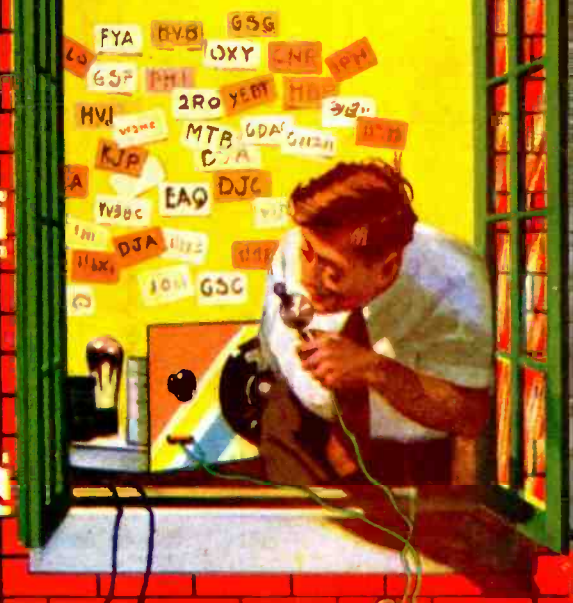
THE RADIO EXPERIMENTER'S MAGAZINE

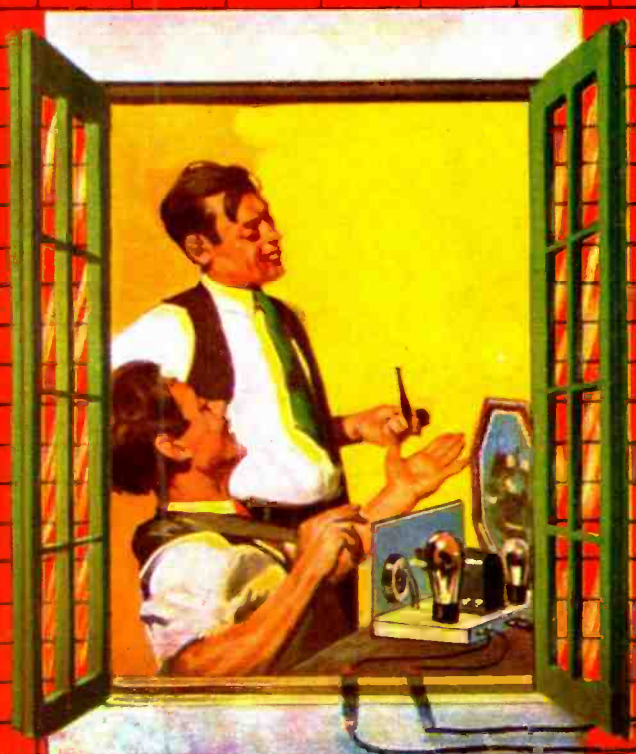
SHORT WAVE CRAFT

November

WORLD'S LARGEST SHORT WAVE CIRCULATION

HUGO GERNSBACK
Editor





XGW 上海

(XGW Shanghai Calling)

(See Page 394)

25¢ IN CANADA 30¢

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START A SPARE TIME OR FULL TIME RADIO SERVICE BUSINESS WITHOUT CAPITAL

Many Make $40 $60 $75 a Week

J. E. SMITH, President National Radio Institute
He has directed the training of more men for the Radio industry by the home study method than any other man in America.

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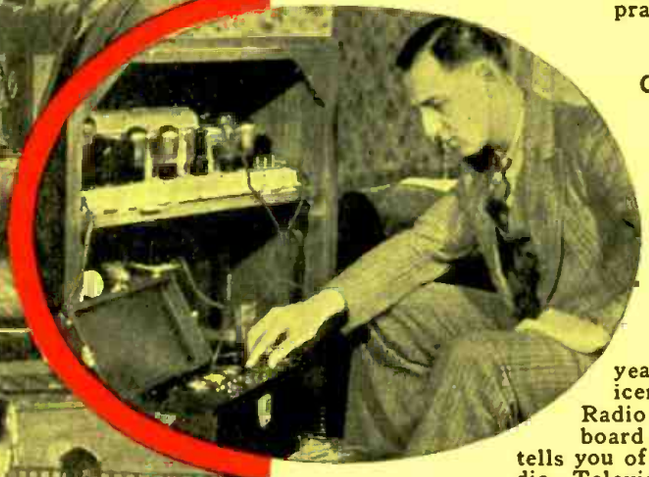

Loud Speaker Systems
Installing and servicing Loud Speaker Systems in auditoriums, for sporting events, political rallies, in schools, factories, railroad stations, etc., is another growing money-making field for Radio trained men.

The world-wide use of Radio sets for home entertainment—over 18,000,000 in use in the United States today—has opened many opportunities for you to have a profitable spare time or full time Radio service or retail business of your own. I show you an easy, quick way to do most Radio service jobs. The day you enroll I send you instructions for doing 28 Radio jobs common in almost every neighborhood. Many N.R.I. men make $5, $10, $15 a week extra in spare time while learning. I show you how to install and service all types of Radio receiving sets. I give you Radio equipment and instructions for conducting experiments, for building circuits and testing equipment, and for making tests that will give you broad, practical Radio experience.

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Get my big FREE book, "Rich Rewards in Radio." It gives you a full story of the success of N.R.I. students and graduates and tells you how they start a spare time or full time Radio service business on money made in spare time while learning.

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(Continued on other side)

Some Other Jobs N.R.I. Men Train For

- Service Business of your own
- Spare Time Service Jobs
- Salesman of Sets and other Radio Equipment
- Service Expert for Stores
- Broadcasting Station Operator
- Aviation Radio Operator
- Ship Radio Operator
- Loud Speaker Systems, Installations and Service
- Auto Radio Installation and Service
- Short Wave Transmitter Installation and Maintenance
- Designing and Building Testing Equipment
- Service Expert with Radio Factory
- Commercial Radio Station Operator
- All-around Servicing Expert

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National Radio Institute
16th and U Streets N. W.
Washington, D. C.

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$55 to $65 a week

"I am doing lots of repair work on the latest model sets, and am getting along splendidly, thanks to you and N.R.I. training. It has surely helped me to get ahead in Radio. The depression did not seem to hurt me. I have been making an average of $55 to $65 a week." PETER J. DUNN, 901 North Monroe St., Baltimore, Md.

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"I would estimate my yearly earnings at $2,000 to $2,500. I have been with Montgomery Ward for quite a few years—have been able to buy a fine home and a new car. I have advised several to take your Course—men who have since made a big success in Radio." STEPHEN MILLARD, 390 South Dale St., Denver, Colorado.

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

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Many of the 18,000,000 Radio sets now in use are only about 50% efficient. Some are out of date—need modernizing. Many need slight adjustments of tuning circuits—others lack tone quality. Still others need new tubes or need "balancing"—to put them in perfect working order. I will show you how to cash in on these conditions. I will give you the plans and ideas that have enabled many N.R.I. men to make $5, $10, $15 a week in spare time while learning. Ford R. Leary, 1633 Davison Road, Flint, Michigan, writes: "My part time earnings while taking the N.R.I. Course were $651."

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Get My Free Book of Facts—NOW!

Mail the post card below for your FREE COPY of my big 64-page book, "Rich Rewards in Radio," which I want to send free to every ambitious person over 15 years old. It tells you all about Radio's spare time and full time opportunities; about my Training; what others who have taken it are doing and making. MAIL THE POST CARD NOW.

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

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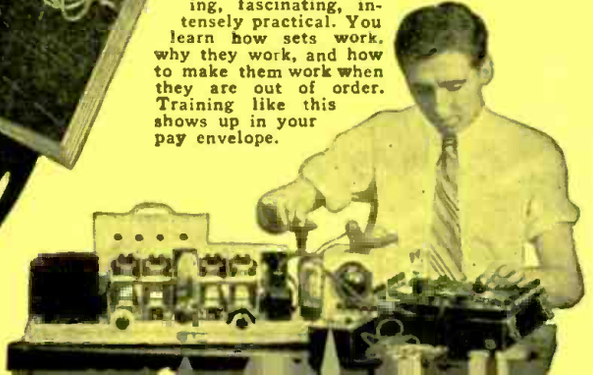

Mr. J. E. SMITH, President
National Radio Institute, Dept. 4MB3
Washington, D. C.

Dear Mr. Smith: Without obligating me, send your book which points out the spare time and full time job and business opportunities in Radio and explains your amazingly practical 50-50 method of training men quickly and inexpensively at home in their spare time to be Radio Experts. (Please Print Plainly)

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This meter has a sensitivity resistance of 1000 ohms per volt, with an accuracy tolerance of 2%. It is calibrated for a full-scale current value of 1 milliampere. A dimensional drawing is supplied with each meter which may be used as a template for drilling a panel. The parts kit includes: one meter adjustment resistor, one "Mils" shunt strip, nine special metalized resistors, one "Ohms" shunt strip, one 0-3600-ohm potentiometer, and one Capacitor for output measurements. Complete circuit diagram with resistance values included for building an AC-DC tester with ranges of: Four-range output meter; resistance ranges of 2,000-200,000 ohms D.C. mils of 5-125 mils, A.C. volts of 5-125-500-1250 volts, D.C. volts of 5-125-500-1250 volts.

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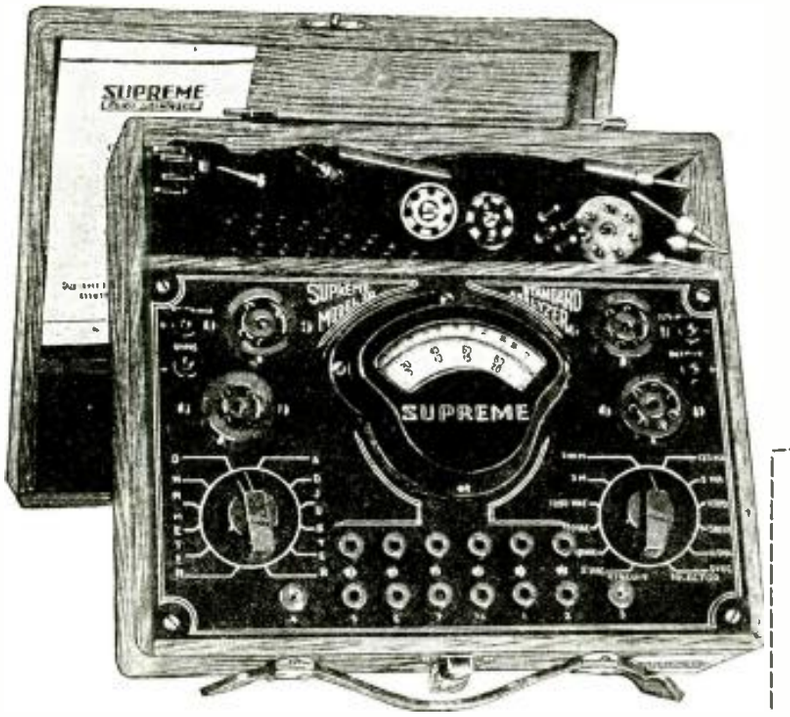

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Denton . Barnett . Shuart . Woehr . Johnson . Moller

HUGO GERNSBACK
Editor

SHORT WAVE CRAFT

H. WINFIELD SECOR
Managing Editor

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A Low-Powered DeLuxe Transmitter for the Ham, by Gerrald A. Swank.
Short-Wave Receivers in "Book" Form, by Heinie Johnson.
A Separate "Regeneration Tube" Receiver, by George W. Shuart, W2AMN.
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• SHORT WAVE CRAFT goes to a large expense in verifying new circuits published in this magazine. Whenever you see the seal shown here in connection with any of the sets published in this and future issues of SHORT WAVE CRAFT, this will be your guarantee that this set has been tested in our laboratories, as well as privately, in different parts of the country to make sure that the circuit and selected parts are right. Only "Constructional-Experimental" circuits are certified by us.

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

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

OUR COVER

• OUR front cover illustration this month shows the happy moment when a short-wave "fan" thinks he has just landed a prize station—XGW, Shanghai. But perhaps his brother "fan" on the floor above had something to do with it—Read all about it on page 394

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It was well worth waiting for.

Many thanks.

(s) H. H. PEBBLES,
6512 Carnegie Avenue,
Cleveland, Ohio.

"WOULDN'T TAKE $10.00 FOR IT"

Gentlemen —

I received my copy of the OFFICIAL SHORT WAVE RADIO MANUAL (and autographed too) this morning. I have just finished looking it over, and say I wouldn't take a ten-spot for it. Everything a ham could want between the two covers. I certainly am satisfied with my copy and know everyone else who gets one will be satisfied and proud too.

I am sure that this is the finest and most up-to-date book out, and consequently would like all of it.

Verly truly yours,
(s) LOUIS SCHMADELBECK
Beaver Dam, Wis.

"WORTH MORE THAN YOU ASK FOR IT"

Dear Mr. Gernsback:

I am in receipt of the 1934 OFFICIAL SHORT-WAVE RADIO MANUAL, and wish to state after looking it over I think it is one of the finest Manuals I ever saw published on Short Waves, and I certainly wish to congratulate you on your effort of compiling such a fine Manual. It is sure filled full of Good Radio Material, and I am proud of my Manual.

It is worth quite a bit more than what you ask for it.

FERREL THOMAS,
1328 Locust Street,
St. Louis, Mo.

"GLAD TO OWN ONE"

Gentlemen —

I received my "SHORT WAVE RADIO MANUAL" and it is a real joy to read and study the book. I waited long for it, but it was worth waiting for.

I am introducing it around to all of my friends, and I am glad to own one of these books.

Yours respectfully,
(s) VINCENT KRAJNAK,
100 West 119th Street,
New York City.

WORLD'S GREATEST SHORT WAVE BOOK!

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It is a big book in which you will find everything on short waves, regardless of what it might be. It is not only a complete manual, but a veritable encyclopedia of facts, information, hookups and illustrations. Lack of space does not permit a complete description of this comprehensive volume.

The Manual has been edited by Hugo Gernsback, Editor of SHORT WAVE CRAFT, and H. W. Secor, Managing Editor. If you are a reader of Mr. Gernsback's other publications, you know just about what to expect from this book—his greatest effort in the short-wave field.

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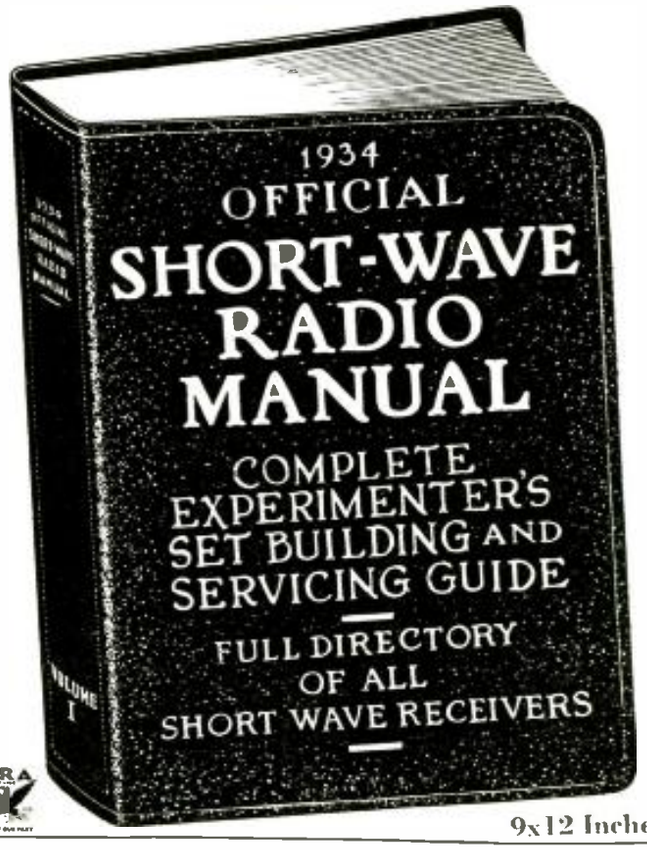
- A section devoted to Short-Wave Converters and their construction. Full servicing data on all commercial models is included.
- A special section on Short-Wave Antennae and noise eliminating procedures.
- A section on Short-Wave Superheterodynes. This section tells how to build them, including many commercial models of receivers. The latter with complete service data.
- A section on Amateur 'Phone Transmitters and how to build them.
- A Short-Wave Physics section on theoretical short-wave data for the advanced experimenter and radio student.
- A most interesting section on Super-Regeneration in Short-Wave Receivers.



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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Disappearing Waves

An Editorial By HUGO GERNSBACK

● MOST short-wave listeners are aware of the fact that radio reception from foreign countries is not uniformly the same all year round, nor, for that matter, from week to week, or from day to day. One night the stations may come pounding in like locals, when next week it will be impossible to even pick up the carrier with the same set under like conditions. There is, in other words, today, no certainty that the listener can tell in advance that he will be able to get a certain foreign station on any pre-arranged day.

What causes these "disappearing" waves, and why? Is not the action of the waves the same all year round? No exact answer to this can be made at the present time, because there are many factors that may have something to do with it, a number of which we know nothing about.

It is expected that sunspots have something to do with short-wave vagaries. Sunspot activity means that tremendous electro-magnetic forces are set up in connection with these spots. These so-called sunspots are holes in the surface of the sun, and some of these holes or vortices are frequently large enough to drop several bodies the size of the earth into the hole. Some of them measure as much as three and even four times the diameter of the earth across. A tremendous amount of electrical energy is radiated by these sunspots, and the electrical particles bombard the earth at intervals. These solar electronic storms have an effect on the Heaviside layer in the upper strata of our atmosphere, and this interferes with the radio wave propagation. It is believed that when the Heaviside layer shifts or raises up, that this has something to do with the absorption of the short waves. Very exact data on this, however, is missing.

Another cause which has, as yet, to be sufficiently investigated, may be the *cosmic rays*. Just what the action of the cosmic rays is on the earth's atmosphere, the Heaviside layer, and the earth itself, is not known. It is certain, however, that the cosmic rays must have some effect, and it would seem plausible that short waves are affected by these rays. We will know more about this in the years to come.

The moon, also has some effect on short waves, and this has been frequently reported by radio listeners. Exactly what this effect is and whether the moon has any direct bearing on the disappearing of short waves is, as yet, not known.

At the present time, there is considerable activity going on in connection with the so-called "radio echoes." It was observed a few years ago that the signals from certain stations were heard the same as customary, but then a second signal of identically the same character was received several minutes later— a *radio echo*, in other words. Inasmuch as radio waves travel at the rate of 186,000 miles per second, no body in the vicinity of the earth could account for this reflection of the radio waves, and it seems conclusively proven that a reflecting layer of some sort must exist millions of miles away from the earth. Just exactly what this reflecting layer is, has, as yet, not been made clear. It is certain, however, that it is of an electrical nature. For want of a better name, I may call it an *electrical cloud*. Just what this electrical cloud is, whether it has something to do with cosmic rays, or whether it is a combination of cosmic ray and electro-magnetic particles sent down from the sun due to sunspots, is only surmised. I can, however, imagine that an electrical body composed only of electrical charges can well exist independently in space. I make this assumption from the experience we have had on earth in connection with *ball lightning*.

Ball lightning is a pure concentrated electrical charge which travels not at all like ordinary lightning, at the speed of light, but is usually a ball composed of some form of electricity in the shape of a luminous sphere. Such ball lightning is frequently observed. A ball the size of a child's head may come in through the window, or it may come down the chimney and usually floats leisurely through the air, and then for no accountable reason explodes, with a loud noise, often killing people or cattle, or both. A similar electrical charge in the form of a cloud or sphere may conceivably exist somewhere in space, independent of the earth or any of the planets. When a radio wave strikes such a body, it is conceivable that it might be reflected. There is also no telling what effect such an electrical cloud may have on our own atmosphere and the Heaviside layer, but the radio echoes are proof that something of this type must exist. Further research may throw more light on this question.

Of course, when we say that the radio waves disappear, we do not mean by this that they disappear altogether. For instance, our commercial radio stations, which have a number of listening stations tied together, and which use far greater power in reception than the average radio listener, are not quite as conscious of the *disappearing waves* as the average listener, but even they experience a rather strong reduction of the signal's intensity, all of which tends to show that something certainly happens to it between the transmitter and receiver.

SHORT WAVE CRAFT IS PUBLISHED ON THE 1st OF EVERY MONTH

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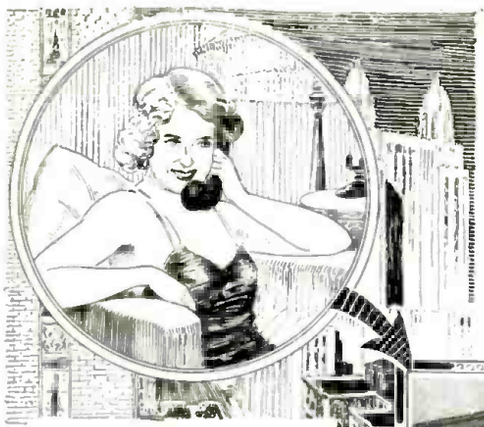
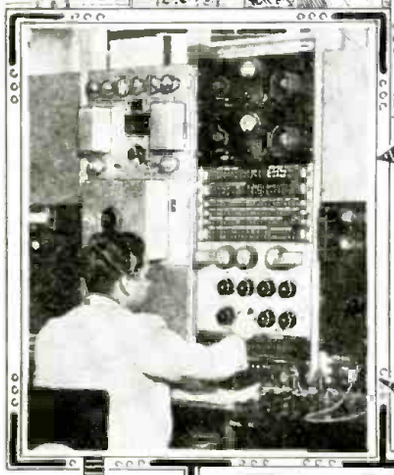
"SHIP—TO—SHORE" Phone Picturized

Whether or not you have spoken to or from a ship at sea, you will be interested in the accompanying picture story and the description on the opposite page, which help to clarify the marvelous short-wave engineering accomplishment here exemplified.



You may sit in the comfort of your home on land and talk to a person on the high seas bound for Europe.

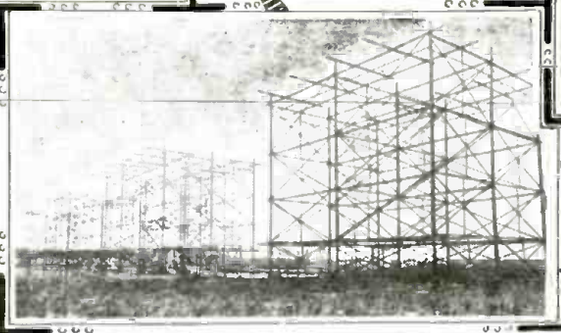
Right — Passenger aboard the S.S. "Leviathan" talking to a telephone subscriber on land. 21 ships are now fitted with radio-phone and can be contacted by land subscribers anywhere in the country.



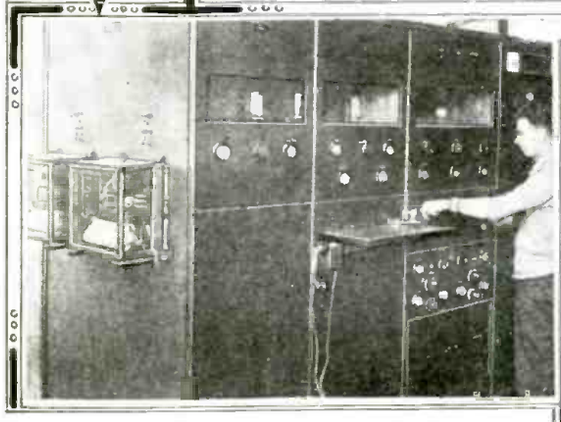
Above — Over-Seas switchboard operators who handle the "incoming" and "outgoing" phone calls between ships and land subscribers.

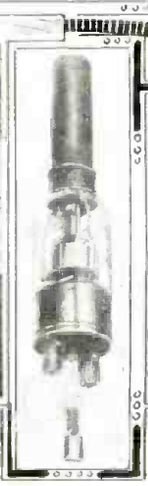
Photo at left—One of the technical operators in the A. T. & T. Co. Building, New York City, who has technical supervision over calls.

Left—Typical phone transmitter aboard 21 ships now sailing the Atlantic and fitted for carrying on radio phone traffic with subscribers on land. This transmitter is that aboard the S.S. "Empress of Britain." Receiver below on "Ile de France".

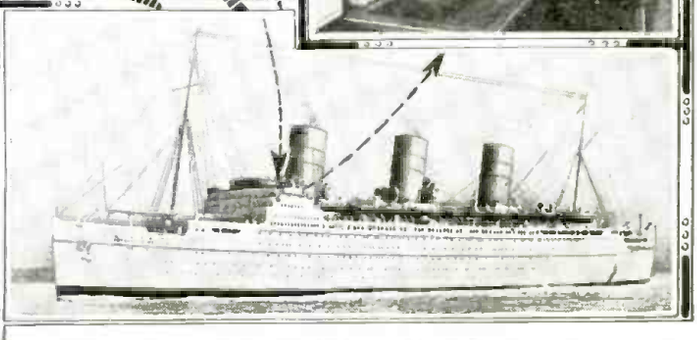


Photo, right, shows the elaborate short-wave receiving antenna at Forked River, N. J. Here the voice waves are picked up from ships.





The land transmitter at Ocean Gate, N. J. Right—One of the power tubes. An elaborate antenna and feeder system is used in conjunction with the transmitter. Different aerials for various frequencies are employed.



Above—The magnificent steamship, "Empress of Britain", which handled telephone calls with New York and San Francisco all during her 25,000 mile journey around the world.

Photos courtesy A. T. & T. Company.

WHAT HAPPENS
When You Talk to a Ship
AT SEA

By H. W. SECOR

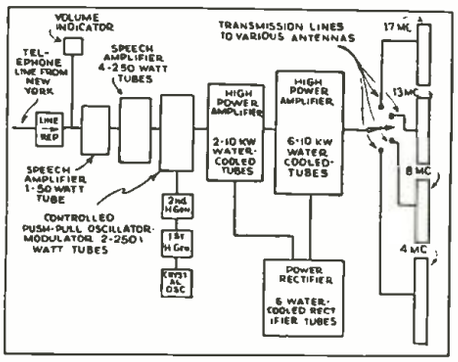
Today you can talk by radiophone to or from any one of twenty-one ships traversing the Atlantic Ocean, thanks to the marvellous development of short waves in the past few years. The voice-operated relay that switches the transmitter and receiver circuits for two-way conversation is described; also the successive stages through which your voice passes before leaping out to sea. The ship's radiophone equipment is also described.

● YOU can now talk by radiophone to twenty-one ships which sail the Atlantic between this country and Europe, and people who have used the Ship-Shore phone service, now a regular twenty-four hour daily service —thanks to *short waves* —have probably often wondered just what transformations the human voice passed through on its way to or from a ship at sea.

The writer recently had the pleasure of talking by short-wave radio-phone over the service given by the American Telephone and Telegraph Company with the German steamship—*Bremen*. The voice of the chief operator aboard the ship was perfectly steady and clear and it is a very thrilling experience indeed to think that you may now talk to a person aboard ship located practically anywhere along the 2,700 mile expanse of water separating Europe and America. The writer's conversation with the *S.S. Bremen* spanned a distance of 1,400 miles, the ship at the time being approximately in mid-ocean and in a severe wind and rain storm, while the sun was shining brightly in New York. Let us briefly consider the successive stages through which a telephone subscriber's conversation passes as he sits in his hotel or apartment in New York City and talks to possibly his wife or business partner on board a ship on the high seas.

Arranging for "Call" to the Ship

Ordinarily the person who wishes to make a call to a ship at sea calls Long Distance and is connected with the *Overseas* switchboard located at 32 Sixth Avenue, New York, in the A. T. & T. Company's building. Unless the circuit with the ship desired is being used for traffic at the moment, it is necessary for the Overseas operator to consult her schedule of the various ships to see what time contact is due with the ship concerned. Of course, if the ship is being "worked" at the time and traffic is light it is frequently possible to put through a call in a few minutes. Radio transmission conditions, sometimes preclude the possibility of the call being put through at the expected time. In such rare instances the call is postponed until conditions improve and the subscriber or ship's passenger is notified accordingly.



Simplified diagram of phone transmitter circuit used at land end of shore-to-ship radiophone "circuit."

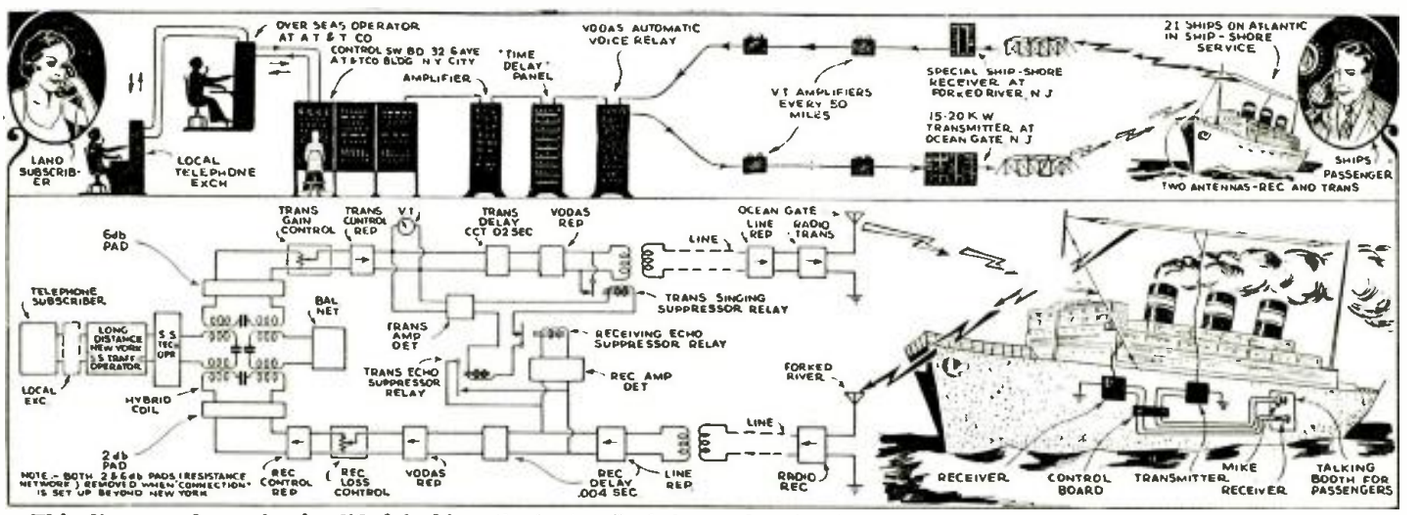
Suppose you are now ready to talk to the person aboard ship; your telephone bell rings and the *Overseas operator* asks if you are ready to talk to, let us say, the *S.S. Bremen*. The technical control operators have beforehand called the *Bremen* (by code, on modulated C.W.), on the particular wave-length best suited for that time of day and distance of the ship at sea, and have verified that conditions are right by a brief exchange of words with the ship's technical operator.

Let us assume you have started talking to a passenger aboard a ship: your voice, or rather the fluctuating electric currents representing your voice, pass over telephone wires to the *Overseas* switchboard, from which point they pass along another telephone circuit to the *technical* control board, located in the same building; from this control panel your voice passes onward with the speed of light to the powerful radio-phone transmitter located at Ocean Gate, N. J. You will probably be interested at this point in knowing that the incoming voice from the person aboard ship is picked up on short waves at the *shore-ship* special receiving station located at Forked River, N. J., the incoming voice passing through the same *technical control* and *overseas operator's* switchboards as the transmitted voice.

