self-contained so that it may be used as a complete short-wave set or as an adapter. It has a range of approximately 2,500 miles. The size of the cabinet when closed is 8¾"x6½"x5½"; the set weighs about six pounds. The small size and low weight make it an ideal set to be taken on a camping trip. In five minutes the set can be hooked up and ready for reception; two wires with battery clips are provided. These are to be hooked on the antenna and ground posts of the set, and then hooked onto some convenient objects such as a bedstand, wire fence, etc. If an antenna and ground cannot be had, the set will work with either one or the other. After an antenna and ground have been provided, all that is necessary is to plug in the headphones. This automatically turns on the filament current, thus eliminating a filament switch. An antenna condenser is used to make the set oscillate at all points on the dial.

A. C. Adapter: The third binding post, which is located at the top of the panel, is for the *adapter* connection. A wire is connected between this post and to the plate prong of the detector socket. To hook up the set as an adapter, disconnect the antenna and ground leads from your receiving set and hook them onto the antenna and ground posts of the adapter. Hook on wire to the ground post on the receiving set and hook the other end to the ground post of the adapter. Remove the detector tube from the receiving set and in its place insert the five-prong adapter which is included in the set. Connect the wire which leads to the tube socket adapter to the third binding post on the adapter. Disconnect the jack plug from the headphones and insert into the jack; this is necessary to turn on the filament. As the headphones have been disconnected, there is no drainage on the B battery. The adapter is tuned the same as when it is used as a set. On some sets the plate voltage may be too high. If this is the case, open the midget knife switch which is located beside the tube. This puts a 10,000 ohm resistor into the plate lead and on most sets, will cut down the plate voltage enough to permit the adapter to be used.

On the first tests the following stations were received at Rochester, Minnesota: when the set was used as both a set and adapter: W3XAL Bound Brook, N. J., W2XAF Schenectady, N. Y., W8XK Pittsburgh, Penn., W8XAL Cincinnati, Ohio, W1XI Boston, Mass., VE9GW Bowanville, Ontario, Can., and a countless number of amateur phone stations, code stations, and police calls.

A .0001 mf. midget condenser is used, in connection with four plug-in coils ranging from 15 to 210 meters, for tuning in the stations. Regeneration is tuned by a 200,000 ohm Clarostat. The '30 type tube was selected because of its small size and low filament voltage. A small size 22½ volt Burgess battery is used for "B" current; its size is 3½"x2½"x2". For filament current, two 1½ volt large-size flashlight cells

(Continued on page 557)

$20.00 Prize Monthly For Best Set Submitted

● **THE $500.00 Short-Wave Set-Builders' Contest closed on September 30; at least, that was the final date for the receipt of entries in the fifth and last monthly "set-builders'" contest. SHORT WAVE CRAFT readers showed so much interest in the contest, especially as it drew to a close, that the editors have decided to offer a $20.00 monthly prize for the best short-wave receiver submitted.**

If your set does not receive the monthly prize you still have a chance to win cash money, as the editors will be glad to pay space rates for any articles accepted and published in SHORT WAVE CRAFT. So if your set does not become a prize winner, it still may win space as an editorial article for which you will receive a check.

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

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

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

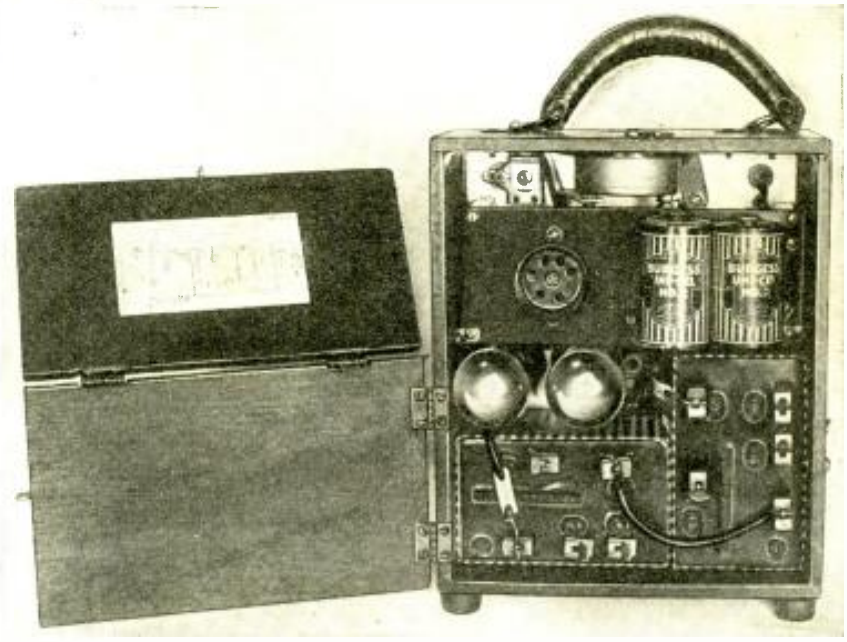
The judges will be the editors of SHORT WAVE CRAFT, and Robert Hertzberg and Clifford E. Denton, who will also serve on the examining board. Their findings will be final.

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

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

First "Honorable Mention" to Louis P. Maigret, New York

for His Design of An Efficient Portable S-W Receiver



First Honorable Mention is given to Louis P. Maigret for his "Companion" portable short-wave receiver illustrated below. It has a voltmeter fitted in the top of the case.

● HERE is a two-tube short-wave portable receiver of fine qnality and very low cost. It was designed to give excellent performance with very smooth regeneration control, absence of fringe howl, and accurate filament voltage control, in order to insure long life for the tubes. Batteries, coils, tubes, earphone, etc., are all self-contained in the 3-ply wood cabinet which measures 8⅜" high by 7⅛" wide by 4⅝" deep. An inexpensive suit-case handle adds to convenience in carrying.

It seems that one important element is invariably left out, namely the filament voltmeter. When using 2-volt tubes, the manufacturers specify that "an *adjustable* rheostat must be used together with a *permanently installed indicating instrument* to secure the proper filament voltage." Such an instrument is obtainable for as low as 59 cents and is a wise investment, because a new tube costs at least twice that amount.

The *Companion* receiver is especially adapted to portable high frequency service, but will "do its stuff" just about anywhere. Simply attach about 30 feet of antenna to it and *listen to the world!*

Circuit

A small Hammarlund equalizing condenser serves as antenna coupler in this receiver and may be adjusted easily for different antenna lengths. Tuning and regeneration condensers are both Pilot 23-plate midgets. The detector tube output is coupled to the audio transformer through a Sprague .01 mf. midget fixed condenser, and voltage is fed to the detector plate through a 5000 ohm fixed resistance. This coupling method is highly recommended for regenerative detectors because it does away entirely with troublesome *fringe howl.*

The audio transformer primary winding being at ground potential eliminates any danger of *burn-out* and prolongs the transformer's life *ad infinitum.* The novel method of mounting the flashlight cells for "A" supply insures easy access for quick replacement of worn-out cells. A Carter midget 10 ohm rheostat supplies proper filament ballast for the tubes, and the 0 to 3 Readrite D.C. voltmeter warns of any excess voltage. It is advisable to use a *filament-control jack* to protect the batteries against accidental drain caused by neglect to turn the rheostat off. 45 volts plate potential is obtained from two small 22½ volt "C" batteries, measuring each 4 inches by 2½ by 2¾.

Construction

The ¼ inch thick 3-ply wood for making the cabinet was obtained from a discarded portable phonograph, as were the name plate on the panel and the carrying handle. Ply wood is readily purchased from any lumber mill or cabinet maker. A total of five sections are required: two 7⅞" by 4⅝" for the sides; two 7⅛" by 4⅝" for top (Fig. 5) and bottom; and one 8⅜" by 7⅛" for the back door. This latter section (Fig. 3) is sawed in two exactly 4 inches from the top, and is hinged horizontally to the lower half. The lower half of the door is hinged vertically to the side of the cabinet. This arrangement is more convenient for removing coils and batteries. Small hooks and eyes serve to keep this double door closed.

After cutting out the voltmeter opening in the top and drilling other necessary holes, assemble the box with small brads and set with good thick glue. This should dry sufficiently in about four hours. Now, to make the aluminum panel fit perfectly, it becomes necessary to slice out from the inside front edge of the cabinet, a narrow strip 1/16" wide on all sides, the thickness of one ply of the wood. This is easily accomplished with an old razor blade or a sharp knife. The next step is to mount the back door on its hinges and then proceed with the painting. Black brushing lacquer may be used, or any other color to suit the constructor. After the paint has dried, the carrying handle may be mounted on the top.

After all necessary holes have been drilled in the panel and (Fig. 1 & 2) the bakelite shelf, assembly of the parts is in order. First, mount the four aluminum corner posts on the shelf, after which the coil socket may be installed in its hole. The four spring clips for the flashlight cells (grid-leak clips are ideal for this purpose) are then put in place with 6/32 screws and nuts, being sure to insert a soldering lug under each. Now suspend the audio transformer and the RF choke coil on the under-side of the shelf with 6/32 screws.

Now to the aluminum panel: Mount the tuning condenser in the center hole,

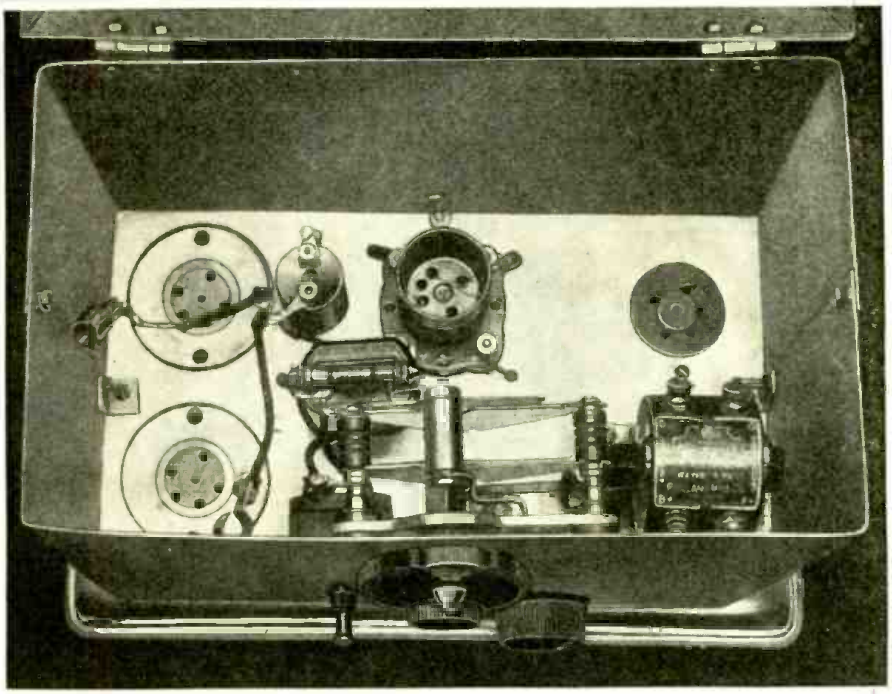
(Continued on page 558)

Second "Honorable Mention"

Awarded to Ewald Zischewsky, Racine, Wisc.

For His 3-Tube "A-C." Short Wave Receiver

Second Honorable Mention goes to Ewald Zischewsky, of Racine, Wisconsin, for his excellent 3-tube short-wave receiver, having R.F., detector and A.F. stage.



● HERE is as efficient and simply constructed an A.C. receiver as can be found anywhere. It is completely shielded, and employs a '24 or '35 in the R.F. stage, a '24 detector, and a '47 amplifier.

Being a "ham," simplicity and compactness, as well as efficiency were aimed at. Its mechanical as well as circuit arrangement is a little different from the ordinary. The chassis is an aluminum cake pan, which can be purchased for 25c. The rest of the cabinet consists of two pieces of zinc, cut to the proper dimensions and bent at the proper places to form two corners. Then the two pieces are bolted together, and then bolted onto the chassis. Another piece hinged onto these serves as the lid of the cabinet. No dimensions are given, because the constructor can build the cabinet to the desired size. The resulting cabinet is solid and has a fairly good appearance, but costs little and is free from the noises that some cabinets that are joined at the corners have.

R. F. Stage Features

The set itself has plenty of pep and selectivity. The R.F. stage of this receiver has some advantages over the ordinary methods used. Usually, direct coupling is used between the plate of the R.F. tube and grid coil of the detector. As a result, the plate voltage of the R.F. tube is in the detector or coil. The disadvantages of this arrangement are: there are potential strains across the grid condenser (and across the tuning condenser), with possible leakage. Another system is to use a primary coil and thus couple the plate of the R.F. tube to the detector. Its chief disadvantage is the construction of the coil and the necessity for using six-prong coils and sockets. The system used in this receiver, using a resistance of 65,000 ohms for the R.F. tube's plate impedance, and a .00015 mmf. condenser to by-pass the R.F. energy from the plate of the R.F. tube to the detector, overcomes these disadvantages; besides making the receiver extremely sensitive and selective.

Because of restricted space and a desire for simplicity, a radio-frequency choke was used in the antenna circuit of the R.F. tube. A radio frequency choke, although not as sensitive as a tuned circuit, still has advantages over

(Continued on page 566)

Third "Honorable Mention" To William Bole, Sharon, Pa.

The "Pie-Tin" Receiver

● THE main idea of this set is to have an ordinary hook-up entirely shielded; in hunting for a shield the author became convinced that two aluminum pie-tins would be excellent for this purpose.

The two pie-tins are obtained in any five-and-ten cent store and are placed one on top of the other as shown. They are both cheap and easily obtained.

One pan is used as the panel. After the panel is drilled a piece of bakelite or hard rubber panel is then cut to fit inside of pan and then drilled as required.

The parts are then mounted inside of the pan used as a panel, with the exception of the transformer, which is mounted on the outside.

The RF choke is wound on a wooden

Third Honorable Mention is awarded to William Bole for his "pie-tin" S-W receiver here illustrated.

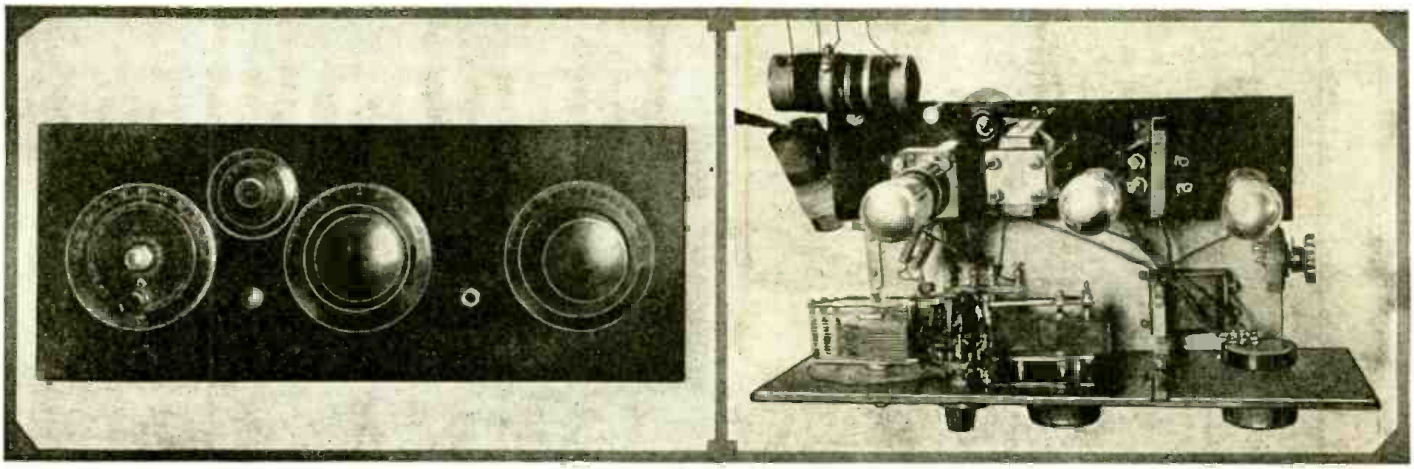
thread spool which is cut in half and then turned down to ½ inch in diameter; it has 150 turns of No. 30 double cotton covered wire.

The coils are all wound on tube bases and when they are all wound and tested they are filled up with sealing wax; they cover approximately from 25 to 80 meters.

The wiring of the set is done in the usual way, making the leads as short as possible. The antenna coil is wound around the coil socket between the socket and the panel. It consists of 10 turns of No. 24 cotton covered wire.

A .5 ampere automatic fixed rheostat is connected in series with the A plus lead of the two '01A tubes. The set is connected to the batteries by means of a three foot color coded cable.

(Continued on page 566)



Front view of Mr. Lindberg's Long Wave Receiver.

Top view of the 150 to 3,000 meter receiver.

A "Long Wave" Receiver

With Wavelength Range of 150 to 3,000 Meters

By C. E. LINDBERG
W8CIL

Long Waves! A new target to shoot at! Here's your chance to explore a brand new field. Build one of these LONG WAVE receivers and see what you can hear. Warsaw, with 158,000 watts, should knock your ears off! Let's know your results.

● A LONG WAVE receiver is very useful in any *ham* station. On the bands around 1,000 meters steady code signals may always be heard. The signals have a leisurely, consistent character and there is little fading or interference. Many stations send for hours at constant speeds varying from ten to sixty words per minute. These transmissions make ideal code practice. Then there are the foreign broadcast programs, aeronautical and transatlantic phone stations, as well as the press and weather reports.

The receiver described was built with the idea of avoiding the usual array of plug-in coils. An old inductance switch was mounted on the panel and arranged so as to connect three fixed condensers, either singly or in combination, in parallel with the tuning condenser. This arrangement provides an unbroken secondary capacity range of zero to .0035 microfarads. Only two plug-in coils are necessary to tune from 150 to about 3,000 meters.

The construction of the receiver is already shown in the photographs. The vernier dial controls the tuning condenser C1, the center dial C2 and the right hand dial, the potentiometer R2. The vernier dial was used because it was handy. It is not needed but it is convenient for DX or phone stations.

The tubes, transformers and the detector rheostat are mounted on the bakelite subpanel at the rear of the set. The AF rheostat and the by-pass condenser are placed on the baseboard. Two lamp cord sections, six feet long, are used as a battery cable. They are brought out at one side. Three grid-leak condensers are mounted side by side and provided with short leads so that the capacity may be adjusted if desired. A single condenser of .001 mf. size may be used. A small sheet of aluminum mounted between the panel and the tuning condenser effectively eliminates *hand capacity* effects.

The coils are provided with pieces of bus-bar and plug in to the binding post strip mounted between condensers C1 and C2.

Both coils are wound on cardboard forms of 1¾ inches outside diameter. The smaller coil has 35 turns of No. 26 D.C.C. wire for L1. It is wound in scramble fashion in two layers. The

(Continued on page 570)

LONG WAVE STATIONS

(Brief List)

Wave Length, Meters	Name of Station	Power, kilowatts
1796	Lahti, Finland	54
1635	Konigswusterhausen (Berlin, Germany)	75
1554	Daventry, England	35
1481	Moscow, RA1	—
1446	Eiffel Tower (Paris, France)	15
1411	Warsaw, Poland	158
1352	Motala, Sweden	40
1304	Moscow, U.S.S.R.	100
1200	Reykjavik, Iceland	21
1153	Kalundborg (Copenhagen, Denmark)	10
1103	Moscow (Popoff)	—
1071	Oslo, Norway	75

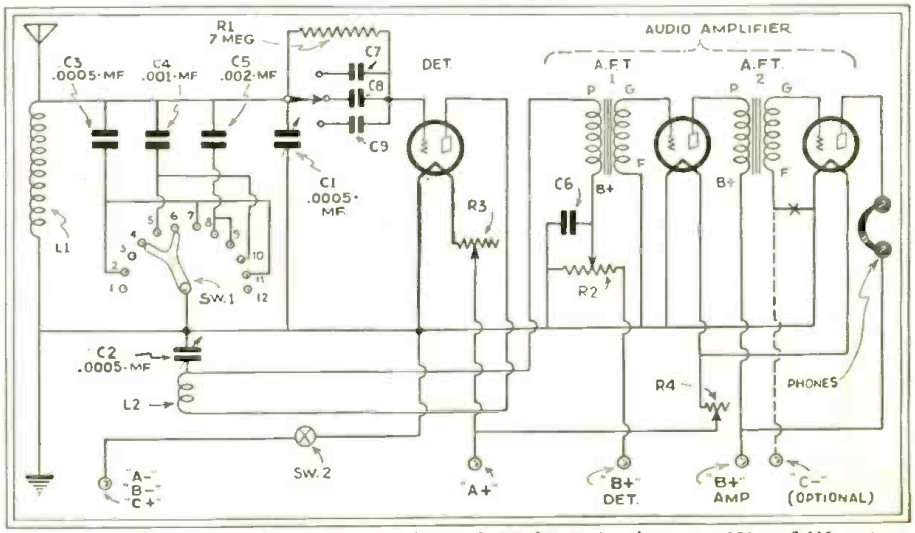


Diagram showing ingenious condenser switching scheme for tuning in waves 150 to 3,000 meters in length

Improving

Mr. Shuart, well-known eastern amateur, recently built and very successfully operated this neat-appearing 5-meter transmitter.

● THE past year has shown a considerable increase in the number of amateur stations operating in the five meter band, and a lot of fine work has been done. However, some amateurs have given up five meter activity because of their poor locations or because of the transmitter itself. Not much can be done about the location, but we can change our transmitter.

We have found that extremely low power has a very limited range and a hard job competing with the high background noise level of the present day super-regenerative receiver. As we increase the transmitter power, the effective range is greatly increased. Therefore, the plate voltage on the type 71A or 12A, or whatever tubes happen to be in use, was increased to around 300 volts, and in some cases even more. This was all very fine but the tubes developed a habit of going "west." At least this happened more times than was pleasing at the author's station, and many other amateurs have had the same trouble.

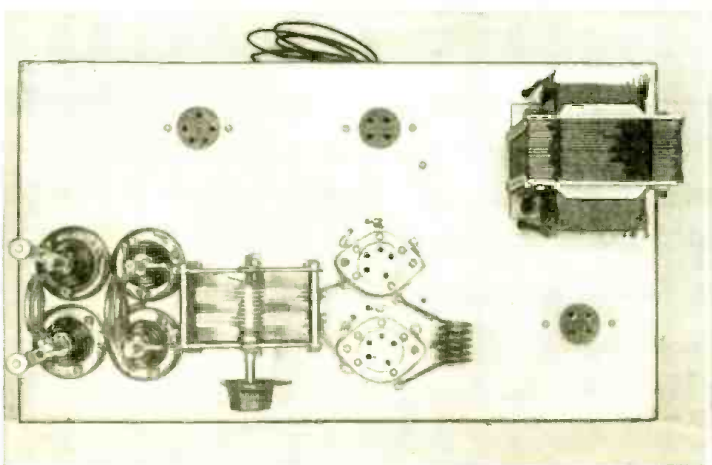
We then turned to the old standby, the type '10 with 300 to 400 volts on the plate. To our disappointment the output was no higher than with the smaller tubes, even with much higher inputs, with the disadvantage of being harder to modulate. This proved even worse than the blowing of the smaller tubes, because the modulator had to be a single type '50 with 500 volts on the plate. After all, percentage of modulation plays a very important part in the effective range of any phone transmitter.

So it can be seen we need a tube with good efficiency around five meters, with from 300 to 400 volts on the plate and still have low enough input to be completely modulated with a single type '50. With these facts all in mind a search was made for that tube, a large number being tried, and finally the type 46 was selected as the most suitable.

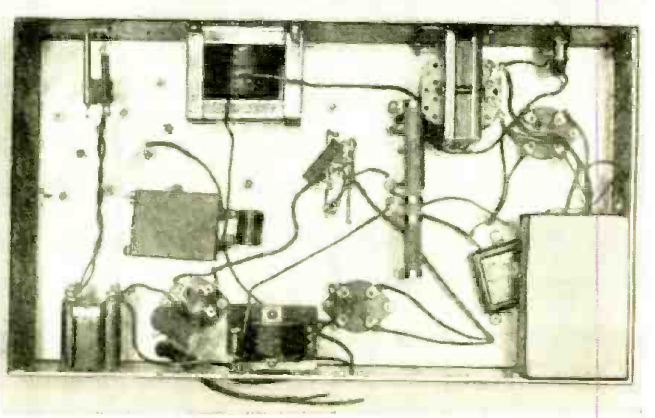
46 Type Tube Ideal for 5 Meters

This tube (the 46 type) will oscillate far below five meters, and the plate efficiency is high. The input was lower than other tubes and proved easier to modulate. The extra grid in this tube is connected to the plate when used as an oscillator, as shown in the diagram. It might be well to mention at this point that the type 46 makes a very fine *radio frequency amplifier*, when used in a five meter master oscillator, power amplifier circuit. The extra grid in this case is connected to the control grid, and both are connected to the negative through a radio frequency choke and requires no grid bias.

Getting back to our oscillator (which of course is push-pull), the grid leak necessary to bring the current to



Top view of Mr. Shuart's 5-meter transmitter.



Bottom view of the 5-meter push-pull transmitter.

Our 5 meter Transmission

Mr. Shuart here describes a new 5-meter phone transmitter circuit which he has tested out very successfully. The transmitter employs an '82 rectifier, '27 voice amplifier, '50 modulator and push-pull 46 oscillator. Its cost is very nominal

By GEORGE W. SHUART, W2AMN—W2CBC

about 100 ma. was 50,000 ohms, when 400 volts was applied to the plates. This input was just a bit too high to be modulated one hundred per cent by our '50. However, this can be modulated easily with a pair 46's in class "B" push-pull, and give higher power than the outfit herein described. But with class "B" the modulator requires its own separate power supply with a subsequent increase in the cost of construction. The highest input to the oscillator that the '50 would modulate was 300 volts at about 90 ma. Even this required some juggling of the grid bias on the modulator tube. At this input the 46's gave far more output than anything tried. This just about covers the tube problem. Now the actual transmitter designed and used by the author will be described.

The foundation of this transmitter is a 10 x 18 x 3 inch steel chassis, and provides ample room to mount all parts. A pleasing finish can be had by giving the chasis a thin coat of aluminum paint after all drilling is done.

Power Transformer

The power transformer must have a high voltage winding capable of supplying 500 volts at approximately 175 milliamperes. Three filament windings are required: one 2.5 volts for the 82 rectifier tube, one 7.5 volts for the modulator, and another 2.5 volt winding for the two 46 oscillator tubes and the '27 speech amplifier.

The single 30 henry choke used in the filter must also pass 175 ma. with good regulation. This choke with a two mf. condenser on each side gave a hum-free carrier in the receiver. A voltage divider of 100,000 ohms across the power supply improved the regulation. The tap on this resistor which supplies plate voltage to the speech amplifier must be by-passed with a one mf. condenser.

The reason for describing the power supply first is that unless the power supply is capable of supplying the above voltages at the required current the builder will not get very gratifying results. As the voltage to the oscillator has already been dropped to 300 volts, a power supply with poor regulation is liable to deliver from 200 volts downward, with the dropping resistor shown in the diagram. So it can be seen that any old power supply just will not do.

Modulation Choke

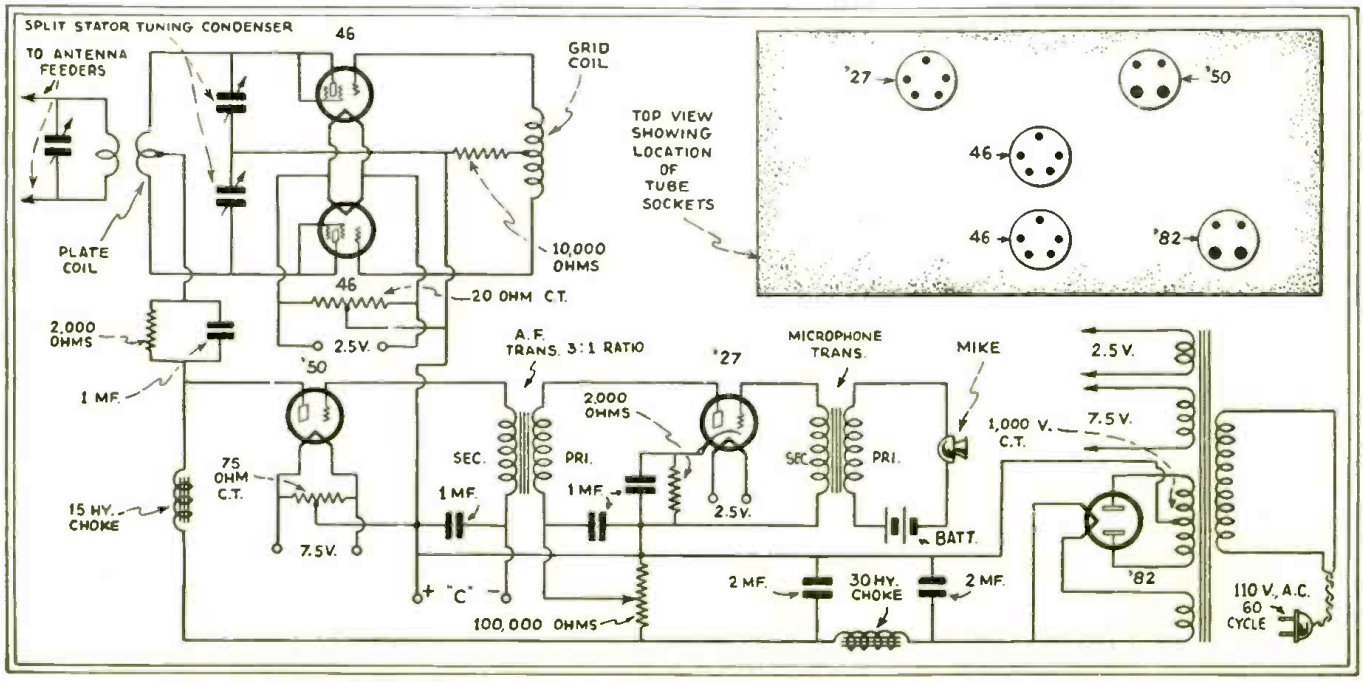
Next comes the modulation choke or constant current choke, whichever one wishes to call it. This choke must pass the full plate current of the oscillator and the modulator combined, and still not impose so much resistance in the circuit that the voltage drop is enormous. It is easy to lose as much as 100 volts in this choke. So it is recommended that a 15 henry choke with a low D.C. resistance, and capable of passing at least 175 ma., be used.

A resistance of 2,000 ohms at one hundred ma. is used to drop the oscillator plate voltage. This gives a 200 volt drop. If this resistor is rated at less than 100 ma. the drop will be much more than 200 volts and will result in low oscillator output. The audio by-pass condenser across this resistor is one mf. and is rated at about 800 volts. So much for the power supply.

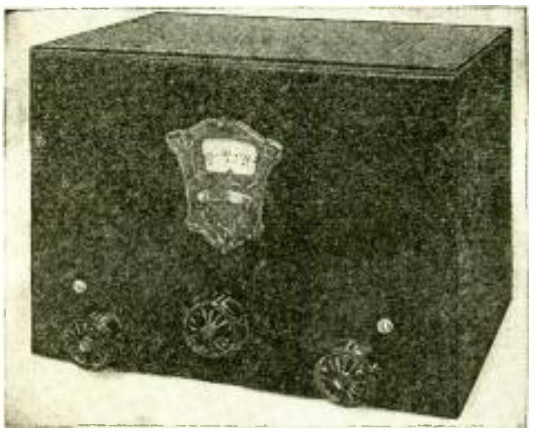
Oscillator Not Complicated

The oscillator is not a bit complicated; in fact by-pass and blocking condensers, R.F. chokes, etc., are left out, making it quite simple. The R.F. chokes were left out because they are not needed in a properly balanced push-pull circuit. If the tubes match up, if the grid and plate coils are tapped as near as possible to the electrical center, and if the circuit symmetrically laid out, there is not the slightest indication of R.F. in the low potential wiring or the plate supply lead.

(Continued on page 571)

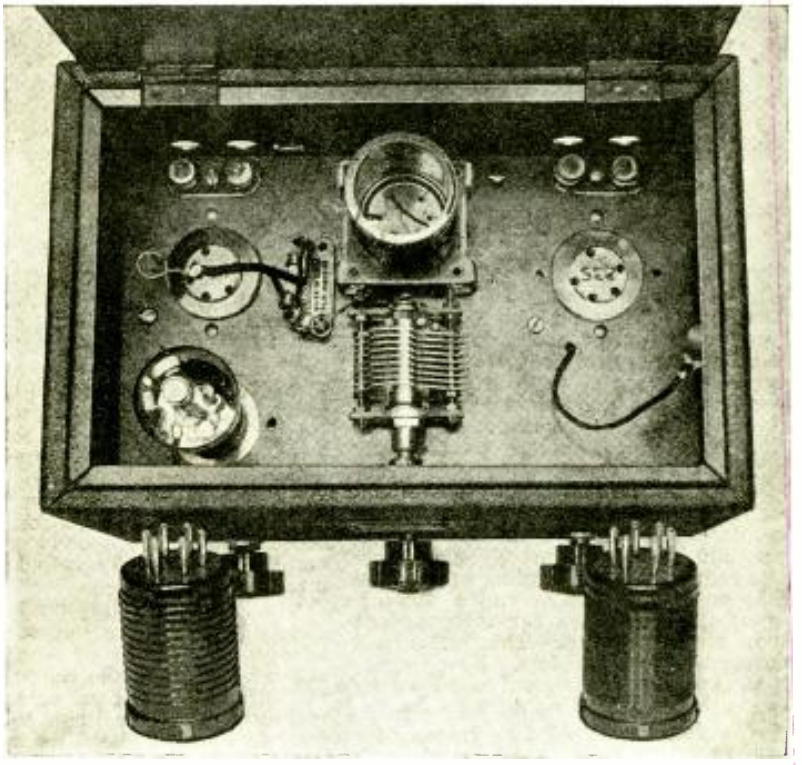


Wiring diagram for Mr. Shuart's 5-meter push-pull transmitter, using 46 tubes in the oscillator.



Above—Attractive appearance of the 3-tube short-wave receiver; right—looking down into the 3-tube receiver. Plug-in coils are used as the picture shows.

This 3-tube receiver represents a very popular sized set, due to its economic first cost and its smooth and satisfactory performance. This receiver employs an R.F. stage, a regenerative detector and an A.F. output stage.



A 3-Tube SHORT WAVE Receiver of Quality

Particularly Suited to Beginners

By H. W. SECOR

● TO HEAR short-wave stations located thousands of miles away, with a receiver of minimum first cost but capable of reproducing signals of good quality, is the goal of every radio experimenter today. The accompanying photos show the appearance of a 3-tube short-wave receiver which is capable of giving excellent results. This particular model is an experimental one which was built for special tests by National engineers, but which is not a regularly manufactured model. In other words, you have the benefit of private engineering research without having to purchase a complete instrument and you can buy the parts in the open market, many of the parts probably being available from your collection.

This 3-tube receiver ensures excellent "DX" or long distance reception, due to the screen-grid tube used in a radio frequency stage, ahead of the regenerative detector. Maximum amplification is achieved in the regenerative detector stage by utilizing a '36 screen grid tube. The R.F. stage also employs a screen grid six volt tube of the '36 type, while the audio stage uses the '38 type of output pentode. Stability is obtained in the audio frequency stage by using resistance coupling between the detector output or plate circuit and the grid of the AF tube.

This reliable 3-tube set can be used very nicely with a pair of 2000 ohm or higher resistance headphones, or the output may be fed into a power amplifier of one or two stages. This receiver may be operated from "A" and "B" batteries or also from a good "A" and "B" eliminator.

Data on the coils and tuning condenser in the detector circuit are given herewith. The antenna is choke-coupled to the grid of the R.F. tube and may have an inductance of 60 to 85 millihenries. The regeneration is controlled by a 50,000 ohm potentiometer which accurately varies the voltage applied to the screen grid of the pentode detector.

The radio frequency choke, R.F.C. in the tickler plate circuit of the detector, may have a value of about 28 to 30 millihenries, or it may consist of about 700 turns of No. 36 insulated magnet wire (silk covered enamel) wound on a ½" diameter dowel stick or cork. Wind coil in slot or between separators 3/16" wide, random fashion. This choke is of extreme importance and it is therefore strongly recommended that the finest type possible, such as the new National type 100, wound on an Isolantite core, be utilized. The coupling resistors, joining the output of the detector to the input of the A.F. stage, have values of .25 megohm and 1 megohm, respectively, the two resistors being coupled through a .01 mf. fixed condenser.

The 6-pin coil socket is mounted about 1" above the metal subpanel and the coils should be kept a distance of at least ¾" from the metal cabinet, to avoid all undue losses and also broadening of the tuning or lack of selectivity. The forms used are made of National R39 material, which ensures the minimum loss at these high frequencies; this material is far superior to ordinary bakelite. The tickler coil "T" may be wound in the slot at the bottom of the National form; the primary winding can be wound in between the turns of the secondary.

The R.F. choke coupling the antenna to the ground and to the grid of the R.F. tube may comprise 350 turns of No. 36 (silk covered enamel) magnet

wire wound on a ½" diameter dowel stick, the coil being 3/16" thick and random wound (helter skelter style). The main variable tuning condenser connected across the secondary, S, of the regenerative coupler has a capacity of 90 mmf. or .00009 mf. You can substitute other values of tuning condenser such as 140 mmf. if you already have coils or data for that value of tuning condenser and wish to use them instead.

Data on National "Short Wave" Coils

The secondary winding of the coils is shunted by 90 mmf. (.00009 mf.) variable condensers. Diameter of coil forms 1½ inches:

No. 10 coils, covering from 9 to 15 meters:
Secondary 2 5/6 turns of No. 16 Enamel
Primary 1 5/6 turns of No. 34 Enamel
Tickler 3 turns of No. 32 Double Silk.

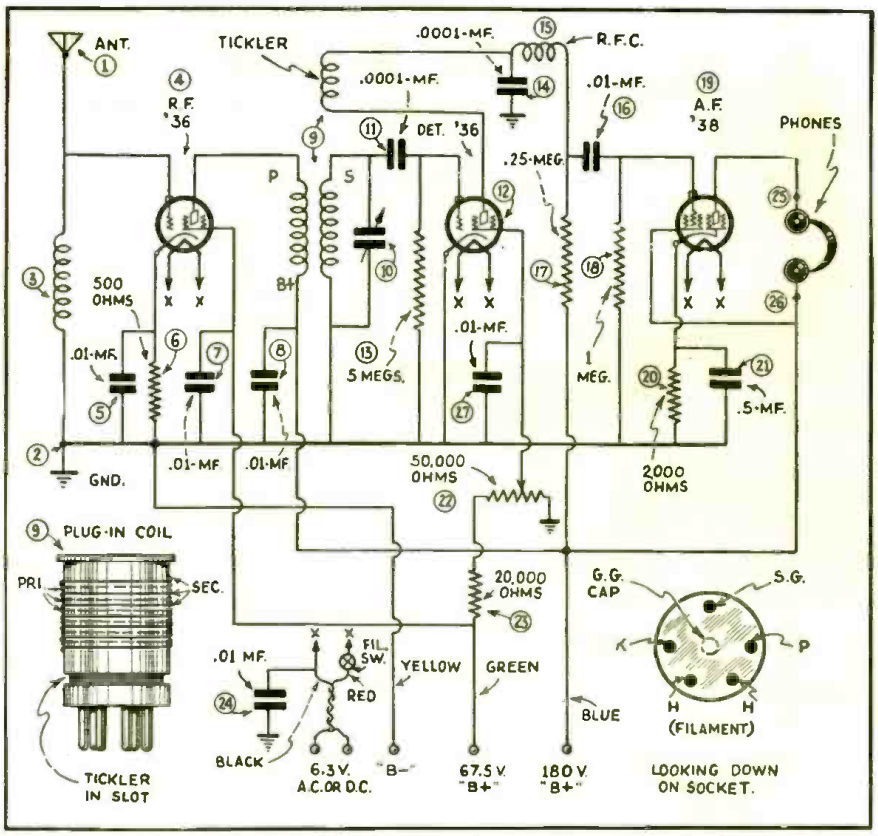
No. 11 coils, covering from 14.5 to 25 meters:
Secondary 6¼ turns of No. 16 Enamel
Primary 3 5/6 turns of No. 34 Enamel
Tickler 3 turns of No. 32 Double Silk.

No. 12 coils, covering from 23 to 41 meters:
Secondary 11 5/6 turns of No. 18 Enamel
Primary 7 5/6 turns of No. 34 Enamel
Tickler 3 turns of No. 32 Double Silk.

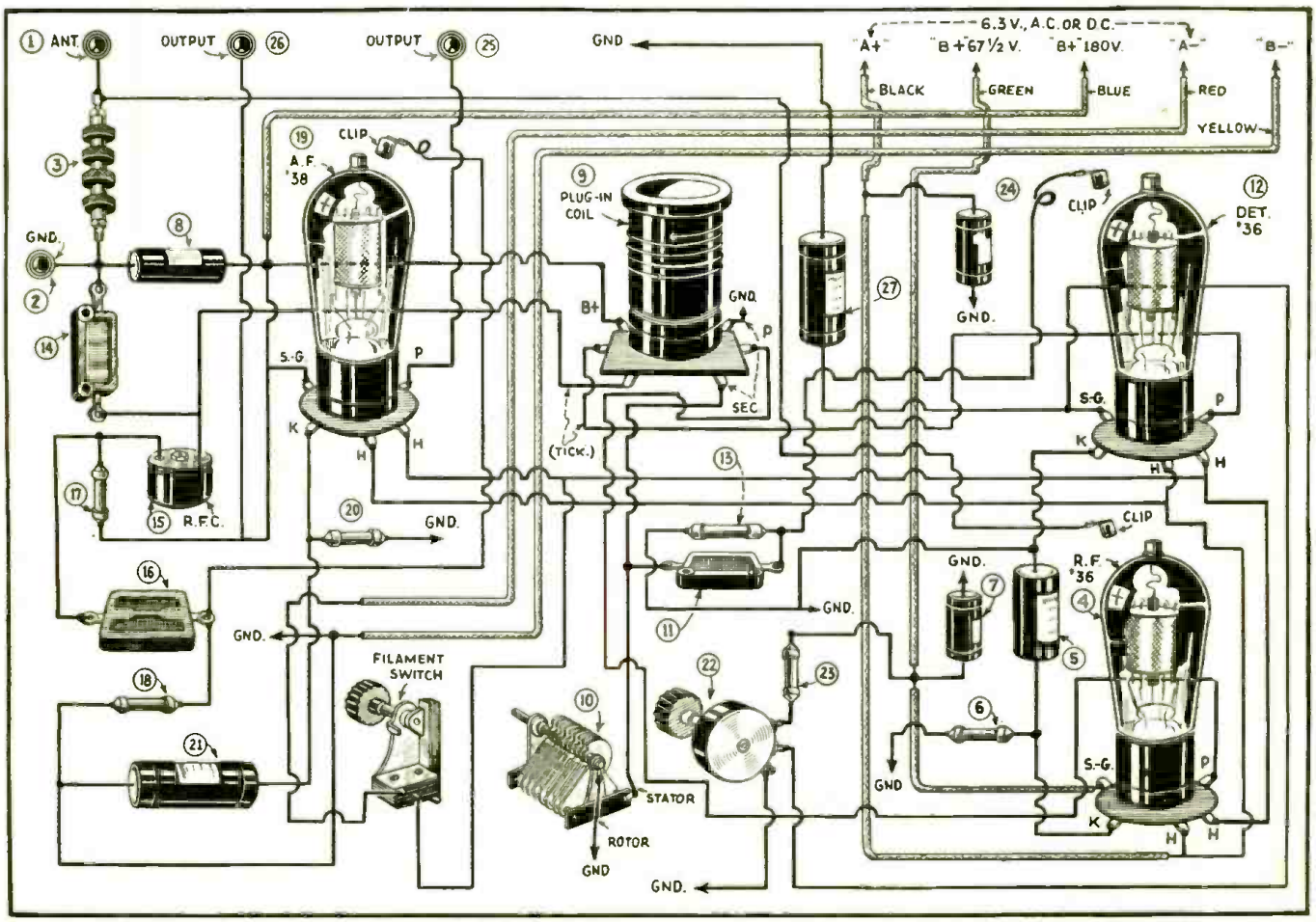
No. 13 coils, covering from 40 to 70 meters:
Secondary 19 5/6 turns of No. 18 Enamel
Primary 12 5/6 turns of No. 34 Double Silk
Tickler 4 turns of No. 32 Double Silk.

No. 14 coils, covering from 65 to 115 meters:
Secondary 34 5/6 turns of No. 24 Enamel
Primary 21 5/6 turns of No. 34 Double Cotton
Tickler 4 turns of No. 32 Double Silk.

No. 15 coils, covering from 115 to 200 meters:
Secondary 62 5/6 turns of No. 28 Enamel
Primary 38 5/6 turns of No. 32 Double Silk
Tickler 5 turns of No. 32 Double Silk.



The schematic wiring diagram for the 3-tube receiver here illustrated and described, is shown above. A stage of screen-grid R.F. is used ahead of a regenerative detector with S.G. tube, together with a powerful A.F. stage utilizing a 38 pentode.



For those who are not so well initiated in the building of short-wave sets, the editors have had the above picture-diagram especially made. Anyone who has the least knowledge of radio or electrical circuits can easily follow this diagram and should achieve splendid results.

A Balanced-Detector

By CLIFFORD E. DENTON

A novel super-regenerative receiver is here presented with constructional details by Mr. Denton, well-known to our readers for the many practical and outstanding short-wave receiver designs he has presented in the past. This particular receiver eliminates the usual tendency of the detector or super-regenerative tube breaking into self-oscillation and thus nullifying the super-regenerative action.

Tuning of the balanced-detector super-regenerator is made easy by the use of a National velvet vernier dial.

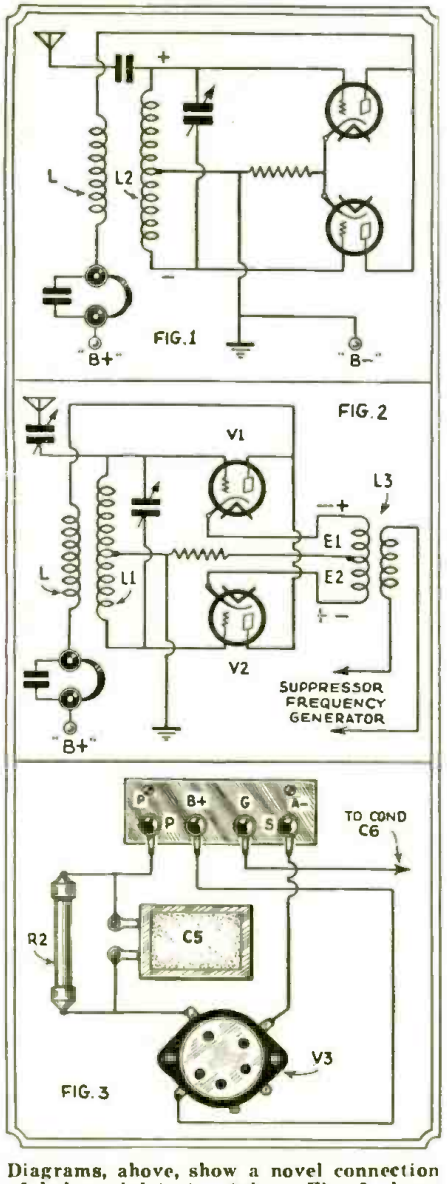
● ONE of the major difficulties encountered in operating receivers using super-regeneration is the action of the detector or super-regenerative tube when the circuit amplification is too high. Under this condition the tube breaks into self-oscillation and the super-regenerative action does not take place.

An interesting circuit was tried by the author which has the qualification of eliminating this tendency of self-oscillation in the Super-regenerative tube circuit. Here the tubes are used in a peculiar circuit. Note that the grid circuits are in push-pull and that the plate circuits are connected in parallel. A point in this circuit's favor is that of lowered plate impedance. The two plate circuits are in parallel so the impedance is half that of a single tube under the same operating conditions. This gives a more satisfactory match for phones and is more convenient when audio amplifiers are to be used to increase the output. It is hard to match tubes with transformers or a pair of phone so that the most satisfactory transfer of energy will take place under the normal operation of tubes as bias detectors.

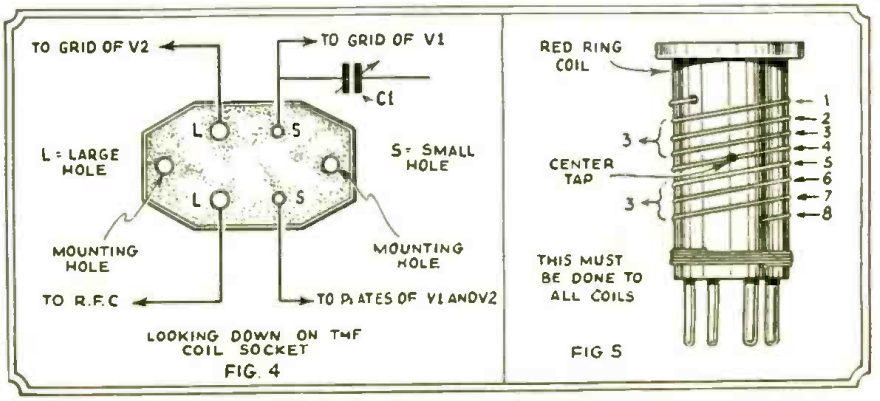
Breaking this circuit down so as to study it, let us look at Fig. 1. A radio signal applied in the ordinary manner will not cause a feed-back of energy into coil L2 from coil L because the grids are equal and opposite in phase and the plate currents will be constant. Placing a center-tapped coil in the cathode leads, as shown in Fig. 2, will act as a means of supplying the quenching frequency from the local oscillator. Tubes V1 and V2 should have the same approximate value of mutual conductance, as the action of the circuit is better when they are matched. This point is mentioned for the best results, though the circuit will work with tubes with mutual conductance variations of 25 to 30%. The closer the two tubes are matched the better will be the regenerative action.

The voltage output of the quenching frequency generator is supplied to the cathode circuits of the two detector tubes in opposite phase, as indicated in Fig. 2. This voltage developed by the local oscillator during one half of a cycle will increase the effective voltage on the grid of one detector tube and decrease the voltage on the grid of the other tube. With unequal voltages applied to the two grids there will be a change in the mutual conductances of both tubes as far as the signal frequencies are concerned, so that some feed-back will take place between L and L1 of Fig. 2. When the opposite half of the quenching frequency cycle appears across L3 it will cause a voltage in reverse phase, as shown in the dotted lines. Thus the two tubes are made unequal as far as their mutual conductances are concerned and some energy is fed-back, as stated above. This energy will be in reverse phase to that which flowed on the first half of the quenching frequency cycle.

As long as the quenching frequency generator is functioning there will be a regenerative and *degenerative* feed-back action from the coil L to coil L1. Now the value of the two feed-backs are equal, so all of the energy that may be present in the feed-back coil during the period of regeneration will be nullified during the *degenerative* period. This degenerative action will throw the circuit out of oscillation even though the values of the two feed-backs are equal, due to the resistance of the circuit, which aids the quenching action



Diagrams, above, show a novel connection of balanced-detector tubes; Fig. 3 shows hook-up of apparatus to Acme 30 K.C. transformer.



Diagrams, above, show the proper coil socket connections at Fig. 4; Fig. 5 above, how the center tap is soldered to the plug-in coils.

Super-Regenerative Receiver

of the *degenerative* portion of the cycle and tends to prevent the regenerative portion from building up to values which would cause self-oscillation in the circuit.

Construction Details

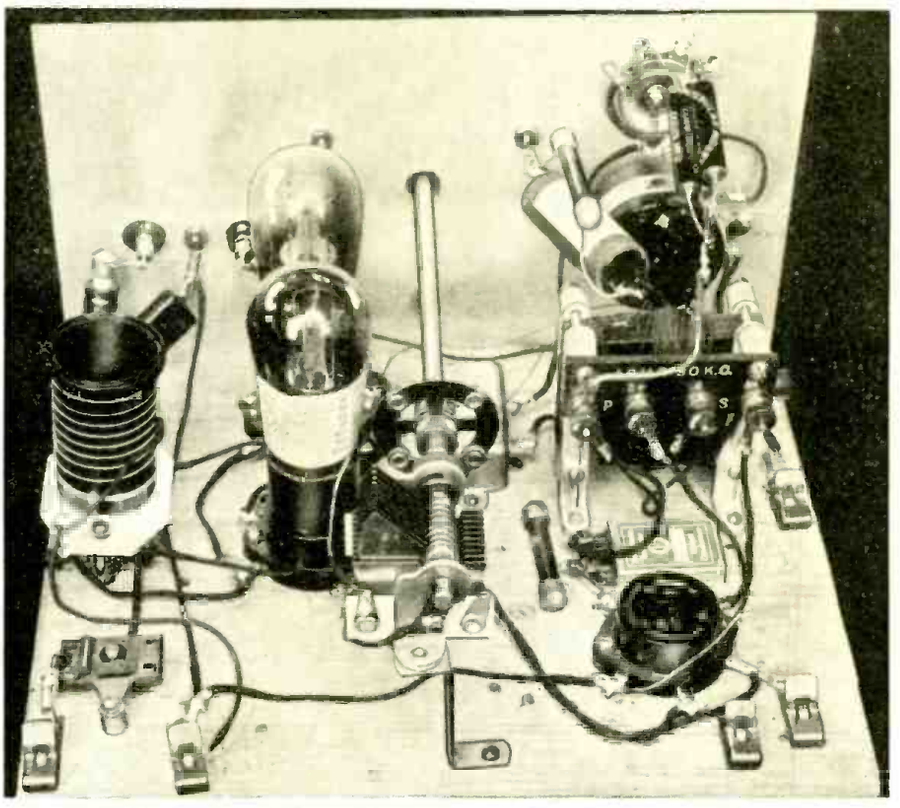
The construction of the set is shown in the photographs and should offer no trouble to the builder. A wooden baseboard is used with an aluminum front panel so that hand-capacity effects are reduced to a minimum.

Parts mounted on the front panel include the phone terminal block, oscillator frequency selector switch and the oscillator power control. Of course the tuning dial is placed in the center of the panel with a rod of sufficient length to reach the tuning condenser coupling unit. The rest of the parts are mounted on the chassis with wood screws or are held in place by the wiring. The photographs should furnish the builder with all information necessary to duplicate the original set.

A winding must be placed on the core of the Acme transformer. This consists of 120 turns of No. 28 silk covered wire. Loosen the two top machine screws holding the core in place and slide the L shaped section out of the frame. Random-wind 60 turns of wire and then leave a 6 inch long loop. This loop will serve as the center tap connection of the oscillator pick-up winding. Then continue with the additional 60 turns, which will give the required number of turns.

Wiring

Run all wires directly to their points of connection. Do not try for looks, but for results! *Make all connections clean ones.* Poorly soldered connections make receivers noisy especially if they are high-gain short-wave receivers.



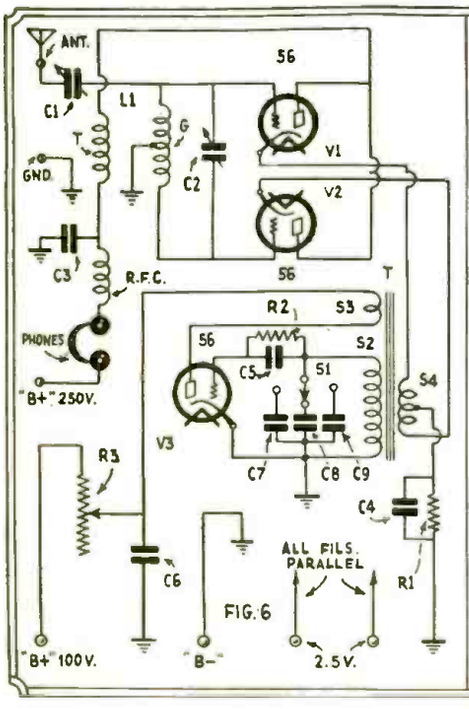
Rear view of Mr. Denton's latest short-wave receiver—the balanced-detector super-regenerator; the third tube has been left out of the socket at the right for clarity.

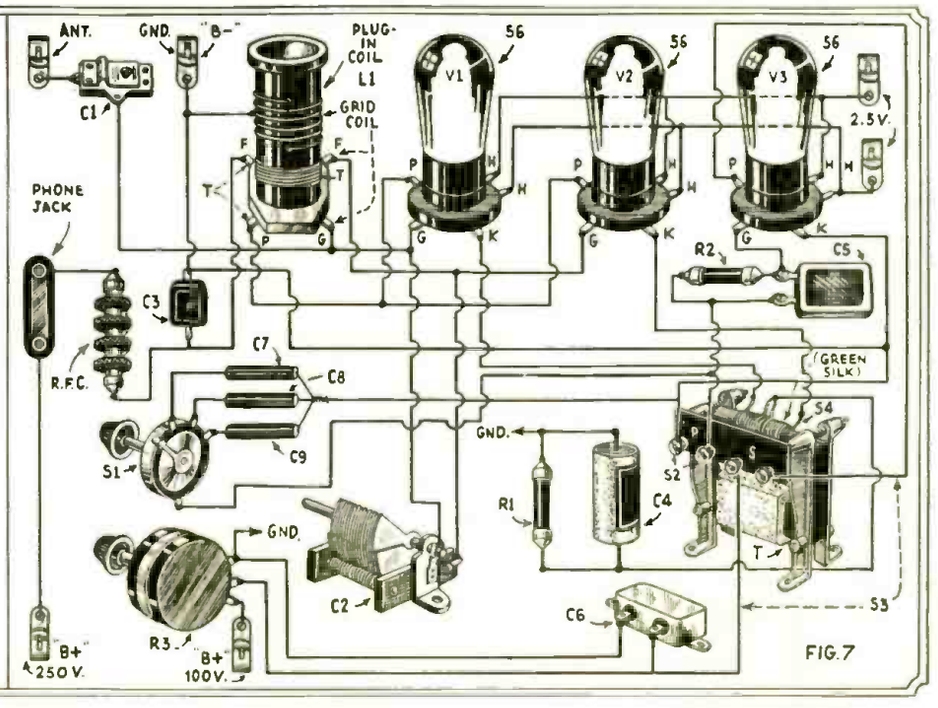
When making the special connections to the Acme transformer follow the detail wiring diagram of Fig. 3. If the diagram is followed correctly there will be no difficulty in getting the tube to oscillate. Figure 4 shows the proper coil socket connections. *Remember that the tube tends to go into oscillation only when the local oscillator is working.*

Operation

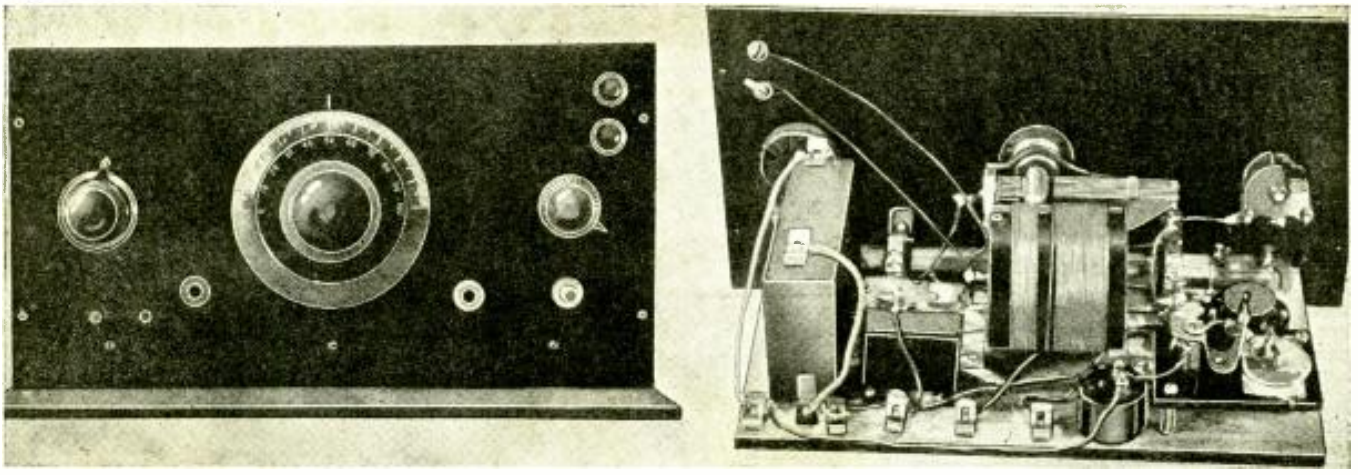
The set is placed into operation by connecting a power supply unit that will give the required voltages. The author used the power supply unit described on page 82 of the June, 1932, issue of SHORT WAVE CRAFT. This unit

(Continued on page 571)





Schematic and picture diagrams are presented above, so that the uninitiated as well as the experienced short-wave fan can build this latest creation of Mr. Denton's—a super-regenerator receiver with halanced detector.



Photos above show front and rear of the author's crystal controlled oscillator.

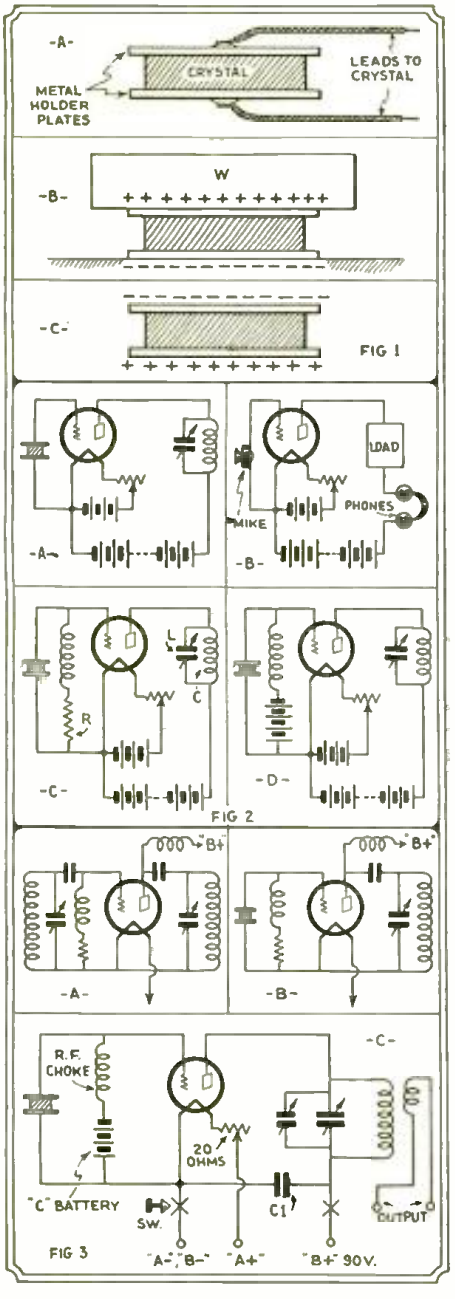


Fig. 1 (top)—Fundamentals of piezoelectric effect. Fig. 2 (center) shows various applications of quartz crystals. Fig. 3—Tuned grid circuits; (C) that of the crystal oscillator shown in photos.

Crystal Oscillators and Crystal Control

By A. BINNEWEG, Jr.

● WHEN a natural quartz crystal is cut in a definite way with parallel faces, and is sufficiently thin, it will oscillate at a radio frequency. Such a crystal can be used to control the frequency of a vacuum-tube oscillator.

The internal structure of a quartz plate is such that when a pressure exists between the parallel surfaces, a positive charge appears on one surface and a negative charge on the opposite surface, as shown in Fig. 1B, which illustrates this fact clearly. A weight, W, is placed upon the crystal; this exerts a pressure on it causing the appearance of the charges shown. If the weight is suddenly removed, the crystal will expand, passing through the "neutral position" and at some instant, charges will be reversed as shown in Fig. 1C. In order to use the crystal in a vacuum-tube crystal oscillator, it must be provided with a holder consisting of a pair of metal plates, as shown in Fig. 1A. A simple holder would consist of two metal plates held to the crystal by means of a rubber band. The frequency at which the crystal oscillates depends upon its dimensions.

Suppose that such a plate is carefully cut to oscillate at a radio frequency. The frequency at which it will oscillate will be remarkably steady, changing slightly with the temperature. However, the change in frequency with change in temperature is not considered of great importance in this discussion.

Figure 2A shows a mounted crystal connected to a vacuum tube. This looks good and shows the essential connections, but it won't work. It is something like the connection of Fig. 2B in this respect. Fig. 2C is the same as Fig. 1A, except that a small R.F. choke and a resistance have been connected across the crystal. This circuit will operate provided the tuned circuit, LC, is tuned to the frequency of the crystal. When the circuit LC is not tuned to the natural vibrating frequency of the crystal, no electronic "kicks" are passed back through the tube to keep the crystal going. The feedback through the grid-plate capacity must be sufficient to supply the grid circuit losses and keep the circuit oscillating. Fig. 2D is a more practical arrangement. The resistance R of Fig. 2C has been replaced by a suitable battery.

The action of a crystal oscillator is not difficult to understand. To those who know anything about oscillators, Fig. 3A is familiar; it is a tuned plate tuned grid oscillating circuit. If its action is understood, the operation of Fig. 3B is also understood. This circuit is the same as Fig. 3A, except that the grid electrical oscillating circuit has been replaced by a mechanical one. The frequency of the crystal cannot, of course, be varied. It is similar to a coil shunted by a fixed condenser. Figure 3C gives the connections of the crystal oscillator shown in accompanying photographs. This oscillator is suitable for use in the engineer's laboratory.

Practical Crystal Oscillators

When building up a practical set, there are certain factors which must be considered. A crystal oscillator of the type to be described can be used for many different purposes. Its first use is to furnish a fundamental oscillation of constant frequency, and harmonics thereof. Ordinarily, the frequency furnished is sufficiently steady without the use of any temperature-control boxes as are commonly used in transmitting stations, where the frequency must be maintained at an extremely steady value. The frequency furnished by a dynatron oscillator compares favorably with that of a crystal oscillator without temperature control, provided the space

(Continued on page 572)

The Short-Wave Beginner

BY C. W. PALMER **No. 7 of a Series. A Power Unit and Pentode Amplifier**

● THE last change that we made to our *Beginner's Set* was the addition of a second tube to amplify the sounds. We learned how a tube could be used to increase the volume of programs. At that time, we also promised to explain how to make a *second amplifier* to give full rounded loudspeaker tones on even distant stations.

In making the latter amplifier, which is usually called a "power amplifier," we need much higher "B" battery voltages than we have used up to now. As an economy measure and also to do away with the batteries which will require replacement after a short time, we will combine a power supply unit with our power amplifier. This power supply unit is plugged into the alternating current electric light line and changes the alternating current to direct current.

To make this change, a "rectifier tube" is used. This type of tube will only pass a current in one direction, so that as the direction of the alternating current reverses, the current passing through the tube is all in one direction. This current, however, is not steady, but keeps increasing and decreasing in voltage. We must use some means of steadying this current or the variations will affect the operation of our receiver.

We will remember that a condenser stores electricity; so, if we connect condensers correctly to the rectifier tube, they will store electricity when the voltage increases and supply current when the voltage decreases. This action of current keeps the voltage constant.

In addition to the rectifier tube and the condensers, we will need a transformer, to change the voltage of the 110 volt electric light line to the high

An amplifier to give full loudspeaker volume and a power unit that will be used to supply all the power for the set.

voltage needed for the "B" supply and the low voltage required to light the filaments of the tubes. Several other parts are needed which we will describe as we come to them.