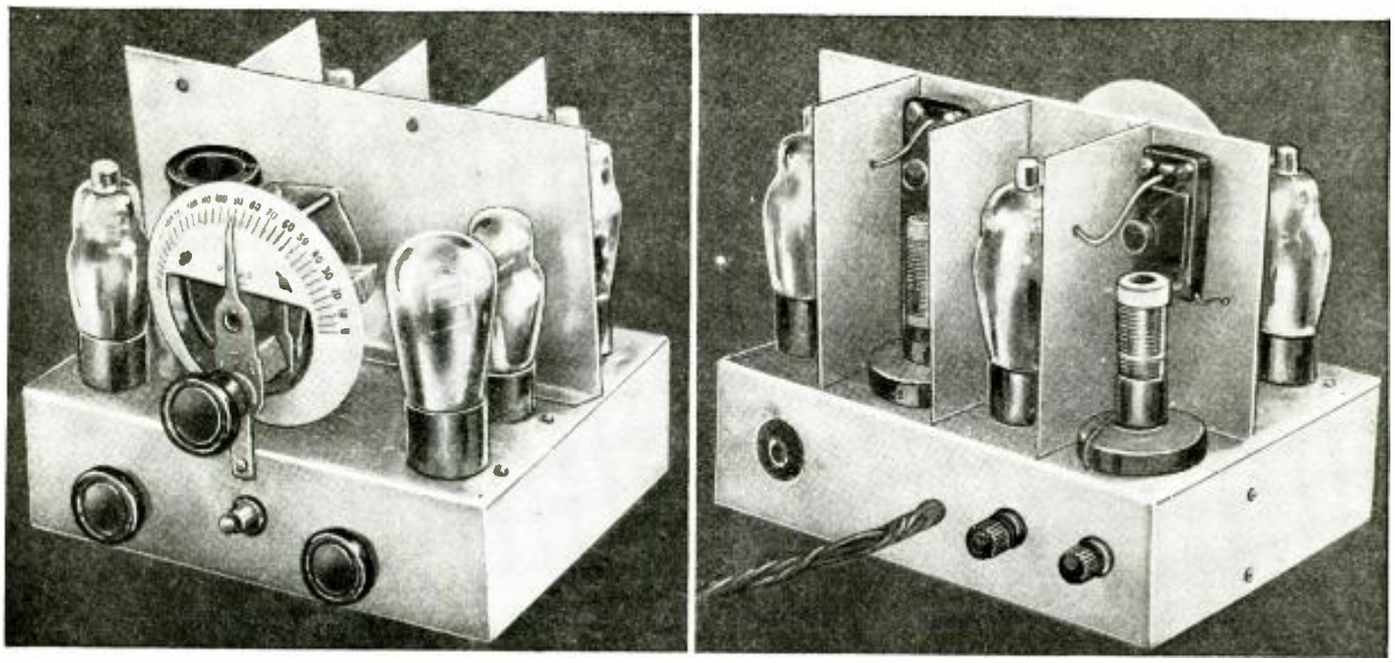
Voice Operates Relay to Switch "Talk" and "Receive"

Two very remarkable devices, perfected by the radio and telephone engineers responsible for this shore-ship radiophone service, take charge of your voice after it leaves the *technical operator's control* board. Located close to his switchboard there is a large amplifier panel, in which vacuum tubes basically similar to the type used in your radio receiver, amplify the voice currents which then pass into a *time delay* panel comprising a series of resistor and

(*Continued on page* 422)



This diagram shows, in simplified fashion, the "set-up" of the land and ship apparatus to carry the human voice both ways between ship and shore. Short waves are used and a different frequency is employed for transmission and reception.



Front and rear views of the 5-tube superhet—full constructional details are given herewith by the author, even to the winding of the I.F. coils.

New 5-Tube Super-het
For Battery Operation

By MANDER BARNETT, England

One of the leading English short-wave exponents here describes a very interesting 5-tube superhet receiver, designed to use standard 2-volt battery tubes. The set is very efficient, using but .44 ampere while the plate current is only 25 ma. Complete data is given for winding the I.F. and other coils. This set features regeneration in the second detector stage and has brought in American short-wave stations in England on a loud-speaker.

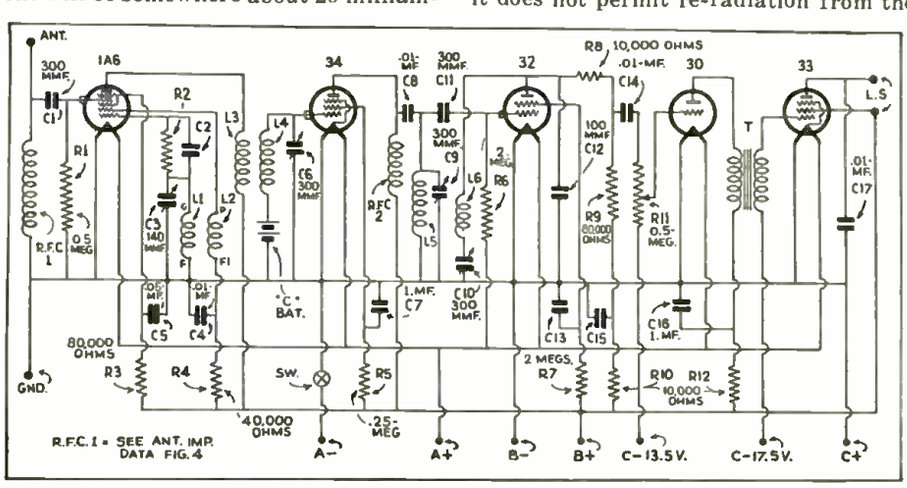
● SHORT-WAVE superheterodyne receivers for battery operation appear to have received less attention in the past than they really deserve, most short-wave receivers built by experimenters and short-wave listeners for use with batteries being generally of the "straight" type, with or without amplification at radio frequencies and employing two to four tubes. This is rather surprising, because a battery-operated super can be really good and although the results per tube will not compare quite so well with receivers using A.C. tubes, a *really powerful* short-wave super for battery use can be built with no more than five tubes. The set to be described here is first and foremost a *short-wave* receiver and will find its greatest use with the experimenter who likes to use a separate receiver for short-wave work and to leave the *broadcast* receiver free for the family to twiddle the knobs.

There's a great advantage in a separate receiver, because while the family is listening to the program on the *broadcast* band, you can be up in the "shack" listening to the *short-wave* stations and, incidentally, listening to programs which do not contain any advertising.

Low Battery Drain

This receiver uses the latest type tubes in the 2-volt class, including the 1A6 frequency changer and is extremely easy on battery consumption. The total filament current for all five tubes comes to only .44 ampere, while the average "B" current will be somewhere about 25 milliamperes, according to the actual amount of "C" bias used. This receiver is essentially home-made, right down to the intermediate frequency transformers, and the experimenter or short-wave listener who has had some experience with a two or three-tube short-wave receiver will find this set just right when something larger is required.

Apart from the I.F. stages, there is but one tuned circuit in the whole receiver and a ganged condenser is not used, so there are no trimming or padding condenser troubles to be encountered. On the other hand, *selectivity* is good and the *sensitivity* extremely high. The 1A6 is an excellent short-wave mixer and has the added advantage that it does not permit re-radiation from the

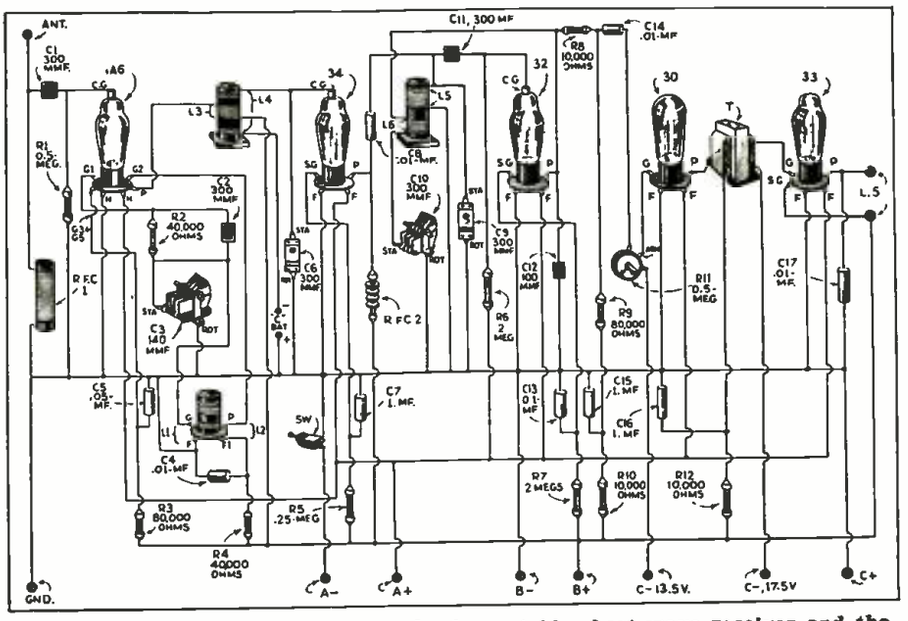


Simple wiring diagram for Mr. Barnett's 5-tube superhet designed for use on American 2-volt battery type tubes.

antenna circuit. The input circuit to the mixer is untuned and consists of a special choke, R.F.C.1, plus the condenser, C1, and resistance, R1. A grid-leak detector arrangement is successfully used instead of a bias detector, thus permitting of a high sensitivity. The whole of the tuning is carried out by the oscillator condenser, C3, in conjunction with plug-in tuning coils, L1 and L2, which are of the standard type using four-pin tube base sockets.

400 Kc. I.F. Used

Despite the fact that the input circuit is untuned, exceedingly few "birdies" or image frequency whistles are to be heard on the short waves. An intermediate frequency of about 400 kilocycles is used and although a higher frequency would have some advantages, the extra amplification obtained at the lower frequency is well worth while having. Actually the I.F. stages may be set to a point free from local interference as they are variable over quite a wide range of frequencies, i.e., from about 350 to about 650 kilocycles. From the anode of the 1A6 tube, the I.F. signals are fed through the first I.F. transformer, of whch the secondary winding is tuned by a pre-set condenser of .0003 mf. maximum capacity. A type 34 pentode is used in the I.F. amplifying stage, this tube being parallel choke-fed to the second detector, a 32 screened-grid tube, where the single tuning coil, L5, is again tuned by a pre-set condenser of .0003 mf. maximum capacity. *Regeneration* is applied at this point, to boost signals and to make the reception of C.W. stations possible. A single triode type 30 and 33 pentode output tube, form the audio side of the receiver and provide sufficient "bump"



This 5-tube superhet would make a dandy portable short-wave receiver and the picture diagram above makes it a very simple matter to build one.

to shake the speaker diaphragm and to fully load a dynamic speaker on many stations. At this point it is worth mentioning that the writer has not yet detected any suspicion of *body capacity* effects with this receiver on any wavelength and it is completely stable in use.

Shielding

As will be seen from the photographs, the receiver is quite compact, but on the other hand it is not so small as to require the hands of a conjurer to wire it up and to assemble the parts. The metal chassis measures approximately 9" long x 6½" x 2½" deep. The shielding at the back of the chassis houses the I.F. coils and the I.F. amplifier and second detector tubes. If the reader prefers to use *commercial* intermediates, the method of shielding used here can be dispensed with, the transformers and tubes being mounted so that the transformer screening cans shield each tube separately. In any case it will be advis-

(*Continued on page* 437)

Stop Graying Hair

By WILLIAM H. FRASER

● YOU contracted a touch of that sinister malady *shortwaveitis* and foolishly thought it would pass off . . . that you would recover after throwing the radio magazine behind the bookcase.

But constructional and operative complications set in and your relapse was complete when you found the magazine, and grimly determined to try your hand at that "how-to-make-it" article telling how easy it was for anyone to build for himself the two-tube *Pacific Skipper* receiver. You would soon find out what this crazy fad was all about anyway.

Oddly enough, it was only some twenty minutes later that you chanced to unearth baby sister's dime bank, from which you floated a loan of $8.30, leaving intact one world-scarred dime—it wouldn't do to rob the kid outright.

Hurrying to purchase the kit of parts from the list you had copied (including the solder, but forgetting the socket for the plug-in coil) you pondered over what Fate and the foreign broadcasters might have in store for you. With a twinge of fear you recalled the appearance of several short wave addicts you had seen recently. To a man, they had all looked starved for sleep and food, bright-eyed with excitement, neglectful of family and employment . . . quite ignorant and indifferent as to whether it was Tuesday or August, but able to tell you within a kilocycle and a split second just when Zeesen next "opened up" or why that British Empire transmitter on 11865 kc. came in so clearly before noon. You shuddered a bit, knowing that such things could be carried too far . . . but of course it would never happen that way in your case—so you thought!

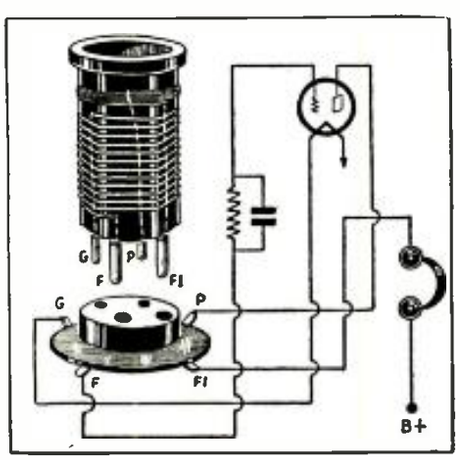
Followed the feverish activity of assembling the receiver and making various and widely differing stabs at the mystery of wiring same. Just which post on the variable condenser was the rotor, and why weren't the silly parts marked? And was there a head and tail to those flat fixed condensers?

As for winding the coils—did white men really accomplish such feats as a hobby, and survive? No wonder they had that wild and startled gleam in their eyes! Solder, perhaps?

You had to insulate a rheostat and that 50,000 ohm variable resistor from a metal panel, but not condensers, at least not the variable ones. A bakelite panel gave insulation, but no shielding. And you absolutely refused to believe the author had ever piled, let alone wired, all those parts on a measly 9" x 11" base. . . .

Despite all your fears to the contrary, your Great Moment arrived at last. The

(*Continued on page* 447)



Proper grid and tickler coil connections.

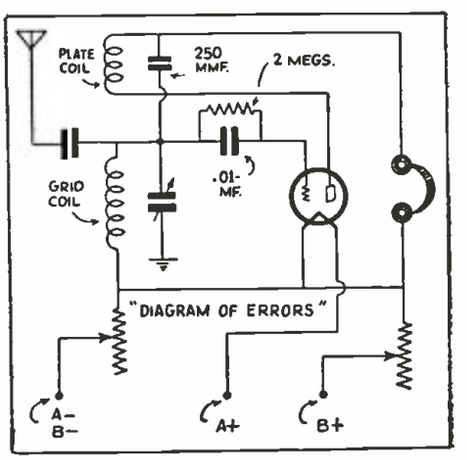


Diagram showing the usual mistakes made by the beginner.

OUR COVER — XGW—SHANGHAI Calling?

• OUR cover painting this month shows what we would term the sublime height of practical joking. Just imagine if you were listening in, on a newly built receiver and the first station you tuned in happened to be XGW, Shanghai, China! This undoubtedly would create a feeling of superiority in set building. However, we dread to think what might happen when you discover that your playful "Chinese" neighbor had pulled a fast one on you. You may say "Darn clever, these Chinese," and then again you may say something that we would not care to print—Hi! As long as we have gone this far, it might be well to go further and tell you how this practical joke was actually "engineered".

The cover illustration shows that moment of great jubilation when the short-wave listener believes he has picked up Shanghai, China, thousands of miles away! But, wait until he learns that a brother "fan" next door has played a trick on him. The article tells how.

In Fig. 1, we have a plain 2-tube receiver using a regenerative detector and one stage of audio. By connecting the microphone transformer in series with the grid leak and connecting the antenna and ground posts of the detector to the transposed lead-in, we have a form of "wired wireless". The detector, of course, will have to be oscillating in order to transmit the signal over the wire to the receiver below.

In Fig. 2, we have essentially the same circuit, minus the audio amplifier. If some of our friends are interested in *wired wireless* they can construct something along these lines and communicate over the telephone or electric wires with their friends next door. In using a system like this, it must be stressed that care should be taken *not* to radiate a signal "over the air", which may inter-

(*Continued on page* 438)

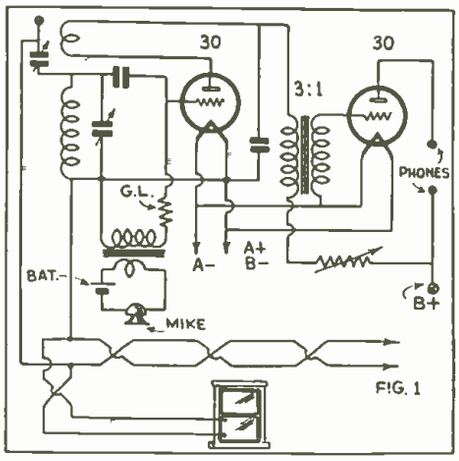
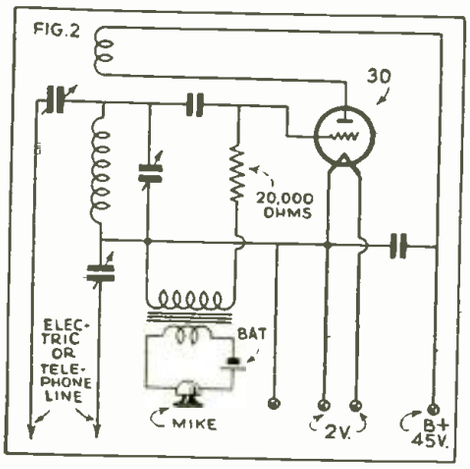


FIG. 1

Fig. 1 shows diagram illustrating how the "Chinese" boy fooled his friends.



With this circuit "wired-wireless" transmission can be performed.

What British Are Doing With 5 Meters

• CONTRARY to popular belief, our foreign brothers are experimenting with the ultra high frequencies with as much interest as we are here in the United States. The two very interesting photographs shown below will give a fair idea just to what length some of the British amateurs have gone in order to make fairly accurate observations of the behaviour of the ultra high frequency signals. H. L. O'Heffernan (G5BY) has constructed a most elaborate mobile installation. The large box mounted on the rear of the automobile contains both the transmitter and receiver and operates on 56 megacycles (5 meter band). The transmitter is located on one side of the box and the receiver on the other. Two separate antennas are shown, one on each side of the case. For directive measurements in receiving, the transmitting antenna is used as a reflector. When transmitting the receiving antenna can be used as the reflector. This is a very unique arrangement. However, directive transmission and reception cannot be obtained in one direction unless the car is turned around. The antennas are constructed of heavy nickel-plated metal tubes. These tubes can be dismantled by just unscrewing the nuts on the insulators. The rear of the case, as can be seen from the photograph, has a hinged back plate which, when lowered, completely encloses the ultra high frequency apparatus. We believe it would be well for some of our American amateurs to construct a system of this type. Of course, a great number of American amateurs have already installed mobile *transceivers*. However, we have never heard of any being as elaborate as Mr. O'Heffernan's. Mobile transmitters and receivers are really ideal for making ultra high frequency observations because it more or less eliminates the errors which may enter into the tests of point-to-point communication where the condition between the two stations may be either excellent or very poor. With the mobile apparatus, tests can be made under varying geographi-

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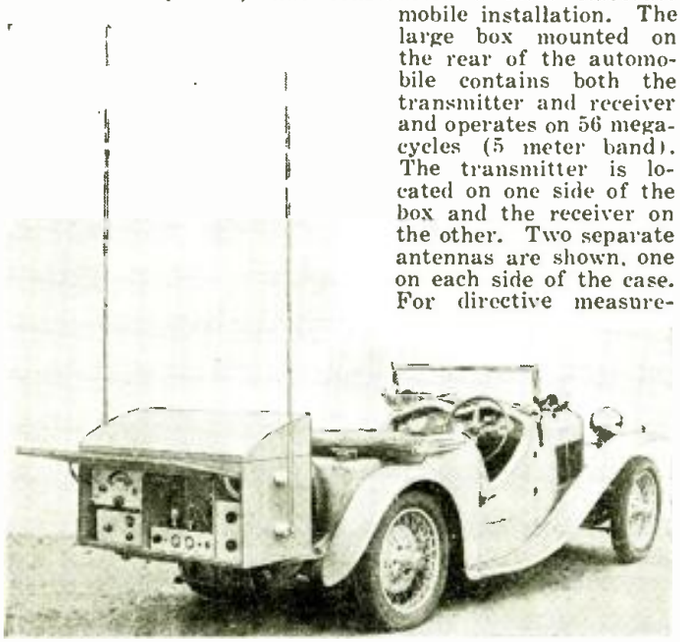
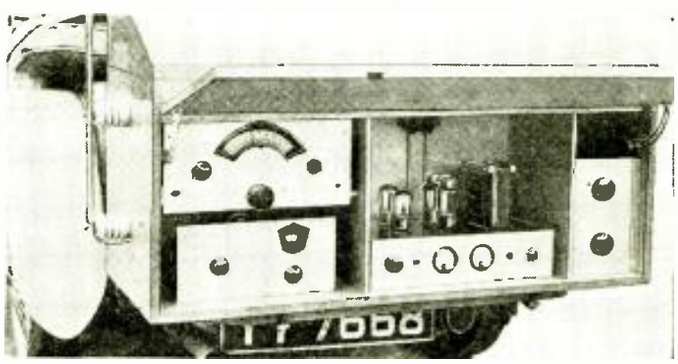
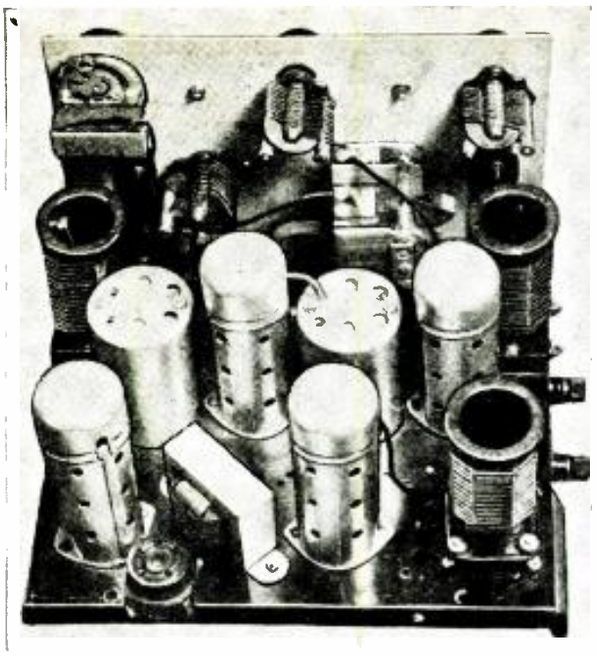




Above—General view of the 5-meter transmitter and receiver built in a substantial weather-proof cabinet on the rear of an English amateur's car; right—close-up of the 5 meter "rig."

©—Wireless World.



Rear view of the improved Victor 2-Tube Superhet with added R.F. and A.F. stages, as described in detail by Mr. Woehr.

Improving the VICTOR 2 Tube Super-het

By W. A. WOEHR, W9PTZ

Hundreds of readers of this magazine have built Mr. Victor's 2-tube superhet and have reported surprisingly fine results obtained with it. The present author describes how to add a stage of tuned R.F. and also an A.F. stage to the original Victor circuit. With these improvements extremely good loud-speaker reception can be enjoyed.

● RESULTS obtained by those who built the Victor 2-*Tube Super-Het*, described in the December, 1933, SHORT WAVE CRAFT, testify to its high efficiency in "pulling 'em in," despite the fact that only 2 tubes and a minimum number of parts are used. At the author's location, generally considered as being only "fair," this little set brought in all the well-known *foreign* short wave stations as well as a host of U. S. amateur, police, commercial and experimental stations. Consistent results of the "Victor" were certainly *above par* as compared with the usual run of popular short-wave receivers tried out, including both home-made and factory-built sets.

However, it was felt that this two-tube super-het would serve admirably as the basis for something just a little better, and capable of much greater performance, both as a stationary and as a "portable" receiver, with only a few changes and the addition of but two tubes.

R.F. and A.F. Stages Added

The main improvements, as first noticed on viewing the set (from the front), are a pre-selector stage of tuned R.F. and one stage of audio amplification. The other tuning dial is for *band-spreading*. The original oscillator circuit, using the triode portion of the 6A7, has the tickler of the oscillator coil, connected in the plate circuit. With a very steady line voltage or using "B" batteries, the original hook-up holds the weaker signals very steady but any variation of

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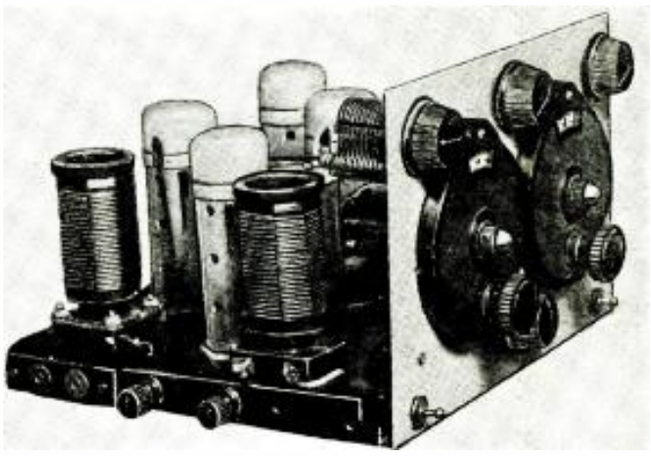
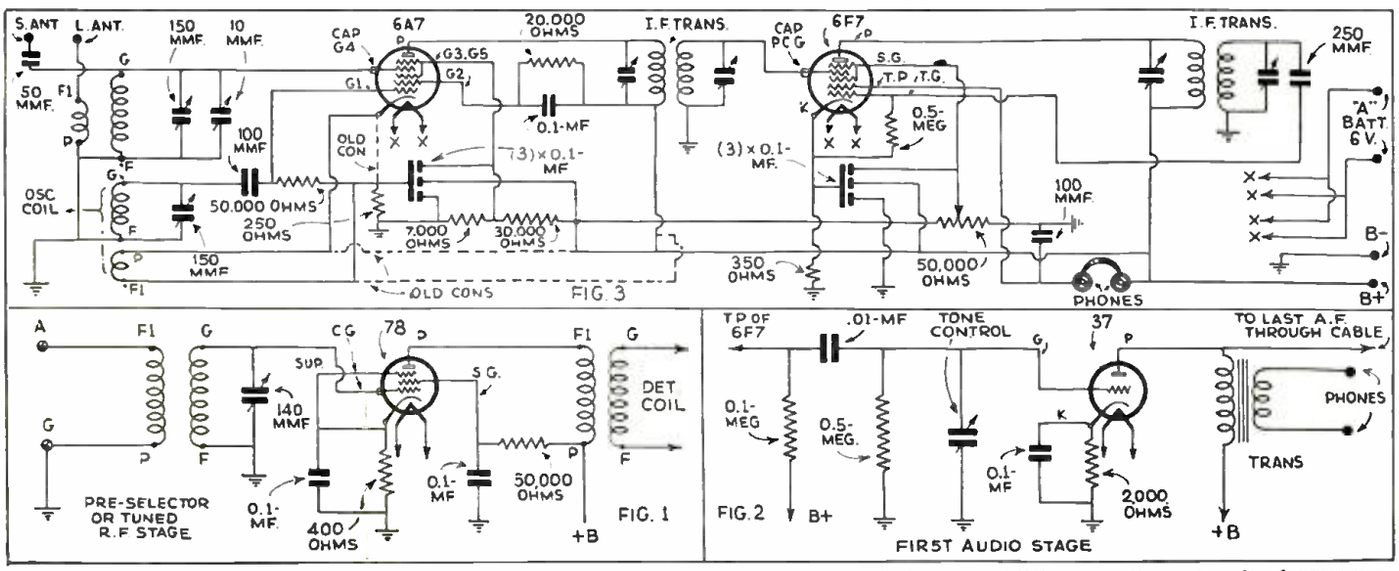


Perspective view of the improved Victor superhet with added stages of R.F. and A.F.

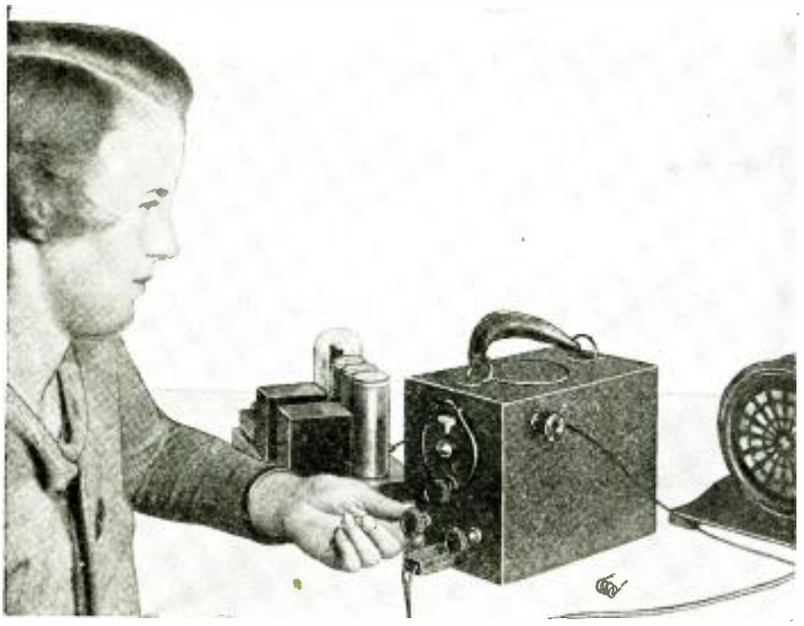


Wiring diagram of the original 2-tube superhet as described by Mr. Victor and also the additional radio and audio frequency stage diagrams, to be added as described by Mr. Woehr.

2-5 Meter

George W. Shuart, W2AMN

Here is one of the most efficient ultra-high frequency receivers we have had the privilege of describing. It uses only two tubes, a 56 super-regenerative detector and a 2A5 pentode amplifier for A.C. operation. It can be used in an automobile or boat, by the use of a 6 volt auto "B" eliminator in which case the detector will be a 76 and a 41 for the audio amplifier. This set is surprisingly sensitive and selective.



Above we see the new 2 to 5 meter receiver which will also serve as an excellent "portable" receiver.

● NEVER before in the history of amateur radio, has the amateur had so great an opportunity of showing his skill in designing new equipment to be used in an entirely new field of short-wave radio. The recent ruling by the Federal Communications Commission permitting the amateur to use the entire high frequency spectrum above 110 megacycles, provides the amateur and experimenter with opportunities equal to, if not indeed, exceeding those of the days when 200 meters represented "short waves". The amateur so ably developed equipment to make use of those *short waves* (that no one wanted then), that it is a very safe bet to say that it will only be a very short time until the "ham" has done the same thing with the now more or less useless *ultra high frequency* spectrum, as most people have called it, and once more established himself as an important part of the greatest group of radio experimenters in the world.

Not so long ago the writer heard some one say—"the romance has practically gone out of radio". But today it is a sure thing that for those who like to DO THINGS there is romance and fascination in the ultra high frequencies heretofore undreamed of. The writer has spent the best part of the past three years delving into the possibilities of the ultra high frequencies. Many extremely interesting things were uncovered and proved to be contrary to popular belief.

The ultra-high frequency transmitting and receiving "gear" of tomorrow will look as different from the present-day apparatus as the old "spark-coil" outfit looks compared to the modern vacuum tube sets; witness the writer's *5-meter transmitter* described in the last issue of this magaz'ne and the 2.5-meter outfit described elsewhere in this issue—and these are by no means the ultimate. Receivers will also take on the improvements set forth in these transmitters. We could go on for hours talking about these things but the purpose of this article is to describe a "new" receiver. All we can say is—*get busy on the ultra high frequencies and experience once more the real thrill of the "old days"*.

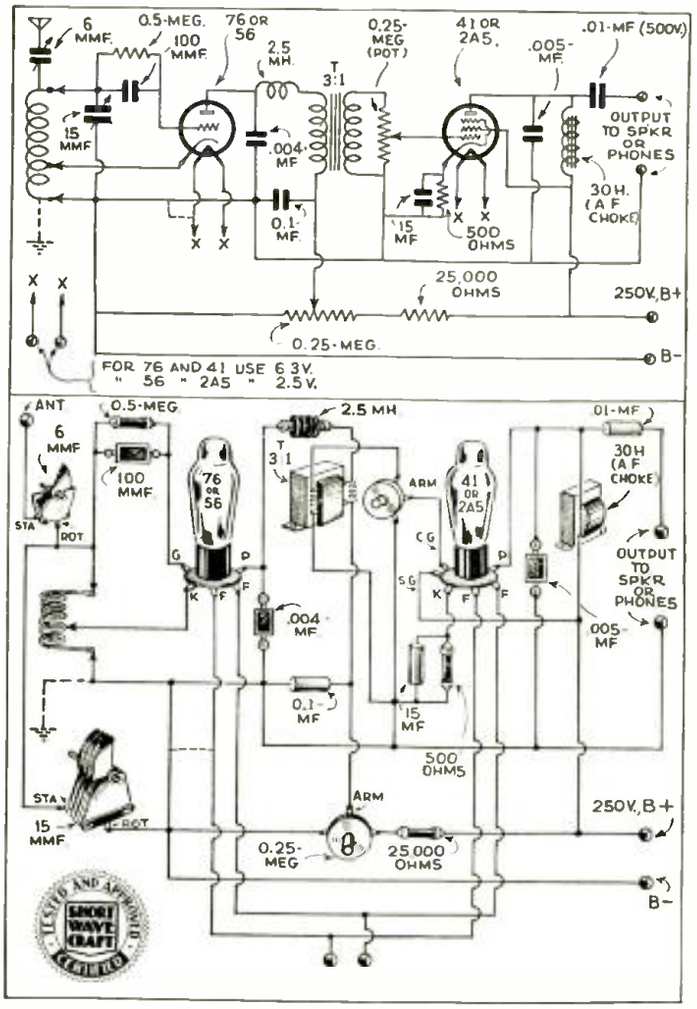
A New Ultra-Short Wave Receiver

The receiver shown in the photographs was designed with two important things in mind. First, a receiver with improved sensitivity and second, one that could be used on wavelengths down to 2 meters. It was also borne in mind that the experimenter must have a receiver of the best possible design, at the present time, to form a basis for further experimentation; for nothing can be done in that direction without a standard to go by. This receiver has accomplished all of the outlined objectives and is far more sensitive to *weak signals* than any *present day super-regenerator, regardless of the type of tubes used.* The back-ground noise, or hiss, is very low in this set, a further aid to weak signals, and besides it is very simple and economical to build.