Constructing the Unit

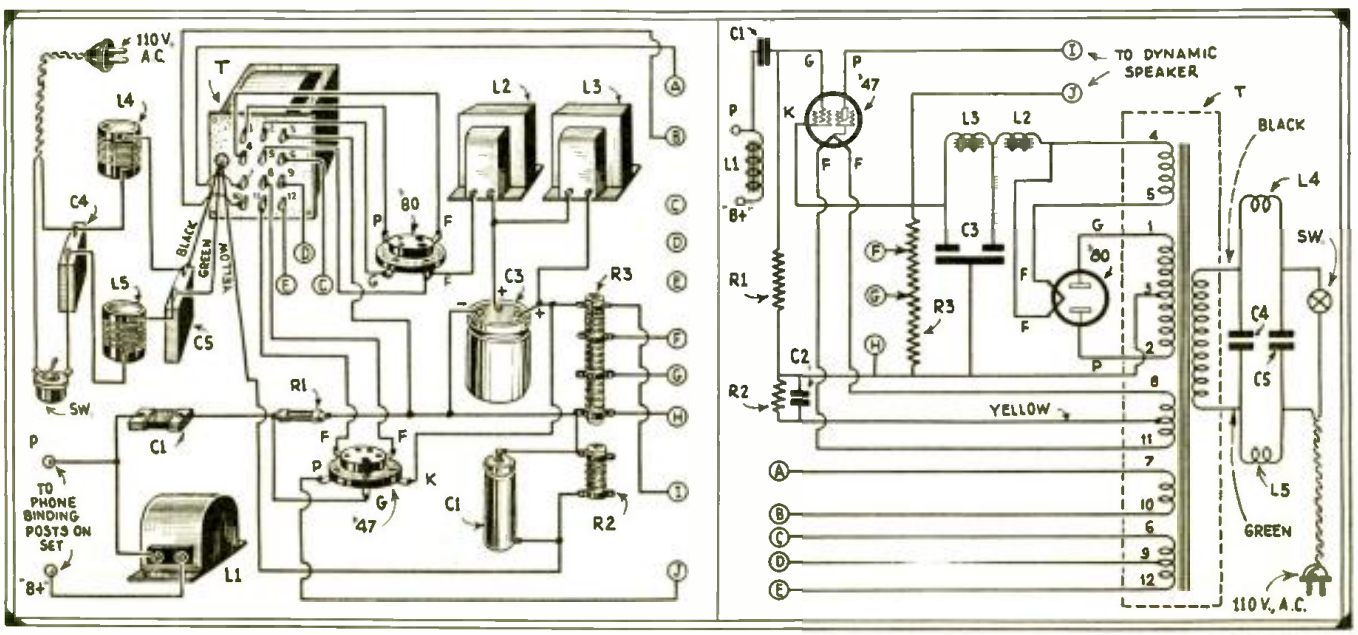
First, we must obtain all the parts needed for our unit. These are listed below:

1—Power Transformer—Thordarson type T1450.
2—30 Henry Choke Coils—Thordarson type T1442.
1—500 Henry Choke Coil—Kenyon type BC5000.
1—Dry Electrolytic Condenser (8 mf. in each of two sections)—Concourse type M-16.
1—Dry Electrolytic Condenser (10 mf.) Concourse type A-10.
2—2 mf. filter condensers—Polymet type 261.
1—.01 mf. fixed condenser—Polymet type C-674.
1—15,000 ohm Voltage Divider—Electrad.
1—500,000 ohm resistor—Polymet (1 watt size).
1—4 prong Tube Socket—Alden.
1—5 prong Tube Socket—Alden.
1—80 Rectifier Tube—Triad.
1—47 Pentode Tube—Triad.
1—Grid-Leak type, Resistor Mt'g.
1—Power Toggle Switch.
¼ lb. Bell Wire (No. 18).
2 pieces of bakelite tubing, 2 inches in diameter and 3 inches long.
1—Wooden baseboard—15 inches by 8 inches by 1 inch.
12—Binding posts—Eby Junior.
1—Roll hook-up wire.
1—10 foot piece of flexible electric light cord and a plug.

Mount the parts on the wooden baseboard in the positions as illustrated. You will notice that the power transformer is shown on its side, to show how the connections are made to the contacts on the bottom. The coils L4 and L5 are choke coils to prevent noises from entering the set through the electric light lines. They consist of 50 turns of bell wire (No. 18 double cotton covered wire) wound on the pieces of 2 inch diameter tubing. The remainder of the wiring is clearly indicated. Three leads pass through a hole in the bottom of the power transformer. They are colored black, green, and yellow. The black and green leads are connected to the power line through the coils that we just mentioned.

The yellow wire is fastened to a piece of hook-up wire and run to the lower side of the 450 ohm resistor. Contacts 1 and 2 on the transformer are wired to P and G on the 80 tube socket, respectively. Number 3 contact is connected to the bottom of R3; Nos. 4 and 5 are soldered to the F contacts on the 80 tube socket; contact No. 6 is connected to the binding post marked E; No. 7 contact is wired to the binding post A; No. 8 and No. 11 contacts on the transformer connect to the two F posts on the 47 tube socket; No. 9 is wired to binding post D; No. 10 connects to post B and No. 12 is soldered to post C. These are the difficult parts of the wiring. With the experience we have had thus far with our short wave receiver, we should have no difficulty in wiring the power unit.

(Continued on page 563)



Schematic and picture diagrams showing how to build power unit and pentode amplifier for S-W beginner's set previously described.

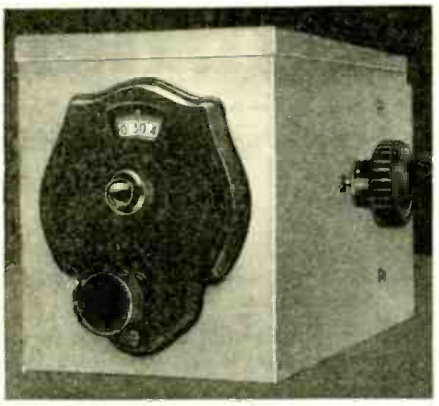


Fig. A—A neat stage of tuned radio-frequency amplification.

How to Add R. F. to

By A. BINNEWEG, JR.*

Adding Radio-Frequency Amplification. How to Make R. F. Tuning Coils. How to Adjust R. F. Tuning Coils. How to Make R. F. Choke Coils. How to Add an Untuned R. F. Stage to Any Set. How to Add a Tuned R. F. Stage to Any Set. How to Use R. F. and Audio Pentode Tubes.

● MANY readers of SHORT-WAVE CRAFT have undoubtedly by this time heard stations from nearly every other part of the world on the two-tube receiver described by the author in the December issue of this magazine. Receivers of this kind have proved extremely popular.

The purpose of this article is to give further information on this most popular receiver, for extending its usefulness, increasing its power to bring in distant stations, and "stepping up" the volume. Although intended primarily as a supplement to the previous article, it contains useful information that can be applied to any existing sets.

For example, it shows how to add either a tuned or an untuned stage of radio-frequency amplification to any existing receiver, together with all the constructional and coil-winding information, how to change from D.C. to A.C. tubes, how to use R.F. and audio pentodes, and much other valuable information which any set constructor or prospective set constructor cannot afford to miss.

Short-Wave "Radio-Frequency" Amplifiers

Although ordinary three-element tubes have been known to function fairly well at wave-lengths of the order of 80 meters, in tuned radio-frequency amplifier circuits, yet it may be stated as a general rule that, for any noticeable gain on short waves, it is necessary to use *screen-grid* tubes. In other words, do not attempt the construction of a radio-frequency amplifier employing ordinary three-element tubes. This is mentioned for the benefit of "newcomers" to short waves.

Untuned or Tuned R.F. Amplifiers?

Because selectivity is not the primary consideration in the design of the average short-wave regenerative receiver, untuned stages of R.F. amplification are often used ahead of the detector. However, the amplification afforded by an *untuned R.F. stage is small, compared with that given by a tuned stage.* Any kind of an R.F. stage ahead of a regenerative detector reduces radiation, so that such a stage, even if untuned, has other advantages. For the sake of brevity, radio-frequency amplification is referred to as simply "R.F. amplification."

Building an Untuned R. F. Amplifier

Figures 1 and 2 show the connections for an untuned stage of radio amplification which can be added ahead of any receiver if the proper voltages are applied to the tube used. The two chokes used are similar and are constructed as described later in this article. This amplifier can be added ahead of the Binneweg receiver arrangement described in December SHORT-WAVE CRAFT, or it can be connected ahead of *any regenerative short-wave receiver*, provided a small coupling condenser (constructed of 2 small stiff metal plates, 1" square, and separated ⅛") is used, as described in the writer's December article.

The reason for adding the untuned stage is to get more DX (distance) and to reduce detector radiation. Another good reason is that, by adding a socket and a set of plug-in coils, a tuned stage will result, and give a good gain in volume on DX stations. Thus, the experimenter can add the untuned stage first, and, at little expense or effort, change it to a tuned stage. A tuned stage of R.F. adds one more control but the results are so much better that this is a worthy feature.

Tuned R.F. Amplifiers

Since there is considerable advantage in a tuned radio-frequency amplifier,

*Short Wave Radio Engineer, Delft Radio Company.

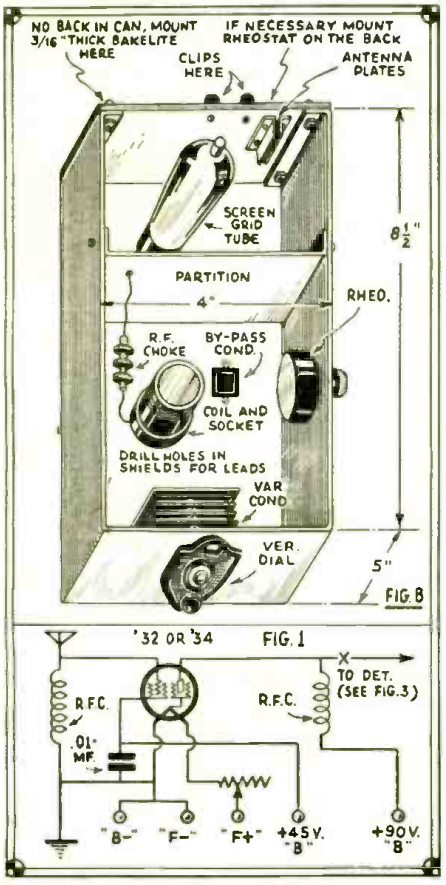


Fig. B, above, shows author's suggested arrangement of shielded R.F. stage. Fig. 1—Simple R.F. stage hook-up.

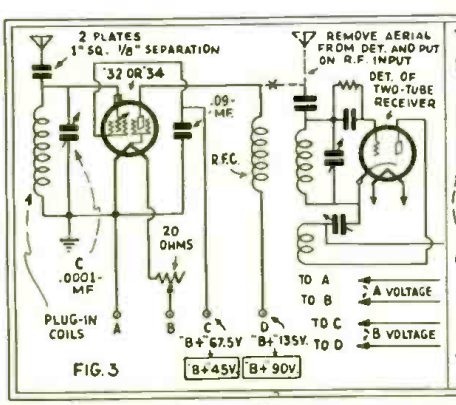


Fig. 3. Circuit of tuned R.F. amplifier; the "B" battery voltages indicated should be used, if only 90 volts of "B" is available. All R.F. amplifiers described are coupled to the detector in the same way.

Fig. 4. A 3-tube set employing a tuned stage of radio frequency amplification, detector, and 1 stage of transformer-coupled audio frequency amplification. Two volt tubes are here employed.

Any S.-W. Receiver

the construction will be described in detail. The circuit to be discussed is shown in Fig. 3, at the left. To the right is shown the input of the Binneweg receiver. The small coupling condenser is required for connecting this R.F. amplifier ahead of any short-wave receiver.

Adding Tuned Radio Frequency Amplification to Your Present Receiver

To make this article of benefit to all who constructed that set, as well as to any others interested in adding tuned R.F. amplifiers to their sets, several combinations will be considered.

If you used two-volt tubes in your set, the following applies to your set in particular. (However, if you use separate filament batteries on the R.F. amplifier, you can use a type 34 pentode, no matter what kind of tubes are used in the rest of the set.)

It will be noticed that the above list also applies to the construction of an untuned stage if the proper omissions and admissions are made as indicated in the Parts List itself. The parts can be purchased from advertisers in SHORT WAVE CRAFT. The particular coils used must match the coils in the detector circuits, and should be made as the specifications call for.

In Fig. 3, the choice of a type 32 or 34 tube is indicated. If you have the 32 tube already, use it. If you have not purchased the tube, purchase a Type 34 tube. Both the 32 and 34 tubes require a four-prong socket; although the 34 is a two-volt *pentode*, the extra (suppressor) element is connected inside the tube, so that the same socket can be used. The 34 tube operates very efficiently at relatively low plate voltages. The plate voltage may be greater, equal to, or even less than the screen voltage. The filament current is only 60 milliamperes.

A complete circuit employing one stage of tuned R.F., detector and a transformer-coupled stage of audio, is shown in Fig. 4. This circuit is for two-volt tube operation. One 10-ohm rheostat controls the filament voltage of all three tubes. Two No. 6 dry cells supply the filament current for the entire set. For detailed information on the theory and operation features of a three-tube set of this kind, the reader is referred to an article in November S.W.C. by Mr. Doerle, describing the operation of a "Signal Gripper" set.

Parts Required for Untuned and Tuned R.F. Stages

1 Pilot .0001 mf. midget variable condenser (omit if untuned stage is desired).
1 Set of three R.F. coils, range 15 to 125 meters with .0001 mf. condenser. (For the 100 to 200 meter range, get one more coil) (omit coils if untuned stage is desired.)
1 Set of Antenna plates
2 UX sockets (omit one of these if untuned stage is desired.) Alden.
1 .01 mf. by-pass condenser
1 R.F. choke coil. Constructed as described, or purchased. (Make two chokes, if untuned amplifier is desired.)
1 20-ohm rheostat
7 Fahnstock clips
1 7" x 9" Panel (necessary for the arrangement of Fig. C only)
1 9" x 10" Baseboard (necessary for the arrangement of Fig. C only).
1 Shield Box (if you desire the Fig. C arrangement, a 4½" x 4½" x 5" high, box (dimensions are not critical), will be required.) Note: for the arrangement of Fig. A, have your tinsmith make a can to the dimensions of Fig. B; this can is a special size which was purchased from Delft Radio Co.
Wood screws (for Fig. C), machine screws, and nuts.

Adding an R.F. Stage to a Storage Battery Set.

If you use type 01A tubes (or other 5-volt tubes such as the 12A which operate from a storage battery), it will be perhaps better to use the circuit arrangement of Fig. 5. You could use either a 22 or a 39 R.F. pentode. If you have a 22 tube, use it; otherwise the 39 tube will give very good results. If a 22 tube is used, use the circuit of Fig. 4 (with the proper filament voltage for the storage battery tubes, of course). It must also be noted that the filament voltage of a type 22 tube is 3.3 volts. The circuit of Fig. 4 will apply exactly, except that a storage battery is connected to the "A" terminals, and a resistor must be used to drop the filament voltage to the correct value. The most practical way of reducing the filament voltage for this tube is to insert a 20-ohm rheostat at the point "X" in Fig. 4. (Point "X" can be unmistakably identified in this diagram by the arrow pointing to it.)

(Continued on page 559)

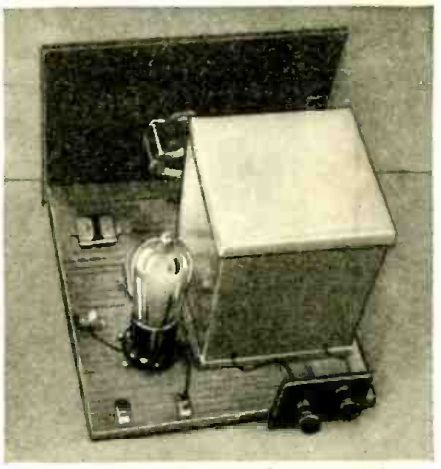


Fig. C—Rear view of R.F. Amplifier.

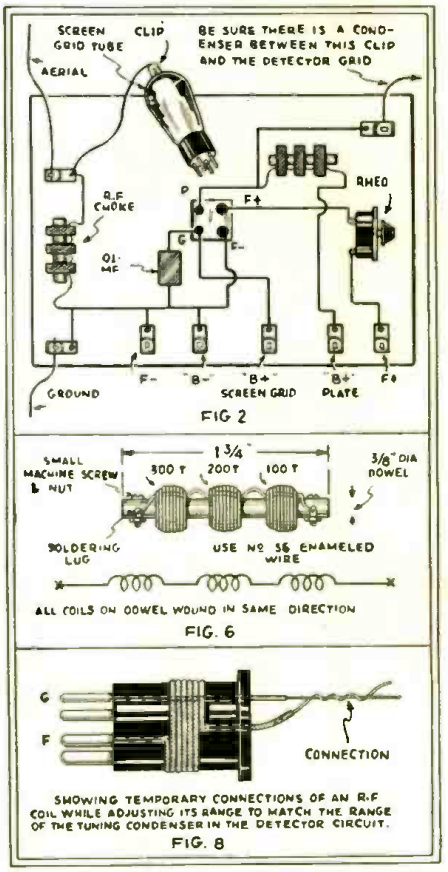


Fig. 2, above, shows base-board layout for an untuned stage of R.F. Fig. 8—Connections of R.F. coil while "matching" it.

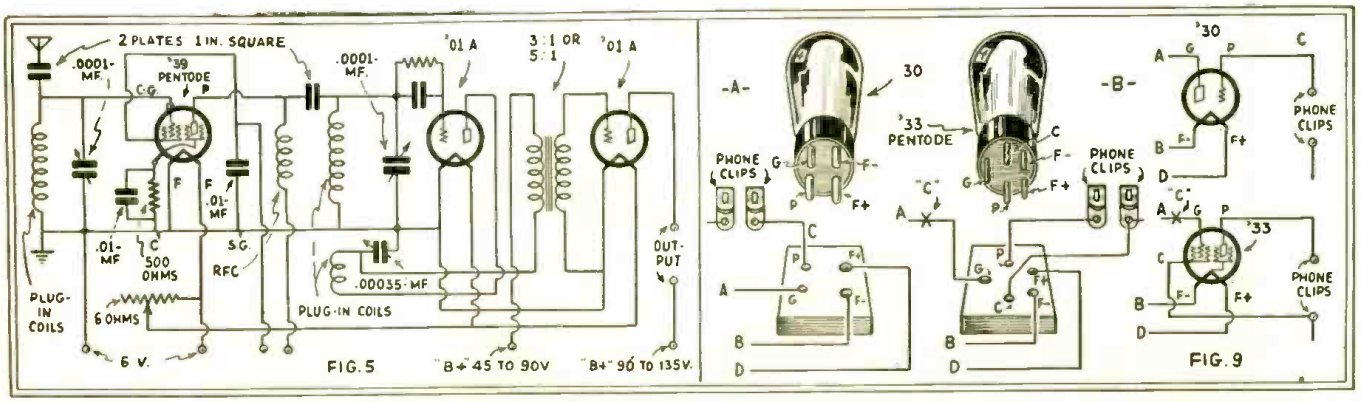


Fig. 5, above, shows 3-tube R.F., detector, and one A.F. stage hook-up for use with type '01A tubes. Fig. 7—the coils for use in the tuned R.F. stage are wound on forms as shown.

Fig. 9, above, illustrates the circuit changes necessary when converting the last audio stage for use with a pentode. Grid and plate elements reversed at B in error.

SHORT WAVE STATIONS OF THE WORLD

ALL SCHEDULES EASTERN STANDARD TIME: ADD 5 HOURS FOR GREENWICH MEAN TIME

Short Wave Broadcasting Stations

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
13.93	21.540	W8XK	Westinghouse Electric, East Pittsburgh, Pa. 7:30 a. m.-noon.
15.93	18.830	PLE	Bandoeng, Java. Wednesdays, 4:00-8:00 a.m.
16.87	17.780	W3XAL	National Broadcasting Co., Bound Brook, N. J.
		W9XF	Downers Grove, Ill.
19.56	15.330	W2XAD	General Electric Co., Schenectady, N. Y. Broadcasts 3-6 p.m. daily; 1-6 p.m. Sat. and Sunday.
19.65	15.270	W2XE	Wayne, N. J.
19.68	15.240	FYA	"Radio Colonial," Pontoise (Paris), France. Service de la Radiodiffusion, 103 Rue de Grenelle, Paris. Daily 8:30-10:00 a.m.
19.72	15.210	W8XK	Westinghouse Electric & Mfg. Co., East Pittsburgh. 7:30 a. m. to 5 p.m.
		DJB	For address, see listing for DJA. Mondays, 10-11 p.m.
19.83	15.120	HVJ	Vatican City (Rome, Italy) Daily 5:00 to 5:15 a.m.
		JIAA	Tokio, Japan. Irregular.
19.99	15.000	CM6XJ	Central Tuinucu, Cuba. Irregular.
20.50	14.620	XDA	Trens-News Agency, Mexico City, 2:30-3 p.m.
20.95	14.310	G2NM	Gerald Marcuse, Sonning-on-Thames, England. Sundays, 1:30 p.m.
21.50	13.910	.....	University of Bucharest, Bucharest, Roumania. 2-5 p.m., Wed., Sat.
23.35	12.850	W2XO	General Electric Co., Schenectady, N. Y. Antipodal program 9 p.m. Mon. to 3 a.m. Tues. Noon to 5 p.m. on Tues., Thurs. and Sat.
		W2XCU	Ampere, N. J.
		W9XL	Anoka, Minn., and other experimental relay broadcasters.
23.38	12.820	.....	Director General, Telegraph and Telephone Stations, Rabat, Morocco. Sun., 7:30-9 a.m. Daily 5-7 a.m. Telephony.
25.16	11.905	FYA	"Radio Colonial," Pontoise (Paris). See listing for 19.68 meters. Daily 1:00-2:00 p.m.
25.21	11.880	W9XF	National Broadcasting Co., Downers Grove (Chicago), Ill. 9-10 p.m. daily.
25.26	11.870	VUC	Calcutta, India. 9:45-10:45 b.m.; 8-9 a.m.
		W8XK	Westinghouse Electric, East Pittsburgh, Pa. 4-10 p.m.
25.34	11.840	W9XAO	Chicago Federation of Labor, Chicago, Ill. 7-8 a.m., 1-2, 4-5:30, 6-7:30 p.m.
25.36	11.830	W2XE	Wayne, N. J.
25.4	11.810	I2RO	"Radio Roma Napoli," Rome, Italy. Daily, 11:30 a.m. to 12:15 p.m. and 2:00-6:00 p.m. Sunday, 11:00 a.m.-12:15 p.m.
25.42	11.800	VE9GW	W. A. Shane, Chief Engineer, Bowmanville, Canada. Daily, 1-4 p.m.
25.45	11.790	WIXAL	Boston, Mass.
25.47	11.780	VE9DR	Drummondville, Quebec, Canada. Irregular.
25.50	11.760	XDA	Trens-News Agency, Mexico City. 3-4 p.m.
25.53	11.750	G5SW	British Broadcasting Corporation, Chelmsford, England. Programs: 6:30-7:30 a.m. and 12:15-6 p.m. News: 6:30 a.m. and 12:15-6:00 p.m. Transmits every day except Sunday.
		VE9JR	Winnipeg, Canada. Weekdays, 5:30-7:30 p.m.
25.6	11.705	FYA	"Radio Colonial," Pontoise (Paris). See listing for 19.68 meters. Daily, 3:00-7:00 p.m.
29.30	10.250	T14	Amondo Cespedes Marin, Heredia, Costa Rica. Mon. and Wed., 7:30 to 8:30 p.m.; Thurs. and Sat., 9:00 to 10 p.m.
30.4	9.860	EAQ	Transradio Espanola, Alcala 43-Madrid, Spain. (P. O. Box 951). Daily for America, 6:30-8:00 p.m.; for Europe and Canaries on Saturdays only, 1:00-3:00 p.m.
31.10	9.640	HSP2	Broadcasting Service, Post And Telegraph Department, Bangkok, Siam. 9-11 a.m., daily.
31.28	9.590	VK2ME	Amalgamated Wireless, Ltd., Sydney, Australia. Sun., 1-3 a.m., 5-9 a.m., 9:30-11:30 a.m.
31.30	9.580	W3XAU	Byberry, Pa., relays WCAU daily.
31.33	9.570	WIXAZ	Westinghouse Electric & Mfg. Co., Springfield, Mass., 6 a.m.-10 p.m daily.
		SRI	Poznan, Poland, Tues., 1:45-4:45 p.m., Thurs., 1:30-8 p.m.
31.38	9.560	DJA	Reichspostzentralamt, 11-15 Schoenberge Strasse (Berlin), Konigswusterhausen, Germany. Daily, 8 a.m.-7:30 p.m.
31.48	9.530	W2XAF	General Electric Co., Schenectady, N. Y., 5-11 p.m. Daily.
31.49	9.520	OXY	Skamleboek, Denmark, 2-7 p.m. daily.
31.55	9.510	VK3ME	Amalgamated Wireless, Ltd., 167-169 Queen St., Melbourne, Australia. Wed. 5:00-6:30 a.m., Sat. 5:00-7:00 a.m.
31.58	9.500	PRBA	Radio Club of Brazil, Rio de Janeiro. 4:30 p.m. to about 8:00 p.m.
31.70	9.460	.....	Radio Club of Buenos Aires, Argentina.
32.00	9.375	EH9OC	Berne, Switzerland, 3-5:30 p.m.
32.26	9.290	.....	Rabat, Morocco, 3-5 p.m. Sunday, and irregularly weekdays.
35.00	8.570	RV15	Far East Radio Station, Khabarovsk, Siberia. 5-7:30 a.m.
38.6	7.790	HBP	League of Nations, Geneva, Switzerland. 3-8 p.m., irregular.
39.80	7.530	.....	"El Prado," Riobamba, Ecuador. Thurs., 9-11 p.m.
40.00	7.500	.....	"Radio-Touraine," France.
40.20	7.460	YR	Lyons, France. Daily except Sun., 10:30 to 1:30 a.m.
40.50	7.410	.....	Eberswalde, Germany. Mon., Thurs., 1-2 p.m.
40.70	7.370	X26A	Nuevo Laredo, Mexico. 9-10 a.m.; 11 a.m.-noon; 1-2; 4-5; 7-8 p.m. Tests after midnight. I.S.W.C. programs 11 p.m. Wed. A.P.31.
40.90	7.320	ZTJ	Johannesburg, So. Africa. 9:30 a.m.-2:30 p. m.
41.46	7.230	DOA	Doberitz, Germany.
41.50	7.220	HB9D	Zurich, Switzerland. 1st and 3rd Sundays at 7 a.m., 2 p.m.

(NOTE:—This list is compiled from many sources, all of which are not in agreement, and which show greater or less discrepancies; in view of the fact that most schedules and many wavelengths are still in an experimental stage; and that wavelengths are calculated differently in many schedules. In addition to this, one experimental station may operate on any of several wavelengths which are assigned to a group of stations in common. We shall be glad to receive later and more accurate information from broadcasters and other transmitting organizations, and from listeners who have authentic information as to calls, exact wavelengths and schedules. We cannot undertake to answer readers who inquire as to the identity of unknown stations heard, as that is a matter of guesswork; in addition to this, the harmonics of many local long-wave stations can be heard in a short-wave receiver.—EDITOR.)

41.67	7.195	VSIAB	Singapore, S. S. Mon., Wed. and Fri., 9:30-11 a.m.
42.00	7.140	HKX	Bogota, Colombia.
42.70	7.020	EAR125	Madrid, Spain. 6-7 p.m.
42.90	6.990	CTIAA	Lisbon, Portugal. Fridays, 5-7 p.m.
43.60	6.875	F8MC	Casablanca, Morocco. Sun., Tues., Wed., Sat.
46.10	6.480	TGW	Guatamala City, Guat. 8-10 p.m.
46.70	6.425	W9XL	Anoka, Minn.
46.70	6.425	W3XL	National Broadcasting Co. Bound Brook, N. J. Relays WJZ. Irregular.
46.72	6.420	RV62	Minsk, U.S.S.R. Irregular.
47.00	6.380	HCIDR	Quito, Ecuador. 8-11 p.m.
47.35	6.335	VE9AP	Drummondville, Canada.
		CN8MC	Casablanca, Morocco. Mon. 3-4 p.m., Tues. 7-8 a.m., 3-4 p. m. Relays Rabat.
47.81	6.270	HKC	Bogota, Colombia. 8:30-11:30 p.m.
48.00	6.250	HKA	Barranquilla, Colombia. 8-10 p.m. ex. Mo., Wed., Fri.
48.62	6.170	HRB	Tegucigalpa, Honduras. Monday, Wednesday, Friday, Saturday 5-6 p.m. and 9-12 p.m.
48.86	6.140	W8XK	Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. 5 p.m.-midnight.
48.99	6.120	W2XE	Columbia Broadcasting System, 485 Madison Avenue, New York, N. Y. 7:00 a.m. to midnight.
		FL	Eiffel Tower, Paris. 5:30-5:45 a.m., 5:45-12:30, 4:15-4:45 p.m.
49.10	6,110	VE9CG	Calgary, Alta., Canada.
49.15	6,100	W3XAL	National Broadcasting Company, Bound Brook, N.J., Irregular.
		VE9CF	Halifax, N. S., Canada. 6-10 p.m., Tu., Thu., Fri.
49.17	6,095	VE9GW	Bowmanville, Ontario, Canada. 5:00 p.m. to midnight.
49.18	6,100	W9XF	Downers Grove, Ill.
49.31	6,080	W9XAA	Chicago Federation of Labor, Chicago, Ill. 6-7 a.m., 7-8 p.m., 9:30-10:15, 11-12 p.m. Int. S.-W. Club programs. From 10 p.m. Saturday to 6 a.m. Sunday.
49.40	6,070	VE9CS	Vancouver, B. C., Canada. Fridays before 1:30 a.m. Sundays, 2 and 10:30 p.m.
		JB	Johannesburg, South Africa. 10:30 a.m.-3:30 p.m.
49.46	6,065	SAJ	Motala, Sweden. 6:30-7 a.m., 11 a.m. to 4:30 p.m
49.50	6,060	W8XAL	Crosley Radio Corp., Cincinnati, O. Relays 6:30-10 a.m., 1-3 p.m., 6 p.m. to 2 a.m. daily. Sunday after 1 p. m.
49.50	6,060	VQ7LO	Imperial and International Communications, Ltd., Nairobi, Kenya, Africa. Monday, Wednesday, Friday, 11 a.m.-2:30 p.m.; Tuesday, Thursday, 11:30 a.m.-2:30 p.m.; Saturday, 11:30 a.m.-3:30 p.m.; Sunday, 11 a.m.-1:30 p.m.; Tuesday, 3 a.m.-4 a.m.; Thursday, 8 a.m.-9 a.m.
		W3XAU	Byberry, Pa. Relays WCAU.
49.59	6,050	VE9CF	Halifax, N. S., Canada. 11 a.m.-noon, 5-6 p.m.. On Wed., 8-9; Sun., 6:30-8:15 p. m.
		HKD	Barranquilla, Columbia.
49.67	6,040	PK3AN	Sourabaya, Java. 6-9 a.m.
		W4XB	Lawrence E. Dutton, care Isle of Dreams Broadcast Corp., Miami Beach, Fla.
49.75	6,030	VE9CA	Calgary, Alta., Canada.
49.96	6,005	VE9DR	Canadian Marconi Co., Drummondville, Quebec. 6-10 p.m. daily.
49.97	6,000	YV2BC	Caracas, Venezuela. 7:45-11 p.m. daily ex. Mon.
		.....	Eiffel Tower, Paris, France. Testing, 6:30 to 6:45 a.m.; 1:15 to 1:30, 5:15 to 5:15 p.m., around this wave.
		VE9CU	Calgary, Canada.
49.97	6,000	.....	Administration des P. T. T., Tananarive, Madagascar. Tues., Wed., Thurs., Fri., 9:30-11:30 a.m. Sat and Sun., 1-3 p.m.
50.26	5,970	HVJ	Vatican City (Rome), 2-2:15 p.m., daily. Sun., 5-5:30 a.m.
50.80	5,900	HKO	Medellin, Colombia, 8-11 p.m., except Sunday.
51.40	5,835	HKD	Barranquilla, Colombia, 7:45-10:30 p.m., Mon., Wed., 8-10:30 p.m.; Sunday, 7:15-8:30 p.m. Elias J. Pellet.
52.50	5,710	VE9CL	Winnipeg, Canada.
54.02	5,550	W8XJ	Columbus, Ohio.
58.00	5,170	OKIMPT	Prague, Czechoslovakia 1-3:30 p.m., Tues. and Fri.
		PMY	Bandoeng, Java.
		PMB	Sourabaya, Java.
60.30	4,975	W2XV	Radio Engineering Laboratories, Inc., Long Island City, N. Y. Irregular.
62.56	4,795	W9XAM	Elgin, Ill. (Time signals.)
		W3XZ	Washington, D. C.
		W9XL	Chicago, Ill.
67.65	4,430	DOA	Doberitz, Germany. 6-7 p.m., 2-3 p.m., Mon., Wed., Fri.
70.00	4,280	OHK2	Vienna, Austria. Sun., first 15 minutes of hour from 1 to 7 p.m.

SHORT WAVE STATIONS OF THE WORLD

(Continued from opposite page)

Short Wave Broadcasting Stations

70.20	4,273	RV15	Far East Radio Station, Khabarovsk, Siberia. Daily, 3-9 a.m.
7.05	42,530	.....	Berlin, Germany. Tues. and Thurs., 11:30-1:30 p.m. Telefunken Co.
80.00	3,750	F8KR	Constantine, Tunis, Africa. Mon. and Fri.
		I3RO	Prato Emeraldo, Rome, Italy. Daily, 3-5 p.m.
82.90	3,620	DOA	Doeberitz, Germany.
84.24	3,560	OZ7RL	Copenhagen, Denmark. Tues. and Fri. after 6 p.m.
128.09	2,342	W7XAW	Fisher's Blend, Inc., Fourth Ave. and University St., Seattle, Washington.

Experimental and Commercial Radio-Telephone Stations

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
9.68	31,000	W8XI	Pittsburgh, Pa.
10.79	27,800	W6XD	Palo Alto, Calif. M. R. T. Co.
11.55	25.960	G5SW	Chelmsford, England, Experimental.
11.67	25.700	W2XBC	New Brunswick, N. J.
12.48	24,000	W6XQ	San Mateo, Calif.
			Vienna, Austria, Mon., Wed., Sat.
14.00	21,420	W2XDJ	Deal, N. J. And other experimental stations.
14.01	21,400	WLO	American Telephone & Telegraph Co., Lawrence, N. J., transatlantic phone.
14.15	21,130	LSM	Monte Grande, Argentina.
14.27	21,020	LSN	(Hurlingham), Buenos Aires, Argentina.
14.28	21,000	OKI	Podebrady, Czechoslovakia.
14.47	20,710	LSY	Monte Grande, Argentina. Daily 3-6 p.m., Sunday, 10 p.m.
14.50	20.680	LSN	Monte Grande, Argentina, after 10:30 p.m. Telephony with Europe.
		LSX	Buenos Aires. Telephony with U. S.
		FSR	Paris-Saigon phone.
14.54	20,620	PMB	Bandoeng, Java. After 4 a.m.
14.89	20,140	DWG	Nauen, Germany. Tests 10 a.m.-3 p.m.
15.03	19.950	LSG	Monte Grande, Argentina. From 7 a.m. to 1 p.m. Telephony to Paris and Nauen (Berlin).
		DIH	Nauen, Germany.
15.07	19.906	LSG	Monte Grande, Argentina. 8-10 a.m.
15.10	19.850	WMI	Deal, N. J.
15.12	19.830	FTD	St. Assise, France.
15.45	19,400	FRO.FRE	St. Assise, France.
15.55	19,300	FTM	St. Assise, France. 10 a.m. to noon.
15.58	19.240	DFA	Nauen, Germany.
15.60	19.220	WNC	Deal, N. J.
15.94	18,820	PLE	Bandoeng, Java. 8:40-10:40 a.m. Phone service to Holland.
16.10	18,620	GBJ	Bodmin, England. Telephony with Montreal.
16.11	18,620	GBU	Rugby, England
16.33	18.370	PMC	Bandoeng, Java.
16.35	18,350	WND	Deal Beach, N. J. Transatlantic telephony.
16.38	18,310	GBS	Rugby, England. Telephony with New York. General Postoffice, London.
		FZS	Saigon, Indo-China, 1 to 3 p.m. Sundays.
16.44	18,240	FRO.FRE	Ste. Assise, France.
16.50	18,170	CGA	Drummondville, Quebec, Canada. Telephony to England.
16.57	18,100	GBK	Bodmin, England.
16.61	18,050	KQJ	Bolinas, Calif.
16.80	17,850	PLF	Bandoeng, Java ("Radio Malabar").
		W2XAD	New Brunswick, N. J.
16.82	17,830	PCV	Kootwijk, Holland. 9:40 a.m. Sat.
16.87	17,780	W8XK	Westinghouse Electric and Mfg. Co., Saxonburg, Pa.
17.00	17,640		Ship. Phones to Shore; WSBN, "Leviathan"; GFWV, "Majestic"; GLSQ, "Olympic"; GDLJ "Homeric"; GMJQ, "Belgenland"; work on this and higher channels.
17.25	17,380	JIAA	Tokio, Japan.
17.34	17.300	W8XL	Dayton, Ohio.
		W6XAJ	Oakland, Calif.
		W9XL	Anoka, Minn., and other experimental stations.
17.52	17,110	WOO	Deal, N. J. Transatlantic phone.
		W2XDO	Ocean Gate, N. J. A. T. & T. Co.
17.55	17.080	GBC	Rugby, England.
18.40	16,300	PCL	Kootwijk, Holland. Works with Bandoeng from 7 a.m.
		WLO	Lawrence, N. J.
18.50	16.200	FZR	Saigon, Indo-China.
18.56	16,150	GBX	Rugby, England.
18.68	16.060	NAA	U. S. Navy, Arlington, Va. Time signals, 11:57 to noon.
18.80	15.950	PLG	Bandoeng, Java. Afternoons.
18.90	15,860	FTK	St. Assise, France. Telephony.
18.93	15,760	JIAA	Tokio, Japan. Up to 10 a.m. Beam transmitter.
19.60	15.300	OXY	Lyngby, Denmark. Experimental.
20.65	14.530	LSA	Buenos Aires, Argentina.
20.70	14,480	GGBW	Radio Section, General Post Office, London, E. C. 1. Rugby, England.
		WNC	Deal, N. J.
20.80	14,420	VPD	Suva, Fiji Islands.
21.17	14,150	KKZ	Bolinas, Calif.
22.38	13,400	WND	Deal Bench, N. J. Transatlantic telephony.
23.46	12.780	GBC	Rugby, England.
24.41	12.290	GBU	Rugby, England.
24.46	12.250	FTN	Ste. Assise (Paris), France. Works Buenos Aires, Indo-China and Java. On 9 a.m. to 1 p.m. and other hours.
		GBS	Rugby, England.
		PLM	Bandoeng, Java. 7:45 a.m.
24.68	12,150	GBS	Rugby, England. Transatlantic phone to Deal, N. J. (New York).
		FQO.FQE	Ste. Assise, France.
24.80	12.090	.....	Tokio, Japan. 5-8 a.m.
24.89	12.045	NAA	Arlington, Va. Time signals, 11:57 to noon.
		NSS	Annapolis, Md. Time signals, 9:57-10 p.m.
24.98	12.000	FZG	Saigon, Indo-China. Time signals, 2-2:05 p.m.
25.10	11,945	KKQ	Bolinas, Calif.
25.65	18,680	YVQ	Maracay, Venezuela. (Also broadcasts occasionally.)
25.68	11.670	KIO	Kahuhu, Hawaii.
26.00	11.530	CGA	Drummondville, Canada.
26.10	11,190	GBK	Bodmin, England.
26.15	11,470	IBDK	S.S. "Elettra," Marconi's yacht.
26.22	11,435	DHC	Nauen, Germany.
26.44	11,340	DAN	Nordeich, Germany. Time signals, 7 a.m., 7 p.m. Deutsche Seewarte, Hamburg.
27.30	10,980	ZLW	Wellington, N. Z. Tests 3-8 a.m.
28.20	10.630	PLR	Bandoeng, Java. Works with Holland and France weekdays from 7 a.m.; sometimes after 9:30.
28.44	10,540	WLO	Lawrence, N. J.
		VLK	Sydney, Australia. 1-7 a.m.
28.80	10,410	PDK	Kootwijk, Holland.
		KEZ	Bolinas, Calif.
		LSY	Buenos Aires, Argentina.
28.86	10.390	GBX	Rugby, England.
29.54	10.150	DIS	Nauen, Germany. Press (code) daily; 6 p.m., Spanish; 7 p.m., English; 7:50 p.m., German; 2:30 p.m., English; 5 p.m., German. Sundays: 6 p.m., Spanish; 7:50 p.m., German; 9:30 p.m., Spanish.
30.15	9,950	GBU	Rugby, England.
30.30	9,890	LSN	Buenos Aires, phone to Europe.
		LSA	Buenos Aires.
30.64	9.790	GBW	Rugby, England.
30.75	9,750	.....	Agen, France. Tues. and Fri., 3 to 4:15 p.m.
		WNC	Deal, N. J.
30.90	9,700	WMI	Deal, N. J.
30.93	9.690	LQA	Buenos Aires.
31.23	9.600	LGN	Bergen, Norway.
32.13	9,330	CGA	Drummondville, Canada.
32.21	9,310	GBC	Rugby, England. Sundays 2:30-5 p.m.
32.40	9,250	GBK	Bodmin, England.
32.50	9.230	FL	Paris, France (Eiffel Tower). Time signals 4:56 a.m. and 4:56 p.m.
32.59	9.200	GBS	Rugby, England. Transatlantic phone.
33.26	9.010	GBS	Rugby, England.
33.81	8.872	NPO	Cavite (Manila). Philippine Islands. Time signals 9:55-10 p.m.
		NAA	Arlington, Va., Time signals 9:57-10 p.m., 2:57-3 p.m.
33.98	8.810	WSBN	S.S. "Leviathan."
34.50	8,690	W2XAC	Schenectady, New York.
34.68	8.650	W2XCU	Ampere, N. J.
34.68	8.650	W3XE	Baltimore, Md. 12:15-1:15 p.m., 10:15-11:15 p.m.
		W2XV	Radio Engineering Lab., Long Island City, N. Y.
		W8XAG	Dayton, Ohio.
		W4XG	Miami, Fla.
		W3XX	Washington, D. C. And other experimental stations.
34.74	8,630	WOO	Deal, N. J.
		W2XDO	Ocean Gate, N. J.
35.02	8,550	WOO	Ocean Gate, N. J.
35.50	8,450	PRAG	Porto Alegre, Brazil. 8:30-9:00 a.m.
36.92	8.120	PLW	Bandoeng, Java.
37.02	8.100	EATH	Vienna, Austria. Mon. and Thurs., 5:30 to 7 p.m.
		JIAA	Tokyo, Japan. Tests 5-8 a.m.
37.80	7,930	DOA	Doeberitz, Germany. 1 to 3 p.m. Reichpostzentralamt, Berlin.
38.00	7.890	VPD	Suva, Fiji Islands.
		JIAA	Tokio, Japan (Testing).
38.30	7,830	PDV	Kootwijk, Holland, after 9 a.m.
38.60	7,770	FTF	Ste. Assise, France
		PCK	Kootwijk, Holland. 9 a.m. to 7 p.m.
39.15	7,660	FTL	Ste. Assise.
39.40	7,610	HKF	Bogota, Colombia. 8-10 p.m.
39.74	7,520	CGE	Calgary, Canada. Testing, Tues., Thurs.
43.70	6,860	KEL	Bolinas, Calif.
			Radio Vitus, Paris, France, 4-11 a.m. 3 p.m.

(Continued on next page)

"STAR" SHORT WAVE BROADCASTING STATIONS

The following stations are reported regularly by many listeners, and are known to be on the air during the hours stated. Conditions permitting, you should be able to hear them on your own short-wave receiver. All times E.S.T.

G5SW, Chelmsford, England, 25.53 meters. Monday to Saturday, 6:30-7:30 a.m. and 12:15 to 6:00 p.m.

HVJ, Vatican City. Daily 5 to 5:15 a.m. on 19.83 meters; 2 to 2:15 p.m. on 50.26 meters; Sunday 5 to 5:30 a.m. on 50.26 meters.

VK2ME, Sydney, Australia. 31.28 meters. Sunday morning from 1 to 3 a.m.; 5 to 9 a.m.; and 9:30 to 11:30 a.m.

VK3ME, Melbourne, Australia. 31.55 meters. Wednesday 5:00-6:30 a.m.; Saturday 5:00-7:00 a.m.

FYA, "Radio Colonial," Paris. On 19.68 meters, daily 8:30-10:00 a.m.; on 25.16 meters, daily 1:00-2.00 p.m.; on 25.6 meters, daily 3:00-7:00 p.m.

Konigs-Wusterhausen, Germany. On 31.38 meters daily from 8 a.m. to 7:30 p.m.

HKD, Barranquilla, Colombia. On 51.4 meters, Monday, Wednesday and Friday, 8 to 10:30 p.m.; Sunday, 7:45 to 8:30 p.m.

VE9GW, Bowmanville, Ontario, Canada. 25.42 meters, from 1 to 10 p.m.

EAQ, Madrid, Spain, 30.4 meters, 6:30 to 8 p.m. daily; 1 to 3 p.m. Saturday.

RV15, Khavarovsk, Siberia. 70.2 meters. Daily from 2 to 9 a.m.

SHORT WAVE STATIONS OF THE WORLD

(Continued from preceding page)

Experimental and Commercial Radio-Telephone Stations

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
43.80	6.840	CFA	Drummondville, Canada.
44.40	6.753	WND	Deal, N. J.
44.99	6.660	F8KR	Constantine, Algeria. Mon., Fri., 5 p.m.
		HKM	Bogota, Colombia. 9-11 p.m.
45.50	6.560	RFN	Moscow, U.S.S.R. (Russia) 2 a.m.-4 p.m.
46.05	6.515	WOO	Deal, N. J.
62.80	4.770	ZL2XX	Wellington, New Zealand.
63.00	4.760	Radio LL	Paris, France.
63.13	4.750	WOO	Ocean Gate, N. J.
63.79	4.700	WIXAB	Portland, Me.
72.87	4.116	WOO	Deal, N. J.
74.72	4.105	NAA	Arlington, Va. Time signals, 9:57-10 p.m., 11:57 a.m. to noon.
92.50	3.256	W9XL	Chicago, Ill.
95.00	3.156	PK2AG	Samarang, Java.
96.03	3.124	WOO	Deal, N. J.
97.53	3.076	W9XL	Chicago, Ill.
			Motala, Sweden. 11:30 a.m.-noon, 4-10 p.m.
193.5	1.550	W2XCE	Passaic, N. J.

Airport Stations

98.95	3.030	VE9AR	Saskatoon, Sask., Canada.
53.25	5.630	WQDP	Atlanta, Ga.
86.00	3.490	WSDE	Tuscaloosa, Ala.
		WSDB	Jackson, Miss.
		KGUK	Shreveport, La.
		KGUF	Dallas, Tex.
		KGUC	Fort Worth, Tex.
		KGUL	Abilene, Tex.
		KGUG	Big Springs, Tex.
		KGUA	El Paso, Tex. (Southern Air Transport Lines.)
53.53	5.600	WQDU	Aurora, Ill.
94.52	3.170	KQQ	Iowa City, Iowa.
		KQM	Des Moines, Iowa.
		KMP	Omaha, Neb.
		KRF	Lincoln, Neb.
		KMR	North Platte, Neb.
		KQE	Cheyenne, Wyo.
		KQC	Rock Springs, Wyo.
		KQD	Salt Lake City, Utah.
		KKO	Elko, Nevada.
		KJE	Reno, Nevada.
		KFD	Oakland, Calif.
		KRA	Boise, Idaho.
		KDD	Pasco, Wash. (Boeing Air Lines).
54.00	5.560	WAEF	Newark, N. J.
96.77	3.100	WAEE	Camden, N. J.
		WAED	Harrisburg, Pa.
		WAEC	Pittsburgh, Pa.
		WAEB	Columbus, Ohio.
		WAEA	Indianapolis, Ind.
		KGTR	St. Louis, Mo.
		KSY	Tulsa, Okla.
		KSW	Amarilla, Tex.
		KSX	Albuquerque, N. M.
		KGPL	Kingman, Ariz.
		KGTJ	Las Vegas, Nev.
		KSI	Los Angeles, Calif.
		KGTD	Wichita, Kan.
		KST	Kansas City, Mo. (Transcontinental Air Transport).

Television Stations

3.75 to 5 meters—60 to 80 megacycles.
5.96 to 6.18 meters—48.5 to 50.3 megacycles.
6.52 to 7.14 meters—42 to 46 megacycles.

		W8XF	The Goodwill Station, Pontiac, Mich.
		W3XE	Philco Radio, Philadelphia, Pa.
		W8XL	WGAR Broadcasting Co., Cleveland, Ohio.
6.89	43.500	W9XD	Milwaukee Journal, Milwaukee, Wis.
		W3XAD	Camden, N. J. (Other experimental television permits: 48.500 to 50.300 k.c., 43.000-46.000 k.c.).

101.7 to 105.3 meters—2.850 to 2.950 kc.

		W1XAV	Short Wave & Television Corp., Boston, Mass. 1-2, 7:30 to 10:30 p.m. daily ex. Sun. Works with W1XAU 10-11 p.m.
		W2XR	Radio Pictures, Inc., Long Island City, N. Y. 4 to 10 p.m. exc. Sundays. Silent 7-7:30 Sat.
105.9	2.833	W6XAN	Los Angeles, Calif.
		W7XAB	Spokane, Wash.

105.3 to 109.1 meters—2.750 to 2.850 kc.

		W2XAB	Columbia Broadcasting System, 4 8 5 Madison Ave., N. Y. 8:00-10:00 p.m. Sight and Sound Transmission daily except Saturday and Sunday.
		W2XBO	Long Island City, N. Y.
		W3XE	Philco Radio, Philadelphia, Pa.
		W9XAA	Chicago, Ill.
		W9XG	Lafayette, Ind. 60 holes, 1,200 r.p.m. Tuesdays and Thursdays, 2:00 p.m., 7:00 p.m., 10:00 p.m.
108.8	2.758	VE9CI	London, Ont., Canada.

130.4 to 136.4 meters—2,200 to 2.300 kc.

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

136.4 to 142.9 meters—2,100 to 2.200 kc.

		W2VBS	National Broadcasting Co., New York, N. Y., 1,200 R.P.M., 60 lines deep, 72 wide, 2-5 p.m., 7-10 p.m. ex. Sundays.
		W2XR	Radio Pictures, Inc., Long Island City, N. Y. 48 and 60 line. 5-7 p.m.
		W3XAD	R. C. A.-Victor Co., Inc., Camden, N. J.
		W2XCW	Schenectady, N. Y.
		W8XAV	Pittsburgh, Pa. 1,200 R. P M., 60 holes. 1:30-2:30 p.m., Mon., Wed., Fri.
		W9XAP	Chicago, Ill.
			Kansas State Agricultural College, Manhattan, Kans.

142.9 to 150 meters—2,000 to 2,100 kc.

		W2XAP	Jersey City, N. J.
		W2XCR	Jersey City, N. J. 3-5, 6-9 p.m., ex. Sun.
		W3XK	Wheaton, Maryland, 10:30 p.m.-midnight exc. Sun. Works with W3XJ.
		W2XCE	Passaic, N. J. 2-3 p.m. Tues., Thurs., Sat.
		W8XF	The Goodwill Station, Pontiac, Mich.

142.9 to 150 meters—2,000 to 2,100 kc.

		W9XAO	Western Television Research Co., Chicago, Ill.
		W9XAA	Chicago, Ill.

Police Radio Stations

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Location
121.5	2,470	KGOZ	Cedar Rapids, Ia.
		KGPN	Davenport, Ia.
		WPDZ	Fort Wayne, Ind.
		WPDT	Kokomo, Ind.
		WPEC	Memphis, Tenn.
		KGPI	Omaha, Neb.
		WPDP	Philadelphia, Pa.
		KGPD	San Francisco, Cal.
		KGPM	San Jose, Cal.
		KGPW	Salt Lake City, U.
		WRDQ	Toledo, Ohio
		.....	Klamath Falls, Ore.
122.0	2,458	YPDO	Akron, Ohio
		WPDN	Auburn, N. Y.
		WPDV	Charlotte, N. C.
		WRDH	Cleveland, Ohio
		WPDR	Rochester, N. Y.
		WPEA	Syracuse, N. Y.
122.4	2,450	WPDK	Milwaukee, Wis.
		WPEE	New York, N. Y.
		WPEF	New York, N. Y.
		WPEG	New York, N. Y.
		KGPH	Okla. City, Okla.
		KGPO	Tulsa, Okla.
		KGPZ	Wichita, Kans.
		KGZF	Chanute, Kans.
122.8	2,442	KGPX	Denver, Col.
		WPDF	Flint, Mich.
		WPEB	Grand Rapids, Mich.
		WMDZ	Indianapolis, Ind.
		WPDL	Lansing, Mich.
		WPDE	Louisville, Ky.
		KGPP	Portland, Ore.
		WPDH	Richmond, Ind.
		KGZH	Klamath Falls, Ore.
		.....	Muskegon, Mich.
123.4	2,430	WPDI	Columbus, Ohio
		KGPP	Portland, Ore.
		WPDM	Dayton, Ohio
		KGZD	San Diego, Cal.
		.....	Highland Park, Ill.
123.8	2,422	KSW	Berkeley, Cal.
		WMJ	Buffalo, N. Y.
		KGPE	Kansas City, Mo.
		KGPG	Vallejo, Cal.
		WPEK	New Orleans, La.
		WPDW	Washington, D. C.
124.1	2,416	KGP8	Minneapolis, Minn.
		WPDS	St. Paul, Minn.
124.2	2,414	WPDY	Atlanta, Ga.
		KGPS	Bakersfield, Cal.
		WCK	Belle Island, Mich.
		WPDX	Detroit, Mich.
		WRDR	Grosse Point Village, Mich.
124.2	2,414	WMO	Highland Park, Mich.
		KGPA	Seattle, Wash.
		WPDA	Tulare, Cal.
175.15	1,712	KGPJ	Beaumont, Tex.
		WPD8	Chicago, Ill.
		WPDC	Chicago, Ill.
		WPDD	Chicago, Ill.
		WKDU	Cincinnati, Ohio
		KVP	Dallas, Tex.
		KGPL	Los Angeles, Cal.
		KGJX	Pasadena, Cal.
		WPDU	Pittsburgh, Pa.
		KGPC	St. Louis, Mo.
		KGZI	Wichita Falls, Tex.
		.....	Newton, Mass.
		.....	Shreveport, La.
189.5	1,574	WRDS	E. Lansing, Mich.
		WMP	Fram'gham, Mass.
		KGPY	Shreveport, La.
1123	257	WBR	Butler, Pa.
		WJL	Greensburg, Pa.
		WBA	Harrisburg, Pa.
		WMB	W. Reading, Pa.
		WDX	Wyoming, Pa.

Marine Fire Stations

187.81	1,596	WRDU	Brooklyn, N. Y.
		WKDT	Detroit, Mich.
		WCF	New York, N. Y.
192.4	1,558	WEY	Boston, Mass.
		KGPD	San Francisco, Cal.

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

News of Clubs; Readers' Opinions of the 5 Meter "No-Code" Argument

About Learning That Code!

Editor, SHORT WAVE CRAFT:

DEAR SIR:

I have been following with considerable interest your discussions on "unlicensed" radio operators, or I should say, phone men without code examination, on the very short waves, and I wonder if I may add my opinion to the list.

In reading the August issue I note the letter signed W9DKK and think that anyone with views such as those should not be allowed a station license, or any other kind of a license.

Perhaps I am a trifle strong in my views on that subject, but I would like to see the 56 mc. band opened up to those who wish to use phone, and let them have a simple phone examination for them.

If one knows nothing of radio, he should be made to study the subject, at least long enough to pass such an exam, as it will not be a very stiff one.

W9DKK seems to have a very distorted view on the subject and there are many more just like him, who are either too lazy to learn the code and theory or have no thought in mind other than their own personal convenience.

I am of the opinion that we are lucky to have the bands that we have without making any rumpus about the bands that are all OK now. I am a C.W. man and am thinking of taking the phone examination. Now, as turn about is fair play, why, I ask you do all the phone men kick about the code exam?

All the law requires is 10 words a minute and half the time the exam is much slower. BUT when we C.W. men go for the phone exam, do we get any breaks? I'll say we don't. We get the works and you haven't heard of any of the C.W. men squawking about it either.

These so-called amateurs who probably have temporary tickets (which are about to expire), and who are afraid to give a few moments of their time to the study of radio and code, seem to be making the most noise. I do not like to see any more hardships put on the (up and up) phone and C.W. men, and I think that the A. R. R. L. has been doing all that is possible for all of us.

As far as W9DKK and his F. R. C. political pressure goes, how are we to judge the workings of a body of men who can see it from all angles, instead of our own selfish views? I am a constant reader of this magazine and hope to see this in print, because I know that the majority of the real O. M.'s think the same way.

In closing, let me say that there are many ways in which the phone man can get a sufficient amount of code to pass the examination without making such a fuss about it.

73 and the best of luck to you on the 5-meter work.

Yours for success,

W. S. STRINGALL, W6EMO,
340 Eddy Street,
San Francisco, Calif.

Are the Amateurs Selfish?

Short Wave League:

I am enclosing my application for membership of the SHORT WAVE LEAGUE.

Would like to say a few things in regards to the SHORT WAVE LEAGUE. I will refer to the *Platform* sentence No. 3. It is well known that on the 6-meter band that you can not receive and send signals over 75 miles by phone transmission. That is what handicaps a great many radio experimenters. The rules and regulations of the Federal Radio Commission will not permit the use of a transmitter in the 20-40-80-160-meter bands, unless you have license according to the code requirement, etc. Down here in my country there is nobody that would care to have the phone transmitters.

I was talking to an amateur here yesterday about the new short wave transmitters below 6 meters. He didn't like the idea a bit, said that there would be lots of interference, etc. He also stated that if a person didn't have the GET-UP about him to learn the code, he isn't worthy of having the Amateur's License. Well I just turned and walked off and never said any more about it to him. I saw that he was one of those selfish kind; in fact more than half of the amateurs of the United States are selfish; I'm this way for one. If you don't have a high-powered transmitter he will not even exchange words with you at all. They won't even notice your signals if they do hear them.

They don't seem to have the old spirit like they used to have, when there were no high-powered amateur stations. The *Little Fellow* don't seem to have a show at all nowadays, since lots of the amateur stations are on high-power. The little fellow who is not able to have a high-powered transmitter just has to do the best he can.

Would like you to publish this letter and I would like to hear from everybody who agrees or disagrees with me. Hope to see my letter in SHORT WAVE CRAFT soon.

Lots of good luck to S.W.C. and the S.W.L.

Yours very truly,

BEN. F. LOCKE,
Marthaville, La.

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 were explained in the May issue; copies of rules 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.

Hopes They Change the Law

Editor, SHORT WAVE CRAFT:

DEAR SIRS:

I wish to help in the work undertaken to having the code requirements in the ultra short wave band limited.

I wish to build a transmitter for experimental purposes or in other words as a *hobby*.

I commend your attitude toward the amateur and hope your efforts in changing the code ruling will meet with success.

Very truly,

J. B. TUPPET,
College of Wooster,
Wooster, Ohio.

Power City Short Wave League

We have formed a chapter of the SHORT WAVE LEAGUE in Niagara Falls, New York. We call it the *Power City Short Wave League*.

At present we have six members, one of whom is a licensed "ham," W8HNN. So far we have held two meetings and the following officers have been elected: President, Ronald Keeton; Secretary-Treasurer, Bernard Hilts. We meet weekly but as yet have no regular meeting place, so you may address any communication to me at the address below.

We sent in a notice to a local paper of our organization of the League and requested new members. As a result we have several applicants for membership. At present we are out of application blanks so we would appreciate it if you would send some to my address.

Although we have just one licensed "ham," several of us are planning to take the examination soon. By the way, you might be interested in knowing that four of us have built the receiver on page 166 of the July issue of SHORT WAVE CRAFT. We like it very much and one member has logged such stations as G5SW and EAQ.

At present our meetings consist of discussions of radio and its principles. We plan to visit several broadcast stations if we can get permission.

Wishing the League the best of success, I am,

Sincerely yours,

BERNARD HILTS, Secretary,
826 87th Street,
Niagara Falls, N. Y.

A Live Chapter

NEW HAVEN SHORT WAVE LEAGUE
328 Shelton Ave., New Haven, Conn.

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

Gentlemen:

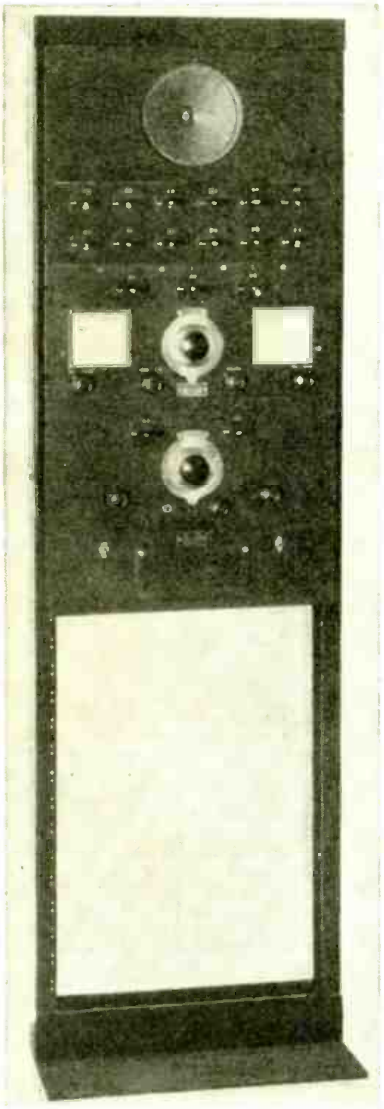
Enclosed you will find forty-two membership applications and a copy of our membership roll.

We would appreciate it very much if you would mention in your next issue of SHORT WAVE CRAFT that any one in this locality desiring to join our club may do so by communicating with us at the above address.

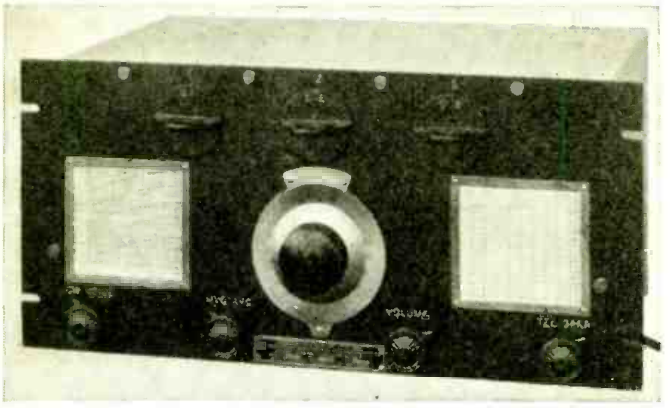
Thanking you, we remain,

Yours very truly,

H. R. SMITH,
New Haven Short Wave League.



New "AGS" Commercial S. W. Receiver



Front view of new "AGS" commercial or "pro" type short wave receiver, with "single dial" control. Yes, it's a super-het!

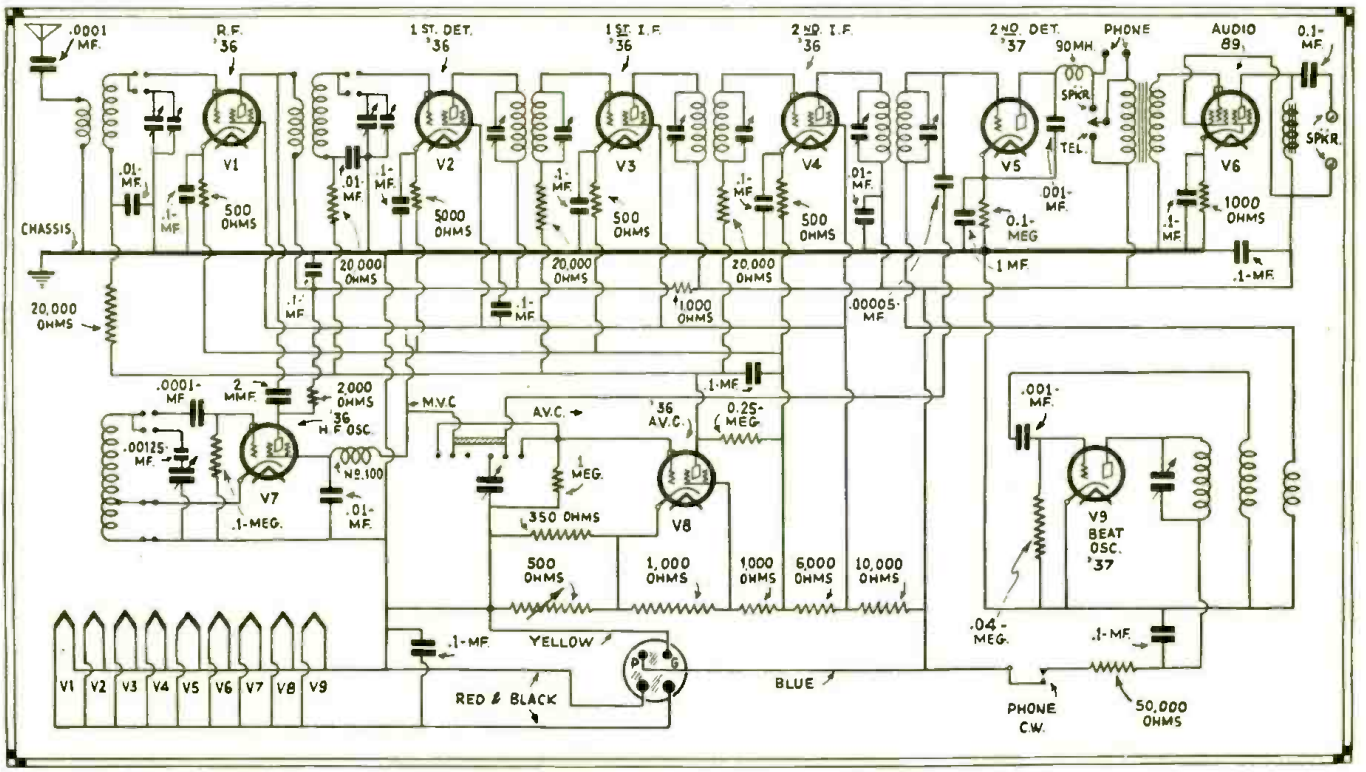
● THIS receiver was developed in conjunction with the Airways Division of the U. S. Department of Commerce, to provide a first-class type receiving equipment for the stringent requirements of aviation ground station use, including extremely high sensitivity and selectivity, combined with easy operation, rigid construction to maintain frequency calibration and dependability of performance. Nine tubes are used in a circuit comprising a stage of tuned R.F. amplication and first detector, employing screen grid tubes, a high frequency oscillator; two stages of extremely selective high-gain screen grid "I.F." amplification; "I.F." power detector; automatic volume control, working in conjunction with both R.F. and I.F. amplifiers; beat frequency oscillator, and pentode output with provision for either phones or loudspeaker. Tubes used: 4 '236s, 4 '237s, 1 '238.

Outstanding Features: Tuned R.F. stage preceding first detector. (Image suppression — improved signal-to-noise ratio—improved "weak signal" response.) Single dial *straight frequency line* tuning (270°). Calibration curves and Station Chart on panel. Coil change from front of panel. Automatic volume control or manual volume control, as desired. Extremely rigid mechanical construction from very heavy aluminum plate. Relay rack mounting (size 8¾x19"). Frequency range 2400 to 15,000 kc. Additional coils to extend the range to 20,000 kc. Heterodyne oscillator for c.w. reception.

The receiver is absolutely "*single control.*" There are no trimmers, antenna coupling devices, or other secondary adjustments; merely one single, accurately calibrated, frequency control, plus the volume control. The oscillator is of the electron-coupled type as modified for use in high frequency superheterodynes, resulting in an extreme degree of frequency stability and steadiness of frequency with fluctuat-

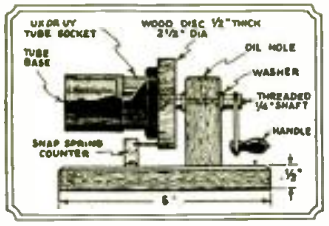
(Continued on page 570)

Left: Commercial type "receiving rack" suitable also for A-1 amateur stations, comprising "AGS" receiver, also "58C" receiver, power supply unit and dynamic speaker. Diagram below.



$5.00 For Best Short Wave Kink

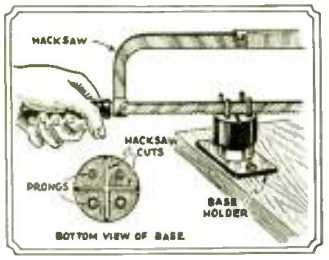
The Editor will award a five dollar prize each month for the best short-wave kink submitted by our readers. All other kinks accepted and published will be paid for at regular space rates. Look over these "kinks" and they will give you some idea of what the editors are looking for. Send a typewritten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



$5.00 PRIZE HANDY COIL WINDER.

Here's a nifty little coil winder which many readers will probably find useful, especially those who use tube bases as supports for the short-wave coils. The beauty of this little winder is that the tube bases can be instantly snapped into or out of the tube socket, which is screwed fast to the wooden disk mounted on the shaft. A suitable handle is mounted on one end of the shaft. To make a simple "turn counter" one may place a nail in the wooden disc so that it clicks against a spring, in the manner made evident in the drawing. If you want to be real fussy about it you can put a Veeder turn-counter or bicycle speedometer on the gadget.—John Garbera.

▼ ▼ ▼



IMPROVED COIL FORM

I present herewith one of my favorite "kinks." It has to do with "coil winding." The efficiency of a "plug-in" coil can be made much higher by cutting slots with a hacksaw through the bottom of the form, twice at right angles, so as to put each prong on a separate piece of bakelite, as it were. The cut is made just deep enough to sever the bottom of the form. By doing this you prevent a good deal of loss through the bakelite. It is especially useful on low wavelengths.—Walter S. Sturgill, Jr.

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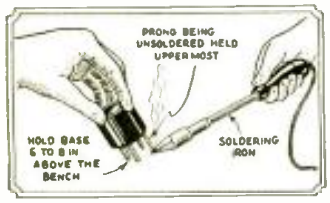
"DE-SOLDERING" TUBE BASES

So many tube bases are being used for plug-in coils that I feel others should know of this time saving wrinkle. You have undoubtedly noticed that no matter



how long you heat the prong to "flow" the solder out, that a film of solder is generally left over the hole by the cohesive force of the solder. Next time you have some tube bases to unsolder, try this: Hold the base, 6" to 8" above the bench, tilted, and with the prong being unsoldered uppermost, as shown. Melt solder with iron and then let the base drop on the bench so that it strikes on the lowest prong first. All solder will be removed, leaving a clear hole.—Ed Bryan.