In experimental work it is preferable that the receiver be sturdily constructed, and designed for *portable* use. It is for this reason that the set was built in a metal carrying case; it can therefore be readily used in an automobile or boat when carrying on experimental communications. Anyone desiring a better high frequency receiver for the *home station*, will find this set "*just the thing*".

Circuit Very Simple

Referring to the circuit diagram we find that the set is *simplicity* in itself. Only two tubes are used and provide *full loudspeaker volume*, far too much for the largest of rooms! A triode is used as the super-regenerative detector, in a circuit which lends itself beautifully to our requirements. A pentode is used as the audio amplifier with a volume control placed in its grid circuit, in order that earphones may be used. The entire set is enclosed in a black crackle-finished carrying case, measuring but 5¼ inches wide, 6¾ inches high and 8¾ inches deep. The case is in two sections, clearly indicated in the pictures, and is equipped with a convenient handle for carrying purposes.



The schematic and physical diagrams shown above clearly show how to wire the 2 to 5 meter receiver.

Set Works Speaker

The *tuning* is done with the small National dial on the front, while *regeneration* is controlled by the knob in the lower left-hand corner. The audio *volume control* is located to the right. The speaker or phone jack is located between the two last mentioned controls.

The small knob on the left-hand side of the box is the *antenna coupling* condenser, along side of this condenser is the antenna binding post; the power cable is brought out the back. Inside the can is mounted a 6½ by 4½ by 1/16 inch aluminum shelf on which most of the parts are mounted.

Tuning and Super-Regeneration Features

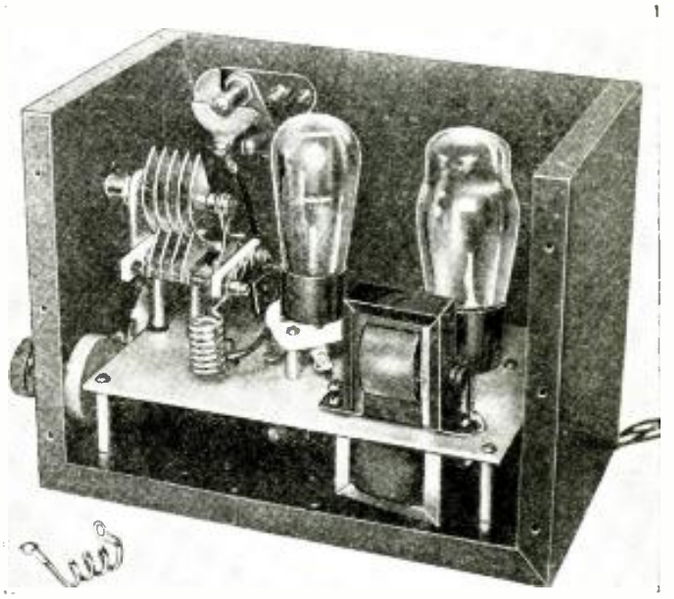
The tuning circuit consists of a single coil and a condenser making it much easier to change coils. The grid is connected to one end of the coil, through the grid-leak and condenser, and the "B" negative is connected to the other side of the coil. Regeneration is obtained by connecting the cathode of the tube to a point near the center of the coil, making it above-ground R.F. potential. When this is done the plate must be brought as near ground R.F. potential as possible. This is accomplished by the .004 mf. by-pass condenser connected from the plate to the "B" minus. The leads of this condenser must be very short and the "B" minus lead of the condenser should connect to the same point on the chassis as the ground end of the grid coil. In this circuit the rotor of the tuning condenser is at *ground potential* and eliminates the usual *hand-capacity* or the use of a long insulating extension shaft. *Super-regeneration* is obtained by using quite high plate voltage on the detector and allowing it to break over into *irregular oscillation*, the frequency of which is more or less determined by the value of the grid-leak.

The optimum value of grid-leak was found to be ½ megohm and the grid condenser .0001 mf. The detector tube socket is mounted on top of the chassis to permit *short leads*. The amount of regeneration is very nicely controlled by the 250,000 ohm potentiometer, which varies the plate voltage. The potentiometer is by-passed with a .1 mf. condenser to make its operation smooth and quiet. A 2.5 mh. R.F. choke proved sufficient to keep the low frequency voltage, generated by the detector, from the grid of the audio tube. In this circuit it was not found necessary to connect one side of the heater circuit to the chassis; however, in other cases the builder may find it beneficial and this connection should be tried for best results.

The Audio Amplifier

The audio circuit is very simple and needs little discussion. A 3 to 1 ratio audio transformer is used as the coupling medium and a 250,000 ohm potentiometer is connected across its secondary for a *volume control*. The *output* is obtained through a choke and condenser arrangement, so that the D.C. plate current does not run through the speaker or phones, whichever is used.

The 5 meter coil has 7 turns of No. 12 tinned buss bar with ½ inch inside coil diameter; the spacing between turns is 1/16 inch. The cathode tap is on the third turn from the *ground end*. For 2.5 meters the coil has 4 turns, ¼ inch inside diameter and 3/16 inch spacing between each turn. The tap is at the center of the coil.



Here we have the inside view of the set, showing just how the parts are placed.

All in all, this set is far more sensitive than the average and is about three times as selective. It ran rings around all other 2 to 5 meter sets compared with it. It is simple to build and costs very little, and can be run on batteries or a power-supply.

The writer has found some very interesting effects regarding the position of the receiving antennas for both 5 and 2½ meters. If a vertical half-wave rod is used and the lead-in taken off from the top, the signal strength will be found to be from 100 to 200 per cent greater. This can easily be proven by setting a vertical half wave rod along side the receiver and sliding the lead-in from top to bottom. The best point as mentioned before will be at the top of the vertical rod. If the antenna is mounted vertically on top of a building the lead-in should also be taken from the top and *not* the bottom. Recent tests have proven that signals could be received "R8" with the connection taken from the top; with the connection taken from the bottom these signals were absolutely inaudible. We hope to have more information along the lines of ultra high frequency antennas at a later date.

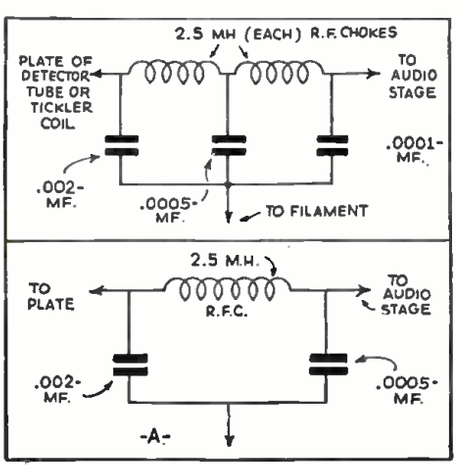
(Continued on page 427)

Eliminating "Fringe Howl"

● IN SPITE of the many improvements in short-wave sets during the last few years, "fringe howl" or "threshhold oscillation" is still with us, especially in home-made sets. The most common method of getting rid of this trouble is to shunt a ¼ megohm fixed resistor across the secondary of the first audio transformer. Unfortunately this method, while eliminating the howl, eliminates most of the signal also.

The radio-frequency filter circuit is the writer's favorite method of eliminating the troublesome howl. The arrangement shown in Fig. 1, consists of two 2½ millihenry R.F. chokes connected to three fixed condensers as shown. The circuit is exactly the same as that used in power supply filter systems, except that radio frequency chokes and small capacity condensers are used.

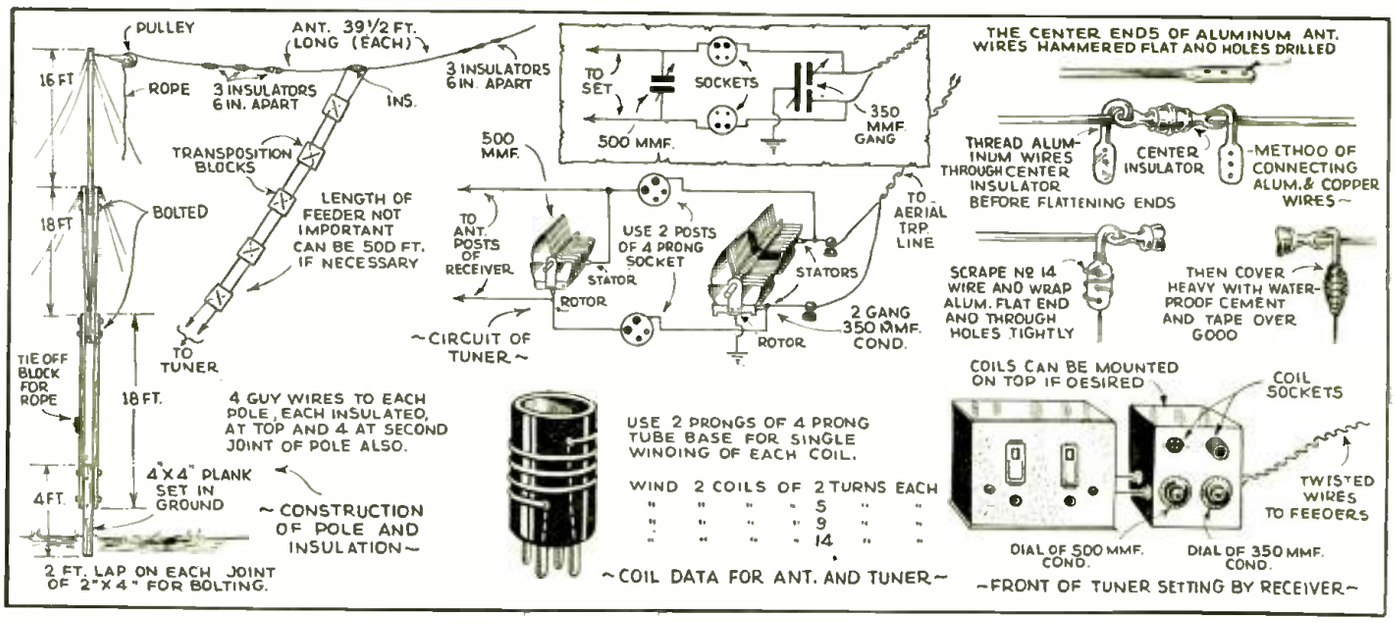
Sometimes very good results can be obtained by the use of only one choke and two condensers as shown in Fig. 1 "A". In either case use only chokes which are wound on isolantite forms and are treated with some kind of moisture repellant.



Two methods described by the author for eliminating "fringe howl."

In many cases where pentode amplifiers are used in regenerative receivers trouble is experienced when the detector is near the oscillating point due to feedback between the audio stage and detector. This is in the form of a high pitched howl and can be very easily overcome by connecting a small by-pass condenser between the plate of the pentode tube and the B negative side of the circuit. The size of this condenser depends entirely upon the amount of feedback present. Usually any size from .002 mf. to .006 will cure the trouble. The pentode amplifiers also have the characteristic of giving a very "thin"

(Continued on page 441)



Details of the special directive doublet antenna used by Mr. Johnson to "listen in" to European S-W stations are given above.

Best Aerial for "Europeans"

By HEINIE JOHNSON

First "Trophy Cup" Winner, Short-Wave Scout Contest

● BECAUSE Europe with the D-G and F signals affords a goodly portion of the pleasurable listening, we have built a special antenna for reception of signals from that continent.

The top, or antenna proper, consists of two 39½ foot lengths of No. 4 aluminum wire at a height of 47 feet above ground, swinging from rope tie-offs between two wooden poles, made from 2 by 4's per sketch. The lead-ins are of No. 14 enameled copper wire, transposed each 15 inches, on home-made insulation blocks which were cut from plywood and boiled in paraffine.

Since aluminum cannot be easily soldered, except with special solder, the ends were flattened out with a hammer as shown and the copper lead-ins, after being well scraped, were wound in and around the holes in the flattened ends of the antenna conductors. Afterward the connection was covered with waterproof cement and well taped over. This forms an excellent connection we have found.

The lead-ins are brought through the wall to a special *antenna tuner* by means of twisted lamp cord. This tuner consists of one two-gang .00035 mf. condenser block, two coil sockets, one .0005 mf. condenser and four sets of coils (two to the set) wound on tube bases—and arranged as shown in the diagram. Coil data is described separately. The lead-ins are taken from this tuner to the antenna posts of the first T.R.F. stage. The antenna coil of this first stage has been freed of ground connection and brought back to the second antenna post, in order to complete the antenna circuit as a whole and the two .00035 mf. condensers furnish the ground capacity used in the antenna circuit—usually you'll find best operating conditions with these condensers well open; i.e., rotor plates well out of the stator plates.

The efficiency of this hook-up will surprise you. You will find it possible to "peak" a signal to the extent of having FYA's 25.63 meter signal come in strong enough to "shake" a heavy loudspeaker with vibrations of their carrier alone, when no program is on! This will also prove true of the GSD and GSF carriers during the usual short periods when the carrier is on, *but no transmission is sent out*. Of course, such antenna efficiency will bring in the program much better than the aperiodic form afforded by a transformer coupling, but will also require considerably more tuning than is required with the usual coupler. We don't mind that and don't believe any "dyed-in-the-wool" short-wave fan will either.

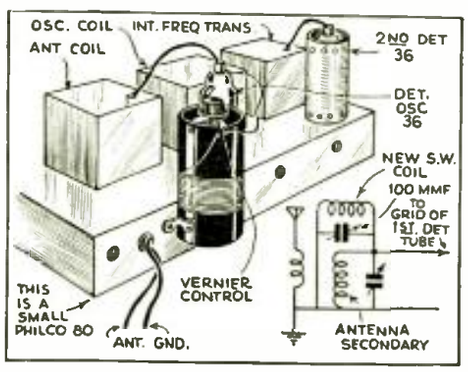
This antenna is "plenty" efficient from 6,000 kc. to 25,000 kc.; therefore covering the best part of the DX bands. It would work equally well if placed so as to be directional to South America, but since we built it for European and

(*Continued on page* 430)

How To Tune In Short-Waves On Broadcast Set

● HERE is an idea that may be applied to any broadcast receiver of the superhet type. The idea is simple enough and that is to lower the inductance of the antenna secondary so that the accepted frequency will mix with the second harmonic of the regular oscillator, producing the desired intermediate frequency.

Take the Philco Model 80 for an example: We have just one tuning circuit between the antenna and the first detector oscillator tube, so in order to get the 160 meter phone band we connect a small coil across the antenna secondary in a shunt arrangement. This may be done without pulling the chassis from the cabinet by winding about thirty-five turns of No. 28 enameled wire on a coil form, about one and one-half inch or two inches in diameter, grounding one end



By connecting a small coil across the first detector grid coil, as explained, short waves can be tuned in on a B.C. receiver.

of the coil to the chassis and connecting the other end to the top cap of the detector-oscillator tube. The inductance may be varied to match the oscillator by varying the space between the turns of the coil nearest the grid end. The top cap connection should be made along with the regular connection to that tube.

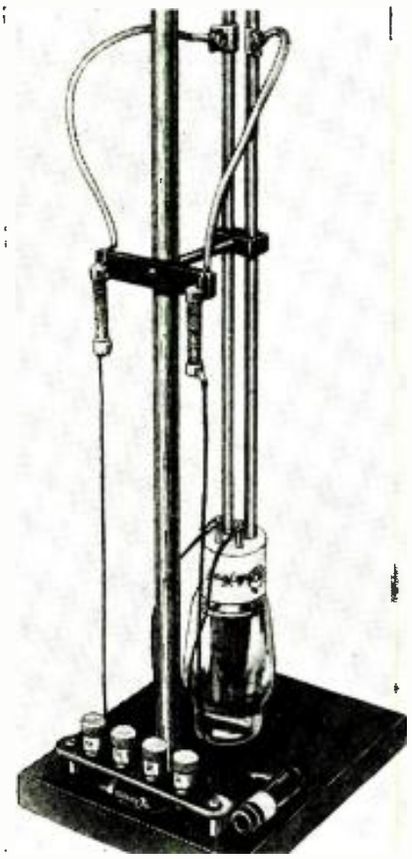
The second harmonic of the oscillator will change about twice as fast as the fundamental accepted through the shunt arrangement, so that full efficiency will only be possible over a short part of the dial. To get away from that bad feature we mount a small variable midget condenser on one end of the coil form and connect it across the coil winding. This makes it possible to adjust the shunt coil's inductance, so as to obtain full efficiency over the whole dial scale.

—J. F. ROESE.

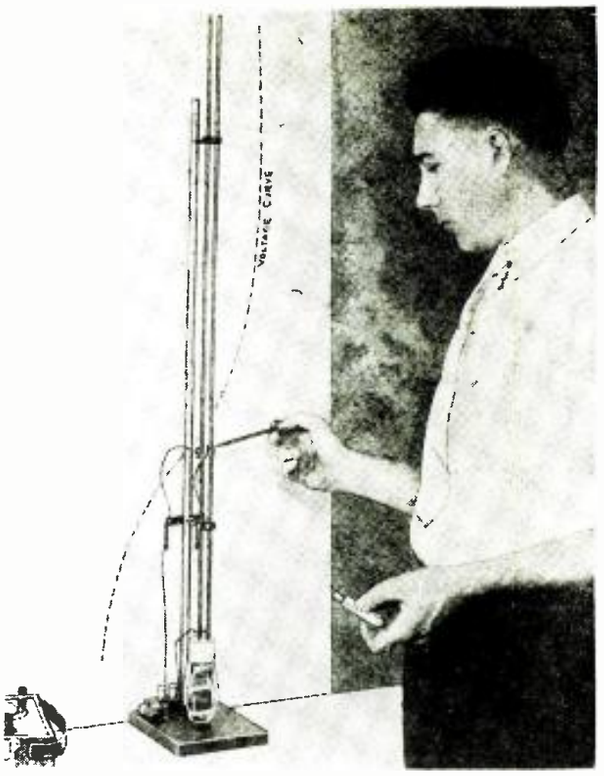
More Power on 2.5 Meters With Triodes

By GEORGE W. SHUART, W2AMN

We are pleased to present this very efficient 2.5 meter transmitter, in which present day tubes can be used with considerably more output than can be obtained with the ordinary "coil-condenser" combination. In this circuit, the tube elements actually form a part of a half-wave "resonant transmission line." One-quarter inch copper tubes are used and fit directly onto the plate and grid terminals of the tube, in order to eliminate losses in long connections. This transmitter can also be operated as low as one and one-quarter meters with a surprising "output" and a marked increase in "stability" over the usual ultra-high-frequency transmitter.



Left: Close up of 2.5 meter transmitter using resonant transmission line.



Right: The 2.5 meter transmitter, together with the voltage curve along the transmission line.

● SEVERAL of our friends have constructed the new 5 meter transmitter described in last month's SHORT WAVE CRAFT. They all experienced quite a surprise when they found out how efficient and stable the "rig" was. The output was reported to be three or four times as much as obtained with a conventional oscillator. And the writer was asked if the same principle could be applied to a 2.5 meter oscillator for use in the newly alloted amateur frequencies. It surely can, and such a transmitter is described in this article.

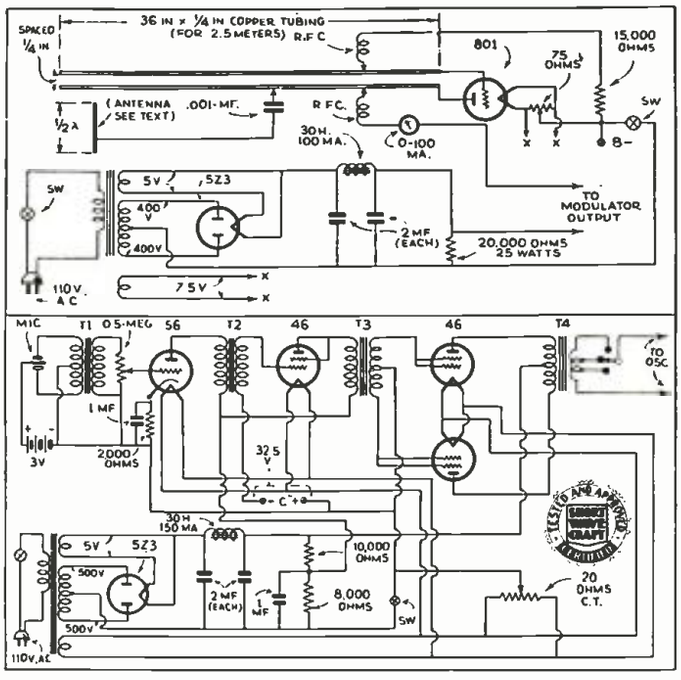
There is little use of going on the wavelengths below 2.7 meters with the regular parallel tuned oscillator as the R.F. output is extremely low, even with large inputs, the plate efficiency being so low as to practically ruin a tube in short order. Then again, being more or less unfamiliar with the characteristics of the extremely high frequencies, we need an oscillator that has a fair amount of output in order to enable us to communicate over any appreciable distance at all. This transmitter together with the receiver described elsewhere in this issue, has proved to be "workable" over distances up to 14 miles, with an R9 signal under ordinary geographical conditions. No one knows, as yet, the maximum possibilities of these frequencies and no doubt it will be quite some time before they do.

However, from the author's experience with these ultra-high frequencies it can be safely said that they exhibit essentially the same characteristics as does the five meter signals. It has been found that the transmitting and receiving antennas need to be a considerable height above the ground and that they are very directional: that is the directional qualities of these antennas are more noticeable than those operated on lower frequencies. The receiving antenna especially is very critical. The horizontal receiving antenna with its directional effects, seems to be superior to the vertical affair in most cases. The vertical transmitting antenna, of course, was used and is recommended as it radiates fairly well in all directions.

Details of Oscillator

The transmitter shown in the photo probably looks like anything else but what it is. As we have said before though, no one knows what our ultra high frequency apparatus is going to look like in the future, so don't let its appearance affect you too seriously. The transmitter uses a single tube employed as a feedback oscillator, not a B.K. oscillator. Barkhausen-Kurz oscillators are notorious for their *low output*, even with special tubes. This oscillator uses an *open-end* transmission line, while last month's transmitter used *shorted-end* lines. *Shorted lines* would be far too short on 2.5 meters to derive any benefit from them. Push-pull was not used in the transmitter as considerable difficulty is encountered when *open-end* lines are used with tubes in push-pull. Further experimentation will probably result in the use of a tube at each end of the line. However, for the present this trans-

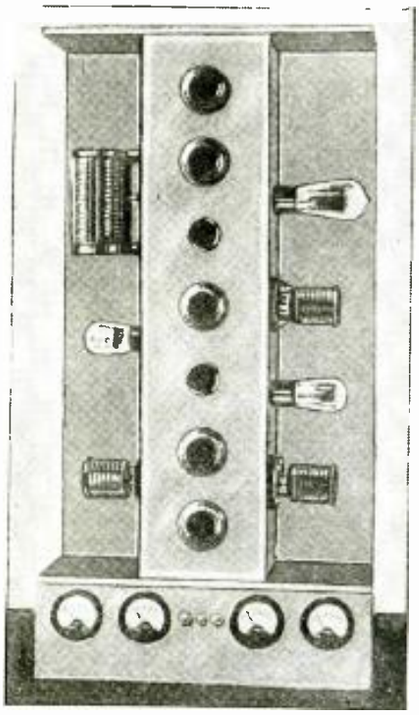
(*Continued on page* 426)



The diagram clearly shows the connections of the new transmitter, together with a recommended power supply and a modulator.

WORLD-WIDE SHORT-

A 10 Watt Phone Transmitter

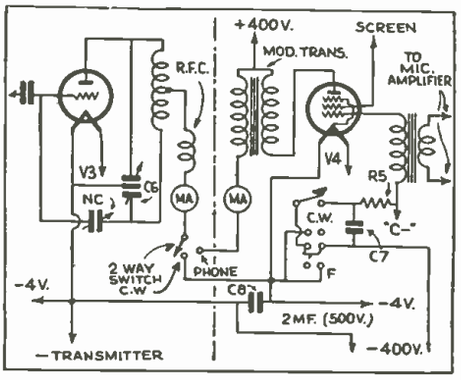


Above we have the very unique 10-watt phone transmitter. The chassis design is such that a minimum of interlocking between the various stages is obtained.

● IN THE T. & R. BULLETIN, the official organ of the Radio Society of Great Britain, recently photographs and a description of an amateur transmitter of unusual design were printed. This transmitter, instead of being mounted on the usual breadboard or panel and shelf, is scientifically laid out to provide not only the shortest possible leads and most efficient shielding for the various circuits but also the most convenient arrangement for circuit changes and adjustments.

The circuit is also scientifically designed and appears on this page for those who might be interested in analyzing it. A glance at the circuit shows that it is a crystal controlled master-oscillator arrangement with provision for using the second harmonic of the master-oscillator frequency for frequency doubling purposes. For use on the fundamental frequency of the master-oscillator, one of the tuned circuits in the plate lead of this tube is short circuited. Following the master-oscillator are two power amplifier stages, the second of which is modulated by a separate modulator and keying tube.

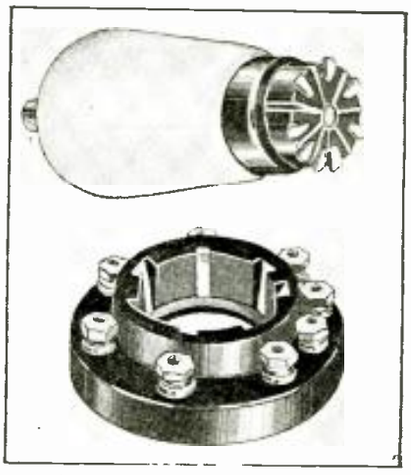
● The editors have endeavored to review the more important foreign magazines covering short-wave developments, for the benefit of the thousands of readers of this magazine who do not have the opportunity of seeing these magazines first-hand. The circuits shown are for the most part self-explanatory to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



Above—We see the diagram of the simple modulator for the 10-watt phone transmitter.

The keying circuit is rather novel, since it employs a tube instead of cutting off oscillation by any of the usual methods. The tube which acts as a modulator for phone work is biased well beyond the cutoff point and is arranged in series with the plate supply to the tube which it controls. Shorting out the bias resistor with the key breaks no current but allows the controlled tube to receive plate current. As the key is lifted the bias naturally cuts off all the conductivity and the wave is thus effectively keyed. This eliminates the tendency towards loud key clicks which are so prevalent in some amateur signals.

A glance at the panel arrangement of the transmitter, which is designed for operation on 1.7 and 3.5 megacycles will show the handy arrangement of parts. It will be noted that the radio frequency coils are well separated and shielded in completely enclosed compartments. Two of the shields are removed in the photograph to show the position of these coils. The novel method of mounting the parts provides six surfaces for the radio frequency components in place of the usual single surface in the breadboard design.



New tube base and socket design providing positive contact at all times.

"Pin-Less" Tubes

● RECENTLY, several large European tube manufacturers have placed on the market tubes using *side contacts* instead of the usual contact pins. One of these tubes is shown in the accompanying illustration, which was printed in *Wireless Magazine*. It will be noticed that this tube has 8 contacts and even with this number the circumference of the base is not crowded. This shows the superiority of this method of construction for multi-element tubes such as those recently introduced on both the European and American markets. Incidentally, the tube shown is a pentagrid converter, similar in design to the American 2A7, except for the addition of a suppressor grid, thus making the first detector an R.F. pentode of the variable mu type.

The appearance of one of the tube sockets for this "octode" is shown here. It will be noticed that this method of constructing sockets is also an improvement over the old method of having spring clips which grip the tube prongs. The clips are inclined to spread after a time thus making poor contact, while the contacts in this new type of socket are backed up by the solid wall of the socket.

We believe that in time, American tube manufacturers will find it of interest to follow a similar style in the construction of multi-element tubes.

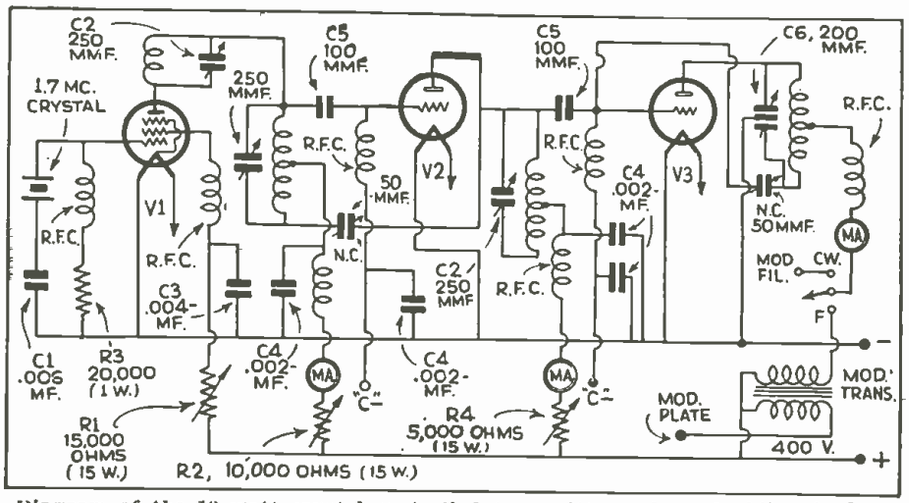


Diagram of the 10-watt crystal-controlled transmitter, where doubling is done directly in the plate circuit of the oscillator tube.

WAVE REVIEW .. Edited by C. W. PALMER

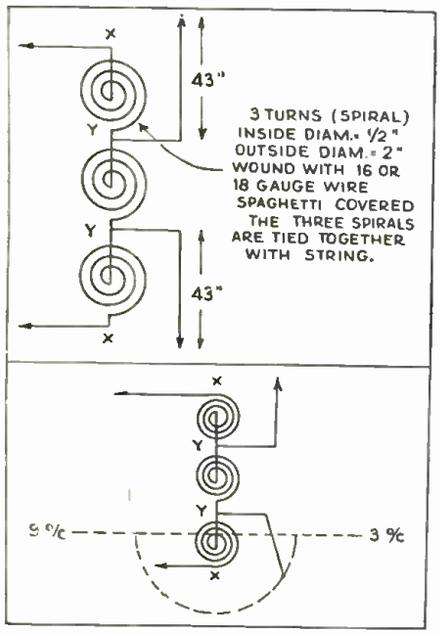
The Picard Aerial for 5 Meters

● IN A recent issue of that interesting booklet—*The T & R Bulletin* of the Radio Society of Great Britain, the description of an aerial used by amateur station 2AVN was published. This description contained many useful facts for the amateur who is working on the 56 megacycle (5-meter) band.

The Picard aerial at this station is a half-wave unit, fed at the center by means of three spiral coils of a few turns each, placed side by side and connected together to form an auto-transformer. The feeders are connected to the outer ends of the coils (X) while the taps to the aerial are taken off at points Y in the accompanying circuit. This method of matched impedance has been thoroughly tested by 2AVN, *and the results definitely proved that it is superior to any other form of aerial coupling.* The great advantage is that any convenient length of feeder lines can be used; wires from 4 to 45 feet have been tried with *identical* results.

The actual aerials used are telescopic legs from a camera tripod, with the impedance matching coils mounted in the center. It has been found that the rods have to be pushed in to a length of 43 inches instead of 49 inches due to the loading of the coupling coils at the center.

A varied collection of results has been accumulated, but one thing is agreed by all, that superior results are obtained by arranging the aerials as shown at B in the accompanying circuit. It will be noticed that one-half of the aerial (that is, one ¼ —wave rod) is vertical. The other can be placed



Two diagrams showing different methods of connecting the Picard antenna. Fig. A is the upper drawing and Fig. B is the lower.

in any position over the arc shown in the sketch.

The description in *The T & R Bulletin* offers no explanation for the latter phenomenon but it is suggested that it is due to the fact that the polarization of the signals change and this happens to suit the aerial arrangement at the receiving end, or vice versa, when the Picard aerial is used for reception purposes. This seems to offer a field for experimentation as there appears to be little doubt that the angle of polarization does not remain constant from transmitter to receiver, and in some cases is twisted as much as 90 degrees.