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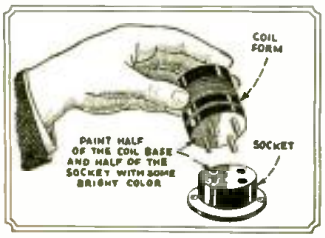
COIL MARKER

Here is a short-wave kink which will help hams to make a quick change of plug-in coils. When one goes to plug-in



coils, he must turn the coil around several times to make it fit. By painting half of the tube base and half of the socket with some bright color, all one has to do is to match the colors.—Edward Conway.

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"LONGER" TUBE BASES

Here is a kink that I find very useful in winding tube-base "plug-in" coils. In space-winding the secondary or winding a coil for the broadcast band, I find that there is not enough room on the tube-base for the windings, so here is my solution.

Take two tube bases and saw the bottom off of one so that you have only the cylindrical part left, then glue them together by taking a strip of thin cardboard and wrapping it around the inside of the tube bases and gluing it fast. By using several tube-bases and gluing them together in this manner you can have as long a tube-base coil as you desire.—Ellis Sergeant.

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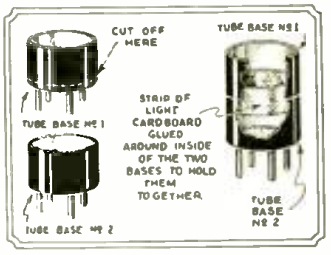
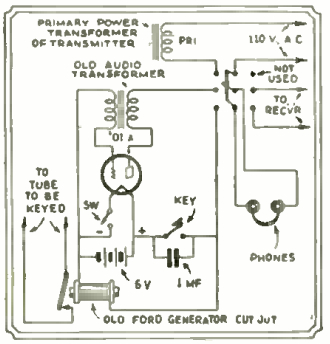


SIMPLE MONITOR

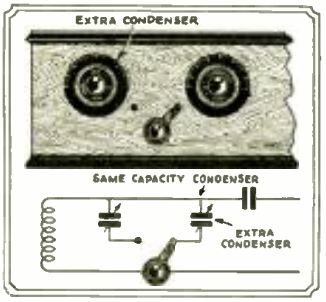
This kink will greatly improve the sending of those who have no other means of listening to their own fist. It also has some advantages over the monitor ordinarily used by others. The relay, of course, can be any standard six-volt relay. However, one that will serve the purpose just as well can be made easily from an old Ford generator cut-out. Remove the old windings and replace them with as much No. 28 or 30 magnet wire as space will permit. Take care that the new winding is insulated from the frame. In some



cases it may be necessary to relieve some of the tension on the armature. Care should be taken in doing this, however, as too little tension may make the relay sluggish. Dress the contacts down with a breaker point file and finish with fine sand paper. The armature should be adjusted until a minimum of spacing is obtained. Of course, the amount will depend on the power to be handled. For low-powered transmitters twice the thickness of a piece of newspaper will be about right. The unit can be mounted on a piece of soft rubber to lessen mechanical noise.—Marvin Carver.

DUAL RECEPTION

Here is my idea for the "kink" section. To listen in on both sides of amateur transmission (code or phone) is a lot of fun; to do this, you simply need to insert an extra variable condenser and a switch. You receive one station on one condenser



and the other station on the second condenser; the switch enables you to do this easily and quickly. The illustrations above will make everything clear.

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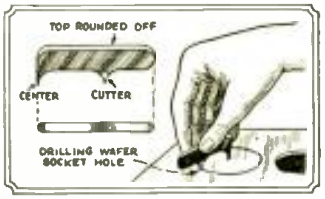
CUTTING HOLES IN METAL

This kink is for those who have difficulty in drilling holes for wafer sockets in the aluminum bases. The idea is to grind out a drill from an old file or other piece of steel. The piece of file is ground to the shape shown in the sketch so that the center of the drill is at one end and the cutter at the other. When



using this drill a guide hole is punched or the drill center and then it is used in the customary manner, except that it is rotated by hand and not by a drill-press. It will be necessary to drill both sides of the metal where the metal is thick and punch out the disc formed in the metal sheet. The size of the drill, of course, is only limited by the length of the file, but for wafer sockets it should be about ⅝" between center and cutter. —William A. Downes.

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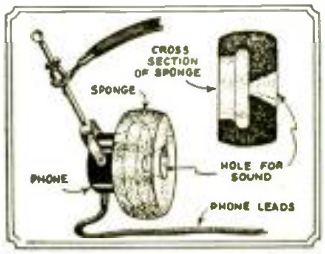
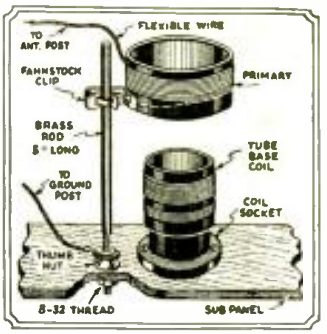
PHONE CUSHIONS

If your ears hurt from wearing the phones too long at one time, which is often the case, buy two "rubber" bath sponges which you can obtain from the Five-and-Ten-Cent store. Take the two "sponge rubber" bath sponges and cut a hole on one side for the phones to go into and a hole on the other side which goes up against the ear for the sound to come through.—Albert Anderson.





ADJUSTABLE COUPLER

The primary (aerial) coil is wound on a bakelite tube two inches in diameter. It consists of ten turns of No. 22 D.C.C. wire.

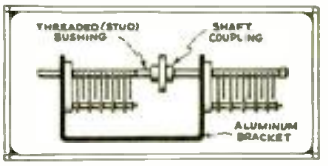
The primary is slid up or down the rod for the proper degree of coupling. To insert or remove a coil it is simply swung to one side.—Joe Ursini.

▼ ▼ ▼

GANGING MIDGETS

Many of the new superhet receivers use low capacity gang condensers. Often the set-builder would like to get a gang condenser of small size but to purchase one is impossible. The following arrangement solves the problem.

Make a suitable "U" bracket from a piece of aluminum or brass of the desired size. No dimensions are given because every one has his own ideas as to how he desires the finished product. Drill a hole in each end of the bracket to receive the shafts of the condensers. On the front condenser remove the nut on the end of the rotor and replace with a ¼" threaded brass-bushing. The length of this should be about ⅜". The bushing is nothing more than a shaft extension. Mount the other condenser on the other end of the

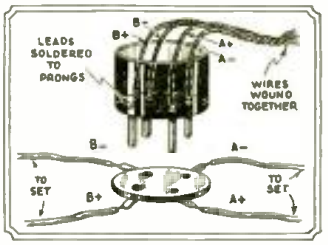


bracket and then connect up with the front one by means of a good shaft coupler. The job is completed and you have an ultra small condenser which will operate on most coils now on the market.—Thomas A. Blanchard.

▼ ▼ ▼

BATTERY PLUG CONNECTOR

Here is a very neat and compact way of making one's battery connections. An old tube-base and socket are all that is needed; the four wires are wound into one large one and then each wire is fastened on to a separate prong. The wires in the set are fastened so they will make the correct connections; when the tube-



base is put into the socket a very neat connection is made.—Bill Buckbee.

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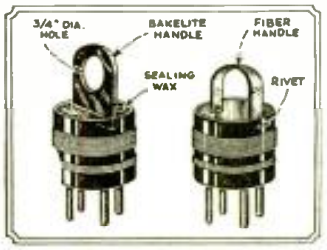
HANDLES FOR COILS

Here are two types of handles for tube



base plug-in coils. Most short-wave fans who make their plug-in coils out of tube bases have trouble in lifting them from the sockets.—Edward Moreira.

How to Become A RADIO AMATEUR

BY JOHN L. REINARTZ.
Member Institute of Radio Engineers

No. 7 of a Series
Building a Transmitter

● IN ANY oscillating circuit we must have capacity and inductance. The value of this combination determines the frequency at which it will oscillate. For any chosen frequency we can have different values of capacity if we change the inductance accordingly. If we make the inductance very small compared to the capacity then the internal capacity of the tube we happen to use will have little influence on the final frequency, resulting in a very stable oscillating circuit. Unfortunately this type of circuit also presents higher losses, which the tube must overcome. It should therefore be used only when we have power to spare. This circuit is shown in Fig. 1.

Going in the other direction, we have in Fig. 2 a circuit that uses no more capacity than is necessary to tune the inductance to the desired frequency. In this case, the capacities of the plate and grid and filament within the tube enter into the picture and have some influence on the generated frequency, as in this case we have a smaller external capacity in series with small values of internal capacities, nevertheless of an appreciable amount. This circuit, while not having the losses of the first circuit because of the high circulating current in the *tank circuit*, due to large capacity and small inductance, has the disadvantage of frequency variations with changes in tube temperature as the filament temperature varies. Changes in frequency also occur as the tube is loaded, being very noticeable when the overload causes the plate to assume color due to plate dissipation.

In addition to the faults listed, these circuits have good and bad points as follows. In the high capacity circuit we have an absence of harmonics to a marked degree. This is due primarily to the fact that we deal with relatively low resistances and large tank currents with moderately low oscillating voltage conditions. The inductance must be made of ample material, such as ¼ inch copper tubing.

In the low capacity circuit we have strong generation of *harmonics* or multiples of the fundamental frequency. These are sometimes so strong that they approach the value of the fundamental and will transmit as readily. This, of course, detracts from the available energy for the fundamental and is a loss. We have gone to both extremes in the above cases and will compromise on a happy medium.

It will allow the use of a reasonable sized condenser and a not too large inductance, as is shown in Fig. 3.

Present day operation of a transmitter requires that we do even better than possible with a self-oscillating circuit and we turn to crystal control to keep our frequency where we want it. A small piece of quartz ground to proper thickness and about one inch square will control the frequency of our transmitter better than we can keep it, even when we use the high capacity circuit mentioned before. To use crystal control means that we must use more tubes than we would without the crystal. However, the advantages are so great that once we have used crystal control a self-oscillating circuit is never considered thereafter. The necessary parts for such a transmitter comprise those we must have for a self-oscillating type and enough for two more tubes, one tube being the *crystal control* tube and the other a *buffer* tube, used to amplify the current obtained from the crystal tube stage and feeding this amplified current at the crystal frequency to the third or final amplifier. At this tube we again have the conventional *tank circuit* from which we take energy to the radiating system.

The ease by which we tune the self-oscillating type of circuit is lost when we turn to crystal control. In the first instance we obtain oscillation as soon as we turn on the filament and plate voltages, it merely being necessary to start off with the proper values of inductance and capacity for the frequency at which we desire to operate, making such slight adjustments as are necessary to obtain the correct frequency. In the crystal-controlled circuit we must start off first with the proper crystal frequency, then we must have the proper values of inductance and capacity in the tank circuit of the crystal tube stage, in order that the tube may function at that frequency. We duplicate this in the buffer or first amplifier and in the last stage or final amplifier. In between these tubes we have neutralizing capacities so that each succeeding stage will not oscillate of its own accord and feed back to the preceding stage high frequency energy of such values that it may damage the crystal, or else be so strong that the crystal will not have control of the frequency of the output.

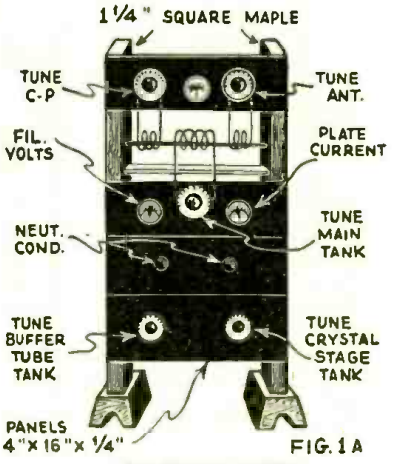


FIG. 1A

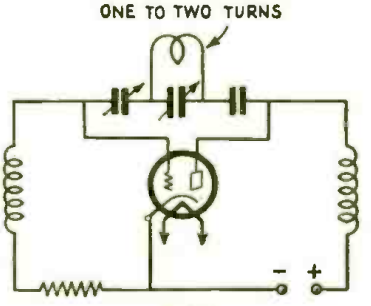


FIG. 1

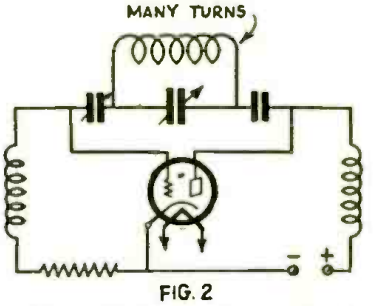


FIG. 2

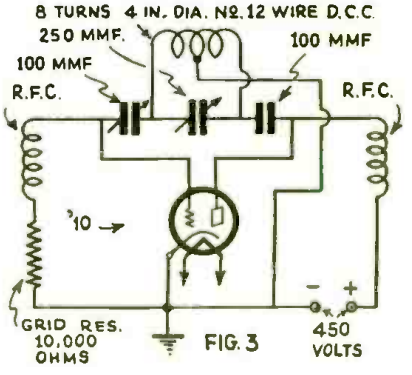


FIG. 3

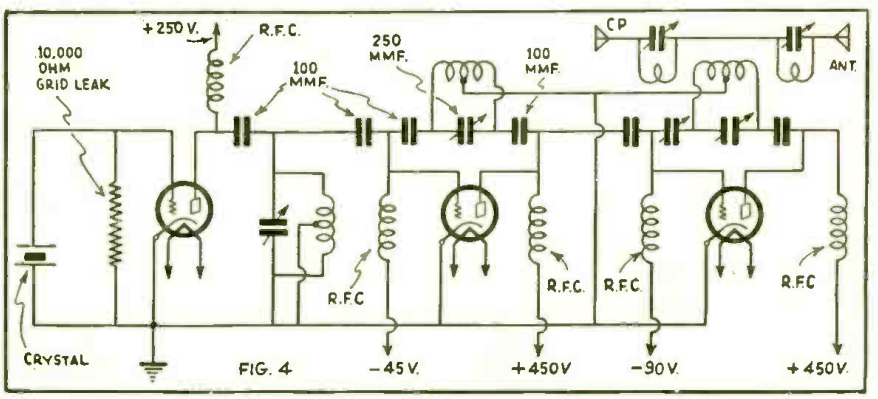


FIG. 4

Complete transmitter hook-up as here described by Mr. Reinartz is shown above.

Front view of dual wave receiver

The LAFAYETTE Dual Wave RECEIVER

BY FRANK LESTER, W2AMJ*

A Modern Combination Short and Broadcast Wave Set Employing the New Tubes, with Automatic Volume Control and a Simple Wave-Changing Switch.

● ONE of the things that retarded the development and commercialization of combination short-wave and broadcast receivers for a long time was a commonly held prejudice against the use of anything but removable plug-in coils for the various wave ranges. Radio men who were brought up on copper-tubing inductances, bus-bar wiring and open-face baseboards threw up their hands in horror at the mere mention of wave-changing switches or tapped coils.

Now we all admit that plug-in coils, if properly made and employed, possess certain low-loss characteristics. Dyed-in-the-wool "hams" of the old school still swear by 'em, but the new and uprising generation, perhaps spoiled a little by some of the other conveniences of modern life, swear *at* them. People nowadays don't want to wrestle with delicate coils that stick in their receptacles as if bolted down. They have "free-wheeling" in their cars; they want the equivalent of free-wheeling in their radio receivers.

The first combination wave receivers, made to meet this new demand, employed separate, fixed coils, thrown in and out of the circuit by massive switches. In some sets the coils are attached to a rotating shaft, and have blades that click into switch jaws. Intensive development work has now brought forth a logically simpler scheme: tapped coils controlled by light, "foolproof" switches.

The latter arrangement is finding successful application in the receiver, which is illustrated on this page. This is a complete set of the mantel type, with built in dynamic loud speaker. It is ideal for the short-wave fan who wants to enjoy the "thrills" of the *short waves* without sacrificing the regular entertainment features of the broadcast band, and who wishes to invest only in a single instrument, rather than two separate ones.

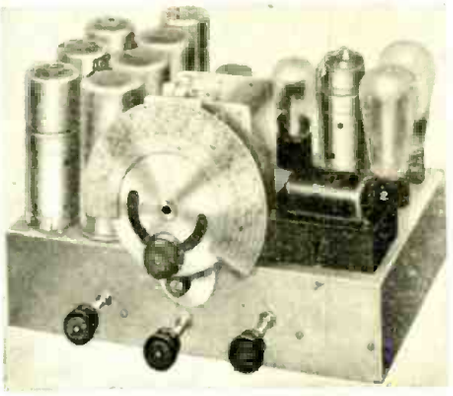
This new set is a superheterodyne, consisting of a 56 oscillator, 58 first detector, two stages of intermediate amplification using 58's, (tuned to 508 kc.) 55 second detector, push-pull 47 audios, and 80 rectifier. The 55, known as the "duplex diode triode", provides automatic volume control, a desirable feature for broadcast operation and a highly important one for short-wave reception, in which fading effects are often very pronounced. The peculiar circuit connections of this interesting tube, which has just recently appeared on the market, merit considerable study. The two diodes and the triode are independent of each other except for the common cathode sleeve, which has one emitting surface for the diodes and another for the triode. In this particular circuit the two diode plates are tied together to form a single diode, which performs at the same time the functions of perfect half-wave rectification and automatic volume control; in addition, the triode unit works independently as an audio amplifier under its own optimum conditions.

Manual volume control is provided by a potentiometer in the audio grid circuit. Tone control is effected by a filter between the triode section of the 55 and the 47 output tubes. These controls are marked in the schematic diagram.

Instead of the usual conglomeration of coils usually associated with all-wave receivers, there are only two coils in this outfit, one for the oscillator (L1) and the other for the first detector input circuit, L2. The top end of each is connected, respectively, to the grids of the oscillator and first detector tubes. Each coil is tapped in four places, the taps being brought out to contacts on a simple rotating switch. A wavelength range of 12 to 555 meters is covered by this arrangement, in four steps as fol-

(Continued on page 565)

*Wholesale Radio Service Co., Inc.



Chassis of Lafayette dual wave receiver

Short wave fans who want to enjoy the thrills of foreign reception in comfort, without bothering with plug-in coils, will find the Lafayette Dual Wave receiver an interesting job. It uses simple tapped coils and the latest type tubes, tunes from 12 to 550 meters and has automatic volume control. It is described here by Frank Lester, who gained international fame a few years ago when, through his amateur station W2AMJ, in New York, he kept the Hamilton Rice Amazon expedition in touch with the civilized world. A short wave expert of long standing, he knows his short wave sets.

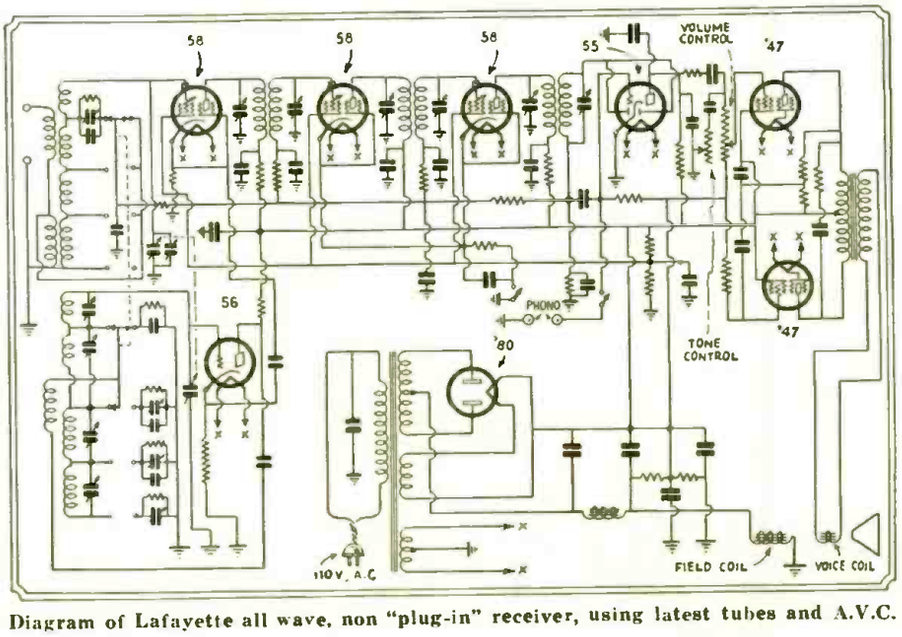


Diagram of Lafayette all wave, non "plug-in" receiver, using latest tubes and A.V.C.

LETTERS FROM S-W FANS

THE "BEGINNER'S SET" PERKS

Editor, SHORT WAVE CRAFT:

I thought maybe some of the *short wave "fans"* would like to know of the good results I have had with "The Beginners' S-W 1-Tube Set," a diagram of which appeared in your August issue.

I made the set about two months ago, and I have been getting wonderful reception with it. Here is a list of the states and countries which I have heard and the number of stations heard therein: Amateur Phone: Maryland-2, Conn.-4, Pa.-14, R.I.-3, Mich.-3, Mass.-5, Indiana-5, N. Y. (distant)-8, New Hamp.-3, N. Car.-5, Iowa-3, Ohio-14, S. Car.-1, Ga.-3, Ky.-2, Texas-4, Calif. 4, Fla.-3, Illinois-3, W. Va.-2, Wisconsin-5, Virginia-2, Tennessee-3, Maine-1, Mississippi-1, Okla.-1, Mo.-1, District of Columbia-1, Canada-4. Short wave broadcast Stations—EAQ, VE9FW, W8XK, VE9DR, GS5W, WOU, W9XF, WGY, NFD, also police stations.

All these stations were received on head phones, loud and clear, some during the day, in the evening and early morning. I have only one difficulty—I am troubled greatly by *hand capacity* and would like to remedy this if someone could help me. I think your magazine is a very good one; have had last three issues and can't wait until the next one comes out!

LEROY LANGHAAR,
1232 Webster Ave.,
Bronx, N. Y.

(Well! Well! LeRoy, we are very glad to hear that you have had such excellent reception with the "Beginners' Set" described in our August issue. There are several remedies for troublesome "hand-capacity." On of them is to use a metal panel on the set and connect this panel to ground. Another point to watch out for is to see that the rotors of the condensers are connected to ground. Still another wrinkle, and one that they use a great deal in Europe, is to mount the condensers seven or eight inches back of the panel and to connect the condenser shafts with the dials on the front panel by means of glass, bakelite, hard rubber, or even wooden rods, through the medium of flexible couplings, several of which are available on the market. Thanks for your letter; we are always glad to hear from readers who have built sets we described.—Editor.)

HATS OFF TO BRISTOL RADIO CLUB

The Bristol Radio Club is twenty-three strong. A clubhouse has been built by the members atop South Mountain on the property of George Bryce, who donated this land for the advancement of amateur radio.

Bristol Radio Club,
VINCENT J. MURPHY, W1DBG,
46 Carlton Place,
Bristol, Conn.

(Looks as if the Bristol Radio Club is going "great guns!," Vincent, and you sure ought to have some real DX receptions atop South Mountain. Do not forget to write us of the results you obtain from any reception test the club members conduct at their mountain top "listening post."—Editor.)

ANOTHER DOERLE ROOTER

Editor, SHORT WAVE CRAFT:

Built the Doerle receiver from a $4.50 kit. I added a 50-1 ratio dial on the tuning condenser. Dials are fastened to condensers by bakelite rods and the whole mounted in a box lined with *brass screen* to stop hand-capacity effects.

The results are surprisingly good; can get practically all U. S. short wave broadcasting stations and have a few from Europe. C. W., phone, and "police stations" from all over the United States. W2XAD, W1XAZ, W2XAF, etc., come in with enough volume so that I can lay the earphones on the table and still understand the signals. Can also get all main U. S. stations in the regular broadcast band. For size and cost it beats all!

Yours very truly,
PAUL S. GODWIN,
Effingham, Ill.

(Fine business, Paul and, we are glad to hear from another Doerle "rooter." We think the honor list of Mr. Doerle must have reached 20,000 by this time. We like your method of joining the dials to the variable condensers by bakelite rods, which is a method widely used in Europe. Another good trick, which we call to the attention of other short-wave fans, is your method of lining the receiver cabinet with "brass screening" for shielding purposes, the screen of course, being grounded. Brass or copper screen has been, and is used, in a number of commercial receivers employed in professional short-wave stations. Of course, the joints in the screen should be soldered and the top fitted on very tightly.—Editor.)

FACTS—FACTS AND MORE FACTS

Editor, Short Wave Craft:

I wish to compliment Mr. A. R. Haidell on the fine article he wrote on "Transmitting Antennas and How to Couple Them."

This was straight from the shoulder, and every word, FACTS, and not theory. For my part, and I am sure many others will agree, facts are what count in the short-wave game. If Mr. Haidell has any more articles, please print them or give me his address. Theory is cheap but it takes money to buy facts. So let's have some more, Short Wave Craft!

I have every issue published and if they came out twice a month I would not miss one!

F. D. BUCHANAN,
209-8th Street, N.W., Faribault, Minn.

(Glad you liked Mr. Haidell's article on transmitting antennas, F. D. B., and we expect to publish some future articles by Mr. Haidell. We do not quite agree with you that theory is cheap, unless you mean "cheap theory," which is something else again; but all joking aside, we do aim to publish some good theoretical articles and, in the same breath, we agree with you very strongly that "facts" or material containing "constructional data" are indeed valuable. How valuable, many readers perhaps do not realize, until one fine day, they suddenly want to construct a short-wave receiver, transmitter, or converter, which they read about moons ago and then suddenly find that they do not have a copy of the magazine in their library file. If you are a "dyed-in-the-wool" short-wave fan you will hang on to every copy of the magazine, as they will form a veritable "reference book" as the months go by. Put them into a home-made or commercial type binder and you will find the back numbers extremely valuable when you least expect it.—Editor.)

ONE FOR OUR S-W LIST

Editor, SHORT WAVE CRAFT:

When I started out in short waves, SHORT WAVE CRAFT was the first and last that I bought. Truly, it's worth its weight in gold. I agree with all others, saying that each issue is always better than the last one.

I have read many letters from short wave "fans" and not much is said towards the good the Short Wave Station list in SHORT WAVE CRAFT has done. Due to this column, I have received VK2ME-Sydney, Australia, VK3ME-Melbourne, Australia, VQ7LO-Nariobe, Kenya, Africa, RV15-Khabarovsk, Siberia, FYA-Pontoise, France, (they do not give FYA as their call, but announce their station-Radio Colonel, Pontoise, France). DJA, Koenigswusterhausen, Germany, and hundreds of others which would take too much space to list.

Wishing more luck to SHORT WAVE CRAFT.

Sincerely,
GEORGE PAPUK,
Box 193,
Grant Town, W. Va.

(Thanks, George, for your worthy letter and we assure you that we use every possible channel in order to keep the short-wave station list published in every issue of SHORT WAVE CRAFT *as thoroughly up-to-date as possible. In fact, you may be interested in knowing that our list of short-wave stations is used and posted on the bulletin board or at the operator's desk in many of the commercial short-wave stations.—Editor.)*

DOERLE "PERCOLATES"

Editor, SHORT WAVE CRAFT:

Having seen published some of the results the short-wave "fans" have had from the circuits published in SHORT WAVE CRAFT, I wish to tell you of my experiences with one of the circuits I have tried out.

I have built four receivers from circuits published in SHORT WAVE CRAFT, but the one I think worked best for simplicity of design is the "Doerle circuit." It sure does "percolate" for me!

Here are some of the stations I have received. The first group are received daily. W8XK, W3XAL, W9XF, W9XFAA, VE9GW, VE9DR, VE9JR, W2XAF, W1XAZ, G5SW, FYA, I2RO, DJB, GBR, GBS, XDA, WOO, and EAQ, Madrid. I also have received VK2ME, VK3ME, W6XAL, KGU, KEZ, WSBN-Steamer *Leviathan*, GFWV, Steamer *Majestic*, HKD, not counting the countless C.W. stations, amateurs, phones, television stations, airport, and police stations. Also, on the broadcast band—KDKA, WWVA, WTAM, KMOX.

My set is slightly different from the original circuit, for I use a '32 screen-grid in the audio stage, with a notable increase in volume. I would like to see an article published on the calibration of wavemeters. I would also like to hear from other short wave "fans."

Yours very truly,
HENRY SABORSKY,
1087 Brackenridge Ave.,
Brackenridge, Pa.

(We are greatly pleased, Henry, to hear that the Doerle receiver "peroclates" in good fashion. You sure have been having a fine time listening in with your Doerle receiver, which must be about the "umpty umpth thousand" one built after the Doerle specifications published in the December '31-January '32 issue of SHORT WAVE CRAFT. *We expect to publish something soon on wavemeters which will appease your appetite on that particular subject. Judging from some of the letters we have had from fans whose names and addresses have been published in this column, you will undoubtedly receive "beaucoup" fan mail.—Editor.)*

HE GUARANTEES IT!

Editor, SHORT WAVE CRAFT:

I should be glad to correspond with any "hams" or "fans" who have built the "Doerle" receiver, and will guarantee to answer all letters. I would like to compare results, as that always helps check up on the efficiency of a set.

After building the "Doerle," plan to build the "Denton Stand-by." Then, perhaps a good band-spread "ham" receiver and finally go on the air about February or March with a transmitter. Without the aid of SHORT WAVE CRAFT, I would have been unable to understand the mysteries of short waves! Yours for a lively winter,

DONALD C. MACGUIRE,
779 Worcester Street,
Wellesley, Mass.

(Well, well, D. C. M., we hope you hear from many hundreds of short-wave fans who have successfully built the Doerle receiver. We note your "guarantee" to answer all letters; the editors have ordered a set of bomb-proof armor to crawl into when you come to town, for after the first avalanche of mail has landed on your doorstep, we think you will be gunning for us —and we don't mean maybe!—Editor.)

1-TUBE MEGADYNE PULLS IN SPAIN AND ITALY

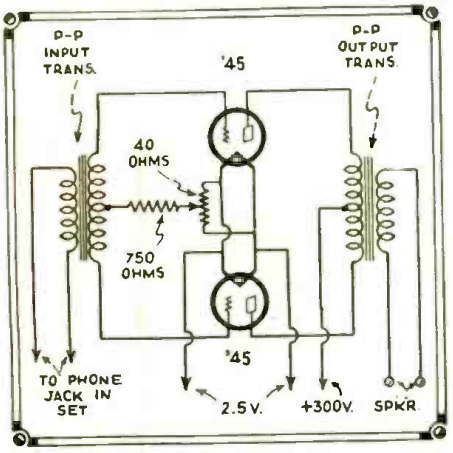
Editor, SHORT WAVE CRAFT:

When I bought your August issue of SHORT WAVE CRAFT I noticed the hook-up of the *Short-Wave Megadyne.* As I had been contemplating

(Continued on page 572)

SHORT WAVE QUESTION BOX

Edited by R. WILLIAM TANNER



Mr. Simmons of Stamford, Conn., asked for this single-stage push-pull amplifier hook-up.

ADDITIONAL AMPLIFIER

Warren Simmons, Stamford Ct. writes:

Q. Will you publish a circuit of an additional stage of amplification for the receiver on page 230 of the August issue? I prefer push-pull '45's.

A. The circuit appears in these columns.

SUPER-HET CONVERTER QUERY

Edward Barker, Detroit, Mich., wants to know:

Q. I want to build a superhet converter but am uncertain as to what tubes to use. Some say a '24 detector and '27 oscillator, while others say '27's in both positions. Can you advise me?

A. Neither arrangement is "best." When no R. F. stages is employed ahead of the detector, with a '24 or '27 detector, cross-talk is quite liable to be bothersome. The use of a vario-mu tube as first detector will then eliminate cross-talk. A '27 seems to be the simplest type of oscillator. Either a '35, '51 or '58 pentode is suitable as a superhet first detector, particularly the latter, due to the possible high gain and efficient method of feeding oscillator energy to detector.

Q. Will you publish what you consider the ideal circuit for detector and oscillator?

A. The circuit is given in these columns. The bias resistor for the '58 pentode detector should be between 300 and 500 ohms, not greater. The supressor grid connects direct to the grid connection of the oscillator coil.

Q. There seems to be considerable argument in regard to the correct I. F. for short wave supers. Some favor 1500 kc. others, 100, 500, 465 and even 175 kc. What is the answer?

A. The opinion of the writer may be considered worthless by some experts; however a frequency of 250 kc. is preferred. At this frequency, a high gain per stage is possible. By employing larger inductance in the I. F. transformers and lower capacity, a higher R. F. voltage is applied to the grids. At higher frequencies, the use of low capacity sometimes is one of the causes of unstability when shielding and filtering are insufficient. Another favorable factor is that selectivity is somewhat better than at higher frequencies. Although at 250 kc. image interference is worse, the use of a band-pass filter between the antenna and first detector will eliminate this trouble. Even at 500 kc. a band-filter is required to completely suppress unwanted stations.

TIME SIGNAL RECEIVER

L. E. DeWees, Columbus, Ohio, writes:

Q. I would like to have a circuit for a two-tube set with which I can pick up Arlington time signals on 78 meters. This will be used with phones.

A. You are referred to back issues of SHORT-WAVE CRAFT. Many such circuits have been published; it is only necessary to do away with all coils except the one for 80 meters On page 230 of the August 1932 issue a suitable circuit appears.

HONEYCOMB COIL

S. Mack, Cincinnati, Ohio, wants to know:

Q. What is a honeycomb coil?

A. A honeycomb coil is merely a type of winding allowing a large inductance to be placed in a small space. The turns are spaced, and one layer crosses the next at an angle.

Q. How can I make them?

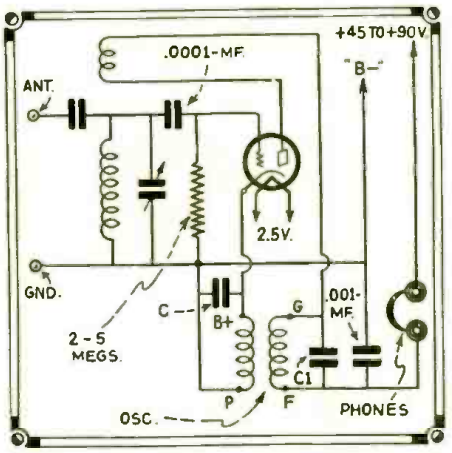
A. It is not an impossible job to wind honeycombs by hand with a suitable winding form, but the job is far from simple. Machines can be bought that will wind these coils.

CONDENSER VALUE

Robert Wielke, Ryder, N. D., wants to know:

Q. The size of the condensers in the circuit page 213 of the August issue?

A. The tuning condenser across the main part of the coil may be of .000125 to .00016 mf. The regeneration condenser connected between the antenna switch and one side of the tickler should be .00025 mf.



Hook-up for 1-tube super-regenerator requested by Mr. Wharton.