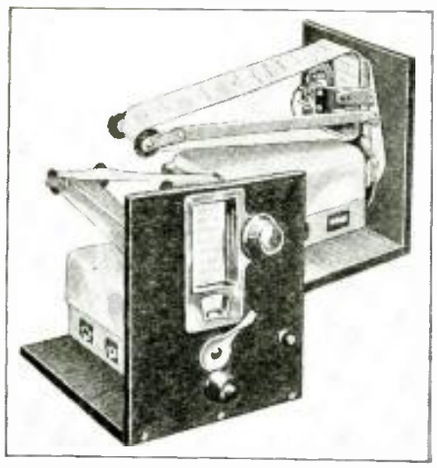
(EDITOR'S NOTE: *Tilting one side of the doublet antenna or, the entire antenna, makes quite an improvement on most signals. We have noticed that certain 5 meter signals cannot be received unless the antenna was tilted in a certain direction and at a certain angle. It is well for our many 5 meter enthusiasts to devise a method for tilting their antennas in order that maximum results can be obtained.*)

A New Dial

● IN A recent issue of *Wireless World*, an interesting, new dial was shown. This dial is of particular interest for *short-wave* receivers since it has an unusually long scale to make easy tuning, and since a paper or celluloid strip is used, stations may be logged directly on the dial.

The construction of the dial can be seen from the illustration. In place of the usual dial and pointer or drum, a flexible paper scale is supported on two rollers at the top and bottom of the dial opening and a third roller supported behind the other two. This paper strip is driven by a series of gears connected to the condenser shaft.

It has the advantage of permitting stations to be recorded in either alphabetical order or in geographic groups, thus greatly facilitating the location of any desired station. Because of the numerous stations crowded in small portions of the short-wave bands, sufficient space is found on this dial to "log" them all.

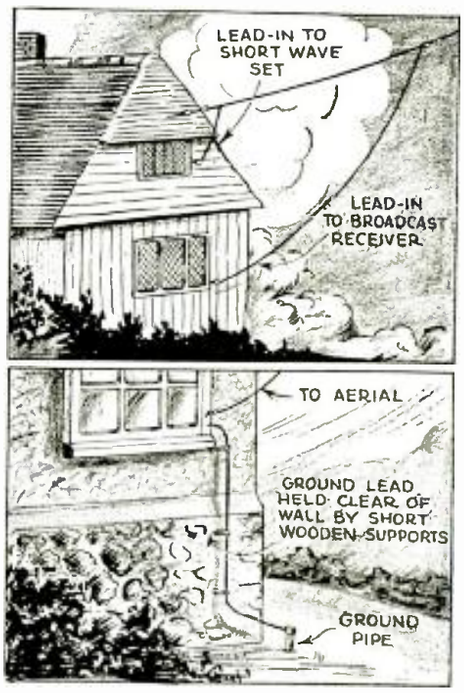


In this dial, the scale is actually of the moving tape type; being very long it should provide easy tuning.

It is interesting to note that a dial of this type can easily be improvised from the drum dial by the addition of the paper strip and third roller, carrying the paper strip over the old drum.

Short-Wave Antenna Hints

● SOME interesting facts concerning the aerials used for short-wave reception appeared in recent issues of *Popular Wireless*, an English weekly publication. The first of these is a hint for using a single aerial for both short-wave and broadcast reception. A glance at the illustration shows that a lead-in is brought into the house from each end of the aerial. One of these lead-in wires is connected to the broadcast receiver while the other connects to the short-wave set. When used in this way there is no interaction between the two receivers; each works as though it had an individual aerial and lead-in. The other hint concerns the placement of the ground lead which often introduces noises into a short-wave receiver, if it is placed near an electric light line or is allowed to rub against a wall, gutter or drain pipe. Varying capacity effects or static



This Illustration shows how a single antenna may be used for both "broadcast" and "short-wave" reception.

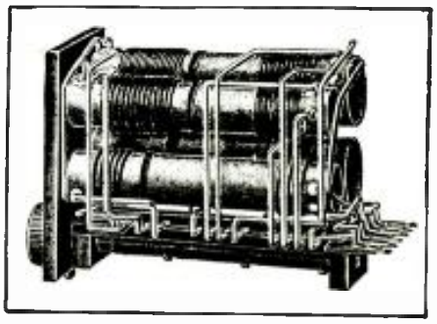
voltages set up either by induction or friction caused by rubbing introduces static voltages in the aerial coil which are picked up and amplified in the receiver.

The solution to the problem lies in correctly spacing the ground lead from any pipes or wires by the use of wood or other insulated spreaders. A glance at the sketch shows how a typical installation is made.

These simple hints show what interest is displayed in short-wave aerials in foreign publications. There is no doubt that worthwhile improvements in short-wave receivers can be made by simple changes in the aerial, especially in the position and care with which it is insulated.

An All-Wave Coil Assembly

● IN *Der Qualitäts Markt*, a German publication, there appeared a short-wave coil unit of unusual design. It consists of four insulated tubes on which the coils are wound with the wave-range switch mounted below. The coils are designed for a superheterodyne type receiver in which the oscillator is directly coupled to the secondary of the aerial coupler. The wave-change switch is a cam type unit with short spring contacts that are compressed by rotating the wave-change knob. This coil unit covers the wave bands between 18 and 200 meters as well as the broadcast band of 200 to 550 meters.



Above we have the illustration of an all-wave coil assembly of German design.

Short Wave Scout Report From John Sorensen, Bronx, N. Y. C.

● RECEPTION from the G stations, D stations and FYA stations has been very good. CT1AA has been very good; also XEBT on 49.8 meters; PRBA on 31.58 meters; VK3LR on 31.3 meters (mornings); EAQ on 30.4 meters; HJ1ABB on 46.5 meters. Other stations have been heard several times during the month and which are as follows: Aug. 4, 1:30 p.m., Radio Vaticano, also mornings, 5 to 5:15 a.m., E. S. T.; KWU-KWO, Disan, Calif., 19 meters; JVF, Tokyo, 19 meters; LSX, Buenos Aires, 28.98 meters; ORK, Belgium, 29.04 meters; VK2ME-VK3ME; HC2RL, 45 meters; YV2RC, 49 meters, good; YV3RC, 48 meters, good; W1XAZ, 31 meters; also W8XK, 19-25-49 meters; W2XE, 25-49 meters; W8XAL, 49 meters; PHI, 16.8 meters; W3XL, 46.9 meters; W3XAL, 16.8 meters; W9XAA, 49 meters; CJRX, 25-48 meters; YV5RMO, 49 meters; HJ4ABB, 41.6 meters; HBL, 31.27 meters; OXY, 49 meters; LCL, 31.45 meters; JB, Johannesburg, 49 meters; HBJ, 20.6 meters relaying Vienna, Austria; WQP, 20.4 meters, and many more, of course, which I did not put down in my "Log Book." A number of South Americans were not positively identified. A Chinese station on around 28 meters mornings is R9, but it's Chinese to me! Also RW15 Siberia on 70.2 meters, but not good enough to send them a report, as static is very bad on this band. Heard several Italian ships on 70 meters early mornings.

Verifications received in August: HJ3ABD, 40.5 meters, writes—"Throw your switch at 1 p.m. and 8 p.m. to enter our advertisement contest, please send a further report mentioning some of our advertisements.

The stations with personality
Apartado 509, Bogota, Colombia, S. A.

* * *

GCS, Rugby, 33.2 meters call WNA—They write "My report has been read with interest." Printed on upper part of letter reads "On-His-Majesty's-Service."

* * *

ORK, 29.04 meters, 20 kw. sends a white card with ORK in large red letters
Sent for August 2, received on August 23—very prompt reply. Radio Ruysselede, West Flanders, Belgium.

Veri from JB 49 meters, Johannesburg reads: We thank you for letter dated June 11. We are happy to advise you that you have obtained reception of our early morning session transmitted by the Johannesburg short-wave station which is devoted to physical exercises. Please accept our congratulations on your achievement.

Yours faithfully,
AFRICA BROADC. CO., LTD.

(This is the *second* veri from JB this year.)

I have heard many *harmonics* this month: W8XK has plenty of them on 24-26-25 meters. Also on 50.5 meters. WICC harmonic has been heard on 49.9 meters for many months here, W8B on 45 meters and many others. Amateurs have been there too; so strong that they would, for instance, blanket GBS entirely. I hear their harmonics at many places on the dial, but none of them are fooling me at all. Many of the American *local* short-wave stations are there today, but gone tomorrow—they play hide and seek. I2RO has not been heard this month; 59 meter band is too noisy in daylight to do any real DXing. The German stations have been sending very fine programs; also the English stations. GSB was sending a "blow-by-blow" description of a boxing bout between Johnny King and Dick Corbett for the bantam-weight championship of Great Britain, at 5 p.m. E. S. T., August 20, and received 139; QSA5. Code transmitters do the most damage to my DXing; there always seems to be two or more working on the same frequencies as the more difficult stations are to be logged. For instance OXY, most of the South Americans, Russia and even DJB have troubles. At times CT1AA, RW15, LCL, and many more like JB, CNR. I now must "train my guns" on India, Sumatra, China, Japan, and others. I expect very good reception in the month of September.—John Sorensen.

Short Wave Scout News

Official Listening Post Report From Edward Heiser, Brecksville, Ohio

● RECEPTION has been rather erratic which I believe was due mostly to weather conditions. There were a few days when the European stations came in exceptionally loud and clear, but the period in general was not very good, because of considerable static.

I2RO in Rome, Italy, has not been heard here for the past two months, although this station was previously heard quite regularly.

There is a new South American station located in Brazil, operating on about 31.5 meters. This station comes in very well and is usually on from about 5:30 p.m., E. S. T. Have not been able to get the call letters.

There is a Spanish speaking station operating irregularly which was heard just above FYA (25.63 M.).

At 7:00 a.m. one morning, I finally heard one of the Japanese stations. The music and speech were just understandable, but as no English was spoken the call could not be identified.

There are a few more CGA stations operating in Canada, on about 23.5 meters. These stations usually work England and use the calls, CGA2 and CGA3.

George Sallade Likes His Trophy

"Words fail me when I attempt to express my thanks to your magazine for such a beautiful Trophy. The Trophy was immediately displayed in a prominent Reading, Pa., store, where it was admired by many people. This, I feel, put SHORT WAVES before the public in a rather convincing manner, and at the same time helped to advertise your publication."—George D. Sallade, Winner of the Seventh Trophy Cup.

Latest "Hot" Tips for Short-Wave Listeners from our "OFFICIAL LISTENING POSTS"

Heinie Johnson of Big Spring, Texas, Reports

On 16 meter band we enjoy our best reception and as we predicted in our last month's report PHI is a dandy. GSG is also mighty fine, while W3XAL is the perfect signal of the month.

The phones and commercial signals around and near this band are also good.

We turn the old dials to 19 meters and find we can hear DJB, GSF and FYA from 8 to 9:30 a. m., C.S.T.; FYA is not as good on this frequency as was the case 30 days ago. Some noise is encountered on this band and we find several mornings when atmospherics are bad, causing lots of WHIRL sound to accompany all carriers. Also, some mornings when sudden, jerky fading is noticeable. As a whole, this band is about 80% O.K.

Stopping among the amateurs on 20 meters, we got a real "kick" one night at about 8:30 p. m., C.S.T., when we heard a "K6" signal real well from Hawaii and a "G" from England. Just dumb luck—haven't been able to do it since.

Thirty days ago the 25 meter band was fine until about 11:00 p. m., C.S.T. We listened to German and English carriers as well as FYA over this frequency and they were good.

Now they are very noisy at those hours. England has been heard sending over GSD as late as 1:30 a. m., but noise kills the value of the pleasure of listening.

That Jap on 27 meters is on as usual and we finally have made out his call. It is JVM, instead of JEM as we once stated. If you hear JOAK over this frequency don't get confused. That is the local (to Japan) *broadcast* station they relay. We like the smoothness with which this station carrier reaches us. Must be a well "engineered" transmitter.

We haven't heard "Little America" or KNRA all month.

I believe VK3BL is now used as call number of station WK3RL in Australia over 31 meters. Noise on this band bothers every signal but W2XAF. The Boston "carrier" has developed a really bad hum.

DX above 31 meters (lower frequency) is still very poor but will improve some in next 30 days. In that respect I want to announce the fact that there is a "real catch" to be made on 85 meters, providing you employ a good receiver and happen to get a favorable break in the weather at your location.

The station is CT2AJ located at Ponta Delgada, San Miguel, Azores, and is on 3,500 kc, every Wednesday and Saturday nights with a power of 50 watts. Hours, 6 to 8 p. m., E.D.S.T., or 4 to 6 p. m., C.S.T.

Report From Official Listening Post of Geo. D. Sallade, Sinking Spring, Pa.

● NOW that there is a regular station broadcasting in the Orient the number of members in the "All-Continents" Club should increase. The new station is none other than JVM, variously reported under different call letters. In Eastern Pennsylvania this Oriental station can be heard

(*Continued on page* 434)

SHORT WAVE SCOUTS

NINTH "TROPHY" WINNER FLORIAN POESCHAL

Point St. Charles, Montreal, Can. 162 Stations; 81 Veris

● IT gives us great pleasure this month to announce the award of the Ninth SHORT WAVE SCOUT Trophy to Florian Poeschal of Point St. Charles, Montreal, Canada. Mr. Poeschal enjoys the unique honor of having submitted the largest list of short-wave stations heard since the inauguration of our Trophy Contest nine months ago.

Mr. Poeschal submitted a total of 168 stations, 162 of which were officially OK'ed by the Board of Judges.

Mr. Poeschal used an 11-tube standard broadcast superhet, in conjunction with a 2-tube short-wave converter, both the converter and the set having been built by Mr. Poeschal himself. For an antenna he used one of the umbrella type. The list of stations was accompanied with the required notarial oath.

The list of stations submitted by the entrant in this Trophy Contest may be for any 30-day period. Keep your list of stations until you have received at least fifty per cent veris, so that you can mail the veris, list, letter, and oath all in one package. Bear in mind that the verification cards must be those received in answer to inquiries made regarding programs heard during your selected 30-day Official Listening Period. Arrange your station list in two groups, if possible, the first the *verified* group and the second, the *unverified*. State in your letter the total number of stations logged and also the number of verified ones. Before you mail your list and the veris, go before a local Notary Public and take an oath to the effect that the person submitting the list of stations has *personally* listened to the stations named. Also, state in your letter what 30-day "Listening Period" the list of stations is for.

List of Verified Short-Wave Stations Heard by Mr. Poeschal

CT1AA—9600 kc.—See card—Lisbon, Portugal—3 Cuckoo calls.
DJA—9560 kc.—See card—Berlin, Germany.
DJB—15200 kc.—See card—Berlin, Germany.
DJC—6020 kc.—See card—Berlin, Germany.
DJD—11760 kc.—See card—Berlin, Germany.
EAQ—9860 kc.—See card—Madrid, Spain.
GSB—9510 kc.—See Transmission List—London, England.
GSC—9585 kc.—See Transmission List—London, England.
GSD—11750 kc.—See Transmission List—London, England.
GSE—11860 kc.—See Transmission List—London, England.
GSF—15140 kc.—See Transmission List—London, England.
GSG—17790 kc.—See Transmission List—London, England.
GSH—21470 kc.—See Transmission List—London, England.
GBC—12780 kc.—In the early afternoon—Rugby, England—Phone to U. S. A.
GBS—18310 kc.—In the early morning—Rugby, England—Phone to U. S. A.
GBU—18610 kc.—In the forenoon—Rugby, England—Phone to U. S. A.
GBS—12250 kc.—In the early evening—Rugby, England—Phone to U. S. A.
GBU—12290 kc.—In the early afternoon—Rugby, England—Phone to U. S. A.
GBS—12150 kc.—In the early afternoon—Rugby, England—Phone to U. S. A.
GBP—10770 kc.—In the late afternoon—Rugby, England—Phone to U. S. A.
GCU—9950 kc.—In the early evening—Rugby, England—Phone to U. S. A.
GCS—9020 kc.—In the evening—Rugby, England—Phone to U. S. A.
GCW—9800 kc.—In the evening—Rugby, England—Phone to U. S. A.
GDW—4840 kc.—In the late evening—Rugby, England—Phone to U. S. A.
GBU—22300 kc.—In the morning—Rugby, England—Phone to U. S. A.
GBC—17080 kc.—In the early forenoon—Rugby, England—Phone to U. S. A.
GBC—13591 kc.—In the afternoon—Rugby, England—Phone to Canada.
GBC—9310 kc.—In the late evening—Rugby, England—Phone to Canada.
GBS—9200 kc.—In the late evening—Rugby, England—Phone to U. S. A.
HBL—9580 kc.—Saturdays, 5:30 p.m.-6:30 p.m.—Geneva, Switzerland — Talks on the Proceedings of the League of Nations.
HBP—7790 kc.—Saturdays 5:30-6:30 p.m.—Geneva, Switzerland—Talks on the Proceedings of the League of Nations.
HH—17740 kc.—Daily except Tuesday and Wednesday, 7:30 - 10:30 a.m. — Hilversum, Holland—In the summer months.
PKI—15070 kc.—See letter—Moscow, U.S.S.R.
RNE—12,000 kc.—See letter—Moscow, U.S.S.R.
HC2RL—6668 kc.—See card—Guayaquil, Ecuador, S. A.
HJ1ABB—6447 kc. — See verification — Barranquilla, Colombia.
XEBT—6006 kc.—See letter—El Buen Tono, Mexico.
VY2RC—6112 kc.—See booklet—Caracas, Venezuela, S. A.
YV3RC—6150 kc.—See card—Caracas, Venezuela, S. A.
PRF5—9500 kc.—Daily, 5:30 p.m.-6:15 p.m.—Rio de Janeiro, Brazil, S. A.
YV5RMO—6070 kc.—Daily, 5 p.m.-10 p.m.—Maracaibo, Venezuela, S. A.
El Prado—6618 kc.—See letter—Riobamba, Ecuador, S. A.
HIX—6065 kc.—See card—Santo Domingo, R. D.
LSX—10350 kc.—In the evenings—Buenos Aires, Argentina — Used for Transmission from KFZ.

(*Continued on page* 439)

NINTH "TROPHY CUP" WINNER

Presented to
SHORT WAVE SCOUT
FLORIAN POESCHAL,
Point St. Charles, Montreal, Can.
For his contribution toward the advancement of the art of Radio
by

SHORT WAVE CRAFT
Magazine

● ON this page is illustrated the handsome trophy, which was designed by one of New Yorks leading silversmiths. It is made of metal throughout, except the base, which is made of handsome black Bakelite. The metal itself is quadruple silver-plated, in the usual manner of all trophies today.

It is a most imposing piece of work, and stands from tip to base 22½". The diameter of the base is 7¾". The diameter of the globe is 5¼". The work throughout is first-class, and no money has been spared in its execution. It will enhance any home, and will be admired by everyone who sees it.

The trophy will be awarded every month, and the winner will be announced in the following issue of SHORT WAVE CRAFT. The winner's name will be hand engraved on the trophy.

The purpose of this contest is to advance the art of radio by "logging" as many short-wave commercial phone stations, in a period not exceeding thirty days, as possible by any one contestant. The trophy will be awarded to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during any 30 day period; at least fifty per cent must be "verified".

HONORABLE MENTION AWARDS

Arthur F. G. Bruder, 11 Everett St., Allston, Mass. 90S; 45V.

Leo A. J. de Roo, Lanikai, Oahu, Hawaii. 86S; 43V.

H. H. Kingston, Jr., R.F.D. No. 3, Rochester, N. Y. 60S; 30V.

S = Total number of stations submitted.
V = Total number of verifications submitted.

SHORT WAVES and

Ethel Behm, Boys, from South Africa!

Ethel C. Behm hails all the way from King Williams Town, South Africa. She has heard all the leading short-wave broadcast stations in this and other countries on the loud speaker from a 3-tube receiver! We hope to receive photos and descriptions of short-wave listening posts as well as ham stations operated by other members of the "fair sex". So let's hear from you, ladies.

Editor, SHORT WAVE CRAFT:

On the white table I have my two valve (tube) "short" wave set. On the desk is my three valve (tube) set. At the rear I have a spare Ormond set. The three valves have been giving me very good results, especially on short-waves, bringing in the following short-wave stations with loudspeaker strength: W3XAL, Bound Brook; KDKA, Pittsburgh; W3XL, Bound Brook; Daventry, Zeesen, Rome, Paris, etc. This set has also been giving perfect "DX" results, as has the two valves on head-phones.

—ETHEL C. BEHM, care Mrs. R. F. Behm, 71 Alice Street, King Williams Town, Cape Province, South Africa.

(*Pleased to hear from you, Ethel, and one thing is certain—you must have developed a very sensitive touch on those tuning dials, in order to bring in the "DX" stations on the loud-speaker, with only a 3-tube set. Let's hear from other members of the "fair sex," who are short-wave "fans" or "hams". —Editor.*)

Our 3-Tube Set Performs "Marvels"

Editor, SHORT WAVE CRAFT:

I have been a reader of your splendid magazine for over two years and like many others I find difficulty in keeping away from the local newsstands until the 15th, always hoping that another issue might possibly come in a few days "ahead of schedule"!

I have built several of the sets recommended by your magazine, and there is one thing especially that I like about your policy, and that is that practically all the circuits published are really "practical" and not just somebody's *dream* of what a set should be, but isn't!

Of course, I had to build the famous Doerle, but did not secure the best results with it, due principally to not taking the proper precautions in careful building. My next effort was the Doerle "Signal-Gripper" and believe me, it showed plenty of "kick," picking up *practically at will* most of the European and South American stations.

About two months ago, again feeling the urge to "rebuild", I hauled out the last year's issues of SHORT WAVE CRAFT and after noting particularly the claims made by Mr. Thayer in describing his "Three-Tube DX-r that hauls them in" (I believe it was in the May, 1933, issue) and decided to see if it really performed as claimed. Believe me, it sure did! A trifle noisy and somewhat broad in tuning at times, but Oh, Boy! what "distance-getting" ability and "volume". Loud-speaker reception on amateur, police, ham, practically all the U. S. A. S-W stations and at times DJA-DJB, GSA, GSB, etc.

I have had on phones many of the L's, PRBA, YV2RC, HKD, K6XO at Honolulu, and best of all the Byrd expedition on the evening it crossed the 120th meridian at the edge of the ice pack (I believe it was at the 60th degree) and many other foreign stations which I could not identify. A peculiar thing about this set is that at times when on my 8-tube superhet "broadcast" receiver and "converter" I could get no foreign stations at all, all I had to do was to go upstairs and pull them in with this little "three-tuber"!

Back in the days of the crystal sets and Copp circuits, I used to read articles in *Radio News*, etc., by our friend, Editor Hugo Gernsback, and when he started the present SWC, I knew that he saw possibilities in that field and I followed and I have ever since been glad I did.

L. DURAND,
14804 Ardenall Ave.,
East Cleveland, Ohio.

(*Hot stuff, L. D. R., and it really is surprising what a "good" 3-tube receiver, such as Mr. Thayer's, can do when carefully operated. The most astonishing thing, of course, about the whole performance in your case is the fact that the 3-tube set completely outdid the 8-tube "broadcast" receiver, plus the short-wave converter, which is rather unusual to say the least.—Editor*)

ROCKETS, SIR, FOR MR. MYER'S SET

Editor, SHORT WAVE CRAFT:

I started reading SHORT WAVE CRAFT in April, and since then have not missed a single copy. First I constructed the *Oscillodyne*, then, the *2-Tube Doerle*, and had fine success with the both of them. When I again looked in my April issue, I saw Mr. Myers' set and decided to build it. What results!! I never knew what a "wallop" three tubes could have! In two nights I had all the ham "phone" imaginable on 75 meters. As I turn the dial while I write this, code stations come jumping past. In every part of the 80 meter C.W. band, there is a continuous stream of carriers from various stations. I use a 40 meter *doublet* antenna. Some of the 75 meter phone stations are: W1EPO, W5CR, W5AOB, W9DXI, W9BDZ, W7AXY, VE5AI, W7RY, 9COU, 4AAB, etc. Also about 250 W6's, Hi, Hi! I received all these on a loud speaker.

CLARENCE RIDGWAY,
La Habra, Calif.

(*Most interesting, Clarence, and your report on Mr. Meyer's hook-up bears out that of hundreds of other readers of* SHORT WAVE CRAFT *who have built and tested the Meyer's circuit. The Meyer's circuit which appeared in the April, 1933, issue of* SHORT WAVE CRAFT, *possesses a number of novel features, particularly the method of regeneration employed. We have heard from many users of this circuit that it is particularly smooth and reliable which coincides with the report you have given. It was one of the first to use "electron coupling."—Editor*)

One Year's Subscription to
SHORT WAVE CRAFT
FREE
for the "Best" Station Photo

Closing date for each contest—60 days preceding date of issue; Nov. 1 for Jan. issue, etc. The editors will act as judges and their opinions will be final. In the event of a tie, a subscription will be given to each contestant so tying.

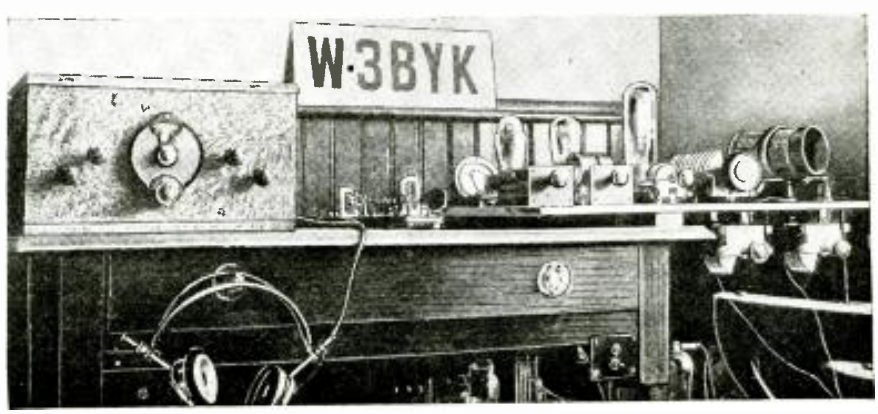
W3BYK "WORKS" ALL COUNTRIES

Editor, SHORT WAVE CRAFT:

Recently you requested photos of short-wave stations; here is mine. The transmitter consists of a 47 xtal osc., 210 freq. doubler and a 203A final amplifier with 450 watts input. The receiver is a home-built superhet and works real well. Antenna used is a half-wave voltage-fed Zepp. Frequencies used are 7016 and 7294 kc. All U. S. and VE districts, Germany, Spain, Cuba, and South America have been "worked." Your magazine is a real Ham publication and I certainly enjoy reading every copy. 73.

STANLEY M. LADAGE, W3BYK,
923 N. 27th Street,
Camden, N. J.

(*A peach of a station and the fact that you "worked" foreign countries shows that you must have the transmitter "perking" at 100 per cent plus.—Editor.*)



Here's a snappy American "Ham" station operated by Stanley Ladage of Camden, N. J. His call is W3BYK.

LONG RAVES . . . OUR READERS' FORUM

BOY! WHAT RESULTS! FROM A "JUNK-BUILT" OSCILLODYNE!

Editor, SHORT WAVE CRAFT:

I feel I owe you and especially to Mr. J. A. Worcester, Jr., an apology, for nailing some old radio parts together and calling them an *Oscillodyne.*

Some years ago, living in New York City then, I had lost all interest in short waves. An occasional squeal and plenty of interference were about all my results. But I always tried to keep informed of the happenings in the short-wave field by reading your publications. And now, during this winter, living up here in a rural district of the Adirondacks I could not resist the temptation to try my luck once more, since from an old copy of SHORT WAVE CRAFT I had become interested in the *Oscillodyne* circuit.

And so I took an old *Pilot Wasp* set apart and fixed the new set up. I actually *nailed* it together, since the next place to get radio parts is about 60 miles from here, and besides, who wants to go there with the thermometer anywhere below—25F. and 3 feet of snow on the roads? And where it was impossible to make the connections in the set with nails and small screws I just wound the wires around the binding posts and *squeezed them tight with pliers!* To get the set going I took an old 201 tube, my car battery and an old 45-volt B-battery I found somewhere standing around at a neighbor's place. I assure you all three had seen plenty of service before. The antenna is a 10-foot piece of wire dangling from the set, just the right size to fall over when I get off my chair—the piece the telephone men forgot when they connected my telephone had been longer, but I used a part for hooking up the set. The ground connection goes to the lightning fuse of the telephone.

And with this outfit—I really hesitate to call it a short-wave receiver—I pulled in during about 4 hours after the set-up:

FYA, EAQ, GSC, DJA, GSB, PSK, YV3BC, W8XK, W3XAL, W9XF, VE9GW, DJC, and numerous domestic "hams", airplane, telephone, and broadcast stations to which I did not pay any attention as I was out for "blood".

And I had lost my interest in short waves, with such a set available since almost a year—what a pity!

KARL F. STEGMANN,
Poultry Farm, Route 2,
Corinth, N. Y.

(Boy, oh boy! What a set—and what results! Mighty pleased to hear from you Karl, and it just shows what a "kick" the Oscillodyne receiver has in it, when it rolled up the score you cite, with the receiver thrown together from "odd parts." We are glad to know that the Oscillodyne revived your interest in "short waves" and if you have been listening to some of the recent fine European musical and vocal programs from England, Germany, France, and Italy (not to mention Russia and a few other countries), as the editors have been doing—you have certainly experienced a mighty big treat.—Editor)

PROUD OF HIS "DOERLE" RECEIVER

Editor, SHORT WAVE CRAFT:

I have been a constant reader of your magazine for over a year and have just a short while ago become the proud possessor of a 2-tube *Doerle* battery type receiver. A few weeks ago I added another tube to it, making it a *three-tuber* and although I haven't logged VK2ME or VK3ME (Australia), I still have a good long list of stations. Here are some of the stations I've heard:

HJ1ABB, Barranquilla, Colombia.
HC1DR, Quito, Ecuador.
HC2RL, Guayaquil, Ecuador.
PSK, Rio de Janiero, Brazil.
LSX, Buenos Aires, Argentina.
HSP, Geneva, Switzerland.
I2RO, Rome Italy.
KNRA, Schooner "Seth Parker".
KEE, California.
KEZ, California.

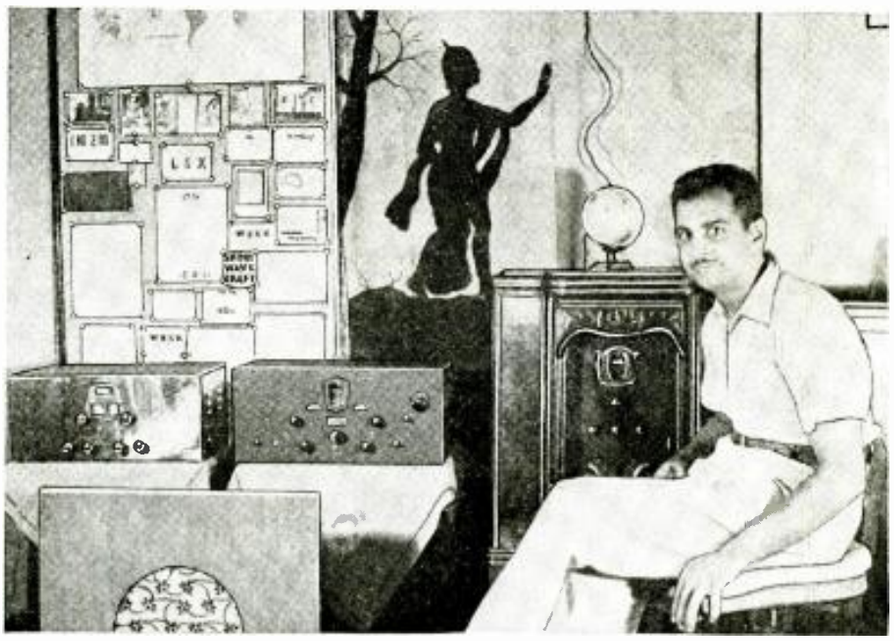
I have also received "amateurs" from Mexico, Porto Rico, and the Pacific Coast. I am using a single-wire aerial about 100 feet long and with a single wire lead-in. I want to tell you people I enjoy your magazine very much and will continue to do so.

GEORGE DEMMITT,
919 N. Pine St.,
York, Pa.

(Again the Doerle! Well, George, the Doerle fans seem to have the "DX" (long distance reception) situation well in hand and, judging from the thousands of favorable reports received in the past few months regarding phenomenal reception results with the Doerle sets, you will most probably have logged VK2ME or 3ME by the time you read this in print.—Editor)

Mr. Wadia of Bombay, India, "Logs" 119 Stations

"Prize-winning" station photo awarded One year's subscription to SHORT WAVE CRAFT.



One of the best-known "short-wave listening stations" is that of D. R. D. Wadia, a lawyer of Bombay, India, who sends us this picture of his short-wave "radio den."

Mr. D. R. D. Wadia, Bar-at-Law of Bombay, India, in his "Radio Den" from where he sends out reception reports to *Short-Wave* and *Broadcast* stations all over the world. His *veris* include such difficult catches as LSX, W8XK, W3XAL, W2XAF, WGY. He has also logged all the Gs, Fs, Ds, VK2ME, VK3ME, VUB, VUC, VU2IY, VU2BY, VUGAH, J1AA, JYT, RV59, RNE, REN, HVJ, 2RO, EAQ, PCJ, PHI, VQ7LO on the short waves and innumerable fones like KAY, G6RX, most of Java, RIM, RKI, Cairo, Teheran, Paris, Rugby, and practically all the European broadcasters having over 20 kw. power.

The only radio that has given him entire satisfaction and 99 per cent reliability is the Philco 11 tube All wave Superhet and he has used many famous makes.

His interest in radio dates back to 1921 and he is a member of the I.S.W.C.; A.R.R.L.; S.W.L.; R9 L.L.; B.B.S.W.C.; N.Z.S.W.C., etc.

Short Wave Stations heard—GSH, IRW, PMA, PLE, GAU, PCK, PZS, PMC, PCV, GSC, W3XAL, PHI, IAC, VWY, JYT, RIM, FYA, DJB, GSF, HVJ, RKI, KAY, GBW, SUZ, JYK, IAC, GBC, PLM, PDV, RNE, FZS, FYA, W8XK, GSE, I2RO, DJD, GSD, PHI, FYA, PDK, LSX, PMN, SUV, EAQ, J1AA, IRM, VK2ME, GSC, DJA, VK3ME, GSB, PLW, PLV, VWY, VUB, IAC, HSJ, RIM, RKI, MEDAN, IAC, REN, ZGE, PK1WK, VUC, VQ7LO, DJC, RV59, HVJ, G6RX, RV15.

Broadcast and Long Wave Stations heard—Algiers, Bari, Belgrade, Bratislavia, Breslau, Brno, Budapest, Bucharest, Cracow, Deutschlandsender, HFI, Frankfort-on-Main, Goteborg, Graz, Heilsberg, Istambul, Katlundborg, Katowice, Langenberg, Leipsig, Leningrad, Ljubljana, Luxemberg, Lnow, Milan, Moravska, Ostrava, Moscow, Motala, Munich, Naples, Oslo, Poste Parisien, Prague, Sottens, Reykjavik, Rome, Beromunster, Stockholm, Strasbourg, P.T.T., Stuttgart, Toulouse, Trieste, Turin, Wien, Warsaw, Wilno, W.G.Y. Total 119. Heard since 1924.

(The editors are happy indeed to hear from our foreign readers and Mr. Wadia, who is very well-known to short wave fans in many countries, deserves a lot of credit for the very thorough short-wave listening job he has done. Mr. Wadia is a "dyed-in-the-wool" short-wave "Fan." He never lets a day go by but what he listens in to some of the leading short-wave stations.—Editor.)

OSCILLODYNE A "HIT"!

Editor, SHORT WAVE CRAFT:

Just a line to let your know that I am enjoying your SHORT WAVE CRAFT magazine better every issue. I've managed to get it since Vol. 3—No. 1, except three issues in Volume 3, which I missed. I think your magazine is F.B. (Fine Business). The "fiction" tales are great and would like to see more of them.

(*Continued on page* 441)

Which AUDIO Should I BUILD?

● SO MUCH material has been printed on the radio amplification and detection end of short-wave reception, that it seems as though some attention should be devoted to the A.F. (audio frequency) circuits of these popular receivers.

Every one is familiar with the three common forms of audio couplings. They are *transformer*, *capacity* and *direct-coupled* as indicated in Fig. 1. Some readers will say that capacity-coupled circuits are called *resistance-coupling* but, like many other radio terms and popular definitions, we find them wrongly stated. An examination of the circuit indicates that the actual coupling means is the capacity C.

There is one thing in the mind of the short-wave "receiver" constructor, and that is to obtain the *maximum signal strength* with the *smallest possible number of parts and tubes*.

Several applications of the tubes available on the market today offer excellent possibilities in the above respect.

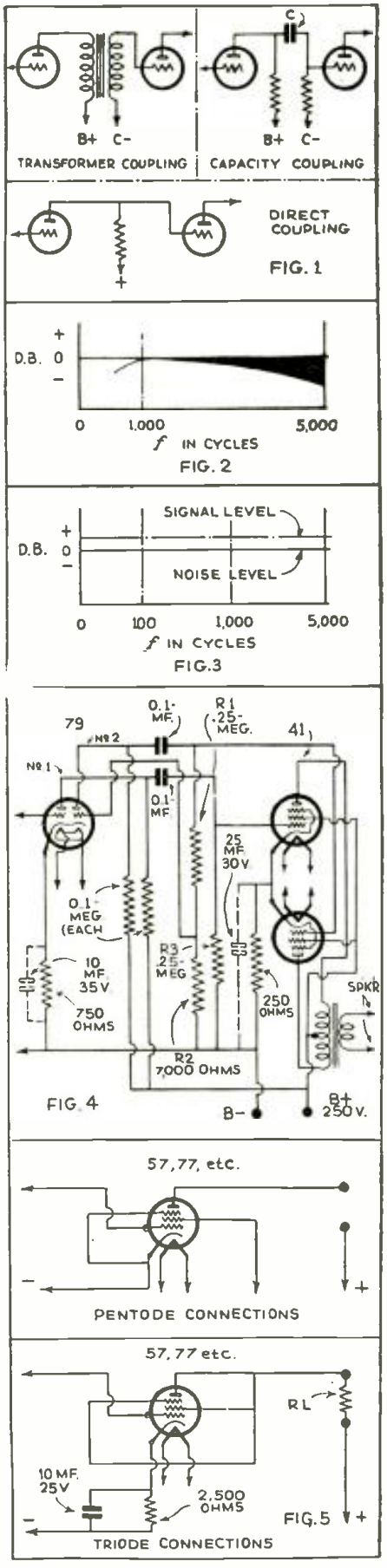
4 Important Factors!

Let these factors be considered when planning audio frequency amplification for short-wave receivers.

1—Voltage Amplification Required.
2—Power Output Required.
3—Power Source. A.C., D.C., Battery.)
4—Frequency Range Required.

The voltage amplification required in short-wave receivers will be dependent on the voltage output of the detector and the voltage necessary to swing the grid or grids of the output tubes. The solution of the problem can be worked out quickly by studying the tube characteristics and then using the DB method of calculating the necessary gain. However, many short-wave receiver constructors are not familiar with the DB unit, and for that reason several combinations will be given which will fit in with most of the receivers in use today. Select the circuit that fits in with your requirements.

The *power output* will depend on the desire of the set builder, the room and the purpose for which the receiver is used. This final stage can increase the cost of the short-wave receiver considerably. Larger power transformers and high voltage filter condensers are costly and for that reason output tubes are chosen for their economy and power output. The factors mentioned above tend to make the pentode type of output power tube very popular. Tubes like the 47, 2A5, 59, etc., are ideal for the purpose. In every case the tubes are used in a Class "A" connection and as Class "A" power tubes. Class "B" with its *grid power* requirements demands good power supply equipment and additional audio amplification. Balancing the cost of Class "B" versus Class "A" operation, one finds that Class "A" operation is the cheapest and most satisfying in the end. Of course, pentode type output tubes offer the greatest value, although the total distortion will be greater than that which would be obtained from triodes such as the 45 type tube. It is not necessary to obtain a higher degree of fidelity than that obtained from a properly matched pentode dynamic-speaker combination, working below the point of grid current in the output stage. The ability of the output tube to develop around three watts should satisfy most requirements, as it is possible that most of the voltage applied to the grid of the output tube will consist of noise anyway. The author



Diagrams, above, show transformer coupling; capacity coupling; direct coupling; curves giving relation of noise caused by drooping characteristic; push-pull circuit, and finally pentode and triode connections.

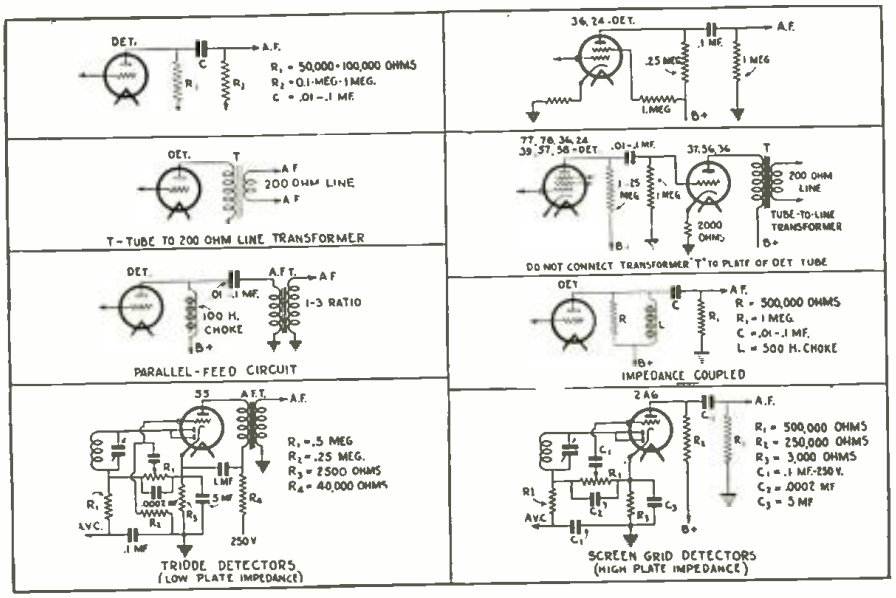
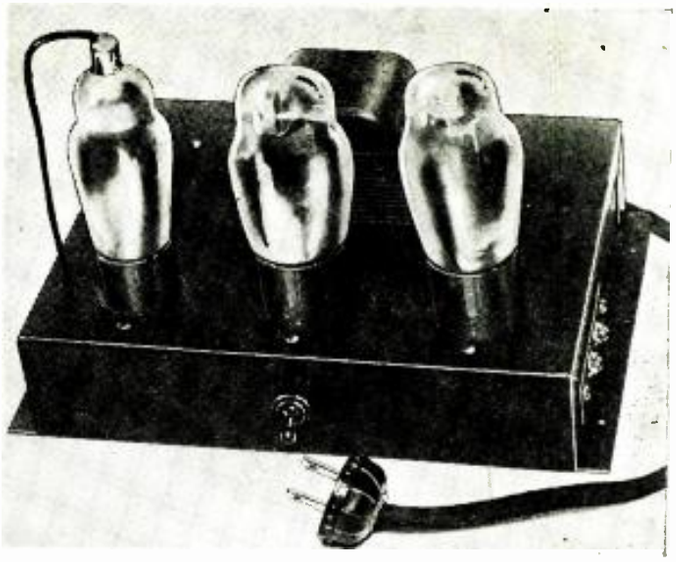


Fig. 6, above, shows various methods of coupling the output of a short-wave receiver to an audio amplifier.

AMPLIFIER

By CLIFFORD E. DENTON



Appearance of finished audio amplifier, shown diagramatically in Fig. 7.

has listened to many sets where the total output was two watts, while the effective signal was about .05 watt. This reception is not pleasing to say the least and such noise levels do not justify great power output.

Power Supply

The power supply units will depend on the line power supply available. In some of the bigger cities D.C. will be found while the greatest majority of homes are A.C. supplied. Battery and 32 volt operation will be found on the farms in many sections. Therefore the power supply unit will depend entirely on the available line power supply. The new tubes permit excellent operation to be obtained from A.C. and D.C. circuits and genemotors (dynamotor) are available for operation on 6 volt batteries or 32 volt farm lighting plants. Remember, power output requires power and voltage for the plate of the output tubes and to obtain 3 watts of power from the receiver with tubes on the market today, that at least 250 volts on the final stage is necessary.

Audio Frequency Range

The audio frequencies necessary for music and speech can be confined to the range between 100 and 4,000 cycles. In many short-wave receivers of the high gain type it is advisable to have the audio cut-off below 4,000 cycles due to tube noise and the hash of interference and static which accompanies long distance reception. In some receivers the audio system has been designed to give a drooping characteristic above 1,000 cycles. The shaded portion of Fig. 2 indicates the effect of this characteristic on the noise picked up by the receiver. Suppose that the output curves of Fig. 3 are correct for a given short-wave receiver, that is, the signal overrides the noise. The response of the receiver to the signal and the noise throughout the audio band will hold the same relationship. From the above, then for any given portion of the audio band, there will be a given amount of noise amplification. The greater the audio range of the receiver, the greater the noise in the output. The narrow audio band will amplify the noise to a lesser degree and if the frequencies up to 2,500 cycles are amplified, speech will be understandable and music reproduction will be passable.

This lack of quality, in so far as frequency response is concerned in present-day short-wave receivers, is accepted as a "necessary evil" at the present time. However, improvements in antennas and tube circuits, plus the use of *highly selective* tuned circuits, will result in high fidelity reception at short-waves. This day is not here and will be some time in coming.

So many readers of SHORT WAVE CRAFT have asked for this information, the editors tell me, that special mention must be made of this interesting circuit. Of course, push-pull transformers are costly and now that the tubes like the 79 are available, transformerless push-pull stages can be built by anyone.

A study of the diagram of Fig. 4 shows how this "push-pull" action is accomplished. The signal from the detector is applied to one of the grids of the 79, and the resultant amplified signal capacity coupled to one of the output tubes. The grid of the remaining triode section of the 79 is connected to the voltage-divider, made up of resistor, R1 and R2. The signal voltage applied to the grid of the No. 2 triode section of the 79 will be 180 degrees out of phase with the original signal voltage applied to the grid of the No. 1 triode section of the 79. As the effective MU of the 79 with the recommended load resistance is 35, and for reasons of symmetry R1 plus R2 should equal R3, it will be noted that the voltage across the resistor R2 (7,000 ohms), will be equal to the voltage on the grid of the *input* triode section. The voltage across R2 is one thirty-fifth of the voltage across R1 and R2. This results in a voltage on the grids of the output tubes equal in value and of the proper phase relationship for "push-pull" action.

The condensers indicated by dotted lines are not necessary ordinarily, as the tubes are operating in a push-pull connection. In cases of electrical unbalance of the tube elements or resistors, such condensers may be useful. The gain of such a circuit is such that one volt from the detector will give ample output volume. A power output of 6 watts can be obtained with a total distortion of 11 per cent. This is entirely satisfactory for short-wave receivers.

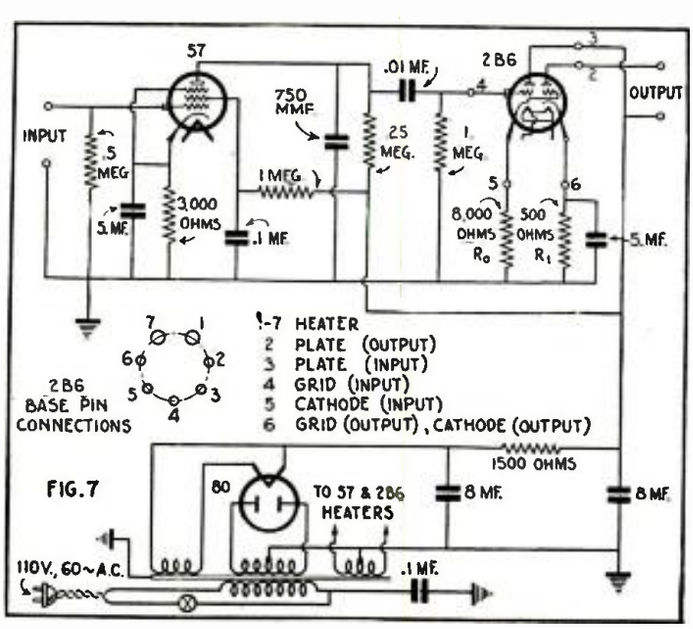


Fig. 7—Showing the use of the new 2B6 tube. A "high gain" four to six watt audio amplifier.

The editors have been looking for a good AUDIO-AMPLIFIER article for some time. Mr. Denton, well-known radio engineer, has, we believe, covered this subject in a very complete and authoritative manner and we are sure that our readers will be glad indeed to have this valuable information placed before them. Mr. Denton discusses the various factors we must watch out for in designing and building an audio amplifier suitable for use with a short-wave receiver, which is quite a different problem than designing such an amplifier for use on a broadcast receiver.

Pentode Tubes As Triodes

In many circuits the "possible" amplification of 77's or 57's cannot be

(*Continued on page* 442)

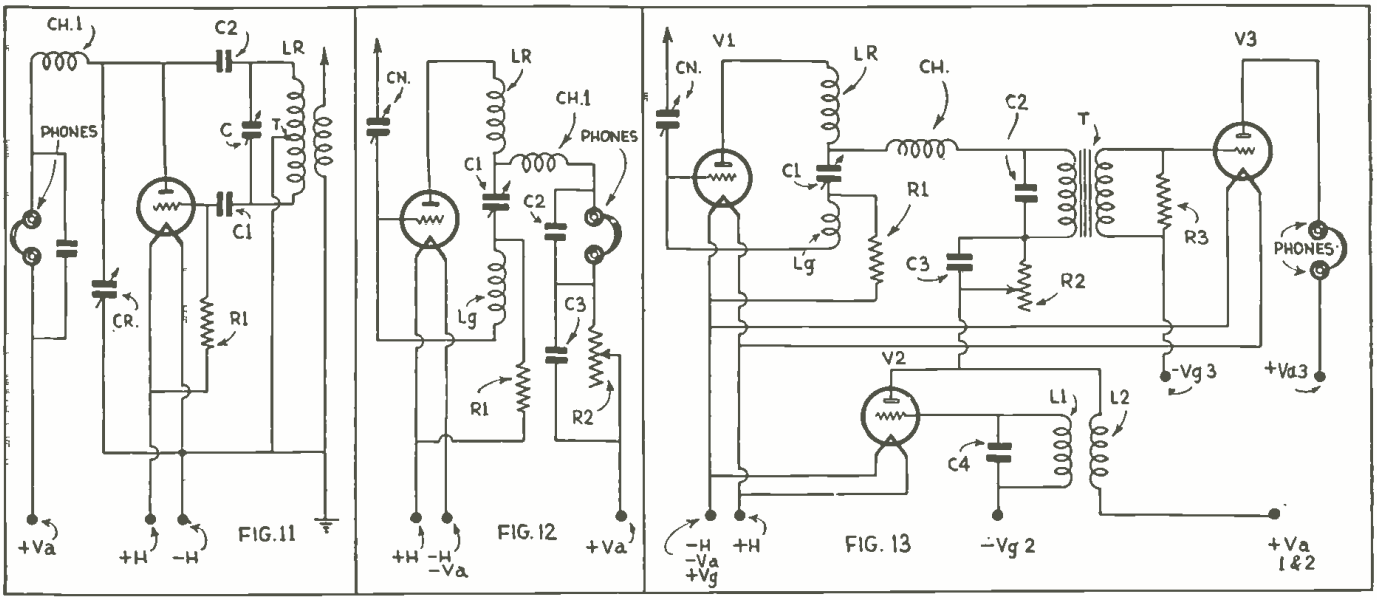


Fig. 11, left, shows ultra-audion 3 meter receiver circuit; Fig. 12, circuit improved by connecting tuning condenser in series with inductance; Fig. 13, detector and 1 stage of audio amplification, with V2 providing the low frequency oscillation, making it a super-regenerative receiver.

3.1 Meter RECEIVER

By DR. W. MÖLLER, Germany

In the Sept. issue the details of the 3.1 meter transmitter were given; in the present article the details of the 3.1 meter super-regenerative receiver are discussed.

● THE receiver described is not a result of countless experimentation and, therefore, there is no reason to insist that it is the best. However, it can be stated without exaggeration, that it operated excellently during our experiments on 3-meter waves over long distances. Similarly to the oscillator, the circuit of this receiver is also based on the Hartley three-point circuit shown in Fig. 1. (Part I, in last issue.) Such receivers in which the oscillatory circuit is located between the grid and plate and not between the cathode and grid are called ultraudions. This arrangement is shown in Fig. 11. The grid-leak, R, and the by-pass condenser C have the usual values of regenerative receivers. The inductance coil of the oscillator circuit has a tap, the position of which depends upon the amplification constant of the tube. The plate end of the coil LR insures the feed-back action. The R.F. choke CH1 and the by-pass condenser C2 separate the R.F. currents from the A.F. currents. Cr controls the amount of regeneration. When Cr increases a larger part of the R.F. current is shunted to the ground and the feed-back becomes less. The opposite is true when the capacity of Cr is decreased.

However, this circuit is not well adapted to operate on very short wavelengths. First, the inductively coupled antenna is very inefficient in the range of the above wavelengths. Only an antenna coupled directly through a small capacity to the H.F. generator can be taken in consideration. Secondly, it will be too difficult to tune in to very short waves with a condenser connected across the inductance. It is preferable to put the condenser C1 in series with the inductance, as shown in Fig. 12. With such an arrangement, condensers C2 and C1 of Fig. 11 are not necessary and are omitted. The regeneration is very satisfactorily controlled by adjusting the plate voltage with a series resistance R2. The variable neutralizing condenser Cn, connecting the antenna directly to the grid has a maximum value of 20 mmf. The oscillatory circuit Lr, C1, Lg contains in series also the plate-to-grid capacity Cga and therefore C, can be relatively large without increasing very much the total capacity of the circuit. The R.F. choke CH, which cuts off the R.F. currents from the headphones can be replaced by a corresponding filter.

The *sensitivity* and the *loudness* are considerably increased by adding a *local oscillator* to the above circuit, and a one or two stage A.F. amplifier. The object of the *local oscillator* is to superimpose upon the normal plate voltage of the regenerative tube, an R.F. potential and thus amplify the sensitivity of the tube. This phenomenon can be explained in the following manner: An increase of the D.C. plate voltage in a regenerative receiver reduces the damping of the oscillatory circuit and naturally increases the sensitivity. However, the direct current plate voltage can only be brought to such a point where the tube is near the oscillation state. By approaching the critical point of zero damping of the oscillatory circuit, the operation becomes unstable. The slightest cause, even the smallest variation of the plate voltage supply is sufficient to set the tube in oscillation and make impossible any reception whatsoever. When an R.F. voltage superimposes on the D.C. plate tension, the value of the latter can be so adjusted, that during the positive half-cycle the resulting plate voltage surpasses the critical point, while during the negative half-cycle the combined voltage is way below this point. The plate voltage oscillates around the critical point and the result of this is an enormous increase in the sensitivity of the tube. Unfortunately this method has its drawback. Although this type of plate voltage variation is of the R.F. order and therefore cannot be intercepted with the earphones, the receiver has a certain peculiarity: the background of the received tone is never so "clean" as in ordinary regenerative receivers.

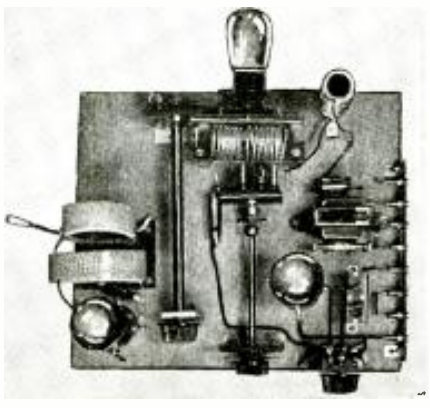


Fig. 14—Appearance of finished 3-meter receiver using 3 tubes.

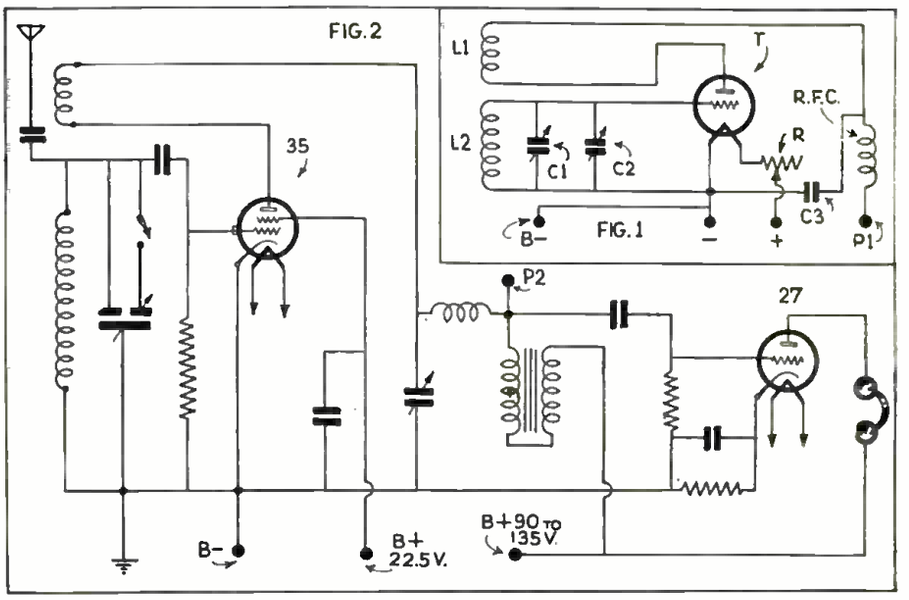
Because a certain number of tests were made with the receiver, the circuit of which is given in Fig. 13, details are given below about the separate parts. The tube V1 and its corresponding circuit are the same as in the circuit shown in Fig. 12. If a tube of the 112 type is used, the oscillatory circuit will be in resonance with the incoming wave of the transmitter, when Lr has two turns

(*Continued on page* 447)

"Break-In" Monitoring

By DONALD McKINLEY, VE3AU

This is a very clever idea for a break-in system to be used at amateur transmitting stations; the "home" signal blocks the regular detector but comes through on the monitor circuit into the phones. When an "outside" station signal comes in on the aerial it "clears" through the regular detector and the operator hears the station "breaking in".



Circuit for the clever "break-in" monitoring system here described by Mr. McKinley, which permits hearing the "home" signal and also a "break-in" signal from an outside station.

● LISTENING in on your own transmitter by means of the monitor or *frequency meter* is recognized as one of the best aids to better sending and improved operating. However, many amateurs claim that the delay and bother necessary to transfer the phones from the receiver to the monitor and switch the latter on and off after each transmission offsets this advantage.

Again, and this applies especially among the traffic handlers, the practice of working "break-in" or *duplex* is becoming more prevalent. Whenever break-in operation is employed the transmitters and receivers in both stations are in continuous operation; and whenever one operator misses a word of the message he has only to press his key to stop the other, who then repeats the word and continues. This method also prevents those long five minute calls since the called operator has only to send the characteristic signal "BK" to inform the calling operator that communication has been established.

A combination of these two operating procedures is, of course, to be desired but few amateurs seem to be using it. The following scheme of break-in monitoring has been employed at this station for nearly a year and has given very satisfactory results.

The monitor (Fig. 1) is the typical oscillating frequency meter; its fundamental frequency being in the 160 meter band and the second, fourth and eighth harmonics used to check up on the transmitter in the usual way. The accompanying reference table gives the various values of inductance and capacity.

It will be found that the trimmer condenser C2 will be set at about full capacity, which, incidentally, helps to provide that Hi-C tank which is quite as important for frequency stability in monitors as in transmitters. The meter is calibrated by the zero beat method and the trimmer may be adjusted slightly from time to time if the dial readings should happen to slip from the calibration curve. A D.C. "battery" tube is used because the A.C. tubes seem to modulate and fail to give a faithful reproduction of the signal from the transmitter. However, if perfect fidelity in the reproduction of the transmitter note is not required, a 227 tube may be substituted for operation from the receiver filament transformer.

The receiver at this station is typical of the usual home-made job (Fig. 2) but the principle of break-in monitoring can be applied to almost any receiver.

(*Continued on page 436*)

A Home-Made Condenser "Mike"

● FOR broadcasting or recording work the condenser mike has hardly any equal and, in fact, is considered by those who should know to be the best type of microphone obtainable.

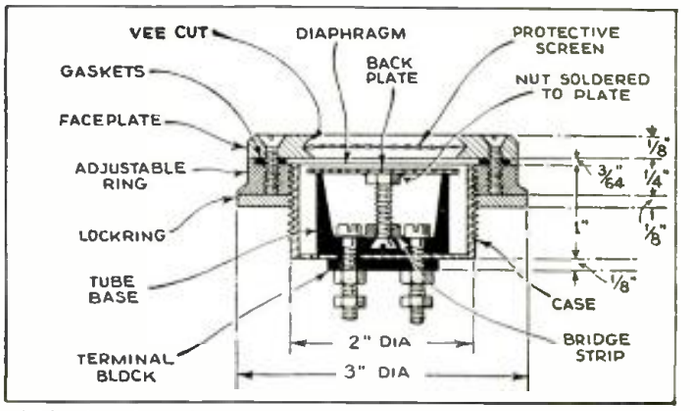
When compared with the carbon type of mike the most important item of interest where high quality is concerned, is the lack of back-ground noises. The "frying carbon hiss" which is generally associated with that of carbon mikes being entirely absent from the condenser mike, giving the clear bell-like response which can be detected instantly by anyone having had experience with high quality microphones.

The writer has experienced trouble, due to the remarkable sensitivity of the mike; the trouble was in the nature of echo effects, due to the room not being acoustically designed for the purpose.

In the average amateur's shack such troubles are to be experienced unless special precautions are taken to deaden the echoes; usually a number of blankets, or heavy curtains, hung around the room, will prove to be quite satisfactory.

Construction of Microphone

The drawing clearly shows the various parts used in the construction of the microphone and all the important measurements are given. It must be stressed, in the construction of an instrument of this type, that extreme care be taken in all machine work in order that good tone quality will be obtained. The diaphragm must be stretched carefully and it must be free of nicks or wrinkles. The material used for the diaphragm is either tin or aluminum foil .005 inch thick; lay it on a clean piece of glass and rub with a piece of cloth until free of any irregularities. The gaskets are made of three thicknesses of paper about as thick as this page.—*Australian Radio News.*



This drawing shows how to make a first-class condenser microphone.

WHAT'S NEW In Short-Wave Apparatus

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

FUN With 5-Meter Trans-Ceivers!

By FRANK LESTER, W2AMJ*

The author operating the 5 meter Trans-Ceiver. (No. 215.)

● THE most interesting piece of apparatus in amateur radio at the present time is the five-meter "transceiver," which gets its name from the fact that it is a combination transmitter and receiver using the same tubes and accessories for both purposes. A recent ruling of the Federal Communications Commission permitting mobile as well as portable operation on five meters has greatly accelerated amateur activity along these lines, and amateurs everywhere are deserting the hopelessly crowded 20-, 40- and 80-meter bands to find considerable pleasure on the shorter waves.

Five meters is a lot of fun because you can pack a complete outfit into a box about the size of a typewriter case and set it up for operation in about fifteen seconds. You can operate it in a car in motion, and contact dozens of different "hams" as you drive from one town to another. Five-meter "field days," held on Saturdays or Sundays, are getting to be regular affairs in amateur circles.

In recognition of this growing acclaim of five meters, the writer has designed a three-tube transceiver that has proved exceptionally successful. A description of it will undoubtedly interest readers of SHORT WAVE CRAFT, as it contains some unique features of design and construction.

A single case, made of steel finished in durable black crackle and measuring 15¼ inches high, 8 inches wide and 7 inches deep, houses the complete outfit, which is known as the Lafayette Transceiver. Why steel and why not aluminum for a portable job? The writer has found that steel stands the punishment of portable service better than aluminum does, and its extra weight pays for itself in durability.

* Engineer, Wholesale Radio Service Co., Inc.

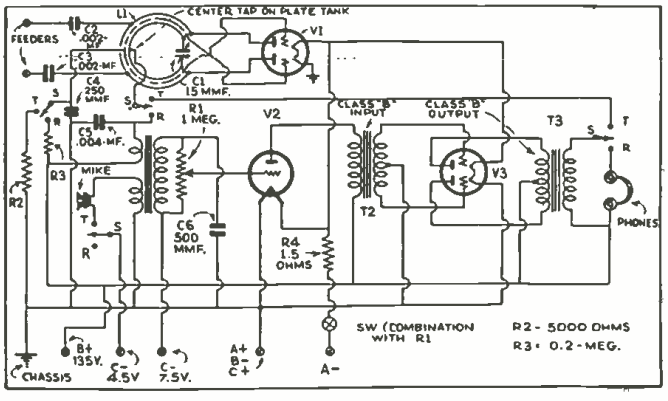
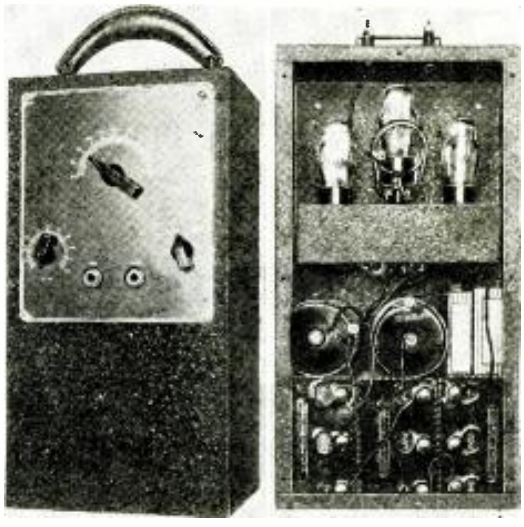


Diagram of 5 meter Trans-Ceiver, showing novel use of the 19 tube.