1-TUBE SUPER-REGENERATOR

Wm. Wharton, Atlanta, Ga., inquires:

Q. I have a 45 kc. iron-core transformer and want to use it in a 5-10 meter set. How can I increase the frequency of the coils?

A. Turns can be removed or better yet take out the core.

Q. Can you supply circuit of a one-tube super-regenerator using this transformer for the oscillator coils? A '27 tube will be used.

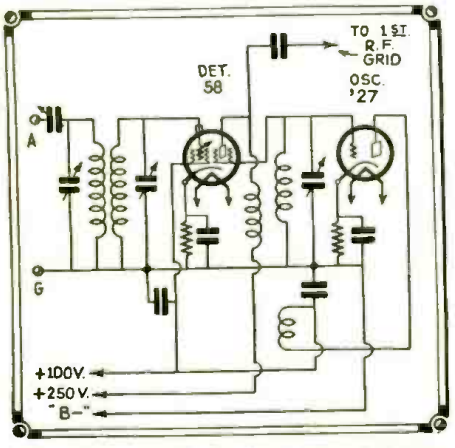
A. The circuit appears in these columns. The antenna coupling condenser must be very small. The oscillator cathode coil will be the transformer plate coil. The grid coil will be the tuned plate coil. C is a bypass condenser of approximately .0001 mf. The tuning condenser C1 will depend upon what frequency you will employ; it will range somewhere between .0005 to .002 mf.

3 PENTODE HOOK-UP

P. D. Viele, Boston, Mass., wants:

Q. A circuit for a tuned R. F. stage, regenerative detector, and one audio power stage, using all *pentode* tubes.

A. The circuit appears in these columns. The signal frequency amplifier is a '58 and the detector a '57. The power A. F. is a '47. Regeneration is controlled by varying the detector screen-grid voltage. The coils may be any type on the market or they may be homemade.



Mr. Barker asked for this super-het converter diagram, showing the preferred circuit for the detector and oscillator.

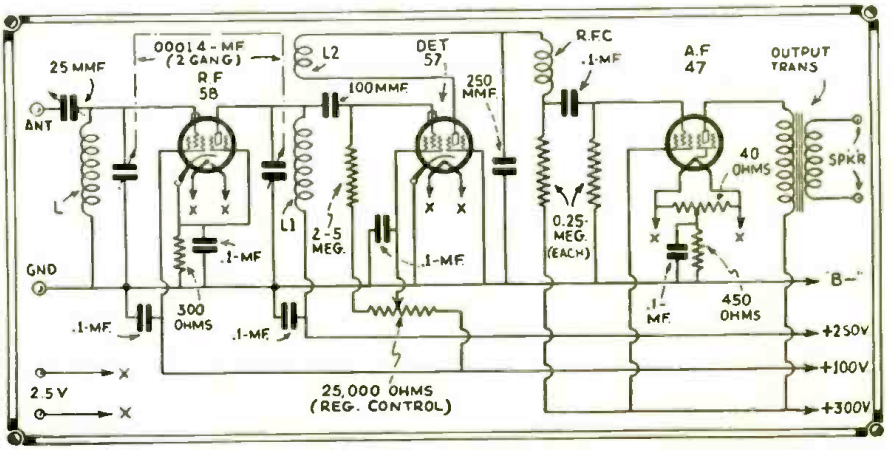


Diagram requested by Mr. Viele for a 3-pentode hook-up, comprising R.F. stage, regenerative detector and power audio.

$20.00 Prize Winner

(Continued from page 532)

are used. The current is cut down to 2 volts by a 15 ohm resistor. As there is very little drainage on the "B" battery it will last a long time. The filament batteries will last about 15 hours, as the tube draws about three times as much as a flashlight bulb. The set does not have to be pulled out of the cabinet to plug in the coils as a hole has been cut in the panel for this purpose.

The cabinet is made in two equal halves. Each half measures 8¾"x6½"x2¾". These boxes are covered with imitation leather and the insides of them are painted black. The filament batteries are contained in the same side of the cabinet which the set is in. They are located right above the socket for the plug-in coils. The "B" battery, headphones, plug-in coils, and five prong adapter are included in the other half of the cabinet. The ends of the handle are fastened in opposite corners of the top of the cabinet. One side is constructed so that one side of it may be detached in order to open the cabinet. The "B" current is passed from one side of the cabinet to the other through the hinges. A hole is drilled beside each hinge, on the box that contains the set, to a depth of 2½ inches. Inside the box and near the bottom two holes are drilled at right-angles to the first holes and to meet the first holes. A wire is passed through each of these holes, one end being fastened to a hinge, and the other ends extending into the box five inches or more. At the ends of these wires a phone tip is soldered. Two phone tip jacks are provided on the back of the set to plug these "B" battery leads into. This method of conducting the "B" current is used in case the set has to be taken out of the box for adjustment, because it allows it to be instantly disconnected.

The list of parts are as follows:

1 set of Air King (Radio Trading) plug-in coils, 15 to 210 meters
1 .0001 mf. variable midget condenser (National; Pilot; Hammarlund)
1 National vernier dial
1 100 mmf. antenna condenser
1 Alden (Pilot) 4-prong socket
1 Benjamin 4-prong cushion socket
1 200,000 ohm Clarostat
3 binding posts (antenna, ground, plate)
1 15 ohm filament resistor
1 .00025 mf. grid condenser
1 2 megohm grid condenser
1 .0015 mf. fixed condenser
1 1 mf. block condenser
1 10,000 ohm resistor (1 watt)
1 midget knife-switch (single pole, single throw)
1 '30 type tube (2 volt)
1 rheostat knob
1 fil. control phone jack
Miscellaneous: Bolts, nuts, washers, etc.

Parts mentioned in brackets are other recognized trade names of apparatus which the builder can substitute for the first mentioned make of apparatus.

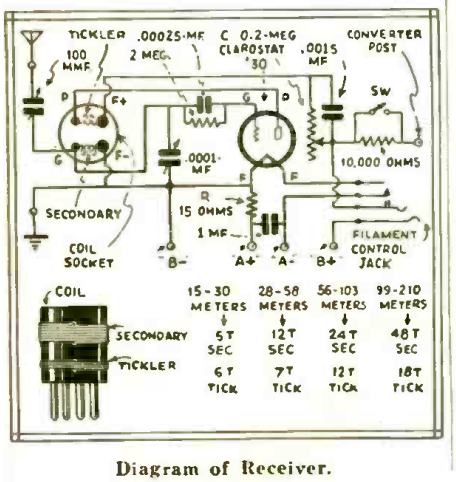


Diagram of Receiver.

First "Honorable Mention"—Mr. Maigret

(Continued from page 533)

and the rheostat in left-hand hole. Earphone jack goes in lower center hole; be sure to insulate it from panel with fiber washers. The Antenna binding post belongs in the top right hole and Ground post in the left hole. The hole in the fixed plate of the equalizing condenser serves to attach it to the antenna binding post and is most convenient in this case. Space it off from the panel about $\frac{3}{8}$" with fiber washers. The tuning dial may be mounted next.

It is now time for the wiring and this is speedily done. The 5000 ohm resistor is soldered directly to the side lug of the Pilot midget jack, perpendicular to the panel. The .01 Sprague condenser can be conveniently soldered to the other end of the resistor. A short wire goes from the rheostat to the top outside A battery clip marked plus. The two bottom clips are connected together by a short jumper. The top inside clip marked minus connects to the negative voltmeter terminal and thence to the tube sockets. Incidentally, two additional spring clips are also provided to prevent batteries from slipping out sideways, and have no electrical connection. Now run a short wire from phone jack for connecting to B 45 plus. A similar wire is run from F plus of detector socket for connecting to B minus of batteries. Positive filament lugs of the tube sockets are grounded to the adjacent mounting screws. Remainder of the wiring is conventional. *Do not fail to ground the transformer core and rotors of variable condensers.* These latter are grounded through the panel, but may develop noise if the above extra precaution is overlooked.

The three plug-in coils are constructed with 5-prong tube bases and cover a range of from 16 to 100 meters approximately. The coil socket connections are as follows:

Lug P goes to Detector GRID.
Lug C goes to GROUND.
Lug G goes to RF CHOKE.
Lug F goes to Detector PLATE.
Following are the coil data:

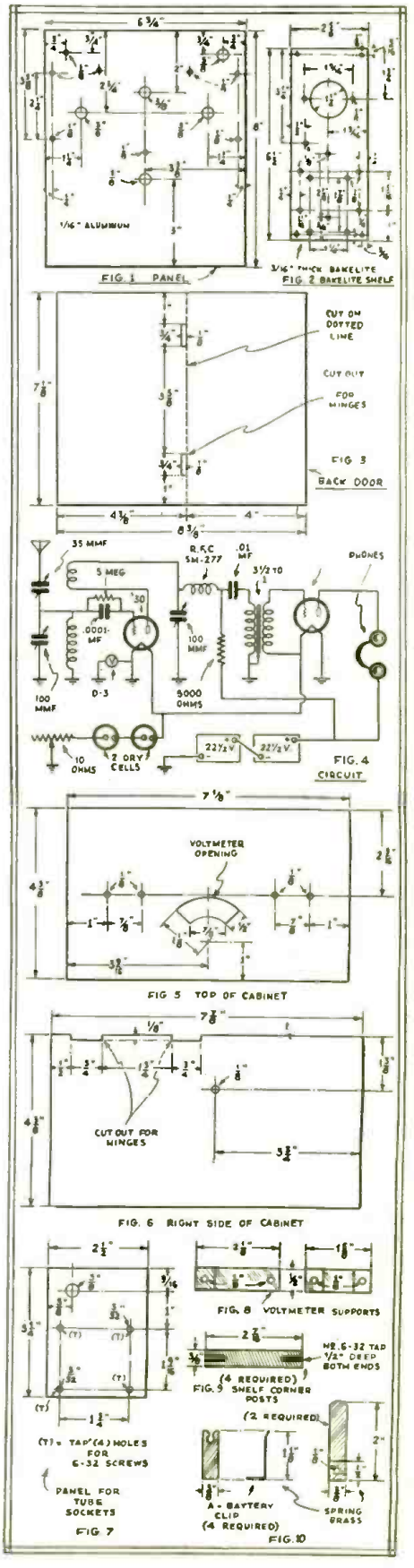
RANGE IN METERS	GRID TURNS	TICKLER
16 to 30	5 ⅛	6 ⅓
29 to 58	10 ¾	7 ½
57 to 100	22 ½	9 ½

Space windings ⅛ inch.
Use No. 22 D. S. C. wire for GRID.
Use No. 30 D. S. C. wire for TICKLER.

Make sure that windings are in the *same* direction and *reverse the tickler connections if set fails to oscillate.*

List of Parts

1 Wood cabinet, Size 8⅜" x 7⅛" x 5⅝", ¼" 3-ply wood.
1 Aluminum panel, Size 8" x 6¾".
1 Aluminum panel, Size 3¼" x 2½".
1 Bakelite shelf, Size 6½" x 2⅝".
4 Aluminum corner posts, 2 7/16" long.
2 PILOT-23-plate midget variable condensers.
1 HAMMARLUND 35 mmf. equalizer condenser.
1 CARTER 10 ohm midget rheostat.
1 THORDARSON Type R-100 audio transformer, Size 2⅛" x 1⅝" x 2".
1 PILOT Midget Jack or Filament-Control Jack.
1 KURZ-KASCH 3" walnut vernier dial.
1 5,000 Ohm Resistor (any type).
4 Grid-leak clips.
2 Other spring clips.
1 S-M No. 277 RF Choke.
1 READRITE 0 to 3 D.C. voltmeter.
2 Eby binding-posts, ANTENNA & GND.
1 SPRAGUE .01 mf. fixed condenser, (midget).
1 5-Megohm grid-leak, pigtail-type.
1 .0001 mf. grid condenser.
2 UX-'30 tubes.
1 PILOT No. 217-5-prong socket (Alden).
2 PILOT No. 216-4-prong sockets (Alden).
2 BURGESS No. 5156 22½-Volt "C" batteries.
2 BURGESS No. 2 flashlight cells.
3 5-Prong tube bases.
2 One-inch walnut knobs.
4 Brass hinges, ¾" long.
3 Dozen $\frac{3}{16}$" screws, ½" long.
4 Rubber feet.
D. S. C. wire No. 22 and No. 30.



Various dimensions etc., for building Mr. Maigret's Portable S-W receiver.

Adding R.F. to Any Receiver

(Continued from page 545)

In general, the tuning condenser ("C" in Fig. 3), should be of the same size as in the detector input. If desired, however, it may be made somewhat larger. For purposes of illustration, it is assumed to be a .0001 mf. size. This reduces cost and allows the amplifier to be employed ahead of the receiver described in the December issue. No constructional detail was omitted in that article; the beginner should read it as an introductory course.

If you have no R.F. tube available, purchase a type 39 tube and make connections as in Fig. 5. Note that the detector and audio tube are run from the same filament rheostat, but that the R.F. tube is run directly from the storage battery. The 39 is an R.F. pentode employing a D.C. heater and belongs to the so-called "automobile" family of tubes. Results will be found to be excellent when using this tube.

Letters are marked opposite the tube terminals in Fig. 5, showing how connections are made to the tube socket. Remember that the "signal" grid is the cap of the tube, and the screen-grid connects to the socket "G" terminal. The cathode of the tube is biased with a 500-ohm pigtail resistor, shunted with an .01 mf. midget by-pass condenser. The screen-grid is also by-passed with an .01 mf. condenser.

Construction of Radio-Frequency Choke Coils

Ordinary "broadcast" type radio-frequency choke coils (called "R.F. chokes" for short), do not operate well on short waves as a general rule. However, very efficient chokes can easily be constructed for the purpose. All R.F. chokes referred to in this article can be constructed in the same manner to be described.

Procure a short length of 3/8" dowel and cut it into 1¾" lengths, depending upon the number of chokes desired. The pieces of dowel should then be shellacked or boiled in hot paraffin. It is not necessary to go to extremes in this respect; it is not necessary to have chokes of exceptionally "low loss" construction; their purpose is to allow direct currents to pass freely, while hindering the flow of radio-frequency currents.

Fig. 6 illustrates the methods of construction. Drill two small holes at the end of each choke form and fasten a couple of soldering lugs at each end with small machine screws and nuts.

The choke sections can be wound by hand. The choke coils consist of three sections wound of 300, 200 and 100 turns. No. 36 enameled wire is a good practical size to use; smaller sizes break too easily. *All sections are wound in the same direction.* The ends of the windings are scraped and soldered to the lugs. The exact method of winding the sections is not important, although a distance of about 3/16" should be maintained between sections. The wire ends should be wound around the lugs before soldering, so that when soldering a choke into the circuit used, they will not loosen. It is advisable to use two lugs at each end of each complete R.F. choke, for convenience in connecting into the circuit.

Construction of R. F. Coils for the Amplifiers

A tuned R.F. amplifier stage ahead of the detector requires a *tuning condenser* and a *set of plug-in coils*, in addition to the parts required for an untuned stage. The tuned stage requires only one R.F. choke coil.

It is well to remember that the coils for the R.F. stage *must cover as nearly as possible the same ranges as the coils used in the detector.* Consequently, if the reader has constructed the two-tube receiver described by this writer in last issue, he should purchase *coils of the same type;* or, if constructed, wind them on the same kind of forms as nearly as possible to the specifications given in the table just below. The wiring, and other factors of construction will influence the ranges of the coils somewhat. See Fig. 7.

R.F. Coil Table

Wire	No. of Turns.
No. 28 D.C.C.	5
No. 28 D.C.C.	8
No. 28 D.C.C.	15
No. 30 Enameled	55

If the reader desires to wind the coils so that both R.F. and detector tuning condensers

"track" (that is, both tune in at the same condenser settings), the approximate specifications given above will serve. The first three coils listed above will cover the range of 15 to 125 meters with a .0001 mf. condenser; a .00014 or .00015 mf. size will give greater overlap between coil ranges. The latter sizes of condensers should generally be fitted with vernier dials, as a tuning aid. The last coil in the table will cover the 100 to 200-meter range and will be found useful for "police-call" work.

Adjusting the Ranges of R.F. Coils

If you have a set of *detector coils*, the ranges of which are not known approximately, and you desire to construct a set of R.F. coils for the R.F. stage, add a few turns to each coil given in the table above.

The variable condenser used in the R.F. stage should be of the same size as in the detector stage. To adjust a set of R.F. coils, proceed as follows:

First construct a set of coils having the approximate specifications as suggested in the above table. Pass the lower wire end of each winding through a small drilled hole in the coil form and solder the end to one of the proper prongs underneath on the form (see Fig. 7). Solder another lead to the other proper prong, bring it out at the top of the form for a short distance, pass the other end of the wire through a small temporary hole in the form and twist its end around the lead brought out for the purpose of making temporary connections, while adjusting the ranges of the coils. See Fig. 8. Both leads are bared; these serve only as temporary leads during the adjustment of the R.F. coils. It is, of course, desirable to have more turns than necessary, rather than too few, since extra turns can easily be taken from the windings.

Now connect the R.F. stage ahead of the detector and tune in some code or other station on the detector. Then tune the R.F. stage tuning condenser until the signal is loudest. If less capacity is required in the R.F. condenser, to tune in the signal best, than is required in the detector tuning condenser, there are too many turns in the R.F. coil.

To remove turns from the R.F. coil, simply untwist the leads at the top of the form, pull the wire through the form, unwind the turns from the coil, cut off the wire, and twist the two leads together again. Remember that if the total turns in the coils are few, the removal of only a single turn has considerable effect on the tuning range of the coil. It will be found that several turns can be removed from the coils having the larger number of turns without influencing their ranges greatly.

By removing the turns carefully, the R.F. tuning condenser can be made to tune in the stations best at the same dial-setting as the detector condenser. Of course, this assumes that the detector and R.F. condensers are of the same capacity, otherwise the total ranges covered by each condenser would be different.

When you have adjusted a coil for proper "coverage," remove the temporary short lead to the coil prong, and solder the end of the winding permanently in place.

If you have a wavemeter, more precise work can be done. For example, if you discover that removing two turns from a coil reduces the wavelength by 4 meters, at the same condenser dial setting (noted by retuning the detector stage, which is just oscillating), it means that each turn has reduced the wavelength approximately 2 meters. If the total reduction desired is say, 10 meters, you will therefore have to remove about 5 turns in all.

If it is discovered that a howl occurs in the set just at the point at which the R.F. tuning condenser gives its greatest response, it may be necessary to reverse the leads to the primary of the audio transformer in the first audio stage. However, this howl may be used to adjust the coils; after turns are removed from an R.F. coil, the range of which is being adjusted, retune the condenser to this howl each time. This makes adjustment easier, especially at the lower wavelengths, where the "maximum" may be difficult to locate because the amplification is low.

Be Careful in Wiring Your Receiver

It is important to keep the leads in short-wave receivers short for best results. However, do not go to extremes in this respect.

Of the many which have been used in the past, one of the most satisfactory methods of controlling oscillation in R.F. stages is to connect in series with the grid, right at the cap of the screen-grid tube, a small pigtail resistor having a resistance anywhere from 500 to 2000 ohms, depending upon the damping action desired. This method is not ordinarily necessary, but is passed on to those who may strike a case where oscillation is unusually persistent. Use the lowest permissible value of resistance.

Since oscillation, in general, is caused by coupling between the plate and grid circuits of the R.F. tube, it may be prevented ordinarily if the plate and grid circuits are shielded from one another. The resistor method above is used where there still remains coupling which persists in spite of the shielding. The internal shielding of the tubes is sufficient and external shielding may be necessary. However, if the leads in the R.F. stage are short and the detector and grid coils are kept at some distance apart, oscillation will not ordinarily occur. If it does, the R.F. tube and R.F. input coil may be enclosed in a metal container of ample proportions. Keep the coil away from the shield about two inches all around. Mount it on a UX socket. It must be remembered that anything connected to the grid or plate circuits constitutes part of these circuits, and due precautions should be taken to keep all parts of the grid circuit separated from the plate circuits. You may not have any trouble at all getting the R.F. stage working; but if you do, you will find the necessary remedial information here.

How to Use Audio Pentode Tubes

If you have a short-wave set using the two-volt dry-cell tubes, and want to change the last audio tube to a pentode for greater volume, see Fig. 9.

It doesn't matter what the rest of the circuit looks like, or how many tubes it has. The main idea is that you want more volume without making any great changes in your set. Perhaps you have worked out a good two-tube arrangement, and do not want to change it too much, but yet you want a little more volume. The best solution is to replace the last audio tube in your present set with a pentode. This is easily done as shown in Fig. 9. The exact socket connections are shown at A in Fig. 9; the symbolic diagram is at B. Corresponding wires in parts A and B of this diagram are

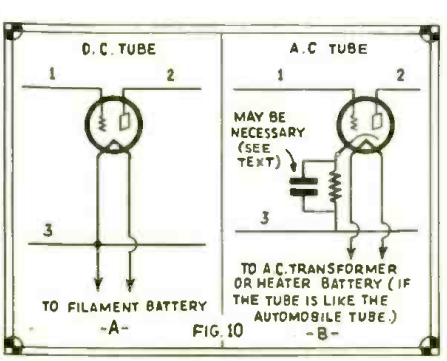


FIG. 10

At "A" the connections for a D.C. filament tube are shown, while "B" indicates the same connections for an A.C. heater tube with the same number of elements.

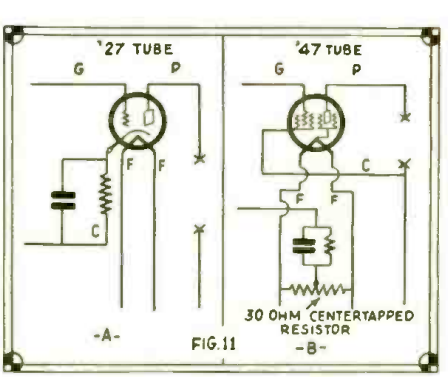


FIG. 11

Changes in connections necessary to use a '47 pentode in place of a '27 in the last stage of audio amplification.

lettered so that both diagrams can easily be compared.

The only new part necessary is a five-pin socket to replace the four prong socket already in the set, and, of course, the tube. The leads are unsoldered from the four-prong socket, care being take to get them on the proper socket terminals. A short length of hookup wire is then soldered to "C" on the five-prong socket, and also soldered to one of the headphone clips as in Fig. 9.

If you have not actually built a set, but have a circuit suitable for two-volt tubes which you wish to try, you can change the connections to use a pentode as shown in Fig. 9B.

There is another possibility. Perhaps many readers have assembled the two-tube set for use with 01A tubes. There is available on the market a 6-volt D.C. pentode tube which can be used in such cases, if loudspeaker operation is desired.

To change the last tube from a 01A to a type "LA" pentode, use Fig. 9 also.

The necessary changes in connections for the use of this pentode are the same. This tube is the Eveready Type "LA" pentode. It has a 6-volt filament, which is run direct from the storage battery without a rheostat.

The pentode tubes, for full output, should be properly "biased," that is, provided with the correct "C" battery voltage. The best "C" battery for a set builder to purchase is one having 22-1/2 volts, with taps at lower voltages. The battery is connected into the circuit at the position marked "X" in Figs. 9A and 9B. A "C" with an arrow pointing from it toward the "X" will readily identify this point in the diagrams of Fig. 9. Simply break the lead at the point indicated and close the circuit again through the battery, with the negative terminal of the battery toward the grid terminal on the tube socket.

Changing DC to AC Diagrams

Have you ever tried a D.C. set and wondered how to change it over to an A.C. set: or, have you ever found a good circuit that you wanted to try, but found that it used A.C. tubes, while you wanted to try a D.C. arrangement Perhaps most of us have. There are some simple rules that will allow you to change any D.C. diagram to an A.C. diagram, or vice versa. Suppose, for example, that the connections to one of the D.C. tubes in the diagram are as shown in Fig. 10A, and you wanted to replace this tube with an A.C. or heater tube. (Note: the "automobile" tubes are like A.C. tubes in that they have also an internal heater). Proceed as follows:

1. All leads connecting to the grid of the D.C. tube also all connect with the grid of the heater tube.

2. All leads connecting to the plate of the D.C. tube also all connect to the plate of the heater tube.

3. The two filament-supply leads of the D.C. tube connect to the filament-supply the heater of the tube. If there is a rheostat in the D.C. circuit, it is taken out and does not appear in the heater-tube diagram, because heater tubes are usually run directly from the filament transformer or battery.

4. All other leads connecting to the filament of the D.C. tube go to the "C" or cathode terminal on the socket of the heater tube.

Heater tubes often require a biasing resistor, although in may cases they will operate without it. If in doubt as to the value of the "C" bias resistor, use from 500 to 2000 ohms. If the tube is for R.F. use, shunt the resistor with an .01 condenser: if it is for audio work, shunt the resistor with a 2 mf. condenser. For the connections for such a biasing resistor and condenser, see the R.F. input tube in Fig. 5. Regenerative detectors are usually not behind in any way.

One very useful circuit change that the reader should be familiar with is that necessary in changing from a type 27 A.C. tube to a 47 A.C. pentode. See Fig. 11. The 27 is a heater tube, while the 47 has a filament. The 27 is not a power output tube, of course, but many use them in the last stage for headphone work because of the low hum. The 47 is intended for the operation of a speaker, primarily. No new socket is necessary. Simply run the lead that connects with the "C" terminal to the centertap on the 30-ohm resistor which is connected directly across the two "F" socket terminals. The "C" lead is then brought to the opposite side of the speaker from the plate lead connection.

"Overseas" 1-Tube A.C.-D.C. Receiver

(Continued from page 530)

to a subterfuge—the capacitative ground; the center-tap of condensers C7, C8 affords this connection to the chassis. At the same time, these condensers act as filters to prevent light-socket *key-clicks*, refrigerator and furnace thermostat noises, etc., being fed into the set, to make a "hash" of our signals.

Resistors R3, R4, R5, R7 must pass the current required by the combined value of the filament of V and resistor R6 in shunt. Without center-tapped resistor R6 (actually, a portion of one resistor composed of R5, R6, R7), a very fine grade of "hum" will be heard (when the set is A.C. operated); with it, a graveyard is a bedlam compared to the between-station silence when the contact clips are correctly set (as a matter of fact, only static or "strays" will indicate that the set is working, when the tuning dial is set off-tune!).

A good design of filter choke and 12 mf. of capacity in the plate-supply filter system furnish adequate filtration of the output of the full-wave rectifier, despite the fact that the efficiency of the dry-disc rectifier is relatively low. Putting R1 in the negative leg of the plate supply slightly increases the efficiency of the filter system.

Construction Details

Due to these numerous factors, exactly the materials specified in the *list of parts* must be used. Of course, there is some excuse for the short-wave tyro to feel that we have an "axe to grind," and that he is privileged to make substitutions to suit his fancy, or to meet the dictates of material on hand; however, the experienced S.W. technician will be able to read between the lines.

For instance: (1), Substitute a screen-plate tube for the one specified for V, and it will not be possible to obtain circuit oscillation on the shortest wavelengths; (2), Replace R1 by a straight-line-variation resistor and the unit will be greatly overloaded in the position of minimum resistance; (3), Use a different coil kit and R.F. choke and regeneration will be uneven (as we found out by trying four different makes); (4), Use inductive condensers for C7, C8 and the hum level will become appreciable; (5), under-rated resistors will overheat—R3 to R7 *must* dissipate power; (6), Increase the size of fuse F and the safety factor on 220 volts is gone; (7), Larger headphones will not fit the carrying case;—and so-on.

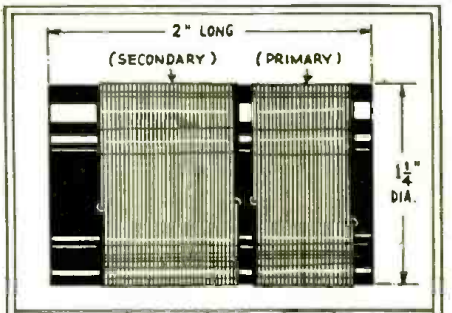
An off-on switch is not needed—just pull out the line plug. The mounting of plug P (which permits the cable to be nested in the case when not in use) is a bit "tricky"—but just use your own judgment, there's nothing very complicated about mounting the female plug.

Note that the *plug-in coils* mount in a raised socket. This prevents a "shorted-turn" effect due to the proximity of the edge of the chassis-hole provided for the coil. This mounting also prevents "absorption" effects by placing the coil-end at a distance from the base-plate. An approximate chassis template is given in Fig. 3C. The coil details are given in Fig. 4.

Every antenna is different—that is why C2 is in the circuit. Adjust this condenser, through the hole in the chassis, so that even regeneration, without a "plop," may be obtained with any coil in circuit.

Oh, yes—don't forget to drill *all* the holes indicated in Fig. 3C, as some of them are necessary for ventilation.

Well, fellows, how about it—think you want to start the New Year by making one of these 1-tube universal-current-supply "all-wave" portables?



COIL	LENGTH OF WINDING SECONDARY	SPACE BETWEEN WINDINGS	LENGTH OF WINDING PRIMARY	NO. OF TURNS S.	NO. OF TURNS P.	WAVELENGTH IN METERS
A	5/32"	1/4"	5/32"	5	7	16 - 30
B	9/32"	1/4"	3/16"	10	10	29 - 58
C	11/16"	3/16"	1/4"	20	15	54 - 110
D	7/8"	1/8"	7/16"	52	25	103 - 225
E	15/16"	3/32"	5/8"	140	57	200-585

Fig. 4.
Coil-Winding Data

List of Parts

One Gen-Win, type WH *litz-wound* "all-wave" coil kit (for 140 mmf. tuning condenser), L1;

One Sun type WH short-wave choke, RFC;

One Hammarlund type MC-140M, 140 mmf. midget condenser, C1;

One Hammarlund type MC-100 M, 100 mmf. midget condenser, C2;

One Hammarlund type EC-80, 20 to 80 mmf. mica equalizer condenser, C3;

One Aerovox type D1018 Hi-Farad 8 mf. dry-electrolytic condenser, C5;

One Aerovox type E5-TD Hi-Farad 4 mf. dry-electrolytic condenser, C6;

Two Aerovox type 381-T5, 0.1-mf. non-inductive paper condensers, C7, C8;

One Ratco Polymet type NM-1271, 150 mmf. mica condenser, C4;

One National, type BM-D vernier dial;

One Clarostat type CLD volume-control resistor, R1;

One Lynch type LF-4½, 6 meg., ½-watt resistor, R2;

Two Electrad type B-1, 100 ohm, 25 watt resistors, R3, R4;

One Electrad type C-2, 200 ohm, 50 watt resistor, (with three extra clips), R5-R6-R7;

One Kenyon type KC-350, 30 hy. filter choke, Ch.;

One twin tip-jack, panel-insulated, J;

One Eby binding post marked ANT., (with bakelite or hard rubber washers and bushing—not fiber or spaghetti), A;

Two Blan type KK black knobs (one for ¼-in. shaft of C3 and one for 3/16-in. shaft of R1);

Two RCA-Radiola dynamic reproducer dry-rectifier stacks, Radiola part No. 5898, (Sun Radio Co.), B;

One Littelfuse ¾-A. fuse, F;

Two Ratco fuse clips;

One Ratco UY-type socket for V;

One Ratco UX-type socket for L1;

One pair Ratco type Erpees, No. 1693 featherweight headphones;

One Ratco carrying case, 4¼"x6½"x11" long;

One Ratco line-plug, P;

One Ratco twin-conductor, No. 18 lamp-cord cable, 6 ft. long, (with male and female plugs);

One Sylvania type '37 tube (*with solid plate*), V;

One bakelite sub-panel (for fuse clips and plug P), 2½"x2"x1/16" thick;

One Blan sheet-aluminum for chassis, 16¾"x 6⅛"x1/16" thick;

One aluminum strip (for bracket of V), 3¼"x 1⅝"x1/16" thick;

One aluminum strip (for bracket of L), 5¼"x ¾"x1/16" thick;

One aluminum strip (for bracket of rectifiers), 2¾"x4⅜"x1/16" thick.

Next Month!!! The A.C. Super-Wasp Brought Up to Date! by A. A. Dolid. The article thousands of "Super-Wasp" owners have waited for. Don't Miss It!!!

In Next Issue! Pentodes in Low Power Transmitters by Dr. W. Möller.

S-W Beginner

(Continued from page 543)

The binding posts A to E will be used later to connect our two-tube Beginner's set for the elimination of the "A" and "C" batteries. For the present, though, we will be satisfied to continue the use of these two batteries.

Operation of the Unit

Now that we have completed the wiring of our receiver, it is time to try it with the receiver. First, connect the terminals P and B+ on the phone binding posts of the receiver. Then connect the dynamic speaker to the I and J terminals on the amplifier. Next connect a wire from the H terminal on the amplifier to the B— binding post on the set and the G post on the amplifier to the B+ 45 on the set. Leave the "A" and "C" batteries connected to the set.

This completes the wiring of the set to the speaker and amplifier. Turn the switch on and turn the filament rheostat on the set to the usual point. Tune in a local station and notice if the set goes into oscillation at the usual point on the regeneration control knob. If it oscillates too quickly, turn the power switch off. Then examine the resistor R3 and find the metal band that connects to the G binding post. Loosen the screw holding the band and move it down a little. Then try the set again and keep adjusting this resistor until the set acts normally.

If the phones are used to tune in distant stations, they should be connected to the output of the set and not the output of the amplifier, as they might be injured by the high voltage applied to the power tube. After the station has been tuned, the phones may be removed and the amplifier connected, or you may connect both the phones and the amplifier permanently. In this case they should be in "series"; connect the P terminal of the amplifier to the set binding post that runs to the plate terminal of the first amplifier tube. Then attach one phone tip to the amplifier B+ terminal and the other tip to the second phone binding post on the receiver.

Just a word of caution: do not make any changes in either the set or power unit, while the power is on. In the first place, the voltages are much higher than we have used before and you might get a bad shock or the power unit might be injured.

With regard to the loudspeaker there are two types of dynamic speakers. One type contains a rectifier tube or a "dry-disc" rectifier to supply the current for the electro-magnet (field coil as it is usually called). The other type obtains its current from the power-supply unit. The first type is simply plugged into the electric light socket. The second type requires a different method of handling. In this case, the connections from the field coil of the speaker are connected to the power amplifier, in place of the choke coil L3 which may be omitted.

A New Light-Weight Phone

With the increasing popular interest in short waves, the Acme Specialty Company has developed a phone that was specifically designed to reduce the back-ground noises so prevalent in DX. The more than 7000 turns of magnet wire bring up the weak signals clearly, ensuring that the operator will hear many more stations with the same set than he would when using a pair of less sensitive phones. The complete headset only weighs five ounces, which gives the utmost in comfort and means you may wear the phones on your ears; not on your face. It is furnished wound for either 2000 or 4000 ohms resistance. The 4000 ohm type being recommended as the best for DX. The manufacturer claims "The Acme" headset to be the lowest-priced phone on the market, giving every amateur and crystal-set builder an opportunity of owning a comfortable and sensitive phone at a price within their reach.