Front and rear view of 5 meter Trans-Ceiver.

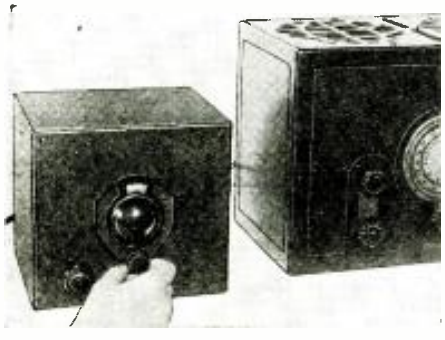
As shown in the illustrations, the case is formed on four sides and has removable front and back panels. A "man-sized" carrying handle is fastened to the top. The upper half of the box is occupied by the transceiver proper, the lower by all the required filament, plate and microphone batteries. A decorative plate for the front panel carries three controls and two jacks; the former are the main tuning knob, in the upper center, volume control, lower left, and receive-transmit "throwover" switch, lower right. The jacks are for earphones and a small hand microphone.

The knobs are of the new pointer type and look very distinctive. A plain knob and not a vernier dial is used for the tuning condenser (C1 in the diagram) because the tuning is not critical

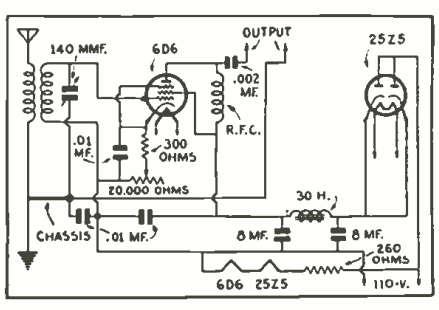
(*Continued on page* 425)

New Pre-Amplifier Helps Weak "Sigs."

● THIS supertone *booster* uses two tubes, one type 6D6 in a stage of tuned R.F. and a 25Z5 as the rectifier. It can be added to any short-wave receiver from a one-tube battery set to a multi tube superheterodyne. When applied to a superheterodyne it will increase the sensitivity of the set and reduce image response to a minimum and in this role it is called a pre-selector. Plug-in coils are used and it covers a range of 15 to 200 meters. A volume control is incorporated in this R.F. amplifier in order that various amounts of gain can be obtained. With the proper adjustment of this volume control, together with the volume control of the set with which it is used, background noise can be reduced to a lower level than can be obtained without a pre-selector stage. The volume control is the right-hand knob. This booster is self-powered, obtaining its filament and plate voltages directly from the 110 volt A.C. or D.C. line. Sufficient filtering is used to render the pre-selector humless. It is housed in a neat black crackle-finished case slightly over seven inches square. The output of this booster connects directly to the antenna and ground post of the receiver with which it is used. Complete details are given in the circuit diagram as to values of parts, etc.



The new Supertone "Booster" or pre-amplifier. It will intensify the signal when used with any set from 1 to 10 tubes. (No. 216.)



Wiring diagram of the Supertone "Booster".

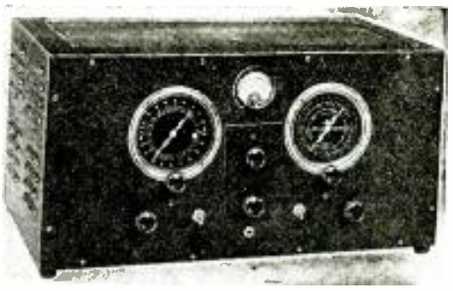
Names and addresses of manufacturers of sets described on this and following pages furnished upon receipt of stamped envelope; mention No. of article.

A New Sensitive . . . Constant Band-Spread Super-het

Right — The handsome appearance of the new Postal Model 35, 10-tube all wave super-het. (No. 213.)

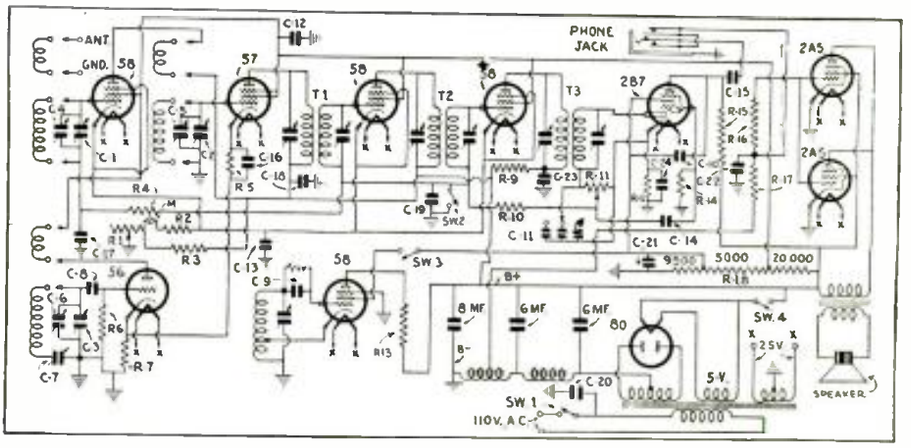
Left — Note the massive construction of the new Postal 10-Tube Constant Band-Spread All-Wave Super. It has accurately calibrated dials.

Below—Diagram of the new 10-tube Postal Super-het; it has "beat oscillator" and "A.V.C."



● THIS new Postal Model 35 receiver is complete in every detail and is truly a versatile receiver. It can be used for amateur work where extreme selectivity and stability are required. It has a beat-oscillator which provides CW reception. The large amount of band-spread incorporated in this receiver design of course makes it an excellent receiver for the short-wave "fan" who listens in on the various short-wave "broadcast" (speech and music from Europe, etc.) bands. These bands are spread over the dial to such a degree that tuning is as simple as that of a broadcast receiver. A pre-amplifier stage, that is, the stage of tuned R.F. used ahead of the first detector, practically eliminates image response and improves the over-all gain of the set. The photograph clearly shows the beautiful crystal finished metal cabinet in which the receiver is built. The various bands to which this receiver will tune are changed by the well-known Postal "draw method." This draw is inserted directly in the center of the panel between the two large tuning dials. The dial to the left of this drawer is the *band-spread* dial and the one to the right is the *general-coverage* or *band-setting* dial. This dial is calibrated, showing the operator at all times in just what frequency range he is working. These illuminated dials are beautiful 4½-inch diameter affairs having suitably high ratio. The *continuous band-spread* arrangement makes it possible to have band-spread at any par-

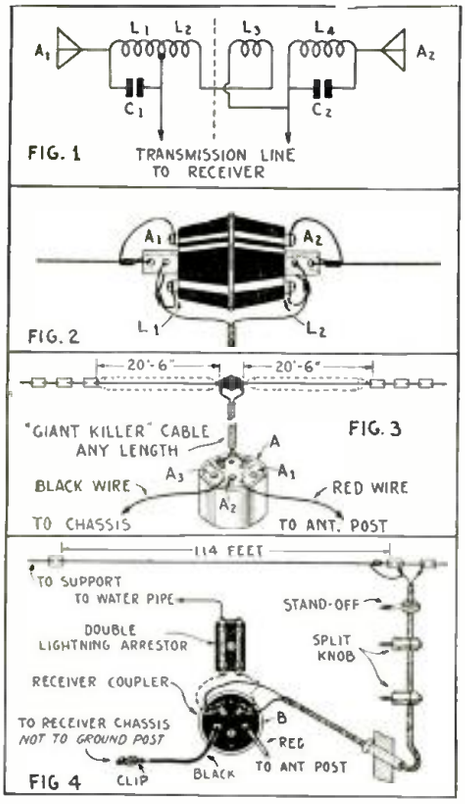
(*Continued on page* 434)



New HI-FI Antenna System

● UP to the present time most *all-wave noise-reducing antenna systems* have been deficient in signal strength on the *broadcast* band. In some systems a compromise has been made with noise by including a switching arrangement which converted the antenna from a doublet with noise-reducing properties to an ordinary "T" antenna with no noise-reducing properties. It had been though impossible to provide an antenna system which would be efficient over the very broad band of frequencies which lie between five meters and six hundred me-

The drawings at the right show the general arrangement of the new Lynch "HI-FI" Antenna System. This is good for noise-proof reception on all wavelengths. Circuit diagram of the coupler, together with the physical drawing, shows complete details. (No. 214)



ters, which is equivalent to fifty-six thousand to five hundred and fifty kilocycles.

The ordinary broadcast receiver has a frequency ratio of approximately three to one. The new Lynch antenna systems have a frequency ratio of more than forty to one.

Where suitable space is available an entirely different type of antenna is suggested having a total overall length of one hundred and fourteen feet which is approximately half a wave-length at seventy meters or 4.3 megacycles. With this type (Fig. 4) of horizontal antenna the lead-in is taken from the end rather than in the center. This has been done as a matter of mechanical convenience rather than electrical efficiency. This system is known as the *Complete Lynch "HI-FI" Simplex System.*

The latter system does not require the elaborate and rather expensive antenna transformer and where space is available it is recommended as being superior to the doublet type. As is true with the Duplex system (Fig. 3), the flat top need not be in a straight line. It may zig zag, but it should not double back on itself.

Most of the important short-wave broadcast stations operate on approximately 13, 16, 19, 21, 31, 49 and 70 meters. A long horizontal antenna cut to receive on 70 meters is fairly efficient on all of the other wave-lengths and it is extremely good in the broadcast band. Such an antenna should be at least thirty feet above the ground. By reason of the size of the collector (antenna) the signal strength it picks up is rather large and compensate for small deficiencies between the antenna and the receiver which could not be tolerated with a collector of the smaller size. Therefore, the impedance matching transformer at the antenna is eliminated for both mechanical and financial reasons. A low impedance transmission line is used on both systems between the antenna and the newly developed receiver impedance matching transformer (B) which is connected directly between the lower end of the transmission line and the antenna and ground posts of the receiver itself.

The impedance of the transmission line is approximately 70 ohms and the input

(*Continued on page* 435)

THOR "RGH-5" Receiver

By ROBERT G. HERZOG, B.S., E.E.,* and LOUIS KRANZ**

● THE characteristic simplicity of the model RGH-4 is embodied in the RGH-5 with a novel panel arrangement. This simplicity, its low cost, and its remarkable performance on all bands, including the broadcast band, account for its popularity among beginners as well as experimenters in the short-wave field.

The plug-in coils are placed in *windows* in the panel, thus facilitating the changing from one band to another.

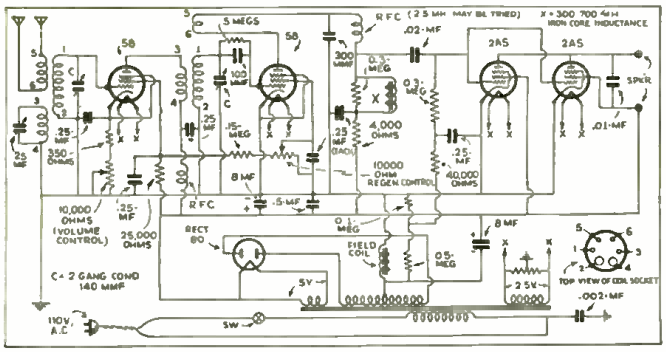
The authors in presenting this handsome panel niche claim both efficiency and convenience. The niche is made of metal and is formed to make a shield for the coil that it houses.

Although no hand capacity effects are evident on any of the bands, doors may be made to fit over the opening in the niches.

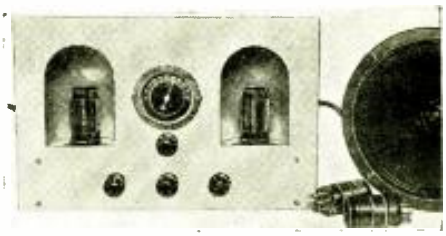
The circuit is of the regenerative type with three circuit coils in the tuned R.F. and detector stages. A single stage using 2A5's in parallel is sufficient to bring in even the European stations on the loud-speaker.

The detector plate choke is a shielded high-impedance type, capable of carrying at least 3 M.A. without saturation.

* Chief Engineer, Thor Radio Co.
** Thor Radio Co.



Hook-up used in building the "RGH-5" receiver, which can be had in "kit" form.



Photo, right, shows the extremely neat appearance of the new "RGH-5". The set tunes very smoothly. (No. 217.)

In wiring the set all the filament, screen, and B plus leads are run around the edges of the chassis, so as to leave the center clear for the small parts and the more important wires. The radio frequency and detector plate and grid leads are wired from point to point with heavy bus-bar. The leads to the detector and the radio frequency grids should be as short as possible with No. 18 stranded wire.

When the set is completely wired, check carefully, making sure all connections are soldered firmly and that no splashes of solder have lodged where they may do harm. After having checked the wiring, plug in the tubes and coils, connect the antenna and ground, and the A-C line. The set is now ready for tuning. No complicated alignment is necessary, for when wired correctly, the RGH-5 will play immediately.

Tuning is a matter which can only be learned by experience and patience. However, some advice can be given here. When the tubes are fully heated with the bias control of the radio frequency stage turned clockwise as far as it will go, turn the regeneration control until a hissing sound is heard in the speaker; rotate the tuning knob very slowly until a slight squeal is heard in the speaker. Concentrate on this squeal, rotating very slightly backwards and forwards until some signal is distinguishable, reducing somewhat if necessary on the regeneration and bias controls. When a signal is heard it can be brought out clearly by means of the antenna compensating condenser.

Although the *doublet antenna* is almost a necessity for short-wave reception, good results are obtainable on an ordinary antenna. In this case the lower end of the antenna winding is grounded and a small (30-70 mmf.) variable trimmer is connected in series with the antenna.

Results depend only upon the skill with which the novice wires and tunes the receiver. Verifications have been received, already by "fans," from all parts of the world, including New Zealand and Australia—all on the loudspeaker.

(*Continued on page* 433)

New Battery All-Wave Sets

New battery-type table set. (No. 218.)

● HERE is a very complete all-wave, battery-operated superheterodyne receiver of modern design. It uses seven tubes. A 1C6 is used as the first detector and high frequency oscillator. Two type 34 tubes are used in the two-stage I.F. amplifier. Automatic volume control is effected by the use of a type 30 tube. This tube also functions as the second detector. A screen grid type 32 tube is used as the first audio amplifier and a type 30 follows it and is used as a driver for the 19 class B output power amplifier. This is one of the most modern battery-operated, all-wave superheterodynes on the market. Short wave fans who are not equipped with facilities for operating an electric set should find this a solution to our problems.

This set should be ideal for summer camps and for use on yachts and other places where electric service circuits do not run. A single knob is used to change from short waves to long waves. The tuning range is from 18,000 kc. to 5,400 kc. for the short-wave band and 1,720 to 540 kc. for the regular broadcast band.

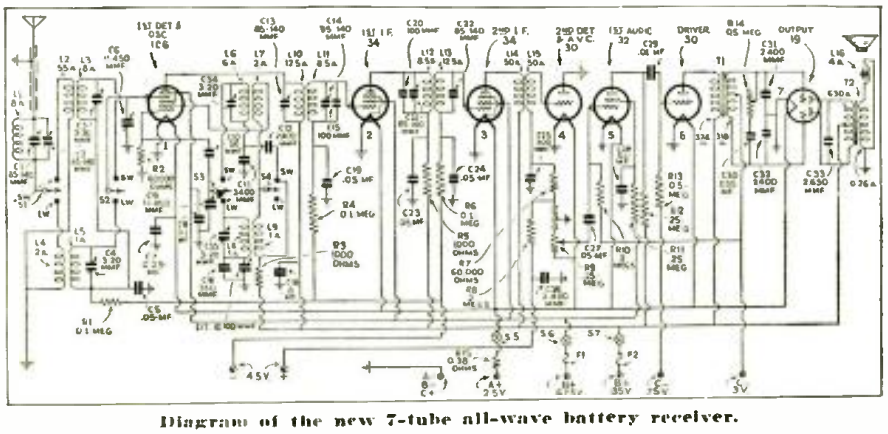
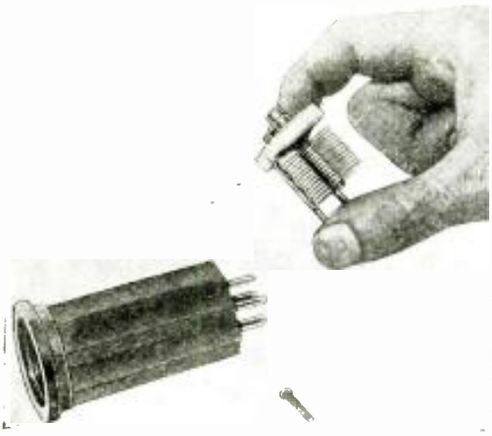


Diagram of the new 7-tube all-wave battery receiver.

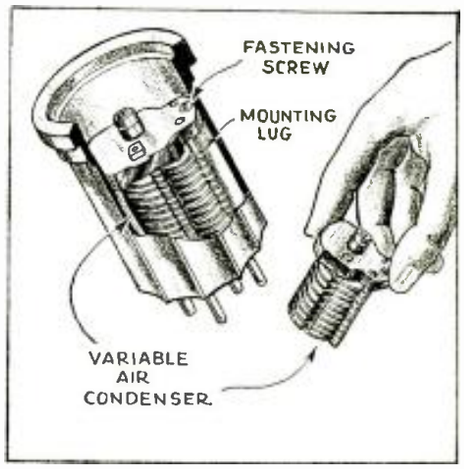
Console model of the new battery-type "short" and "broadcast" wave receiver.

New Hammarlund Coils and Midget Condensers



New Hammarlund fluted coil form, and, held between the fingers, the new Midget condenser. (No. 219.)

● TWO interesting items recently developed by the famous house of Hammarlund are a very small "midget" variable condenser and a new type plug-in coil *form*, bare or wound. The coil forms are made of a new material called XP-53 and this is said to have extremely low losses. By referring to the photograph we find that the side of the form is *fluted*, in order to allow considerable air-space in the coil winding. They are made in 4 and 6 prong types and have a handy grip at the top. Inside this grip or flange, is a slight recess which accommodates a circular card *on which can be written the wavelength which the coil covers*, a fine feature. Ready-wound coils are also available. These are in sets of four, covering a range from 17 to 270 meters, both two- and three-winding coils being available to the experimenter. The secondaries of the 17 to 41 and the 33 to 45 meter coils are wound with heavy silver-plated wire to ensure a minimum of losses. The secondaries of the coils covering the remainder of the tuning range are wound with heavy gauge copper wire. Broadcast coils are also available and are "bank-wound" with Litz (stranded wire). The midget padding condenser developed by Hammarlund will undoubtedly find many important as well as new uses among short-wave fans. They are available in four sizes, namely 25, 50, 75 and 100 mmf. capacities. The over all dimensions of the 100 mmf. condenser are 1 5/32" x 3/4" x 1 1/2". The soldered brass plates have a spacing of .015 inch. The capacity per air-gap is 4 mmf. The drawing clearly shows how this padding condenser can be mounted *inside the coil form* on the special threaded ledge provided in all coil forms. This is a handy arrangement and can be used for padding in band-spread circuits or for fixed tuned circuits. Isolantite insulation is used in this midget condenser which is of extremely low-loss construction.

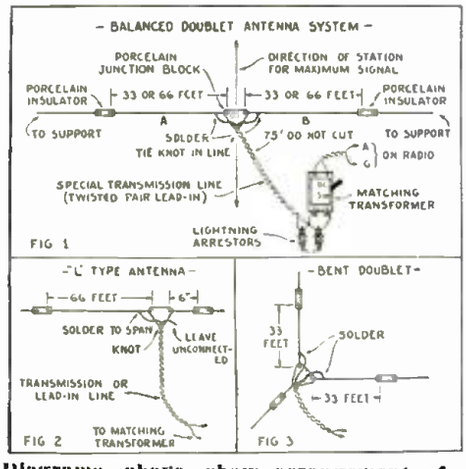


Sectional view of the new Hammarlund fluted coil form, showing how their new Midget Condenser mounts inside the form.

Latest NOISE-REDUCING Antennas

Doublet Uses New Insulators

● SPECIAL antennas seem to be the rage and the short-wave "fan" is now offered a great variety of antenna equipment.



Diagrams, above, show arrangement of the new "noise reduction" antenna system of the doublet type, designed by Porcelain Products, Inc. (No. 220.)

Above, we have three diagrams showing the construction of antennas of different types using a newly developed antenna kit. In Fig. 1 ,the top diagram, we have the conventional doublet with the twisted pair lead-in of special design. This connects to the center of the antenna and feeds through the matching transformer to the antenna and ground posts of the radio receiver. On this transformer we have a switch which changes the antenna system for either short-wave or broadcast band reception. The L-type antenna shown in Fig. 2 is a modification of the conventional Zeppelin type antenna where two wires feed the end of a horizontal antenna. Only one wire is connected to the flat-top, the other wire, of course, is left unconnected and in this way effective transmission of energy from the antenna to the set is accomplished, together with the "noise-reduction" qualities of the special lead-in cable. In Fig. 3, we have the same arrangement as shown in Fig. 1; however, the doublet is bent.

"Parallel" Feed Doublet

● IN developing the A-K type "D" doublet antenna kit ,which is a simple doublet with a *parallel* transmission line, many comparative tests were made with practically every known type of receiving antenna in order to determine its superior advantages. All results showed a greater signal pick-up over the short-wave range and the suppression of local electrical interference. The kit may be used with any radio set provided with double antenna connections. To permit the use of the doublet antenna with all-wave and short-wave receivers equipped with a regular *single* antenna connection, the company has developed a special transformer. The transformer is provided with a change-over switch allowing the doublet antenna to be used as a regular single antenna.

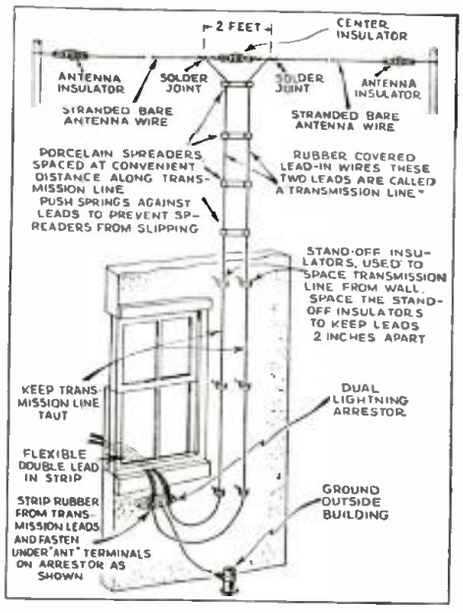
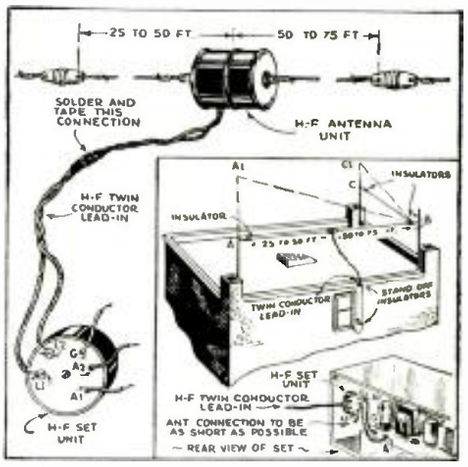


Diagram showing A-K type "D" Doublet Antenna. (No. 221.)

New Noiseless All-Wave Antenna

● A SINGLE antenna with automatic frequency selector and impedance matching switch whereby ideal broadcast or ideal



The Technical Appliance Corp. has brought out an efficient all-wave antenna. (No. 222.)

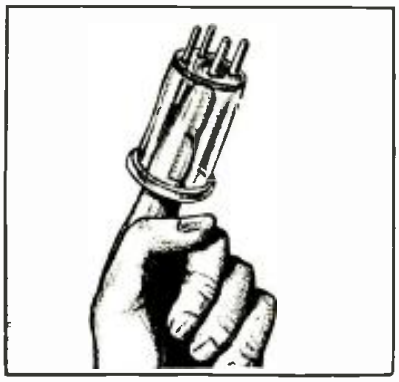
short-wave antenna circuit is provided for intercepted signals, with a positive minimum of background noise, is announced by the Technical Appliance Corporation. The arrangement is available in complete kit form including wire and insulators, or as individual antenna and receiver units.

This noiseless all-wave antenna system is intended primarily for all-wave receivers. It provides the efficiency heretofore attained only through the use of separate broadcast and short-wave aerials, with the added feature of minimum background noise.

Two units comprise the heart of the system. The antenna unit, a compact aluminum-encased device with screw binding posts taking the ends of the aerial wire, is inserted at or near the center of a single-wire aerial. The unit automatically routes signals through the most desirable combination of aerial and downlead. The companion set unit mounted near the receiver, is provided with a switch for impedance selection to obtain the most effective coupling between receiver and down-lead.

New Short-Wave Apparatus of Interest

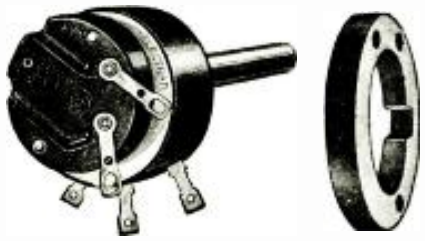
NEW VICTRON TRANSPARENT COIL FORM



You can see your finger through the wall of the new Victron coil form, the newest addition to the well-known Na-Ald family of short-wave coils and coil forms. This insulating material shows extremely low high-frequency losses. (No. 223.)

NEW VOLUME CONTROL

● THIS new volume control embodies a noticeable improvement in the principle of applying a perfected graphite resistance element to a smooth surface, over which the contact arm may slide with a minimum of noise and ensuring a smooth, stable graduation of resistance. After the resistance element is applied to the mounting it is baked at very high temperatures. This provides a very solid and rigid anchorage for the resistance element itself and eliminates warping. The mounting block consists of a moulded bakelite ring of sufficient dimensions to form a really solid base. This



Appearance of the newest Electrad product—an ultra smooth working potentiometer with special resistance unit at right. (No. 224.)

control has a full 300 degree rotation, providing a very smooth and long travel of the contact arm and longer life due to the greater amount of contact surface and reduced friction.

PIONEER DE LUXE ALL-WAVE RECEIVER

One of the newest De Luxe All-Wave Receivers—the "Pioneer".

● THIS modern all-wave receiver covers a range from 11 to 570 meters (29,000 to 530 kc.). It has a four-position selector switch controlled by a single knob. The tube line-up consists of a 58 tuned R.F. amplifier ahead of the first detector, a 2A7 first detector and an electron-coupled oscillator. Three type 58's are used in the intermediate amplifier circuits having 8 tuned circuits, a Wunderlich full-wave rectifier, second detector and automatic volume control tube, a 58 audio frequency oscillator for CW code reception. The first stage of audio uses a 56 and 2V6 power output tubes from the final audio amplifier. A 5Z3 is used for the rectifier and another 5Z3 is used for the speaker field. It is housed in a handsome metal cabinet with a large vernier dial of the airplane type, calibrated for the various ranges which this set covers. The intermediate frequency is 465 kc. and makes use of very high gain I.F. transformers. Extreme selectivity is obtained with the eight tuned circuits in the I.F. amplifier. Provisions are made for phonograph pick-up and also for headphone operation.

ALL-WAVE LINE NOISE FILTER

Newest "All-Wave" Line Noise Filter, built in compact case. (No. 226.)

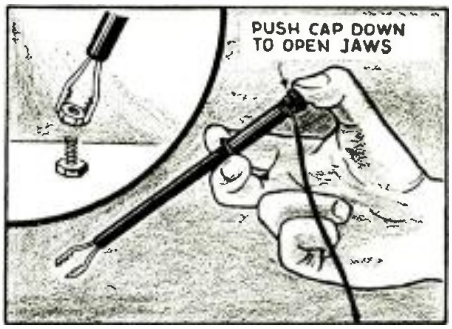
● KEEPING line noises out of present-day all-wave reception is the function of the new TACO H-F All-Wave Line Filter, just announced by the Technical Appliance Corp.

Housed in an attractive brown metal case with receptacle, ground binding post, attachment cord and non-breakable rubber plug, the all-wave line filter comprises separate filter circuits for broadcast and short-wave bands. The circuits have been worked out over a considerable period by Amy, Aceves & King, Inc., well-known engineers specializing in antenna problems and radio noise elimination. The present device is made under license from them. Filtering is thorough in both broadcast and short-wave bands. Only pure, noiseless AC or DC (device can be used on either supply) reaches set. Device handles up to 250 watts. The installation is nothing more than plugging usual set plug in receptacle of filter, inserting filter plug in nearest electric outlet, and connecting binding post to convenient ground, grounded chassis or ground binding post of set. If preferred, filter may be inserted between any electric appliance causing line noises, and its power supply, thus combating interference at source.

VK2ME TO BROADCAST STATE PROGRAMS TO U. S. A.

● **THE EDITORS have just been advised by the famous Australian short-wave broadcasting station, VK2ME, that a portion of their programs is to be dedicated to each state in the U. S. A. These programs are to be broadcast to the respective states in alphabetical order and the tendered program will be radiated at the "peak" period for the particular state's reception. Special announcements via short waves from the station, VK2ME should be listened for, during which time the exact time of the "state" program will be given.**

NEW "LIGHTNING GRIP" TEST PROD.



New one-hand "Triple Threat" test prod for connecting test wire to any part of set quickly. (No. 222.)

● A NEW type of *test prod* has recently been developed, the drawing of which clearly illustrates its construction and immediately suggests that this will be a very handy instrument to have around the "test-bench" or in the "tool-kit". It can be used for various purposes such as getting into those out-of-the-way places in a radio set, grasping wires, screws, etc. Two of them are furnished in the kit, one red and the other black. In making tests, one of them can be clipped fast to the chassis or some part of the wiring to be tested, and the other contacts made with the remaining "prod". The handle is of insulating material and there is no danger of shock. The drawing clearly shows how the snapper is grasped so as to be operable with one hand.

NEW FRENCH HAND-SET FOR "HAM" TRANS-CEIVERS

● NEWEST product from the laboratory of the Universal Microphone Co., is a combination earphone and microphone which is mounted similar to French phone hand-sets. It has been designed for five-meter transmitters and also the new five-meter *trans-ceivers*. Since such equipment is necessarily portable, the new combination is extremely lightweight and compact and weighs but nine ounces. The new product consists of a high output microphone in conjunction with 2,000 ohm lightweight receiver. There is a five-foot cord terminal in three-phone tip terminals which gives microphone and earphone connection with one common to both. The handle is rubber covered.

Appearance of the new "Universal" French hand-set, comprising special mike and high resistance, light-weight receiver. (No. 225.)

SHORT WAVE STATIONS OF THE WORLD

Complete List of Broadcast, Police and Television Stations

We present herewith a revised list of the short-wave broadcasting, experimental and commercial radiophone stations of the world. This is arranged by frequency, but the wavelength figures are also given for the benefit of readers who are more accustomed to working with "meters."

All the stations in this list use telephone transmission of one kind or another and can therefore be identified by the average listener.

Herewith is also presented a very fine list of police as well as television stations. Note: Stations marked with a star (★) are the most active and easily heard stations and transmit at fairly regular times.

Please write to us about any new stations or other important data that you learn through announcements over the air or correspondence with the stations themselves. A post card will be sufficient. We will safely return to you any verifications that you send in to us. Communications of this kind are a big help.

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

Around-the-Clock Listening Guide

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

From daybreak to late afternoon, and particularly during bright daylight, listen between 13 and 33 meters (21540 to 9000 kc.).

To the east of the listener, from about 1 P.M.-6 P.M., the 22-35 meter will be found very productive. To the west of the listener this same band is best from about 9 P.M. until shortly after daybreak. After dark, results above 35 meters are usually much better than during daylight. These general rules hold for any location.

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

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

21420 kc. WKK
-C- 14.01 meters
A. T. & T. CO.
LAWRENCEVILLE, N. J.
Calls Argentina, Brazil and Peru, daytime

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

21020 kc. LSN6
-C- 14.27 meters
HURLINGHAM, ARG.
Calls N. Y. C.
8 a. m.-5 p. m.