New ultra-sensitive, light-weight phones.

Medical Aspects of Ultra Short Waves

(Continued from page 524)

10 k. w. X-ray tube in which the cells were completely covered by ⅛ inch lead sheet.

The roentgen rays do not penetrate lead, and as the tube was quite a distance from the cells, the reaction in the sensitive meter was not due to heat waves, but simply a current output which registered through the lead upon the faces of the cells. The X-ray is noted for producing very bad burns if not handled properly, and the deflection from the *target* is called and identified as the *roentgen ray* after the name of the discoverer. How does science know whether the burns are caused from this additional element as registered in *foot candles*, for want of a better name?

U. S. W. "Fever" Apparatus

Recently, the writer constructed and put into practice an *ultra short wave oscillator* for the production of fever or temperature. This apparatus consisted of two UX-852 tubes arranged in push-pull, but with the "back-to-back" arrangement of *Mesny-Valuri*. It is a persistent oscillator and is capable of running long hours on wavelengths from 2 to 10 meters.

An auxiliary cabinet was constructed with two leads to couple across the plate inductance. This cabinet has one adjustable side; the top and bottom being one lead, and the two sides the other and forming a large condenser.

Rabbits were used in experiments and their temperature reached 41 degrees (Centigrade) from the usual 38 degrees (normal). However, after a few weeks severe burns were noticed. Since that time research has been carried on by other factions in an effort to ascertain the direct cause of the burns, which do not seem to be due to collections of moisture, or from coming in contact with the condenser plates.

This brings to mind that experiments by the writer with the very short waves disclose the fact that some sort of a photo-electric ray could be produced and would highly expose small dental films. It is believed this elementary action was first discovered by Mr. John Reinartz, the noted radio amateur, who perceived a bluish glow within an auxiliary indicator at a certain frequency.

Before any actual application to humans may be applied, it is our duty to ascertain accurately whether other elements are prevailing. To all indications there are many, and one of them is severe burns, which may be caused by an unidentified element.

Constructional Data and Summary

As will be noted in the photographs, the apparatus is entirely enclosed and surrounded by glass sides to better view the "works" in case things tend to go the "hay-wire" route. The lower portion of the cabinet contains the necessary plate and filament transformers, which operate direct from the 110 volt, 60 cycle line. The plate power is raw A. C. at a potential of 2600 volts, the filament transformer being the customary 10 volt affair. Inductances are removable; the ones shown are at present used for 30,000 kc. work. The circuit is shown in Fig. 1, which is the conventional push-pull method.

However, the auxiliary cabinet is for purpose of holding an animal within the field and without strapping him and causing discomfort. The condenser plates are of sheet metal and insulated, the schematic diagram appearing in Fig. 2.

When a rabbit is placed in this pen and the power applied, he fails to react immediately; but as he "warms" up to the situation the veins in the ears show dilation, and in 20 minutes his temperature starts to rise and keeps going. It is only at a much later date that burns are noticed.

From the foregoing it would hardly seem advisable to subject a human to any lengthy treatment, at least, for the present; but the value of high frequency in various forms have proved essential in many cases. Secondly, the natural heavy perspiration that is produced is essential in one degree in opening the pores (some of which have probably never been opened before) and allowing the natural poisons of the body to escape more quickly than could have been accomplished with potent medicines.

The majority of high frequency apparatus produces this result. In the case of pulsating currents, which produce a series of reactions or "jumps" within the muscular system, this often is very beneficial in activating those muscles which could not have been manipulated manually without a great degree of pain.

Probably the first reaction noticed with reference to the ultra high frequencies were from early experimenters while conducting transmission tests with high power. It was noticed that the body temperature tended to rise at various times, due entirely to their proximity to a powerful oscillator. Science has been looking for a long time for some method to raise the temperature in the human body *quickly*. Ultra high frequency oscillators have solved that problem but have brought many other matters to light. Secondly, to produce the desired results the patient must be enclosed between two or more condenser plates of large proportions. The oscillator must be of high power, capable of delivering 500 watts output and the patient must be wrapped in a suitable covering to prevent his contact with any portion of the charged plates.

Various research workers who have volunteered their services as "trial patients" have received a goodly portion of burns as compensation, and are quite satisfied that ultra high frequency currents are "hot stuff!" Where heat is concerned, one could get equivalent results by setting on a hot steam radiator. The writer knows this to be true, and has experienced many a painful burn which he would have been willing to trade for a shock from a quarter kw. closed-core transformer.*

It could hardly seem probable that burns would prevail where the body is not in contact with any metallic object; but an examination under darkness of a large condenser tapped from the oscillator, will disclose a bluish aurora between the two elements, which is similar to that noted in Tesla coil experiments. Within this bluish discharge there can be many components not yet identified, which have a tendency to attack tender portions of the body and produce an internal burn, which does not come to the surface for identification until some days have passed.

Some experimenters have claimed that moisture was the cause; while still others have *saturated* subjects and failed to produce a burn. The moisture portion of the discussion seems to be equally divided, but personally, the writer can see no reason why moisture should have that effect. A high frequency burn is no different than any other type; except that it is produced by very high wave speeds or frequency, which might be accounted for in the manner that one burns his finger with a match and it is probably two seconds before he senses the burn. With the ultra high frequencies, and due to the extreme speed, he might be burned for some time without actually sensing it.

Let it be understood that the writer does not condemn medical-therapeutic appliances, or any of the various electro-therapeutical apparatus being used today. They all have their own purpose, but it can be safely stated that of the many examined inside the "mysterious cabinet" in which each separate cabinet was for simply a few applications; the majority of them contained a Tesla coil with various tapped-off circuits leading to terminals labelled with God only knows how many ills.

The writer is not an electrical engineer, nor a physician, and for this reason, probably, cannot clearly grasp why one tapped lead from the end of an inductance coil is good for treating "hee-bee-gee-bees"; while the center lead from the same coil is labeled for treating those suffering from Saint Vitus Dance.

It is open to discussion whether one-half of the electrical apparatus in present use actually cures the patient of pains, or whether it is the psychology of the matter in which the patient is surrounded by many cabinets of mysteries, of which he knows absolutely nothing. What cures one man does not seem to cure another with the identical complaint.

*Yes—but it is generally understood we believe, that the high frequency currents or field causes heat to be developed inside the body; even in organs such as the liver, etc., without heating up the whole body, which is not the case with direct application of heat as when seated on a hot radiator, etc.—Editor.

Lafayette Dual Wave Receiver

(Continued from page 553)

lows: 12 to 33 meters; 32.3 to 96.2 meters; 72.4 to 216 meters; and 195 to 555 meters. Wave changing is accomplished by turning the lower left knob on the front of the set.

For the convenience of the operator, the indicator scale, which is illuminated, is divided into four sections. The lowest one, covering the broadcast band, is calibrated in kilocycles; the upper three, for the high-frequency bands, in megacycles. Different units are used here merely for the sake of convenience, as kilocycle figures would occupy too much space on the scale. In addition, the vernier dial which controls the dual tuning condensers has two "speeds" or driving ratios: a medium ratio for the broadcast band, and a very high ratio for the short wave bands. This little feature will undoubtedly be applauded by people who have had experience with short-wave superhets and know how critically fine the tuning can sometimes be!

An incidental provision in the set is made for a *phonograph pick-up* or *microphone*, with a switch on the back of the chassis to turn the instrument on or off. The chassis, of course, is of modern all-metal construction with all sensitive units completely shielded. Overall the receiver stands 19 inches high, 16 inches wide and 11½ deep.

With the tubes once installed, tuning and wave changing are accomplished from the front of the set. There are four knobs, as follows: lower left, wave changing; upper center, tuning; lower center, volume control; lower right, tone control. The wave-changing switch, being of light and simple construction, turns easily, and saves the temper of the operator.

When it comes to results the writer realizes that statements about short-wave reception are generally regarded by the uninitiated as in the same class with fish stories. When you talk about bringing in (in New York) European and South American stations loud enough to disturb the neighbors, you are bound to be denounced as a liar. However, readers of SHORT WAVE CRAFT will recall an article on page 333 of the October, 1932, issue, entitled "4 European Stations At Once!" The receiver shown in the illustration and mentioned by the author, Robert Hertzberg, was a preliminary model of the set described in the present article. It did not use the new tubes, which give much greater amplification, and it was minus some other minor circuit improvements, yet it seemed to perform in a rather creditable manner. The new set is even more sensitive and selective, much more so, in fact, than present conditions require.

In New York, in a noisy business district only two blocks from the Holland tunnels, this Dual Wave set brings in Chelmsford, Paris, Rome and Berlin almost as regularly as local stations on the broadcast band. Of course, some days they're weaker or stronger than on others. Toward evening EAQ, Madrid, is a frequent visitor. After business hours South Americans such as YV2BC, Caracas, Venezuela, and the various LS- stations in Buenos Aires, come through with some slight fading. The writer has never heard Sydney, but that's because he likes his bed too much! He still has several hundred hours of lost sleep from his active "ham" days to catch up on. However, one of these Saturdays he's going to stand the old "dog watch" and snare the Australian if it takes all night.

Second "Honorable Mention" Award

(Continued from page 534)

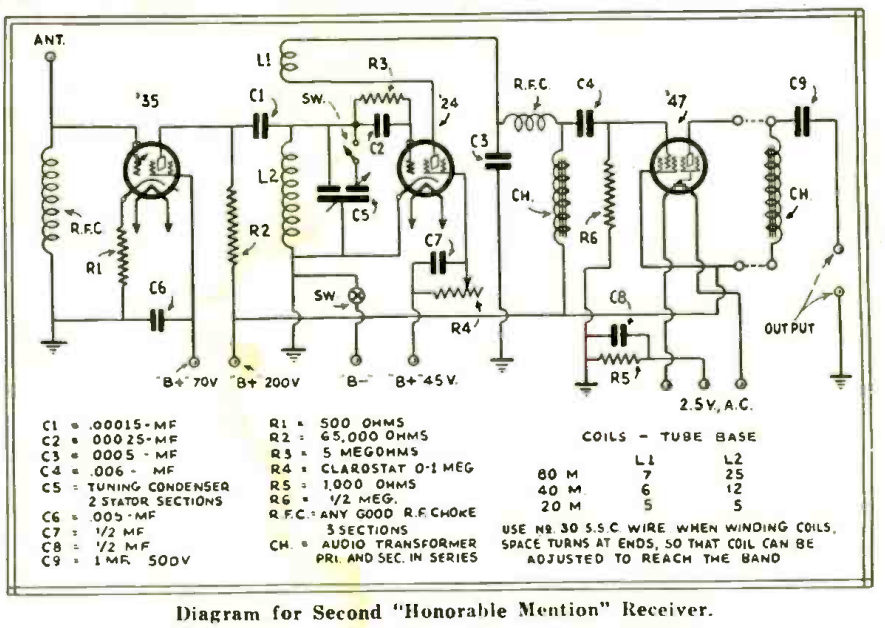


Diagram for Second "Honorable Mention" Receiver.

a fixed resistance.

Although the R. F. stage is extremely simple, its over-all gain is good, and because of its extremely small loading effect on the detector circuit the detector oscillates extremely readily. As a result, small tickler coils are necessary, and the detector oscillates extremely well on very high frequencies. The set has worked easily with several turns on the coil.

Particular pains were taken with the winding of the tickler on the plug-in coils, which are incidentally wound on tube bases. By varying the spacing and number of turns in tickler coil, the set was made to regenerate very smoothly on all bands.

The detector is impedance-coupled to the pentode audio-amplifier. To give the necessary high impedance required in the plate circuit of the '24, an audio transformer was used, the primary and secondary connected in series.

No out-put arrangement was built into the set for the '47 out-put. The ear-phones used here have a fairly high resistance (Baldwin's, type C) and they are connected directly into the plate circuit of the pentode, giving very good volume. I suggest in case a pair of low-resistance phones or a loud-speaker is used, that an out-put arrangement be employed, because this increases the volume considerably. Use either an out-put transformer for a pentode, or use the choke and condenser circuit shown in the diagram.

As for results, the receiver leaves little to be desired. It has plenty of volume on the speaker. It is selective. It is easily operated. The back-ground noise is very low. It has good tone quality.

There has not been much opportunity to try the set out for results. But with a short indoor antenna, a poor ground and rather poor weather conditions, "ham" signals from all over the country came in with plenty of kick on the speaker, coast to coast. On 40 and 20 meters, as well as commercial stations in Europe and Central America, amateurs were heard in Mexico, Cuba, Panama Canal Zone, and Costa Rica.

I might add that if an antenna much longer than 30 feet be used, that a condenser be used in series with it to keep the set selective.

The switch on the left is for adding capacity to the tuning condenser. Pull it out for the 80 meter c. w. band, but leave it in for all the other bands, unless it is desired to tune outside of the band. For 75 meter phone, leave the switch in.

Pie-Tin Receiver

(Continued from page 534)

The coil winding data for the amateurs short wave receiving set is as follows:

Coil No. 1—20 to 30 meters: Tickler winding 5½ turns No. 28 S. C. wire. Grid winding 6½ turns No. 28 S. C. wire.

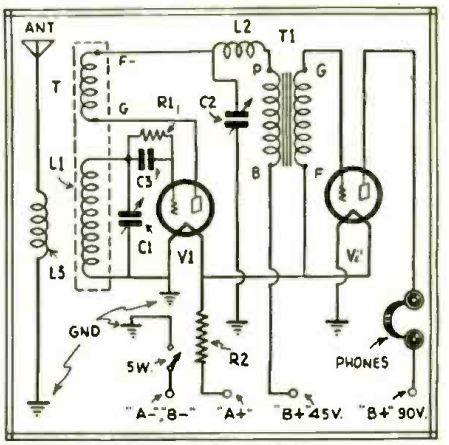
Coil No. 2—30 to 60 meters: Tickler winding 11¼ turns No. 28 S. C. Wire. Grid winding 11½ turns No. 28 S. C. wire.

Coil No. 3—60 to 80 meters: Tickler windings 13 turns No. 28 S. C. wire. Grid windings 20 turns No. 28 S. C. wire.

To keep from pulling the wire from the plug-in coils after the sealing wax is poured put in knobs from furniture drawers purchased in any five-and-ten cent store.

The parts required for the pie-tin receiver are as follows:

C1, C2—2 Pilot 23 plate midget condensers.
C3—1 .00025 mf. fixed grid condenser with grid-leak clips.
R1—1 .5 megohm grid-leak.
R2—1 .5 ampere 6 volt fixed rheostat.
T1—1 audio transformer (Crosley used). Any one available will do.
L2—1 RF choke—150 turns No. 32 wire on ½" spool.
L3—Antenna coil 10 turns No. 24 wire.
2 ordinary aluminum pie-tins of the 10c variety.
8 binding posts.
1 piece of bakelite or hard rubber panel.
3 wafer 4 prong tube sockets. Alden.
1 grid-leak holder for fixed rheostat.
1 filament switch.
3 feet hook-up wire.
2 pieces of steel for bottom pan braces.
3 foot color coded battery cable.



Hook-up of "Pie-Tin" Receiver.

What Are "Near Echoes?"

(Continued from page 531)

echo (signal 4) gives the same distance. A horizontal antenna was used for receiving the signals.

Picture 2 gives a double representation. In the top graph, reception was done with a vertical antenna; below with a horizontal antenna. The signal received was that of the Nauen station DFJ transmitting to South America; reception took place in Geltow. The recording was so arranged that first reception was for 10 seconds with the vertical antenna and then 10 seconds with the horizontal one. It is readily perceived that the vertical antenna took up only one small *near echo* signal, signal 2, the horizontal one, however, taking in a great group of *near echoes*. Picture 3 represents a *distant echo* which is about the same with both types of antenna.

In Figure 3 are represented some receptions from the "Nauen-to-North America" transmitter, DFA. The upper signals were received with a horizontal, the lower with a vertical antenna. We again see in the case of the horizontal antenna the strong *near echo* 3, which in the reception with the vertical antenna has only very small value.

The dimensions shown in this diagram likewise indicate a very great distance of the reflection stratum—over 1000 km. (600 miles).

Now from the Eckersley directional measurements, one could conclude that only the first near echo (3 in Figs. 1 and 3, and 2 in Fig. 2) and indeed only parts of this come from the side, while the real near echoes reach the place of reception vertically from above and at very steep angles in conical form.

In Fig. 4 the near echoes are shown in relation to the time of day. The 15.6 meter wave has been entered for the day hours, the 30 meter wave for the evening hours. It is clear that the reflection distance for the day wave very quickly increases after sunset (16:40 German time, based on 24 hour clock time, i. e., 4:40 P. M.), and then increases infinitely in similar way to the jump distance. For the 30 meter wave, on the other hand, a similar effect does not occur. The reflection distance always remains about 1200 miles. From the left half of Fig. 4 is also to be recognized that the multiple near echoes occur only at definite times of day, at which the ionization of the uppermost reflection strata is apparently especially favorable.

Very interesting indeed is the influence of solar disturbances on the near echoes. If the disturbing radiation from the sun is of short wave nature, so that it strongly penetrates into the lower atmosphere, the near echoes almost entirely vanish. Simultaneous observations of atmospheric disturbances have shown that these too then become less. Magnetic disturbances, which have so much more effect on short wave operation, the closer the path of the waves comes to the magnetic poles of the earth, also show a reduction of the near echo, but also at the same time a change in the time differences of the near echoes among themselves and with respect to the ground wave.

Even if the recent investigations of *Transradio* still may lead to no final conclusion about the nature of the reflection stratum of the near echoes, still it is now determinable that the distance of the reflection stratum is to be assumed at about 1500 miles, provided operation occurs only with day waves in the daytime and with night waves at night. Furthermore, it would seem sure that the reflection stratum is an ionization stratum, whose reflection ability changes under the influence of solar disturbances.

Turn to page 556 and learn how to keep your copies of SHORT WAVE CRAFT intact for future reference.

Read important announcement on page 574

Ship-to-Shore Phone A Success

(Continued from page 523)

the audible level. In the first detector, the received signals are combined with the output of a local oscillator to give beat-frequency signals of about three hundred kilocycles. These are amplified in three stages and then detected and the voice frequencies are passed to the line-terminal apparatus.

Automatic Volume Control

Although no filter, in the usual sense, is used at any point to select the signal-frequency band sharply, the interstage circuits of the three intermediate-frequency amplifiers are tuned to discriminate sharply against undesired signals. To remove the effects of "fading"—the slow variations of volume to which short radio waves are subject—an automatic volume control taps the output of the third amplifier, rectifies the taken portion, and applies the resulting direct current, whose magnitude varies with the signal's volume, as grid bias in the tube of the first detector.

The voice signals after being detected and amplified by the radio receiver, or before going to the radio transmitter, pass through a control operator's position located adjacent to the radio equipment. The received signals pass through a volume control and repeater and the transmitted signals pass through a similar volume control and repeater. Volume indicators on both the transmitting and receiving sides show the control operator the amount of voice frequency volume being received and transmitted. By means of the volume controls a constant volume or level is delivered to the subscriber and the radio transmitter substantially independent of the talker's volume.

On board ship the receiving antenna is of necessity close to the transmitter. This is obviously undesirable, especially as the transmitting and receiving frequencies are not widely separated. As a result, the transmitter would load up the receiving set with every impulse it emitted—unless something was done about it.

Voice Operates Relays

This condition is remedied by the use of an apparatus known as a "voice operated device anti-singing" or, for short, "vodas." As its name implies, this vodas is actually operated by the voice of the person at the telephone. The instant he speaks, it connects him to the ship's transmitter and disconnects him from his receiver. When he ceases, it reverses the process and takes his carrier off the air. This short-circuiting of his receiver prevents any signals from the transmitter being picked up by the ship's receiving aerial and carried back to the speaker's ear.

This equipment functions when a small portion of the voice current, outward bound, is picked up by an amplifier-detector. The amplified and rectified voice current leaving the amplifier-detector operates two relays, the second of which, in turn, operates another, which removes the short circuit that is normally across the outgoing circuit. The first relay shorts the incoming circuit to prevent all echo and singing effects.

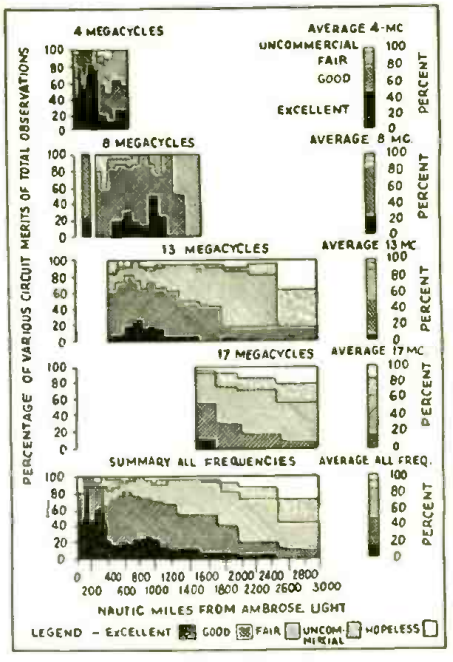


Chart showing radio "phone" transmission from Ocean Gate, N. J., to all ships, January-June, 1931.

It is obvious, that with such a mechanism, a syllable or two might be lost while the relay is acting. To avoid this a *delay network* is inserted in the transmitter circuit. By the time the first syllable or two has passed through this network, the relay has acted and closed the circuit.

Range of Phone Service

Telephone service to transatlantic liners is available whenever the ships are within range of the shore stations. This varies with conditions. On many occasions excellent circuits have been established with ships within sight of the English coast. During a recent cruise of the White Star liner *Homeric* in the Mediterranean, telephone communication was maintained with her throughout the voyage and conversations carried on with great ease while she was off Marseilles, Alexandria and Naples.

The charges for a call between New York and a ship are $9 for the first three minutes and $3 for each additional minute, while the ship is within 500 miles of shore and $18 and $6 respectively beyond that distance. Additional charges for points beyond New York are roughly proportional to the long distance rates. The service to the ships is available to all Bell and Bell-connecting telephones in the United States, Canada, Cuba and Mexico.

A De Luxe T. R. F. Receiver

(Continued from page 525)

grid leads to the radio frequency amplifier tubes. For the screen grid voltages use two heavy-duty resistors of the same size. The drop in the part between B plus and mid-point, due to screen grid current, will be more than that between the joint and the ground, thus giving a little less than half of the total voltage on the screen grids. Due to higher currents flowing in the voltage divider, this point can be read on a good voltmeter accurately, so that if a pack is used having an output of 250 volts, the mid-tap terminal will show approximately 100 volts.

Regeneration Control

Regeneration is controlled by means of a 50,000 ohm variable resistor. This must be a good one, for noise in this part of the circuit will be highly amplified in the audio circuit. The .0001 mf. variable regeneration condenser, in series with the feed-back coil, is used only when first adjusting the receiver. It is set so that the variable resistor will allow the detector tube to go into regeneration at the smoothest point. This greatly simplifies the art of coil-making, for if, when the set is put into operation, the detector "plops" into oscillation, instead of adding or taking turns from the tickler, a slight turn of the variable condenser is all that is needed to solve that usually most difficult problem.

An *audio choke coil* is used in the plate circuit of the detector, so that a maximum voltage may be applied at the plate. The secondary of any good audio transformer may be used at this point.

The next tube, a 56, amplifies the signals

as received and for this purpose a 25,000 ohm resistor is connected in the plate of this tube. This allows undistorted tone to pass on to the power amplifier. For continuous wave work, however, it is important that only a narrow band of frequencies be passed, so a switch is connected in such a manner that the plate of the 56 may receive voltage through either the resistor or a band-pass transformer. In this set an Erla 1000 cycle transformer was used, although the primary of any low-priced audio transformer may be used with success.

Pentode "Output" Tube Used

The power output tube might have been a 45 or 46, class-A amplifier and have proved satisfactory, but since *tone* is not of prime importance on short-wave DX broadcasts, a pentode 47 was chosen, so that maximum sensitivity to weak signals might be realized.

In laying out the panel, the knobs, as shown from left to right, are antenna compensator, volume control, tuning control, and regeneration control. For the antenna compensator, a small two plate midget condenser was used, parallel with the main tuning condenser; this is located between the shield compartment and the front panel. It is not critical and once set should not need further adjustment over a wide range of frequencies.

Pilot shield cans are used and each is separate from each other. They are inexpensive thin aluminum cans and can be easily worked. These cans are fastened to the base and all parts are laid out accordingly. The condensers are then run end to end through the sides of shield cans and are connected by insulated coupling collars. This is a very important item and must not be overlooked if interlocking is to be entirely eliminated. Each tuning condenser must also be *grounded* to its own radio frequency coil as well as to the common chassis ground. *To insure perfect grounding throughout, bus-bar was laid across the bottom of the chassis and all grounds were fastened to this bar.*

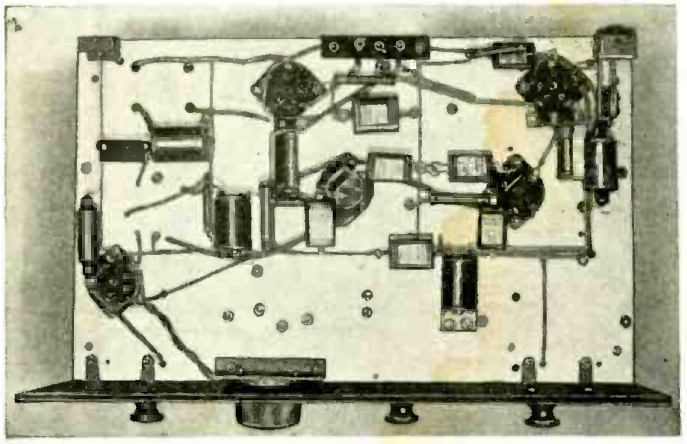
As for the 57 and 58 tubes, some sets require *double shielding*. In this set, however, tight-fitting shields as are commonly used on the type 24 screen grid tube, were found to be satisfactory.

When wiring the set keep all grid and plate leads away from each other and as short as possible. Do not use shielded wire for these important leads, but use ordinary cotton-covered hook-up wire.

Winding The Coils

Now for the coils. Wind three coils, putting the number of turns of wire on each coil as suggested in the table for one band, then plug in receiver with pack and speaker connected and "juice" turned on. If wired correctly the set will respond with a slight hiss as the regeneration control is advanced and the volume control full on. Next attach the antenna and loosen the variable tuning condensers so that each moves independently from the other; then swing each condenser back and forth until the noise level is strongest. If you live in a locality where the *noise-level* is low, turn on a vacuum cleaner in the back bed-room; you'll then have plenty of "static" to work on. After all three condensers respond to maximum noises they should be in a straight line; i. e., all have the same capacity setting. If not, then your coils are not right. To set about correcting coils, leave the detector condenser as it is, but take out the second radio frequency coil. If the condenser for that stage has a greater capacity setting than the detector condenser, add turns to the removed coil. If the condenser has a smaller capacity setting, take off turns until the condensers have the same capacity setting. Proceed in the same manner with the first radio frequency stage.

The set is then ready to bring you many hours of enjoyment and entertainment on short wave broadcasts, on amateur phone and on amateur continuous wave signals.



Bottom View of 5 tube T.R.F. Short Wave Receiver built by Mr. Currie.

Parts for 5 T. R. F. Receiver

C1—.0001 mf. Tuning condenser
C1a—2 Plate midget ant. compensator
C2—.02 mfd. condenser
C3—1 mf. condenser
C4—.0001 mf. condenser
C5—.5 mf. condenser
R1—400 ohm resistor
R2—10,000 ohm resistor
R3—.5 meg. resistor
R4—2000 ohm resistor (heavy duty type)
R5—20 ohm filament resistor
R6—360 ohm resistor (heavy duty)
R7—50,000 ohm resistor
R8—25,000 ohm resistor (heavy duty)
R9—25,000 ohm resistor

Coil Winding Data

FOR AMATEUR USE

7 PLATE TUNING CONDENSER

	Ant. L_1	Sec. L_2	Tick. L_3
14,000 KC	3	8	5
7,000 KC	4	15	7
3,500 KC	7	31	11

GENERAL SHORT WAVE USE

23 PLATE TUNING CONDENSER

	Ant. L_1	Sec. L_2	Tick. L_3
20,000—9650 KC	2	5	4
9700—4700 KC	3	11	6
4800—2500 KC	6	21	9

Use No. 22 D. S. C. on secondaries.
Use No. 28 D. S. C. on primaries and Tickler.
Spacing between windings 3/16".

Radio Signals from the Stratosphere

(Continued from page 527)

way. The wavelength of the whole apparatus varies between 30 and 50 meters.

The advantage of this automatic radio registering transmitter as compared with ordinary registering devices is that the reports are known immediately during the flight and not determined some two hours after the landing. Such radio sounding balloons are moreover entirely indispensable in polar investigation, since in the polar regions the finding of a registering instrument after it has landed is usually quite impossible. The rise of a captive balloon is moreover limited by the fact that in the case of strong wind at a certain height, a captive balloon no longer rises but is forced downward.

New "AGS" S-W Receiver

(Continued from page 550)

ing line voltages. This represents a real contribution to the short wave receiver art. The five sets of coils furnished as standard equipment with the present production "AGS" receivers, cover the range from 15 to 185 meters. Band-spread coils are now available for all of the amateur bands, as well as for the leading commercial communication bands, particularly those used for aviation purposes.

In lining up the receiver the designers have made a practice of *detuning* the beat frequency oscillator slightly from the I.F. amplifier, so that one side of the carrier would be materially louder than that of the other, since this adjustment increases sensitivity to c.w. signals and also takes full advantage of the selectivity of the I.F. amplifier. This gives a "semi-single signal" response, and while this effect is not anything like as pronounced as in receivers designed especially for this work, it is, nevertheless, sufficiently pronounced to be of real commercial value in c.w. reception.

While no superheterodyne has, in the opinion of James Millen, of the National Co., or ever will have, the same high signal to noise ratio on very weak signals that a TRF regenerator has, nevertheless, due to the inclusion of a stage of high frequency TRF ahead of the first detector in the AGS superheterodyne, the signal is first built up considerably before going through the first detector modulator combination. Consequently, the signal-to-noise ratio is tremendously improved over that obtained with superheterodynes not possessing this feature.

The volume control is rather novel, in that an additional tube is used for this purpose in order to eliminate any slide contacts in the high frequency R.F. circuits, which might introduce noise and detract from the generally high overall signal to noise ratio of the receiver.

Volume is controlled by changing the impedance of this volume control tube, which is accomplished by means of shifting its grid voltage.

A New Delft Wavemeter

● THE Delft Radio Co., Pacific Coast manufacturers are constantly improving their line, adding new types of tubes, and otherwise modernizing their receivers, transmitters and wavemeters.

A new inexpensive wavemeter for the short-wave "fan", has been placed on the market by the same company. It can be used in short-wave experimental work such as checking the ranges of coils and condensers, transmitters, or even in locating the position of foreign stations on the dials of short-wave receivers. This wavemeter can also be used as a wavetrap to eliminate interference on short wavelengths.

The latest model uses a special shielded case, an accurate vernier dial and very efficient coils wound on coil forms which protect the coil windings, insuring unusual long life and continued accuracy for the instrument. Each coil furnished covers a different range, the three coils covering all short-wave and broadcast wavelengths. The wavemeter is supplied with an accurate chart so that any wavelength tuned in can be readily identified immediately.

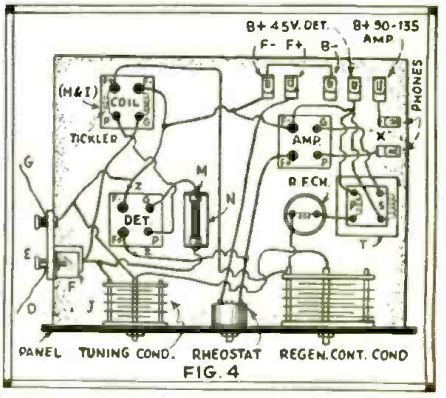


FIG. 4

Above: Corrected "picture diagram" for Binneweg 2-Tube 12,000 Mile "DX" Receiver (Fig. 4) shown on page 481 of December issue.

Omission Notice

In our November issue of SHORT WAVE CRAFT, page 422, we published a table of different kinds of antenna. Credit should have been given to RESEAU DES EMETTEURS FRANCAIS, Paris, France.

Rear view of new National "AGS" commercial type short-wave receiver. The plug-in coil shields are seen at the top of the panel.

A Long Wave Receiver

(Continued from page 535)

tickler L2 has 55 turns of No. 36 S.S.C. wound in one layer.

The larger coil has a secondary of 225 turns of No. 36 S.S.C. bunch-wound in three sections. The tickler has 200 turns of the same size wire, bunch-wound in three layers. The space between L1 and L2 is about ⅜ inch in both coils. Larger coils for higher wavelengths may be wound. A comparatively small number will cover all the long wave bands.

The receiver was tested with 201A tubes and gave excellent results. Of course, other tubes such as the new, low-drain tubes can be used.

List of Parts for Long Wave Receiver

1 Bakelite panel, 7 x 18 inches.
1 Bakelite subpanel, 4 x 15 inches.
1 Wood baseboard, 6 x 14 inches.
2 Variable condensers, .0005mf., Pilot Songbird (C1, C2).
3 Dials, 4-inch.
1 Ind. switch with dial, Regal, 12-point (SW1).
2 Rheostats, 20 ohms (R3, R4).
2 A.F. transformers, 5-to-1 ratio, Thordarson's.
1 50,000-ohm potentiometer, Centralab (R2).
1 By-pass condenser, Pilot, 1 mf. (C6).
1 Open-circuit jack.
3 Fixed condensers, .0005-mf. (C3), .001-mf. (C4). .002-mf. (C5).
3 Grid condensers, .0005-mf. (C7), .001-mf. (C8), .001-mf. (C9).
1 Filament switch, Carter (SW2).
6 Binding posts.
1 Grid leak, 7 megohms (R1).
2 Subpanel brackets.
2 coil forms. 1¾ inches O.D. (outside diameter). Wire, hardware, etc.

A Balanced-Detector Super-Regenerator

(Continued from page 541)

was designed for use with the "STAND-BY" receiver and was found to be very satisfactory for use with this receiver.

Place three type 56 tubes in the sockets after making sure that all connections are properly made. Plug in the tips of a pair of phones and connect the antenna and ground. Select one of the plug-in coils and locate the center of the winding, as shown in Fig. 5. Note that there should be three turns on each side of the tap and that each section of three turns has an equal additional fraction of a turn. The way to take this tap is quite simple. Scrape away the insulation with a sharp knife or a razor blade; then solder a piece of wire about five inches long to the wire which has been bared. This is the center tap of the coil and is connected to the ground and "B"—return.