20700 kc. LSY
-C- 14.49 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

20380 kc. GAA
-C- 14.72 meters
RUGBY, ENGLAND
Calls Argentina, Brazil, mornings

19900 kc. LSG
-C- 15.08 meters
MONTE GRANDE, ARGENTINA
Tests irregularly, daytime

19820 kc. WKN
-C- 15.14 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19650 kc. LSN5
-C- 15.27 meters
HURLINGHAM, ARGENTINA
Calls Europe daytime

19600 kc. LSF
-C- 15.31 meters
MONTE GRANDE, ARGENTINA
Tests irregularly, daytime

19380 kc. WOP
-C- 15.48 meters
OCEAN GATE, N. J.
Calls Peru, daytime

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

19220 kc. WKF
-C- 15.60 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19160 kc. GAP
-C- 15.66 meters
RUGBY, ENGLAND
Calls Australia, early a. m.

18970 kc. GAQ
-C- 15.81 meters
RUGBY, ENGLAND
Calls S. Africa, mornings

18830 kc. PLE
-C- 15.93 meters
BANDOENG, JAVA
Calls Holland, early a. m.

18680 kc. GAX
-X- 16.06 meters
RUGBY, ENGLAND

18620 kc. GAU
-C- 16.11 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18345 kc. FZS
-C- 16.35 meters
SAIGON, INDO-CHINA
Phones Paris, early morning

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

18310 kc. GAS
-C- 16.38 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18250 kc. FTO
-C- 16.43 meters
ST. ASSISE, FRANCE
Calls S. America, daytime

18200 kc. GAW
-C- 16.48 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18135 kc. PMC
-C- 16.54 meters
BANDOENG, JAVA
Phones Holland, early a. m.

18115 kc. LSY3
-C- 16.56 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

18040 kc. GAB
-C- 16.63 meters
RUGBY, ENGLAND
Calls Canada, morn. & early aftn.

17810 kc. PCV
-C- 16.84 meters
KOOTWIJK, HOLLAND
Calls Java, 6-9 a. m.

17790 kc. GSG
-B- 16.86 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See "When to Listen In" Column

17780 kc. ★W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ. 10 a. m.-4 p. m. every day

17760 kc. DJE
-B- 16.89 meters
GERMAN S-W STATION
Broadcasting House, BERLIN
Irregular 8 a. m. - 2 p. m.

17760 kc. IAC
C- 16.89 meters
PIZA, ITALY
Calls ships, 6:30-7:30 a. m.

17310 kc. W3XL
-X- 17.33 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ irregularly.

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

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

17080 kc. GBC
-C- 17.56
RUGBY, ENGLAND
Calls ships

16270 kc. WLK
-C- 18.44 meters
LAWRENCEVILLE, N. J.
Phones Arg., Braz., Peru, daytime

16270 kc. WOG
-C- 18.44 meters
OCEAN GATE, N. J.
Calls England,
morning and early afternoon

16233 kc. FZR3
-C- 18.48 meters
SAIGON, INDO-CHINA
Calls Paris and Pacific Isles

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

15810 kc. LSL
-C- 18.98 meters
HURLINGHAM, ARGENTINA
Calls Brazil and Europe, daytime

15760 kc. JYT
-X- 19.04 meters
KEMIKWA-CHO, CHIBA-KEN, JAPAN
Irregular in late afternoon and early morning.

15410 kc. HC1FG
-B- 19.47 meters
RIOBAMBA, ECUADOR
4:30-6 p. m. Sun.

15330 kc. ★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY daily, 2:30-3:30 p.m.

15300 kc. CP7
-B- 19.6 meters
LA PAZ, BOLIVIA

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
485 Madison Av., N.Y.C.
Relays WABC daily, 11 a. m.-1 p. m.

15250 kc. W1XAL
-B- 19.67 meters
BOSTON, MASS.
Irregular, in morning

15243 kc. FYA
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion, 103 Rue de Grenelle, Paris
7:30-11 a. m.

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

15200 kc. ★DJB
-B- 19.73 meters
GERMAN S-W STATION
Broadcasting House, Berlin, Ger.
12:15-2 a. m., 8-11:30 a. m.
Also 4-5:30 a. m. on Sundays

15140 kc. ★GSF
-B- 19.82 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See "When to Listen In" Column

15120 kc. HVJ
-B- 19.83 meters
VATICAN CITY
ROME, ITALY
5:00 to 5:15 a. m., except Sunday. Also Sat., 10-10:30 a.m.

15055 kc. WNC
-C- 19.92 meters
HIALEAH, FLORIDA
Calls Central America, daytime

14980 kc. KAY
-C- 20.03 meters
MANILA, P. I.
Phones Pacific Isles

14590 kc. WMN
-C- 20.56 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls U. S., evening

14470 kc. WMF
-C- 20.73 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14440 kc. GBW
-C- 20.78 meters
RUGBY, ENGLAND
Calls U.S.A., afternoon

13990 kc. GBA
-C- 21.44 meters
RUGBY, ENGLAND
Calls Buenos Aires, late afternoon.

(Time given is Eastern Standard Time)

13610 kc. JYK
-C- 22.04 meterss
KEMAKAWA-CHO, CHIBA-KEN, JAPAN
Phones California till 11 p. m.

13585 kc. GBB
-C- 22.08 meters
RUGBY, ENGLAND
Calls Egypt & Canada, afternoons

13415 kc. GCJ
-C- 22.36 meters
RUGBY, ENGLAND
Calls Japan & China early morning

13390 kc. WMA
-C- 22.40 meters
LAWRENCEVILLE, N. J.
Phones England morning and afternoon

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

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

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

12800 kc. IAC
-C- 23.45 meters
PIZA, ITALY
Calls Italian ships
Mornings

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

12290 kc. GBU
-C- 24.41 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12150 kc. GBS
-C- 24.69 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sat. 10-11 p. m.
Sun. 6-7 a. m., 10-11 a. m.

11950 kc. KKQ
-X- 25.10 meters
BOLINAS, CALIF.
Tests irregularly, evenings

11880 kc. ★FYA
-B- 25.25 meters
"RADIO COLONIAL"
PARIS, FRANCE
11:15 a. m.-2:15 p. m.-3-6 p. m.

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
4:20-10:00 p. m.
Sat. till 1 a. m.
Relays KDKA

11860 kc. ★GSE
-B- 25.29 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See "When to Listen in" Column

11830 kc. ★W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP.,
485 MADISON AVE., N. Y. C.
3-5 p. m. Relays WABC

11810 kc. I2RO
-B- 25.4 meters
ROME, ITALY

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Irregularly in the evening

11760 kc. ★DJD
-B- 25.51 meters
GERMAN S-W STATION
BRDADCASTING HOUSE, BERLIN
12-4:30 p. m., 5:30-10:30 p. m.

11750 kc. ★GSD
-B- 25.53 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See "When to Listen in" Column

11730 kc. PHI
-B- 25.57 meters
HUIZEN, HOLLAND
Daily exc. Tue. & Wed. 7:30-9:30 or 10:30 a. m.

11720 kc. ★CJRX
-B- 25.6 meters
WINNIPEG, CANADA
Daily, 8 p. m.-12 m.
Sunday, 8-10:30 p. m.

11720 kc. ★FYA
-B- 25.6 meters
"RADIO COLONIAL"
PARIS, FRANCE
6:15-9 p. m.
10 p. m.-12 midnight

11680 kc. KIO
-X- 25.68 meters
KAHUKU, HAWAII
Tests in the evening

10770 kc. GBP
-C- 27.85 meters
RUGBY, ENGLAND
Calls Sydney, Austral., early a. m.

10740 kc. JVM
-C- 27.93 meters
NAZAKI, JAPAN
Phones California evenings.
Broadcasts 3-7:45 a. m.

10675 kc. WNB
-C- 28.1 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, daytime

10660 kc. JVN
-C- 28.14 meters
NAZAKI, JAPAN
Tests 2-7 a. m. relaying JOAK, Tokio

10550 kc. WOK
-C- 28.44 meters
LAWRENCEVILLE, N. J.
Phones Arge., Braz., Peru, nights

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

10520 kc. VLK
-C- 28.51 meters
SYDNEY, AUSTRALIA
Calls Rugby, early a. m.

10430 kc. YBG
-C- 28.76 meters
MEDAN, SUMATRA, D. E. I.
5:30-6:30 a. m., 7:30-8:30 p. m.

10420 kc. XGW
-C- 28.79 meters
SHANGHAI, CHINA
Calls Manilla and England, 6-9 a. m. and California late evening.

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

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

10350 kc. ★LSX
-C- 28.98 meters
MONTE GRANDE, ARGENTINA
Tests Irregularly 8 p. m.-12 midnight

10330 kc. ORK
-C- 29.04 meters
RUYSSELEDE, BELGIUM
Broadcasts 1:45-3:15 p. m.

10300 kc. LSL2
29.13 meters
HURLINGHAM, ARGENTINA
Calls Europe, evenings

10260 kc. PMN
-C- 29.24 meters
BANDOENG, JAVA
Calls Australia 5 a. m.

10250 kc. LSK3
-C- 29.27 meters
HURLINGHAM, ARGENTINA
Calls Europe and U. S., afternoon and evening

10220 kc. PSH
-C- 29.35 meters
RIO DE JANEIRO, BRAZIL

10055 kc. ZFB
-C- 29.84 meters
HAMILTON, BERMUDA
Phones N. Y. C. daytime

9950 kc. GCU
-C- 30.15 meters
RUGBY, ENGLAND
Calls N.Y.C., evening

9890 kc. LSN
-C- 30.33 meters
HURLINGHAM, ARGENTINA
Calls New York, evenings

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

9860 kc. ★EAQ
-B- 30.43 meters
P. O. Box 951
MADRID, SPAIN
Daily except Saturday and Sunday, 5:15-7 p. m.; Saturday, 12 N.-2 p. m., 5:15-7:30 p. m.; Sunday, 5:15-7:30 p. m.

9840 kc. JYS
-C- 30.49 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Irregular, 4-7 a. m.

9800 kc. LSE
-C- 30.61 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

9790 kc. GCW
-C- 30.64 meters
RUGBY, ENGLAND
Calls N.Y.C., evening

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

9710 kc. GCA
-C- 30.89 meters
RUGBY, ENGLAND
Calls Arge. & Brazil, evenings

9600 kc. CT1AA
-B- 31.25 meters
LISBON, PORTUGAL
Tues. and Friday, 3:30-6 p. m.

9600 kc. YV5RMO
-B- 31.25 meters
MARACAIBO, VENEZUELA
Irregular

9600 kc. XETE
-B- 31.25 meters
MEXICO CITY, MEXICO
Irregularly, 2 p. m.-2 a. m.

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

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.
SYDNEY, AUSTRALIA
See "When to Listen in" Column

9590 kc. W3XAU
-B- 31.28 meters
NEWTOWN SQUARE, PA.
Relays WCAU
12 noon 7:50 p. m.

9580 kc. ★GSC
-B- 31.31 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See "When to Listen In" Column

9580 kc. VK3LR
-B- 31.31 meters
Research Section.
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
3-8 a. m. except Sun.

9570 kc. ★W1XAZ
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
SPRINGFIELD, MASS.
Relays WBZ, 7 a. m.-1 a. m.

9565 kc. VUB
-B- 31.36 meters
BOMBAY, INDIA
11 a. m.-12:30 p. m., Wed., Sat.

9560 kc. ★DJA
-B- 31.38 meters
GERMAN S-W STATION.
BROADCASTING HOUSE, BERLIN
8-11:30 a. m., 5:15-9:15 p. m.
also 4-5:30 a. m. Sundays

9540 kc. LCL
-B- 31.45 meters
JELOY, NORWAY,
Relays Oslo 10 a. m.-4 p. m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY 7:30-11 p. m.
Sundays, 7:30 p. m.-12 m.

9510 kc. ★GSB
-B- 31.55 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See "When to Listen in" Column

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

9510 kc. YV3RC
-B- 31:55 meters
CARACAS, VENEZUELA
Irregularly

9500 kc. ★PRF5
-B- 31.58 meters
RIO DE JANIERO, BRAZIL
Irregular, 5-6:30 p. m.

9415 kc. PLV
-C- 31.87 meters
BANDOENG, JAVA
Phones Holland, 7:40-9:40 a. m.

9330 kc. CJA2
-C- 32.15 meters
DRUMMONDVILLE, CANADA
Phones England irregularly

9280 kc. GCB
-C- 32.33 meters
RUGBY, ENGLAND
Calls Can. & Egypt, evenings

9170 kc. WNA
-C- 32.72 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9020 kc. GCS
-C- 32.26 meters
RUGBY, ENGLAND
Calls N.Y.C., evenings

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

8775 kc. PNI
-C- 34.19 meters
MAKASSER, CELEBES, D. E. I.
Phones Java around 4 a. m.

8760 kc. GCQ
-C- 34.25 meters
RUGBY, ENGLAND
Calls S. Africa, afternoon

8730 kc. GCI
-C- 34.36 meters
RUGBY, ENGLAND
Calls India, 8 a. m.

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

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

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

8380 kc. IAC
-C- 35.8 meters
PIZA, ITALY

8214 kc. HCJB
-B- 36.5 meters
QUITO, ECUADOR
7:14-10:15 p. m. except Monday

8185 kc. PSK
-C- 36.65 meters
RIO DE JANIERO, BRAZIL
7-7:30 p. m.
Relays PRA3

8036 kc. CNR
-B- 37.33 meters
RABAT, MOROCCO
Sunday, 2:30-5 p. m.

7901 kc. LSL
-C- 37.97 meters
HURLINGHAM, ARGENTINA
Calls Brazil, night

7880 kc. JYR
-B- 38.07 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
4-7:40 a. m.

7832 kc. OCN
-B- 38.3 meters
LIMA, PERU
(P. O. Box 853)
Irregular in evening

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

7400 kc. HJ3ABD
-B- 40.54 meters
P. O. Box 509
BOGOTA, COLOMBIA
Daily 12-2 p. m.; 7-11 p. m.
Sunday, 5-9 p. m.

7220 kc. HKE
-B- 41.55 meters
BOGOTA, COL., S. A.
Tue. and Sat. 8-9 p. m.; Mon. & Thurs. 6:30-7 p. m.

7140 kc. HJ4ABB
-B- 42.02 meters
MANIZALES, COL., S. A.
P. O. Box 175
Mon. to Fri. 12:15-1 p. m.; Tues. & Fri. 7:30-10 p. m.; Sun. 2:30-5 p. m.

(Time given is Eastern Standard Time)

7000 kc. HJ1ABE
-B- 42.86 meters
CARTAGENA, COL.
P. O. Box 31
Daily 11:15 a. m.-1 p. m.; Sun. 9-11 a. m.; Mon. at 10 p. m.; Wed. 8-10 p. m.

6977 kc. EAR110
-B- 43 meters
MADRID, SPAIN
Tues., Sat., 5:30 p. m.

6905 kc. GDS
-C- 43.45 meters
RUGBY, ENGLAND
Calls N.Y.C., evening

6860 kc. KEL
-X- 43.70 meters
BOLINAS, CALIF.
Tests irregularly

6755 kc. WOA
-C- 44.41 meters
LAWRENCEVILLE, N. J.
Phones England evening

6666 kc. ★HC2RL
-B- 45.00 meters
P. O. BOX 759, GUAYAQUIL, ECUADOR, S. A.
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

6650 kc. IAC
-C- 45.1 meters
PIZA, ITALY
Calls ships, evenings

6620 kc. PRADO
-B- 45.30 meters
RIOBAMBA, ECUADOR
Thur. 9-11:30 p. m.

6611 kc. RW72
-B- 45.38 meters
MOSCOW, U. S. S. R.
1-6 p. m.

6500 kc. HJ5ABD
-B- 46.14 meters
MANIZALES, COL.
12-1:30 p. m., 7-10 p. m.

6447k c. ★HJ1ABB
-B- 46.53 meters
BARRANQUILLA, COL., S. A.
P. O. BOX 715.
11:30 a. m.-1 p. m.; 5-10 p. m.

6425 kc. ★W3XL
-X- 46.70 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Tests irregularly.

6316 kc. HIZ
-B- 47.5 meters
SANTO DOMINGO, DOMINICAN REPUBLIC
Daily except Sat. and Sun. 4:40-5:40 p. m.; Sat., 9:40-11:40 p. m.; Sun., 11:40 a. m.-1:40 p. m.

6275 kc. HJ3ABF
-B- 47.81 meters
BOGOTA, COLOMBIA
P. O. Box 317
12-1:30 p. m.-7-11 p. m. exc. Sunday
Wed. and Sat. 6-11 p. m.
Tues. and Fri. 6:30-11 p. m.

6272 kc. HI1A
-B- 47.84 meters
P. O. BOX 243, SANTIAGO, DOMINICAN REP.
11:40 a. m.-1:40 p. m.
7:40-9:40 p. m.

6150 kc. ★CJRO
-B- 48.78 meters
WINNIPEG., MAN., CANADA
8 p.m.-12 m.; Sun. 8-10:30 p.m.

6150 kc. ★YV3RC
-B- 48.78 meters
CARACAS, VENEZUELA
Generally 4:00-10:00 p. m.

6140 kc. ★W8XK
-B- 48.86 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
Relays KDKA
4:30 p. m.-1 a. m.

6130 kc. ZGE
B-- 48.92 meters
KUALA LUMPUR, FED. MALAY STATES
Sun., Tue. and Fri., 6:40-8:40 a. m.

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

6120 kc. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.,
485 MADISON AVE., N. Y. C.
Relays WABC, 6-11 p. m.

6112 kc. ★YV2RC
-B- 49.08 meters
CARACAS, VENEZUELA
Sundays, 9-11:30 a. m.; 1:30-10:30 p. m.; Weekdays, 11:30 a. m.-1 p. m., 5:30-9:30 p. m.

6110 kc. ★VE9HX
-B- 49.10 meters
HALIFAX, NOVA SCOTIA
9:30 a. m.-1 p. m.; 6-12 p. m.

6110 kc. VUC
-B- 49.1 meters
CALCUTTA, INDIA
Daily except Sat., 3-5:30 a. m., 9:30 a. m.-noon;
Sat., 11:45 a. m.-3 p. m.

6100 kc. HJ1ABD
-B- 49.18 meters
CARTAGENA, COL.
11:30 a. m.-12:30 p. m.; 7-9 p. m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ
Monday, Wednesday, Saturday, 5:30 p. m.-1 a. m.

6100 kc. ★W9XF
-B- 49.18 meters
DOWNERS GROVE, ILL.
Relays WENR, Chicago
Daily, except Sat., 4:30-8:00 p. m.; 9:30 p. m.-2 a. m.; Sun., 4:30-7 p. m.; 9 p. m.-2 a. m.

6095 kc. ★VE9GW
-B- 49.22 meters
BOWMANVILLE, ONTARIO, CANADA
Sunday 11:30 a.m.-8 p. m.
Monday-Wednesday 2-11 p. m.
Thursday 3 p. m.-12 m.;
Saturday 7 a. m.-12 m.

6090 kc. VE9BJ
-B- 49.26 meters
SAINT JOHN, N. B., CAN.
7-8:30 p. m.

6080 kc. CP5
-B- 49.34 meters
LAPAZ, BOLIVIA
7-10:30 p. m.

6080 kc. ★W9XAA
-B- 49.34 meters
CHICAGO FEDERATION OF LABOR
CHICAGO, ILL.
Relays WCFL
Sunday 11:30 a. m.-9 p. m. and Tues., Thurs., Sat., 4 p. m.-12 m.

6072 kc. OER2
-B- 49.41 meters
VIENNA, AUSTRIA
Mon. and Thurs., 9 a. m.-1 p. m., 2-3:30 p.m.

6070 kc. ★YV5RMO
-B- 49.42 meters
MARACAIBO, VENEZUELA
5:15-9 p. m.

6070 kc. VE9CS
-B- 49.42 meters
VANCOUVER, B. C., CANADA
Fri., 12:30-1:45 a. m.; Sun., 12 noon-12 midnight

6065 kc. HIX
-B- 49.46 meters
SANTO DOMINGO, DOMINICAN REPUBLIC
Tues. and Fri., 8-10 p. m.; Sun., 7:45-10:40 a. m., 3-5 p. m.
Sat., 10:40-11:40 p. m.

6060 kc. OXY
-B- 49.50 meters
SKAMLEBOAEK, DENMARK
1-6:30 p. m.; also 8-9 a. m. Sunday

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
7 a. m.-8 p. m.; 11 p. m.-1 a. m.
Relays WLW

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

6060 kc. PK1WK
-B- 49.5 meters
BANDOENG, JAVA
Daily, exc. Fri., 4:30-5:30 a. m.

6060 kc. W3XAU
-B- 49.50 meters
NEWTOWN SQUARE, PA.
Relays WCAU, Philadelphia
8 p. m.-11 p. m.

6050 kc. ★GSA
-B- 49.59 meters
BRITISH BROADCAST. CORP.
DAVENTRY, ENGLAND
See "When To Listen In" Column

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

6025 kc. CQN
-B- 49.79 meters
MACAO, CHINA
Mon., Fri., 7-9 a. m.

6020 kc. ★DJC
-B- 49.83 meters
GERMAN S-W STATION
BROADCASTING HOUSE, BERLIN
12 m.-4:30 p.m., 5:30-10:30 p.m.

6020 kc. XEBT
-B- 49.83 meters
MEXICO CITY, MEX.
P. O. Box 79-44
7 p. m.-1 a. m.

6012 kc. ZHI
-B- 49.9 meters
RADIO SERVICE CO.,
20 ORCHARD RD.,
SINGAPORE, MALAYA
Mon., Wed., Thurs., 5:40-8:10 a. m.; Sat., 12:10-1:10 a. m., 10:40 p. m.-1:10 a. m. (Sunday)

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

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

5990 kc. YV4RC
-B- 50.25 meters
CARACAS VENEZUELA
7:30-9:30 p. m.

5970 kc. HJ2ABC
-B- 50.25 meters
CUCUTA, COL.
11 a. m.-12 n.; 6-9 p. m.

5968 kc. HVJ
-B- 50.27 meters
VATICAN CITY (ROME)
2-2:15 p. m., daily. Sun., 5-5:30 a. m.

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

5880 kc. HJ2ABA
-B- 51.02 meters
TUNJA, COL.
1-2 p. m., 7:30-10 p. m.

5853 kc. WOB
-C- 51.25 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, nights

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

5660 kc. HJ5ABC
-B- 53 meters
CALI, COLOMBIA
11 a. m.-12 m.
Tues. and Thurs. 8-10 p. m.
Sun. 12 m.-1 p. m.

5077 kc. WCN
-C- 59.08 meters
LAWRENCEVILLE, N. J.
Phones England irregularly

5025 kc. ZFA
-C- 59.7 meters
HAMILTON, BERMUDA
Calls U.S.A., nights

4975 kc. GBC
-C- 60.30 meters
RUGBY, ENGLAND
Calls Ships, late at night

4820 kc. GDW
-C- 62.24 meters
RUGBY, ENGLAND
Calls N.Y.C., late at night

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

4752 kc. WOY
-C- 63.1 meters
LAWRENCEVILLE, N. J.

4320 kc. G6RX-GDB
-C- 69.44 meters
RUGBY, ENGLAND
Tests, 8-11 p. m.

4273 kc. RW15
-B- 70.20 meters
KHABAROVSK, SIBERIA, U. S. S. R.
Daily, 3-9 a. m.

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

4272 kc. WOY
-C- 70.22 meters
LAWRENCEVILLE, N. J.

4107 kc. HCJB
-B- 73 meters
QUITO, ECUADOR
7:14-10:15 p. m., except Monday

4098 kc. WND
-C- 73.21 meters
HIALEAH, FLORIDA
Calls Bahama Isles

3600 kc. CT2AJ
-B- 83.5 meters
PONTA OELGADA, SAO MIGUEL, AZORES
Wed. and Sat. 5-7 p. m.

"WHEN TO LISTEN IN" APPEARS ON PAGE 428

POLICE RADIO ALARM STATIONS

CGZ	Vancouver, B. C.	2452 kc.	KGHX	Santa Ana, Cal.	2430 kc.	KGPB	Minneapolis, Minn.	2430 kc.
CJW	St. Johns, N. B.	2416 kc.	KGHY	Whittier, Cal.	1712 kc.	KGPC	St. Louis, Mo.	1706 kc.
CJZ	Verdeen, Que.	2452 kc.	KGHZ	Little Rock, Ark	2406 kc.	KGPD	San Francisco, Cal.	1674 kc.
KGHG	Las Vegas, Nev.	2474 kc.	KGJX	Pasadena, Cal.	1712 kc.	KGPE	Kansas City, Mo.	2422 kc.
KGHK	Palo Alto, Cal.	1674 kc.	KGLX	Albuquerque, N. M.	2414 kc.	KGPG	Vallejo, Cal.	2422 kc.
KGHM	Reno, Nev.	2474 kc.	KGOZ	Cedar Rapids, Iowa	2466 kc.	KGPH	Oklahoma City, Okla.	2450 kc.
KGHO	Des Moines, Iowa	1682 kc.	KGPA	Seattle, Wash.	2414 kc.			

Short Wave Stations of the World

VYR	Montreal, Can.	1712 kc.
VYW	Winnipeg, Man.	2416 kc.
WCK	Belle Island, Mich.	2414 kc.
WEY	Boston, Mass.	1558 kc.
KGPI	Omaha, Neb.	2466 kc.
KGPJ	Beaumont, Tex.	1712 kc.
KGPK	Sioux City, Iowa	2466 kc.
KGPL	Los Angeles, Cal.	1712 kc.
KGPM	San Jose, Cal.	1674 kc.
KGPN	Davenport, Iowa	2466 kc.
KGPO	Tulsa, Okla.	2450 kc.
KGPP	Portland, Ore.	2442 kc.
KGPQ	Honolulu, T. H.	2450 kc.
KGPS	Bakersfield, Cal.	2414 kc.
KGPW	Salt Lake City, Utah	2406 kc.
KGPX	Denver, Colo.	2442 kc.
KGPY	Baton Rouge, La.	1574 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZA	Fresno, Calif.	2414 kc.
KGZB	Houston, Tex.	1712 kc.
KGZC	Topeka, Kans.	2422 kc.
KGZD	San Diego, Cal.	2490 kc.
KGZE	San Antonio, Tex.	2482 kc.
KGZF	Chanute, Kans.	2450 kc.
KGZG	Des Moines, Iowa	2466 kc.
KGZH	Klamath Falls, Ore.	2382 kc.
KGZI	Wichita Falls, Tex.	2458 kc.
KGZJ	Phoenix, Ariz.	2430 kc.
KGZL	Shreveport, La.	1712 kc.
KGZM	El Paso, Tex.	2414 kc.
KGZN	Tacoma, Wash.	2414 kc.
KGZO	Santa Barbara, Cal.	2414 kc.
KGZP	Coffeyville, Kans.	2450 kc.
KGZQ	Waco, Tex.	1712 kc.
KGZR	Salem, Ore.	2442 kc.
KGZS	McAlester, Okla.	2458 kc.
KGZT	Santa Cruz, Cal.	1674 kc.
KGZU	Lincoln, Neb.	2490 kc.
KGZW	Lubbock, Tex.	2458 kc.
KGZX	Albuquerque, N. Mex.	2414 kc.
KSW	Berkeley, Cal.	1658 kc.
KVP	Dallas, Tex.	1712 kc.
WKDT	Detroit, Mich.	1558 kc.
WKDU	Cincinnati, Ohio	1706 kc.
WMDZ	Indianapolis, Ind.	2442 kc.
WMJ	Buffalo, N. Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1666 kc.
WPDA	Tulare, Cal.	2414 kc.
WPDB	Chicago, Ill.	1712 kc.
WPDC	Chicago, Ill.	1712 kc.
WPDD	Chicago, Ill.	1712 kc.
WPDE	Louisville, Ky.	2442 kc.
WPDF	Flint, Mich.	2466 kc.
WPDG	Youngstown, Ohio	2458 kc.
WPDH	Richmond, Ind.	2442 kc.
WPDI	Columbus, Ohio	2430 kc.
WPDK	Milwaukee, Wis.	2450 kc.
WPDL	Lansing, Mich.	2442 kc.
WPDM	Dayton, Ohio	2430 kc.
WPDN	Auburn, N. Y.	2382 kc.
WPDO	Akron, Ohio	2458 kc.
WPDP	Philadelphia, Pa.	2474 kc.
WPDR	Rochester, N. Y.	2382 kc.
WPDS	St. Paul, Minn.	2430 kc.
WPDT	Kokomo, Ind.	2490 kc.
WPDU	Pittsburgh, Pa.	1712 kc.
WPDV	Charlotte, N. C.	2458 kc.
WPDW	Washington, D. C.	2422 kc.
WPDX	Detroit, Mich.	2414 kc.
WPDY	Atlanta, Ga.	2414 kc.
WPDZ	Fort Wayne, Ind.	2490 kc.
WPEA	Syracuse, N. Y.	2382 kc.
WPEB	Grand Rapids, Mich.	2442 kc.
WPEC	Memphis, Tenn.	2466 kc.
WPED	Arlington, Mass.	1712 kc.
WPEE	New York, N. Y.	2450 kc.
WPEF	New York, N. Y.	2450 kc.
WPEG	New York, N. Y.	2450 kc.
WPEH	Somerville, Mass.	1712 kc.
WPEI	E. Providence, R. I.	1712 kc.
WPEK	New Orleans, La.	2430 kc.
WPEL	W. Bridgewater, Mass.	1666 kc.
WPEM	Woonsocket, R. I.	2466 kc.
WPEP	Arlington, Mass.	1712 kc.
WPES	Saginaw, Mich.	2442 kc.
WPET	Lexington, Ky.	1706 kc.
WPEW	Northampton. Mass.	1666 kc.
WPFA	Newton, Mass.	1712 kc.
WPFC	Muskegon, Mich.	2442 kc.
WPFD	Highland Park, Ill.	2430 kc.
WPFE	Reading, Pa.	2442 kc.
WPFG	Jacksonville, Fla.	2442 kc.
WPFH	Baltimore, Md.	2414 kc.
WPFI	Columbus, Ga.	2414 kc.
WPFJ	Hammond, Ind.	1712 kc.
WPFK	Hackensack, N. J.	2430 kc.
WPFL	Gary, Ind.	2470 kc.
WPFM	Birmingham, Ala.	2382 kc.
WPFN	Fairhaven, Mass.	1712 kc.
WPFO	Knoxville, Tenn.	2474 kc.
WPFP	Clarksburg, W. Va.	2490 kc.
WPFQ	Swathmore, Pa.	2474 kc.
WPFR	Johnson City, Tenn.	2470 kc.
WPFS	Asheville, Md.	2458 kc.
WPFU	Portland, Me.	2422 kc.
WPFV	Pawtucket, R. I.	2466 kc.
WPFX	Palm Beach, Fla.	2442 kc.
WPFZ	Miami. Fla.	2442 kc.
WPGA	Bay City, Mich.	2466 kc.
WPGB	Port Huron, Mich.	2466 kc.
WPGC	S. Schenectady, N. Y.	1658 kc.
WPGD	Rockford, Ill.	2458 kc.
WPGF	Providence, R. I.	1712 kc.
WPGG	Findlay, Ohio	1682 kc.
WPGH	Albany, N. Y.	2414 kc.
WPGI	Portsmouth, Ohio	2430 kc.
WPGJ	Utica, N. Y.	2414 kc.
WPGK	Cranston, R. I.	2466 kc.
WPGL	Binghampton, N. Y.	2442 kc.
WPGN	South Bend, Ind.	2490 kc.
WPGO	Huntington, N. Y.	2490 kc.
WPGS	Mineola, N. Y.	2490 kc.
WPGU	Boston, Mass.	1712 kc.
WRBH	Cleveland, Ohio	2458 kc.
WRDQ	Toledo, Ohio	2474 kc.
WRDR	Grosse Pt. Village, Mich.	2414 kc.
WRDS	E. Lansing, Mich.	1666 kc.

AIRPORT RADIO Stations

AERONAUTICAL (AIRPORT) FREQUENCIES

(Red Chain)

3,147.5	3,322.5	5,582.5
3,162.5	5,122.5	5,592.5
3,172.5	5,572.5	5,662.5
3,182.5		

(Blue Chain)

2,906	4,937.5	4,952.5
3,072.5	4,967.5	5,672.5
3,088		5,692.5
2,720	6,510: Day only	
2,732	6,520: Day only	
4,110	6,530: Day only	
	8,015: Day only	

(Brown Chain)

3,127.5	4,917.5	3,005
3,222.5	5,602.5	2,854
3,232.5	5,612.5	5,377.5
3,257.5	5,632.5	
3,447.5		
3,457.5		
3,467.5		
3,485		
2,640	4,740	6,540
2,644		6,550
2,612		6,560
2,636		8,015
3,467.5		

(Green Chain)

2,922	4,122.5
2,946	5,652.5
2,986	
2,748	6,590
4,745	6,600

(Orange Chain)

2,870	5,375	8,220
3,082.5	5,405	12,330
	5,692.5	16,440
2,648	6,570	
3,082.5	6,580	
5,375	8,015	
	16,240	

The various transport companies are assigned frequencies for their use and each transport company's network is given a certain code color.