After a signal has been tuned in, adjust the antenna series condenser C1 for the best results. Try various values of capacity at C7, C8, C9. Each band will have a value that will be best suited for maximum amplification. Lots of time must be spent in adjusting and trying out the circuit because the best results will only be had after considerable work has been done. This does not mean that the set is hard to get working, but that maximum results will be the product of the builder's efforts.

Further information regarding super-regeneration will be in SHORT WAVE CRAFT in the December, 1932 issue. It is recommended that the builder of this set read "*Super-Regeneration on Short Waves*" before he starts to build this receiver.

If the builder does not have the new type 56 tubes he will find that the older type 27 will work very well. This point is mentioned because the new tubes are not yet available all over the country.

Use a good pair of phones and do not worry about the plate current of the tubes flowing through the windings of the phones, because the detector tubes are biased to plate current cut-off and the total plate current is less than one milliampere.

Conclusion

It is, so it seems, the desire of every *short-wave* "bug" to build a super-regenerative receiver that will work. The letters received by the author during the past year show that about one out of three get satisfactory results. After looking at several of the sets, one really wonders why they ever work at all! Use good tubes! Solder carefully! Connect leads as shown! If possible use the parts recommended by the author.

Parts List

1—Alden S.W. Coil Kit (L1).
1—Hammarlund Equalizing Condenser 100 mmf. (C1).
1—Hammarlund MC-140M Midget Tuning Condenser (C2). Capacity-140 mmf.
1—Hammarlund S4 Isolantite Socket (used for L1).
1—Flechtheim Midget Condenser .00025 mf. C10).
1—Flechtheim .25 mf. bypass condenser. Type GB-25 (C6).
3—Flechtheim Midget Tubular Condensers. Type AZ. One .0001 mf. (C7); One. 0002 mf. (C8); One .00025 mf. (C9).
1—National. R.F. Choke Type 100 (RFC).
1—Acratest Mica Condenser .001 mf. (C3).
1—Acratest Electrolytic Condenser 25 mf. 25 volts (C4).
1—Carter 4 position switch (S1).
1—Frost potentiometer 50,000 ohms (R3).
3—Pilot (or Alden) sockets (V1, V2, V3).
1—Acme 30 kc. transformer (T).
1—International Resistor Co. 25,000 ohm, 1 watt resistor. (R1).
1—International Resistor Co. 1 meg. 1 watt resistor. (R2).
1—Blan coupling for the tuning condenser.
1—Blan Aluminum Front Panel.
1—National Tuning Dial.
1—Eby twin tip-jack terminal unit.
1—Base-board 8" by 10" by ¾" wood.
6—Fahnstock Clips for connections.
3—Eveready-Raytheon type 56 tubes.

Data on Alden Plug-in Coils

	Number of Turns		
(1)	4¾	6 Pitch No. 22 D.S.C.	Primary 4 turns No. 31 D.S.C.
(2)	10¾	12 Pitch No. 22 D.S.C.	Primary 6 turns No. 31 D.S.C.
(3)	22¾	16 Pitch No. 22 D.S.C.	Primary 7 turns No. 31 D.S.C.
(4)	51¾	40 Pitch No. 22 D.S.C.	Primary 15 turns No. 31 D.S.C.
(5)	68¾	Close wound No. 28 D.S.C.	Primary 28 turns No. 36 D.S.C.
(6)	131¾	Bank wound, 2 layers. No. 32 (Optional Litz)	Primary 32 turns No. 36 D.S.C

WAVE BANDS:
(1) Blue—10 to 20; (2) Red—20 to 40; (3) Yellow—40 to 80; (4) Green—80 to 200; (5) White—200 to 350; (6) Orange—350 to 550.

D.S.C.—double silk covered. Pitch—turns per inch.

Improving Our 5-Meter Transmission

(Continued from page 537)

The grid coil consists of 6 turns of No. 10 copper wire, ¾ inches inside diameter with ⅛ inch spacing between turns and tapped at its electrical center. The grid-leak for the 46's with 300 volts on the plates is 10,000 ohms, and 50,000 ohms for 400 volts or over.

Isolantite five prong sockets were used as there is no better insulation for five meter work, in the author's opinion. (It is too bad that the 46 doesn't have an isolantite base.)

Plate Tuning Condenser

The plate tuning condenser is the split stator type, (Cardwell) having three stator and two rotor plates in each section. The plate coil is made of 3/16 inch copper tubing, 1⅛ inches inside diameter and has one and one-half turns. This type of coil was used because it brought the two ends and the center tap all out in the same direction, without having the center tap lead running through the center of the coil. This eliminates the R.F. pickup of this lead as is the case with the single turn coil mounted vertically.

The antenna coil is identically the same as the plate coil, except it has no center tap. Antenna coupling is not much of a problem. The stand-off insulators that the coils are mounted on are placed as close as it is possible to get them, and provide about two and three-quarters inch coupling.

Tuning the Transmitter

Tuning this set is by no means a hard job. The only controls are the plate and antenna tuning condensers. The plate tuning condenser can be swung over a very wide range, with a very slight change in plate current; in fact it can be tuned over a range equal to about four times the width of the five meter band. All that is necessary is to set the plate condenser at the frequency one wishes to operate and tune the antenna for highest reading on the antenna meter.

The modulator unit consists of a type '50 tube with 500 volts on the plate driven by a single stage of speech amplification using a transformer coupled '27 with 135 volts on its plate. The coupling transformer should be of good quality and 3-1 ratio. If the microphone transformer is not easily obtained, one can be made by removing the primary of a good quality audio transformer and winding in its place 300 turns of No. 30 cotton covered wire. If a double-button

microphone is used an additional stage of speech amplification will be needed and a transformer matching the microphone.

No gain control is shown and it was not found necessary in this layout. However, if the builder wishes to incorporate one in the set there is ample room to mount it on the chassis. If trouble should occur in the speech amplifier, a 200,000 ohm resistor can be shunted across the secondary to eliminate the feed-back. This cuts down the gain considerably and should be left out if possible.

Antenna and Feeder Details

With this type of transmitter layout, some sort of feeder system had to be used to excite the antenna. About the easiest to construct and the most efficient is the commonly used Zeppelin. In determining the length of the feeders they must be considered as a single wire folded at the center. A point of high current must exist at the center, and in order to obtain this, it must be at least one half wavelength long, or any odd multiple of half waves such as 1, 3, 5, etc. The length of each feeder therefore will be an odd number of quarter waves long. As a quarter of a five meter wave is approximately four feet long, our feeder system will have a length of 4, 12, 20, 28, 36 feet, etc. The antenna tuning condenser will compensate for the slight differences in the different parts of the five meter band.

The antenna system used by the author consists of a *half-wave* vertical brass rod, eight feet two inches long, and fed at one end by the feeder system described. The longest feeder tried was 36 feet, and the spacing approximately 3 inches.

The outfit described has been in use for several months and puts out a very strong and consistent signal. If the reader does not wish to follow the exact layout described, the necessary changes of circuit in his present transmitter to accommodate these tubes can be made with more than gratifying results.

The split-stator tuning condenser is made from a Cardwell receiving condenser, the capacity of each section is approximately .00005 mf.

The center-tapped resistor across the 46 filaments is 20 ohm, the one across the 50 filament is 75 ohms. The audio transformer used is 3-1 ratio; the power transformer has a 1000 volt center-tapped winding, delivering 500 volts when rectified.

Parts List

1 10" x 18" x 3" steel chassis.
1 Power transformer (see text) Acratest.
2 4-prong wafer sockets; Alden.
1 5-prong wafer socket; Alden.
2 5-prong Isolantite sockets; National.
1 Tuning condenser (see text) Cardwell (each section .00005 mf.
4 Stand-off insulators.
1 30 H. filter choke.
1 18 H. filter choke.
2 2 mf. filter condensers.
1 2000 ohm resistor (wire-wound) 100 M. A. rating.
1 2000 ohm carbon resistor.
1 100,000 ohm Electrad bleeder resistance (75 watt).
1 1 mf. audio by-pass; 800 volts rating.
2 1 mf. condensers 200 volts rating.
1 audio transformer, 3 to 1 ratio.
1 20 ohm center-tapped resistor.
1 75 ohm center-tapped resistor.
1 82 tube RCA (Rectifier).
2 46 tubes RCA.
1 50 tube RCA.
1 27 tube RCA.

Crystal Oscillators

(Continued from page 542)

current is always kept at the same value. By using a crystal oscillator in conjunction with a dynatron oscillator, an excellent audio oscillator can be arranged. Such a beat-frequency audio oscillator has many uses. By arranging a small midget type condenser across the tuned circuit of the dynatron oscillator, a variable audio note over the entire audio range can easily be obtained.

The practical constructional features of the crystal oscillator shown here will be described. The crystal used in this oscillator has a fundamental wavelength of about 160 meters. A crystal holder was constructed of two flat metal discs, ground perfectly flat, with a spring contact to hold the top plate against the crystal. Several values of battery voltage in the grid circuit were tried, but 4-½ volts was found to be satisfactory. When one of the type '30 dry-cell tubes is used (90 volts on the plate), plate current drops from about 10 milliamperes to 3 milliamperes when the plate circuit is properly tuned. The condenser used in the plate circuit is .00035 mf. size. The correct adjustment of the plate condenser is rather critical, so a .50-mmf. midget is connected in parallel with it. The plate bypass condenser C1, shown in Fig. 3C, is .5 mf.; .1mf. would serve as well. The R.F. choke used in the grid circuit is an ordinary type used at broadcast wavelengths. A 20-ohm rheostat will serve for any of the usual types of tubes. The type '30 dry-cell tubes are perhaps more convenient for general use where batteries are to be employed. The panel used measures 7x12 inches with baseboard to suit. For testing plate current, or in listening tests with a beat-frequency oscillator, a closing-circuit jack, as shown at the point "x" in Fig. 3C, is convenient.

If a .00035-mf. condenser is used, one can plug in different crystals within its range. If crystals having widely different fundamental frequencies are to be plugged in, an ordinary tube socket and tube-base coils will allow the plate circuit to be changed to the correct dimensions. Small coils wound on ordinary tube-bases can be used for this purpose. The coupling coils can be wound on the same base. A UX socket will serve, since there are four connections to it. For 160-meter use, 21 turns of No. 18 D.S.C. wire on a three-inch diameter bakelite form will serve for the plate inductance. The coupling coil, which is spaced about ½ inch from the plate coil, consists of 12 turns.

(To be concluded)

Letters from S-W Fans

(Continued from page 554)

that I would try this one. Incidently, it is the *first* one I have ever built.

After delays in obtaining two or three parts and the cracking of a Kurz-Kasch dial, I at last had the set "percolating."

I want to say right now that I have never expected that such distance and volume could be obtained with a one-tube set! Following is a list of stations I have heard since the set began operating.

Amateur stations W5VJ, W4BFA, W4MU, W4TM, W5PP, W4AP, W4FK, and many, many others on the 75 meter phone band. Police stations WPDE, WMDZ, WPEC, WCK and others. I have also heard many airplanes and airplane stations. On broadcast short-wave stations I have heard, W8XK, Pittsburgh, Pa., W1XAZ, Springfield, Mass., W2XAF, Schnectady, N. Y., WOO, Ocean Gate, N. J., W3XL, Boundbrook, N. J., W3XAL, Boundbrook, N. J., W9XAA, Chicago, Ill., VE9GW, Bowmanville, Ont., W4XB, Miami, Fla., Bogota, Columbia, S. A., EAQ, Madrid Spain, and I2RO, Radio Roma Napoli, Rome, Italy.

With best wishes for SHORT WAVE CRAFT, I am

Yours very truly,

JACK JONES, Jr.,
Tupelo, Miss.

(We could hardly believe it Jack, although our tests with the short-wave "Megadyne" had shown that this receiver, when properly adjusted, had quite out of the ordinary characteristics. We believe your record of stations "takes the cake" for the 1-Tube Megadyne. It just shows what a little wrinkle like this can do—simply adding a crystal detector in a 1-tube circuit and changing the connections around a bit. The thing that gets the editor's goat, to tell you the truth, is that we do not receive many dozens of novelties like the short-wave Megadyne from our thousands of readers situated all over the globe. It really is unthinkable that there are not many other worth-while novelties in circuits, using but one or two tubes, or possibly a crystal detector or other "gadget," which SHORT WAVE CRAFT readers would be "tickled pink" to read about and try. Let this be a "clarion call" to all short-wave fans who read this—WE ARE LOOKING EXPECTANTLY FOR NEW SHORT WAVE WRINKLES SUCH AS THE "MEGADYNE."—Editor.)

WORLD'S BEST RADIO BOOKS

IT IS always the well-trained man who wins out over the horde of thousands of superficially trained and incompetent men. You are reading this magazine because you are interested in radio. Sooner or later, the time will come when you will wish to cash in on your knowledge. Your chance may come over night, and then the big and vital question will be, "How well equipped am I to fill the job?" You are in radio because you like it. You also realize that, at the present time, there are many branches of the radio art which you do not know as thoroughly as you should. Knowledge, these days, can be gotten cheaper than ever before. It isn't necessary for you to go to college to become proficient in radio. Start today, to build a REAL radio library and become acquainted with all branches of this great and growing art. In this page are listed the world's best radio books. We have combed the market for the really important books in radio; so that, no matter what branch you are interested in, you can pick out the best books that are now printed. Start, now, to build a complete radio library. You do not have to get all the books at once, but make up your mind to get one book a month; so that, when your chance comes, you will be fully equipped to win out over the others not so well equipped.

IMPORTANT.—This list is changed every month to include the latest books. Note also new low prices.

THE RADIO HANDBOOK, by James A. Moyer and John F. Wostrel. Flexible covers, size 5½x8", 886 pages, 650 illustrations. Price **$5.00**

Comprehensive data on short-wave apparatus, vacuum tubes, modern radio receivers and transmitters, photoelectric cells, television, sound motion pictures, tables, graphs, diagrams, etc. No radio man should miss it.

RADIO FREQUENCY ELECTRICAL REQUIREMENTS, by Hugh A. Brown. Cloth covers, size 6x9", 386 pages, 235 illustrations. Price **$4.00**

One of the few great books on this important subject. Everything from thermionic-tube coefficients to piezo-electric measurements.

PRACTICAL TELEVISION, by E. T. Larner. Cloth covers, size 5½x8¾", 223 pages, 127 illustrations. Price **$3.75**

This book explains television in full, including elementary principles, photo electric cells, and all important types of television sets as well as basic principles of optics, images, mirrors, lenses, etc.

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A practical, concise book presenting the theoretical and practical information for the proper operation, maintenance and service as applied to modern radio practice.

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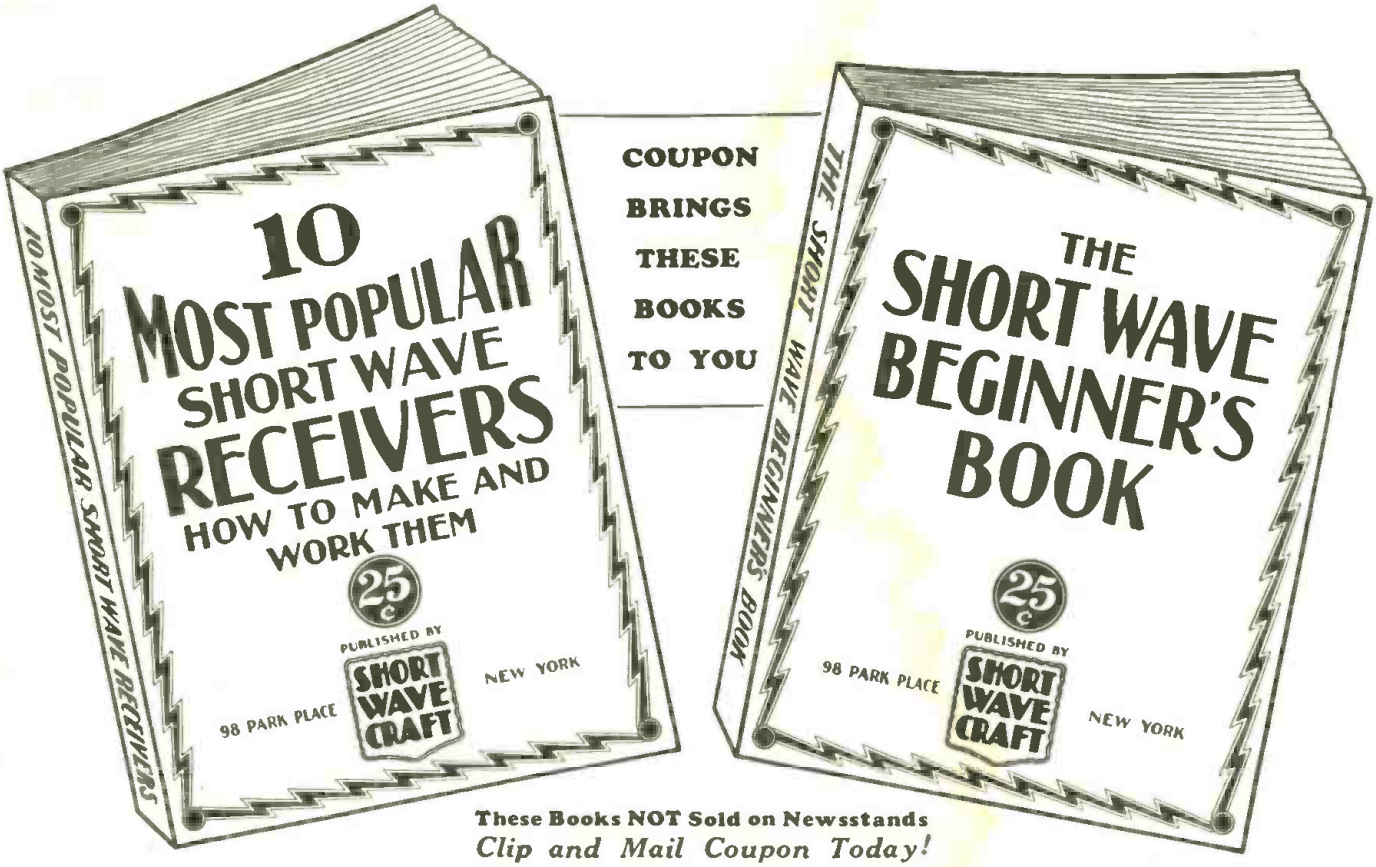

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HERE IS GREAT NEWS

PURSUANT to many requests from our readers, we have decided to publish two new popular short wave books, for which there is a persistent demand at this time.

These new books contain everything on the subjects worth knowing and both books will be welcomed by all short wave experimenters, short wave fans and short wave enthusiasts, the same as our former two books HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS, and HOW TO BECOME AN AMATEUR RADIO OPERATOR were welcomed by thousands of our short wave friends.

In conformity with the times these books have been priced at 25c instead of 50c, which is the price of our other books. Yet the two new 25c volumes that we are offering now contain a tremendous amount of information and the type and illustrations have been chosen in such a manner as to give you almost as much for your 25c as you received for your 50c before. Only by increasing the press run enormously and making other printing economies has it been possible to price these books at such a low, popular price.

You will make no mistake in getting either or both of these new and popular books and we know in advance from our many years of experience with short wave enthusiasts that you will thank us for having made these books possible.

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

This new volume will be a revelation to all those who wish to build their own short wave receivers. The editors of SHORT WAVE CRAFT over a period of years have learned to know exactly what short wave experimenters and short wave set builders want to get. For that reason they have selected ten outstanding short wave receivers and these are described in the new volume. Everything worthwhile about every one of the ten receivers is described in the text. Each receiver is fully illustrated and each receiver has a complete layout, pictorial representation, photographs of the set complete, hookup and all worthwhile specifications, so there is *nothing left to your imagination* when it comes to building any one of these ten popular receivers. Everything from the simplest one tube set to a six tube superheterodyne is presented. Complete lists of parts are given to make each set as complete as it is humanly possible to do. You can select any or all receivers and know beforehand that you will be able to successfully build and operate such a receiver and not waste your money in building some theorist's dream-child. You will also be shown how to operate the receiver to its maximum efficiency.

IMPORTANT

THERE IS NO DUPLICATION WHATSOEVER BETWEEN THIS BOOK AND OUR OTHER VOLUME —"HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS." ALL THE MATERIAL PUBLISHED IN THE NEW BOOK HAS NEVER APPEARED IN

A Short Wave Beginners Book

Here is a book that will solve your problems if you are new to the short wave game. It contains positively everything that you would wish to know in connection with short waves, leading you in easy stages from the simplest fundamentals to the present stage of the art in short waves as it is known today. It is the only low-priced reference book on short waves for the beginner, whether he be a short wave enthusiast, short wave listener or short wave amateur.

The book is profusely illustrated with all sorts of illustrations, explanations and everything worthwhile knowing about short waves in this interesting and growing field. Yet withal, the book is not "technical." It has no mathematics, no "high-faluting" language and no technical jargon which would only serve to frighten you away. *The entire book is kept in popular language throughout.* Wherever technical words are used, explanations are given, leaving nothing to the imagination. You are shown how to interpret a diagram and a few simple sets are also given to show you how to go about it in making them. Yet everything has been done to make it possible to give you a complete understanding of short waves from the ground up.

After reading this book, you will never be at a loss for short wave terms and you will not have to consult other text-books or dictionaries. The editors of SHORT WAVE CRAFT who have edited this book have seen to it that everything has been done to make this volume an important one that will be used as reference for years to come by all those who wish to break into the short wave art. The book covers everything, "from soup to nuts" and will be of tremendous importance to everyone.

It abounds with many illustrations, photographs, simple charts, hookups, etc., all in simple language. It also gives you a tremendous amount

DOERLE WORLD-WIDE Receivers

Official Doerle Receivers

THERE have never been produced short-wave receivers which have taken the whole country by storm as much as the now famous DOERLE Receivers. Mr. Doerle described his first receiver, the now famous TWO TUBE 12,500 MILE RECEIVER in the December-January issue of SHORT WAVE CRAFT. You have seen the many letters published in SHORT WAVE CRAFT lauding this receiver to the skies, and for a good reason. It is a low-priced receiver, yet, pulls in short-wave stations from all over the world, REGULARLY, in practically any location, not only in this country, but anywhere. Thousands of experimenters have built their own, and have obtained miraculous results, as hundreds of glowing testimonial letters from radio fans testify.

Recently, Mr. Doerle brought out another receiver, the THREE TUBE SIGNAL GRIPPER, which already has started to make history. There is no question that the three tube job will also make its triumphant tour all over the world.

We repeat that we do not believe that there are two more efficient and practical low-priced short-wave receivers in existence today at the present stage of the art than the Doerle TWO TUBE 12,500 MILE RECEIVER and THREE TUBE SIGNAL GRIPPER.

In the course of the year, we have received many requests for these receivers, and we have sold a great many parts for both receivers, but not until recently have we concluded our tests which now places us in a position to supply the two complete receivers so that you can either buy them completely wired or in kit form.

By special arrangement with the publishers of SHORT WAVE CRAFT, we are now in a position to sell you these official receivers so that all short wave enthusiasts who ever wished to own either of these fine sets can now be sure to buy them without a question in their minds that they will perform 100%.

It took a lot of labor, and much ingenuity to collect the correct parts to make sure that each receiver would work under all circumstances. This means that all the usual "bugs" have been ironed out by us in such a way that you may order every receiver with full confidence, that in practically every location, anywhere, "they will do their stuff."

ONLY FIRST CLASS PARTS USED

It may be possible to buy the parts of the completed sets at a lower price. We admit this at once. But if you will look over our parts list, you will find that *only first class material is used*. We have done away with all losses. There is no "*hand capacity*." IN THESE TWO SETS ONLY THE BEST CONDENSERS—AND THAT MEANS HAMMARLUND—ARE USED. The sets could be produced for a considerable less amount if we used cheaper condensers. We have refrained from doing so because we wanted a first class product. And this goes for everything else in the sets. They are low in price, yet the quality is excellent considering the low price. Thus, for instance, we are using Kurtz-Kasch dials because we found them excellent for their purpose, and as everyone knows, they are really first class verniers. The baseboards are of laminated well-seasoned veneer wood, that will not warp. Panels are polished aluminum, on which the condensers and other parts are mounted. These panels do away with hand capacity. The plug-in coils are of Bakelite, wound with enamel wire for low losses. In short, despite the exceedingly low price of these sets, we give you quality. Bakelite sockets only are used. Even the aerial condensers are of the Micamoid Equalizing type. We have even included pin-tip jacks, rheostats with switch and binding post strips of Bakelite to keep down losses.

In short, you will be pleased not only with the business-like appearance, but with the performance as well.

Only by making these sets in quantities can we afford to sell them at the extremely low prices quoted.

Note the testimonials printed on this page. They will give you an idea what can be expected from these great sets.

WHAT THEY SAY!

"Does All You Say"

I have built the *Doerle* short wave receiver and I want to say it does all you say it will.
J. Joseph Whaley, 401 Springdale Street, Cumberland, Md.

Some List!

Have just completed your *Doerle* two-tuber. I received the following on the loudspeaker: XDA, LQA, GMH, VE9DR, VE9GW, KKQ, W1XAZ, W2XAF, W3XAL, W3XAU, W2XAB, W8XK, W8XAL, W9XF, W9XAA, Bermuda, Honolulu, Budapest, Hungary, and "hams" in 38 states.
Maurice Kraay, R. F. D. 1, Hammond, Ind.

This Is Going Some!

Today is my third day for working the *Doerle* set, and to date I have received over fifty stations. Some of the more distant ones I shall list. From my home in Maplewood, N. J., I received the following: WYR, Atlanta, Ga.; WGK, Ohio; W8BHM, Ft. Wayne, Ind.; W9AYS, Elgin, Ill.; W8ERK, Girard, Ohio; and, best of all, XDA, Mexico; PZA, Surinam, South America; TIR, Cartago, Costa Rica; G2WM, Leicester, England. I have also received stations WDC and PJQ, which I have not found listed in the call book.

That's not a bad record for three days on a two-tube job, is it? I will answer any Questions concerning the *Doerle* set.
Jack Prior, 9 Mosswood Terrace, Maplewood, N. J.

A Good Word for the Doerle

I would like to put a word in for the *Doerle* 12,500 mile receiver. I recommend this set to all "set wreckers" in a big way! Hoping that this set "perks" for all "hams" in a big way.
H. J. Keilholtz, 1508 Belt Street, Baltimore, Md.

A Doerle Enthusiast

I have just completed my two-tube *Doerle*, and it surely is a great receiver! It works fine on all the wavebands. Nobody could wish for any better job than this one. I can get W8XK and W9XAA to work on the loudspeaker at night, and the code stations come in with a wallop behind them.
Samuel E. Smith, Lock Box 241, Grayling, Mich.

HOW DO THE TWO SETS DIFFER?

The TWO TUBE 12,500 MILE SHORT-WAVE SET is intended to be used with headphones, although it is bringing in, right along, stations on the loudspeaker. We, however, do not make such a claim. For instance, stations 5,000 and 10,000 miles away come in only on headphones. This set uses two 230 two-volt battery type tubes.

The THREE TUBE SIGNAL GRIPPER, as its name indicates, is a three tube set. It also uses the 230 type battery tubes. It is a great deal more powerful than the smaller set, and will bring in stations from great distances on the loudspeaker. A good magnetic loudspeaker should be used. Thus, for instance, stations from all over the country come in on the loudspeaker, but, of course, stations 12,000 miles distant require the use of earphones.

The price of the two sets include a set of plug-in coils. Both sets are operated from ordinary dry cells. The "B" battery supply can be either 90 volts or 135 volts for the THREE TUBE SIGNAL GRIPPER. For the TWO TUBE SET, 90 volts is sufficient.

Both sets tune exceedingly easy, and the oscillation control is always under full control of the operator. The vernier dials are accurate so that stations can be logged and found in their allotted positions every time you use the set.

OUR OWN TESTS

Both sets have been tested by us, and we found that they do all and more claimed by Mr. Doerle, and other enthusiasts who built the sets. We refrain from giving you the astonishing list of stations which we ourselves have logged because we do not wish to let our enthusiasm run away with us, and because you might not believe the actual results accomplished with this set. We much rather have others talk about the results.

Incidentally, we have, as yet, to receive a single complaint on these sets, although we sold a large quantity of parts for both of them.

Two Tube 12,500 Mile Doerle Receiver

$8.90

This receiver is exactly as illustrated in our photographs. Size of aluminum panel is 9x6¾ inches; baseboard 9x5½ inches. List of material used: 2 Hammarlund .00014 Condensers; 1 Carter 20 ohm Rheostat and Switch; 1 Peerless Audio Transformer; 2 Kurtz-Kasch Vernier Dials; 3 Bakelite Low Loss Sockets; 1 Micamoid Equalizer Antenna Condenser; 1-.0001 Aerovox Fixed Condenser; 1-5 megohm Carborundum Grid Leak; 2 Telephone Pin Jacks; 1 Aluminum Panel; 1 Veneer Baseboard; 1 Bakelite Rheostat Knob; 1 Bakelite Binding Post Strip; 1 set of 4 Bakelite Short Wave Plug-In Coils; Instructions for Operation; 1 Set of Hardware, Wire, etc. Complete shipping weight 5 lbs.

No. 2140. TWO TUBE 12,500 MILE DOERLE SHORT WAVE RECEIVER, completely wired and tested as per above specifications. YOUR PRICE **$8.90**

No. 2141. TWO TUBE 12,500 MILE DOERLE SHORT WAVE RECEIVER KIT, with all parts as specified above, *but not wired*, with blueprint connections and instructions for operation. Complete shipping weight 5 lbs. YOUR PRICE **$7.70**

No. 2142. Complete set of accessories, including the following: 2 six months guaranteed Neontron type No. 230 tubes; one set of No. 1678 Brandes Matched Headphones; 2 No. 6 standard dry cells; 2 standard 45-volt "B" batteries, complete, shipping weight 22 lbs. YOUR PRICE **$5.40**

Three Tube Doerle Signal Gripper

$11.85

This receiver also, is exactly as shown in our photograph. The aluminum panel measures 10½x7½; baseboard 10½x8 inches. It comprises the following parts: 3 Hammarlund .00014 Tuning Condensers; 1 Carter 20 ohm Rheostat and Switch; 1 Peerless Audio Transformer; 2 Kurtz-Kasch Vernier Dials; 2 Sets of Short Wave Coils; 1-5 Megohm Carborundum Grid Leak; 2 RTC r.f. Chokes; 5 Bakelite Low Loss Sockets; 2 Micamoid Equalizer Aerial Condensers; 1 Bakelite Binding Post Strip; 2 Telephone Pin Jacks; 2 Bakelite Knobs; 1 Aluminum Panel; 1 Veneer Baseboard. One Set of Directions and Instructions for Operation; 1 Set of Hardware, Wire, etc. Shipping weight 7 lbs.

No. 2143. THREE TUBE DOERLE SIGNAL GRIPPER, completely wired, ready to use. YOUR PRICE **$11.85**

No. 2144. THREE TUBE DOERLE SIGNAL GRIPPER KIT, with all parts as specified above, *but not wired* with blueprint connections and instructions for operation, complete. Shipping weight 7 lbs. YOUR PRICE **$10.50**

No. 2145. Complete set of accessories, including the following: 3 six months guaranteed Neontron type No. 230 tubes; one set of Brandes Matched Headphones; 2 No. 6 standard dry cells; 3 standard 45-volt "B" batteries, 1 B.B.L. 9 inch Cone Magnetic Loudspeaker, complete. Shipping weight 32 lbs. **$11.00**

GUARANTEE

We guarantee and warrant that all material furnished in the two sets described in this advertisement, whether in the completed set or in the kit form, is first class, in every respect; that the complete sets have been tested before shipping, and that we will stand back of these sets and kits in every way. We will replace any parts, with the exception of accidentally blown out vacuum tubes within three months, if parts are returned to us within that time.

PLEASE NOTE

We are short wave specialists. Please understand that the two sets here described are not the only ones which we produce. We can furnish parts, in kit form, of practically any short wave receiver described in SHORT WAVE CRAFT or other radio magazines. Get our prices first. We will save you money.

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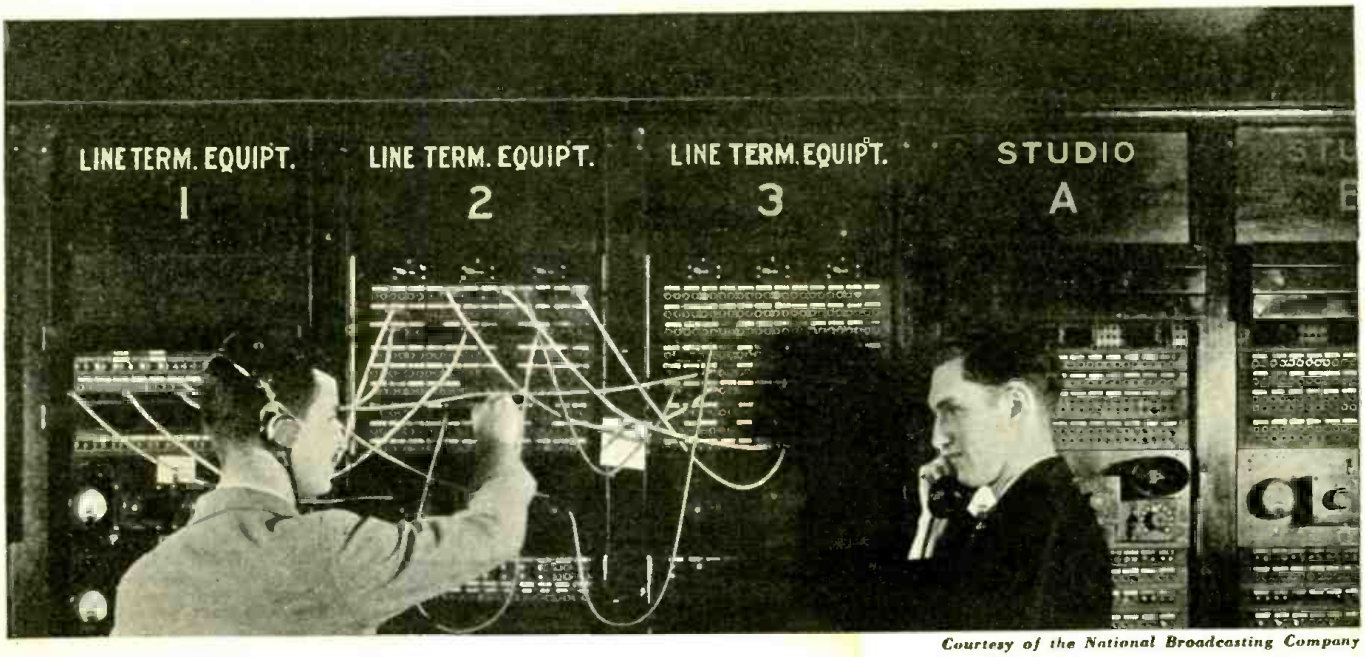

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