TELEVISION Stations

1600-1700 kc. 176.5-187.5 m.

W2XR—Long Island City, N. Y.
W8XAN—Jackson, Mich.

2000-2100 kc. 142.9-150 m.

W9XAO—Chicago, Ill.
W6XAH—Bakersville, Cal.
W9XK—Iowa City, Iowa

2100-2200 kc. 136.4-142.9 m.

W2XBS—New York, N. Y.
W6XS—Los Angeles, Calif.
W9XAP—Chicago, Ill.
W9XAK—Manhattan, Kans.

2200-2300 kc. 130.4-136.4 m.

W9XAL—Kansas City, Mo.

2750-2850 kc. 105.3-109.1 m.

W9XG—W. Lafayette, Ind.

43,000-46,000 kc. 6.52-5.98 m.
48,500-50,300 kc. 6.00-6.20 m.
60,000-80,000 kc. 3.75-5.00 m.

W9XD—Milwaukee, Wis.
W9XE—Marion, Ind.
W8XF—Pontiac, Mich.
W3XAD—Camden, N. J.
W2XR—Long Island City, N. Y.
W9XAT—Portable
W2XF—New York, N. Y.
W6XAO—Los Angeles, Calif.
W3XE—Philadelphia, Pa.
W2XAK—New York, N. Y.
W10XX—Portable and Mobile
W8XAN—Jackson, Mich.
W8XL—Cuyahoga, Heights, Ohio

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

A Good Argument for Modified Code Test on 5 Meters

Editor, SHORT WAVE CRAFT:

Gentlemen:

● THE discussion of code or no code for 5 meter work has been long and voluminous. So far, however, the main reasons advanced have fallen in two general classes. One class seems to say, "I do not know the code and want to use a small transmitter," while the second group seems to say, "*I know the code and think everyone should.*"

The present test requires *ten words per minute code speed*; this seems quite fast to one first learning code, because he seems to get to 6 or 7 words per minute and sticks there for ages. This is an experience common to all and very disheartening. However, in the 160, 80, 40 and 20 meter bands very few ever send that slow. These bands are well populated and a signal in them goes places and does things.

On 5 meters a signal does not go nearly as far but gives quite an amount of pleasure to the owner. If 5 meters was exclusively populated and assigned to phone work, a code test might be readily dispensed with, as it is today in the *broadcast* and *police* bands, but since this is not so, a knowledge of code is essential, if only to receive a request to change frequency slightly to avoid interference.

However, the code test advocates in their protests say that 5 meter transmission *is in the same state at 200 meter work in 1912.* Very fine! *In 1912 the code test was five words a minute.* Then let there be special 5 meter licenses issued for use only in that or higher frequency bands requiring only a 5 words a minute code test. As the 3 letter calls are pretty nearly used up and a 4 letter call is rather bulky for consistent fast code work, let the 4 or 5 letter calls be assigned to this type of license, thereby readily distinguishing the stations and prevent "bootlegging" into the higher code speed bands.

Yours truly,
J. CALEB PHIPPS.

He Wants Action!

Editor, SHORT WAVE CRAFT:

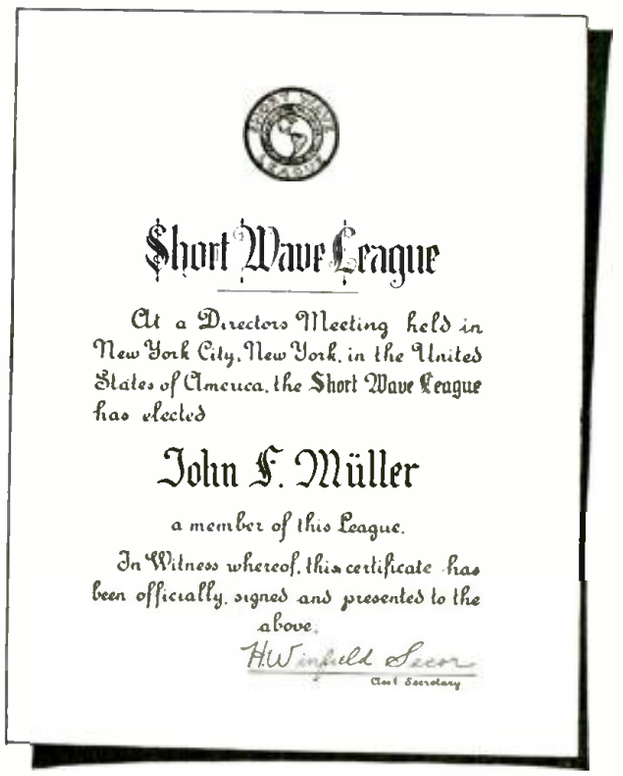
● I WISH to have something to say concerning the 5-meter "Codeless Exam." As it is in any argument, there will always be fellows on both sides of the argument. I am for the "Codeless Exam." below 6 meters and would like to see some official action taken toward putting it over.

Some weeks past I purchased your June issue of SHORT WAVE CRAFT, which started me off in short waves. I have built the "Duo-Amplidyne" receiver with satisfactory results considering all the "static interference" just about in my back-yard; this is in the form of the local street-car line and parallel to that the Interurban line to Waukesha and Burlington, and overhead about 70 feet to 100 feet, eight high tension lines with 4,500 volts in each line making a total of 36,000 volts, in addition to the two electric lines.

Now about the argument. Some day I would like to talk to these amateurs in Muskegon, Elgin, Appleton, and others in my locality here. I believe I could learn the code, but how would the transmitting turn out? Then on the other hand I would enjoy it more to speak with these fellows than sit there and listen to dits and dahs. Fellows who are interested in CW can learn it anyway, if they want to, and no 5-meter fellows will disturb them. I have listened to some CW signals and if they were not QSA1 I would like to hear one that is, even an amateur station located at Muskegon, Michigan, does a poor job in transmitting every once in a while, while other stations in almost the same band come in better, so I do not believe it to be my receiver. I would like to tell these fellows just what good amateurs they are. Most of these fellows are OK on CW, but when they get to phone transmitting—phew! ! !

I suggest a vote from all fellows (including YL's) reading about these arguments to send in their vote either "Pro" or "Con" within two months time on a post-card or Official Voting Blank issued through SHORT WAVE CRAFT to clip and mail. Then you will have the general opinion and I believe it will be in my favor. So let's get this settled!

WM. R. PFARR,
Milwaukee, Wis.



This is the handsome certificate that is presented FREE to all members of the SHORT WAVE LEAGUE. The full size is 7¼" x 9½".

See page 445—how to obtain certificate.

Get Your Button

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

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

Please note that you can order your button AT ONCE—SHORT WAVE LEAGUE supplies it at cost, the price, including the mailing, being 35 cents. A solid gold button is furnished for $2.00 prepaid. Address all communications to SHORT WAVE LEAGUE, 99-101 Hudson St., New York.

40 Per Cent Flunk CODE TEST!

● IN A recent report received from the Federal Communications Commission at Washington, D. C., it is interesting to note that there are now 46,390 valid amateur station licenses in existence. Particularly interesting, from the viewpoint of the proponents of the "No Code Test Below 6 Meters" argument, is the fact that of the 3,631 applicants for amateur station licenses during the last fiscal year, forty per cent failed to pass the code test! This test only required the applicant to receive at the low speed of 10 words per minute, and the failure of forty per cent of the applicants to pass the code test, would seem to indicate that it is not the simplest accomplishment in the world to learn the code.

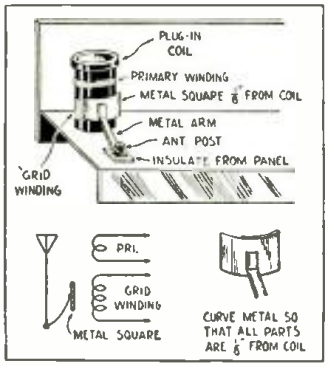
$5.00 FOR BEST SHORT WAVE KINK

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

NOVEL ANTENNA CONDENSER

This antenna coupling arrangement which I have found to work very well is made from a one inch metal square (thin sheet brass) mounted on an adjustable metal arm, so that it rests about one-eighth of an inch from the grid winding of the plug-in coil.



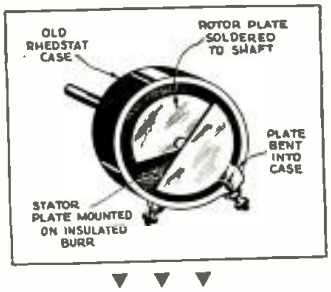
Since the number of turns in the grid windings decrease with the wave-length, this manner of coupling automatically varies accordingly as each of the plug-in coils is inserted. This differs from an equalizing condenser, which has to be changed with each coil.

The exact position for the metal plate in relation to the grid winding of the plug-in coil can best be determined by experiment.—Rolind Mahan.

▼ ▼ ▼

MAKING A MIDGET CONDENSER

Remove the rheostat winding and cut two semi-circular pieces of tin, drill a hole in the edge of one and mount it on the insulated burr, then bend it down over the back of the rheostat. Solder the other plate to the arm, and there you are. The plates should be set so that they can come together without touching.—Henry Limburg.



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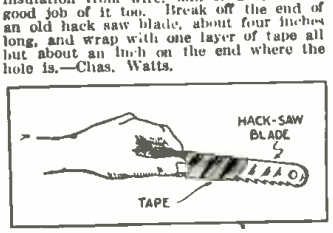
INSULATION SCRAPER

Here's a handy tool I use to scrape the insulation from wire, and it does a very good job of it too. Break off the end of an old hack saw blade, about four inches long, and wrap with one layer of tape all but about an inch on the end where the hole is.—Chas. Watts.



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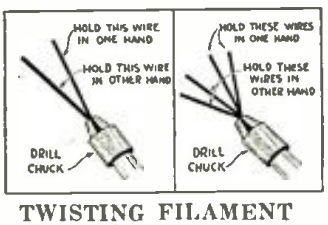
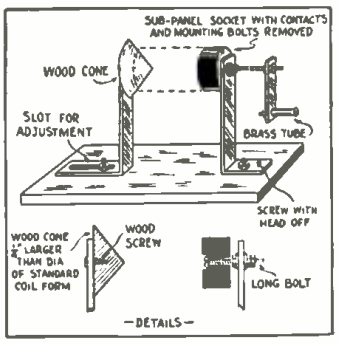


TWISTING FILAMENT LEADS

An excellent method of making twisted leads is to take two wires, twist them together for about a half an inch or so, and then put them in the chuck of an ordinary hand drill. By having someone turn the drill while you hold the two loose ends, twisted filament leads, tightly wound and neatly made can be thus constructed. This method can be used in making wire cables.—Edward Carroll, W2GUY.



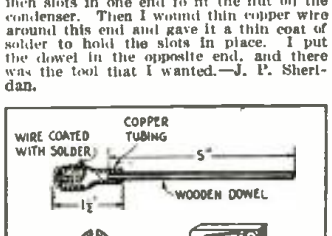
COIL WINDER

This coil-winder makes winding four or five prong coils very easy. This coil winder is not hard to build and I am sure it will help some fellows and I think the sketch explains itself. The sockets used are old tube sockets; the four prong socket is a subpanel mount, having four bolts for mounting which are taken out. The other socket is a five prong one, a baseboard mount with the contacts and base taken off. This leaves just a shell with a hole in the center and the five prong holes.—Howard Cookson.

▼ ▼ ▼

NEUTRALIZING TOOL

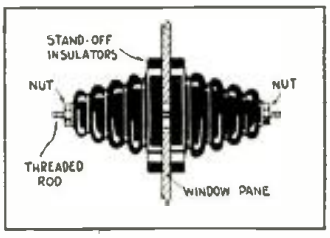
I finished my short-wave set and found that I needed a neutralizing tool to adjust the compensating condenser in the antenna circuit. I hunted around and found that I didn't have any, so I decided to make one. I found a piece of one-quarter inch copper tubing and a five inch long piece of dowel, which would fit into the copper tubing. I cut off an inch and a half of the tubing and sawed half-inch slots in one end to fit the nut on the condenser. Then I wound thin copper wire around this end and gave it a thin coat of solder to hold the slots in place. I put the dowel in the opposite end, and there was the tool that I wanted.—J. P. Sheridan.



▼ ▼ ▼

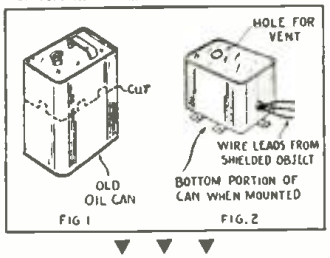
TRANSMITTER LEAD-IN "BOWLS"

Procure two stand-off insulators and remove the hardware. Drill a hole in the window pane. Procure a long threaded brass or other rod and pass this through the insulators and window glass. Tighten the assembly by putting nuts on end of the shaft as shown.—E. B. Frye.



CHEAP SHIELD CANS

In making this shield you must first select a can suitable in size and shape to cover the object you wish to shield. Then measure the height of the object and allow one-half inch for clearance. When measuring this height on the can, allow spaces for flaps. Cut out along this line and discard the top, then drill a half inch hole in the side for wires coming out of shield from shielded object. If a tube is being shielded it is necessary to drill a hole in top just over the tube for ventilation; it also serves to see whether the tube is lighted without removing the shield. The shield is fastened to the base-board of the set with screws or bolts. The shield may be painted, and thus improve its appearance. —Robert L. Wood.



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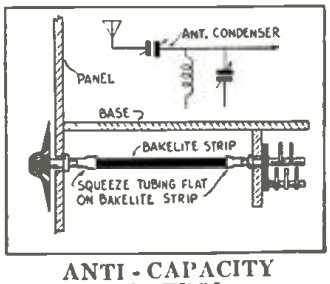

ANTI-CAPACITY CONTROL

In most short-wave sets using the regular antenna condenser "body capacity" interferes whenever the operator is about to adjust it.

I found by installing it at the back of the set and controlling it on the front panel as shown in sketch, that this effect was eliminated. Cut 2 pieces of copper tubing ¾ by ¼ long or a piece of tin to the shape required. Slip this tubing or sleeve over the ¼ inch condenser shaft and solder; next cut a strip of bakelite panel ¼ wide by the length desired to suit. The other piece of tubing is soldered on the ¼ inch shaft and a collar and set-screw provided as shown. Squeeze tube flat on the bakelite strip with a pair of pliers at b-b in diagram. Attach control knob and that's that.—Luis A. D'Henreux.

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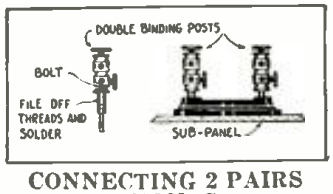
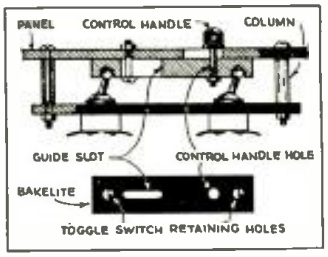


CONNECTING 2 PAIRS PHONES

A convenient method of connecting two pair of ear-phones to a set may be improvised by the use of two double binding-posts, two screws about ⅝ in. long, and two phone cord tips. Thread the screws into the binding posts, remove the threads from the other end, and insert into the phone tip and solder the binding posts to the screw and tip; you then have a simple arrangement for connecting two phones or phone and speaker.—John F. Derr.

GANGING TOGGLE SWITCHES

It is frequently desirable to gang two or more toggle switches so that they can be operated from one lever or button. The accompanying sketch shows how to do this in a simple and efficient manner. A piece of fiber or bakelite has holes drilled in it at the proper points to come in contact with the knobs on the ends of the

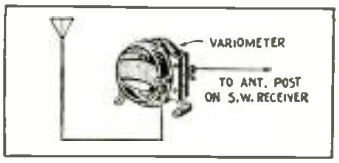


toggle switch levers. A slot in the narrow strip behind the panel permits it to be slid sidewise, with a screw as a "slot guide" as shown.—J. L. Caruth, W5EDB.

▼ ▼ ▼

VARIOMETER IMPROVES TUNING

A variometer placed in the antenna will make signals increase in loudness.

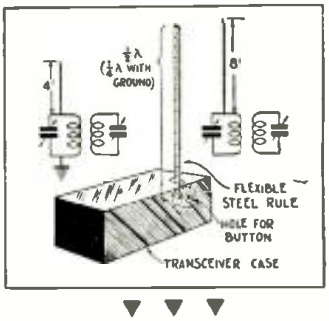


For short-wave "fans" who haven't space for a long antenna, a short antenna works well with this circuit I find.—Wm. Waltman.

▼ ▼ ▼

A COMPACT ANTENNA FOR 5 METERS

This antenna has proven very satisfactory for five meters. It does not have to be hung on a tree or rolled up at every transmission—it is a "time-saver". It occupies a minimum of space and has proven very efficient. The antenna consists of a small steel rule of the type that rolls out straight when a button is pressed. These may be purchased for a nominal sum at any hardware or "5 and 10 cent" store. It should be secured against the side of the case with a hole in the case for the button. As a voltage-fed Hertz aerial the length should be eight feet. With four feet and a ground, the Marconi type may be used. The length may be read directly from the rule. A slot in the top of the case allows the rule to rise vertically in the air.—W. Holme.



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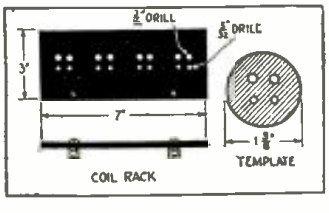
HANDY COIL RACK

My coils, too, have a habit of rolling off the table and on the floor, so I stopped this by making a rack of bakelite for them. I cut out a piece of bakelite 7" x 3", then taking the top off an old Grebe spring socket, I used it as a template for locating the holes and spacing them properly. If a socket-top is not handy, one can be made from cardboard easily. Two angles bolted to the bakelite serve as a means of fastening the rack to the side of the table. Handiness and simplicity are the two main features of this rack.—Wm. Fishback.



SHORT WAVE QUESTION BOX

EDITED BY

GEORGE W. SHUART, W2AMN

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

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

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

BROADCAST COIL FOR SHORT-WAVE SET

Paul Sawin, Sheridan, Wyoming.

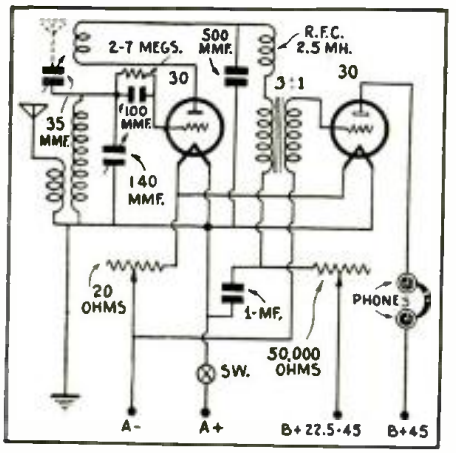
(Q) Could you supply me with information on how to wind a broadcast coil for my short-wave receiver. My receiver circuit is one using two stages of audio, with a detector and two 01A's in the other two stages. The tuning condensers are one 0-35 mmf. trimmer condenser and one standard receiving type variable condenser from a 3-tube Crosley "B.C." receiver.

(A) A broadcast coil for your receiver should have approximately 120 turns of No. 30 enamelled copper wire for the grid coil and 25 turns of the same size wire for the tickler. The spacing between the tickler and grid coil should be approximately ¼ of an inch.

"ALL-PURPOSE" RECEIVER

E. J. Villwock, Milwaukee, Wisc.

(Q) Will you please publish the diagram of the "*All-Purpose*" *Receiver* which used two type 30 tubes? The receiver was recently published in the issue in which the picture of the Oscillodyne was on the cover.



Here is the diagram of the "All-Purpose" receiver, which appeared in the April, 1933 issue.

(A) The All-Purpose Receiver was very popular with our readers and we are very pleased to reprint the diagram for you. The values for the parts are all given and you should obtain excellent results with this 2-tube set.

2-TUBE RECEIVER DIAGRAM

H. Aitkenhead, 924 Tuxedo Blvd., Webster Groves, Mo.

(Q) Would you be kind enough to print a selective and sensitive 2-tube receiver using a 57 regenerative detector and a 56 resistance coupled audio amplifier, to which I could add an R.F. stage in the future. I have a set of two-winding coils that I want to use in this receiver.

(A) A 2-tube receiver using a 57 and 56 is printed on this page and it is one of the most sensitive type of regenerative receivers that you can build. An R.F. stage can easily be added at any time.

TRANSFORMER HEATS

Donald Pratt, Harpursville, N. Y.

(Q) I have a transformer that I want to light a 27 tube from the 110 volt line (A.C.). The voltage is a little too high on the secondary winding—it heats up so badly I cannot use it. What could I use to obtain the correct voltage

(A) If your transformer heats considerably there is no method of eliminating this trouble unless you wish to rewind the secondary with heavier wire. The voltage could easily be cut down with the resistance but due to the fact that the transformer heats up there is little use of continuing to use it, because the wire is evidently not heavy enough to carry the load of a 227 tube.

REVAMPING OLD SUPERHET

D. D. Keller, c/o Lowndes County ERA, Valdosta, Ga.

(Q) I have one of the old "RCA" 6-tube superheterodyne sets, on the plate which appears on the front of the cabinet are the words "second harmonic." My interest lies in rebuilding this set into a short-wave unit. For power supply, I have an "A" and "B" eliminator which was used on a Kellogg set. Would appreciate any information or data you could give me.

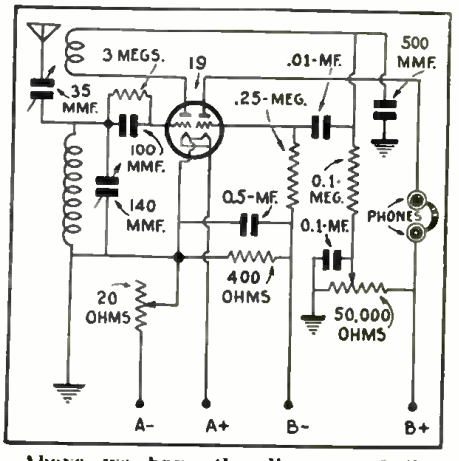
(A) Due to the design of the particular receiver you have, we do not believe it would be advisable for you to make it into a short-wave set. Several of our friends have tried unsuccessfully to make a short-wave super out of an old second harmonic set. The sensitivity and selectivity in all cases were very poor. We believe you would be much better off to build a more up-to-date set, following some of the designs set forth in the various issues of SHORT WAVE CRAFT.

THE "19-TWINPLEX" RECEIVER

Frederick Miller, 38 Staniford, Boston, Mass.

(Q) Will you please publish a diagram of a receiver using a 19 tube and four-prong coils?

(A) The "19 *Twinplex*" receiver has proven to be one of the most popular sets that we have described in quite some time. Naturally, it would be quite popular with the "beginner" because really only one tube is used, while 2-tube performance is obtained. We print herewith a diagram for you, together with the values of the parts. Coil data for this receiver can be obtained by referring to the July, 1934 issue of SHORT WAVE CRAFT.



Above we have the diagram of the 19 Twinplex receiver.

TWO STAGE AMPLIFIER

Henry Laureys, 370 Webster Ave., Jersey City, N. J.

(Q) Please publish in the *Question Box* a circuit of two stages of audio, using one 53 tube. Phones are to be connected to the first stage and a speaker to the second. If the above is not as good as using separate audio tubes, such as two 56's, please mention it.

(A) We believe the two stage audio amplifier shown in the diagram will work much better than a single type 53 tube, using one stage of resistance coupled audio. Most audio volume can be obtained from the two type 56 tubes with transformer coupling.

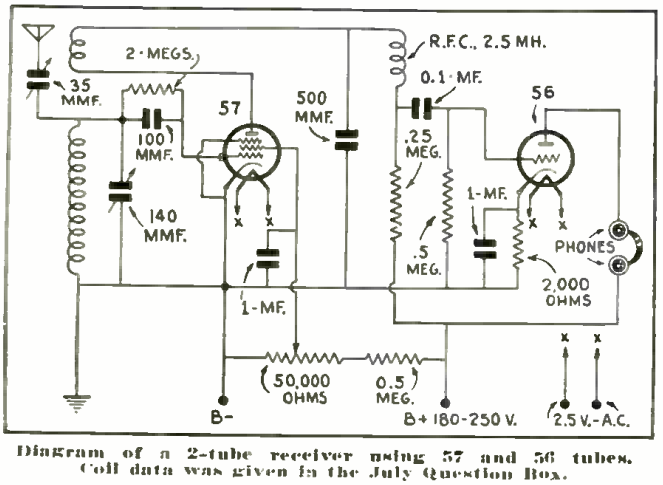
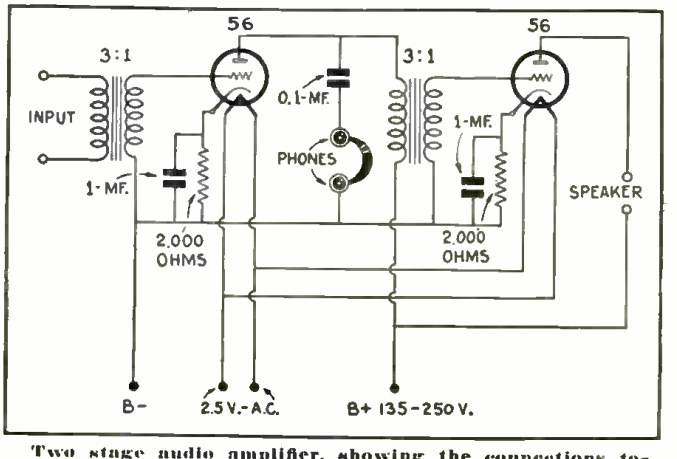


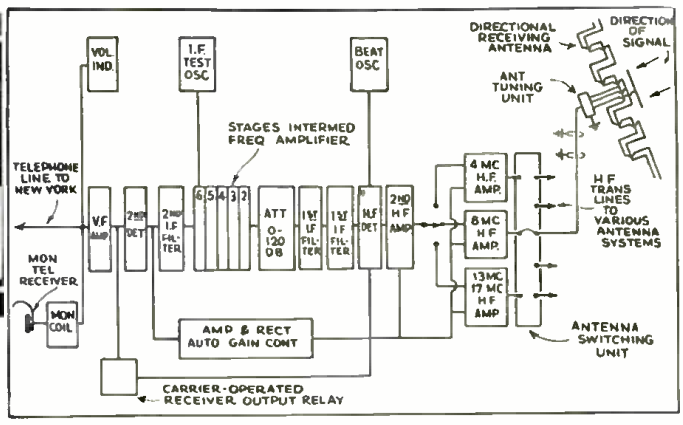
Diagram of a 2-tube receiver using 57 and 56 tubes. Coil data was given in the July Question Box.



Two stage audio amplifier, showing the connections together with the values of the parts.

When You Talk To A Ship At Sea

(*Continued from page* 391)



The map, above, shows "round-the-world" route followed by the S.S. "Empress of Britain"; during this 25,000 mile journey telephone calls were put through regularly to and from ship. Diagram, right, shows line-up of short-wave receiver at the land station located at Forked River, N. J.

reactance networks. The object of this *time delay* panel is to give the voice-operated relay, which switches the transmitting and receiving circuits, time in which to operate without cutting off the first and last syllables of the words of a sentence which you have just spoken. The Vodas (which in radiophone language means "*Voice Operated Device Anti-Singing*" (comprises in its elemental form a highly sensitive, specially designed, polarized relay, which is so sensitive that it will operate on but one-half milliampere. These relays can operate extremely fast and, in fact, do their work in less than a hundredth of a second. In the time delay panel there are twenty groups of *time delay* resistance-reactance networks, each of which delays the speech one thousandth of a second or twenty-thousandths of a second for the whole group of twenty units.

Suppose you have just finished a sentence and are ready to listen to the person aboard ship talk back to you. As soon as you have pronounced the last word or, in fact, a fraction of a second after that, thanks to the *time delay* mechanism, the Vodas, or voice-operated relay, connects the circuit to the receiving line coming in from the short-wave receiving station at Forked River, simultaneously blocking off the transmitter circuit at Ocean Gate.

As soon as the last word of the sentence on the incoming short-wave phone voice from the ship has been pronounced, the voice-operated relay switches the circuit so that your next sentence or sentences will be transmitted.*

A most remarkable set-up of radio, telephone and electrical apparatus has been perfected by the coordination of many special engineers and physicists of the A. T. & T. Company and its associated laboratory and consulting staffs. Following the usual telephone practice, the voice currents are amplified along the line between New York and the transmitting and receiving stations proper, located at Ocean Gate and Forked River, the vacuum-tube amplifiers serving to boost the voice currents in order to compensate for electrical losses occurring along the lines are located at Asbury Park. Such amplifier or repeater stations are usually located at points approximately fifty miles apart on long distance telephone lines.

Transmitting and Receiving Stations

The accompanying photographs show the appearance of the 20 kw. transmitter located at Ocean Gate, N. J., and a special antenna is used at this point. One of the photos shows the appearance of the large 10 kw. vacuum tubes used in the transmitter at Ocean Gate. There are several antennas erected at the transmitting station each designed of the proper size for a certain frequency and wavelength and these can be switched into service selectively in the transmitter operating room.

The short-wave voice "signals" picked up from ships at sea are intercepted on the special short-wave aerials of the receiving station at Forked River, N. J.

Shore-Ship Traffic Available Half-Way Around the World

On the last "around-the-world" cruise of the beautiful steamship *Empress of Britain*, frequent radiophone contact was established with radio stations of the A. T. & T. Company at San Francisco and New York, which enabled more than 100 of her passengers to talk with friends and relatives in every quarter of the U. S. and Canada. After the *Empress of Britain* reached the vicinity of Singapore, contact was established with the A. T. & T. Company's powerful radio transmitting and receiving stations located at San Francisco. Remarkable as it may seem, and considering that the ship had only a 1,000 watt transmitter, these telephone calls by wire and short wave radio were executed in fine order; there were 40 phone calls to points in Massachusets and California, Texas, Florida, Wisconsin, and other states in this country, as well as Canada, while the *Empress of Britain* was steaming along between Singapore and Hong Kong. Most of these calls involved short-wave and wire phone circuits of 10,000 miles and more in length. 13,000 miles was the gap spanned in one call put through between Halifax, N. S., across the American continent and the Pacific Ocean to the *Empress of Britain*.

One kilowatt telephone short-wave transmitters are now carried by the *S.S. Rex*, *Conte de Savoia*. The *S.S. Leviathan* carries a 500 watt transmitter; the *S.S. Bremen*, an 800 watt transmitter, while others in the group of 21 ships equipped to carry on ship-to-shore telephone service for its passengers, have transmitters rated from 200 to 500 watts; the *S.S. Majestic* has a 2 kw. transmitter, as has also the *Olympic*.

For the longer distances, the frequencies or wavelengths used about the middle of August were as follows: For daylight transmission, average wavelength employed was 22 to 35 meters; for night-time transmis-

(*Continued on page* 424)

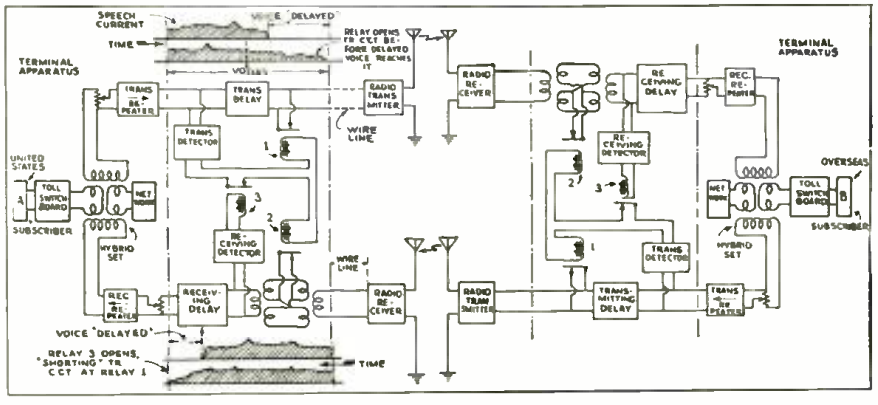
* (The following description of the **Vodas** may help to make its action clearer and was written by one of the A. T. & T. Co., engineers.—Editor.)

"The voice-operated mechanism normally is set up to permit voice frequencies to come through from the radio receiver, and prevent any of these frequencies from going out to the radio transmitter.

"As soon as the subscriber on shore talks, his voice operates the transmitting side of the **Vodas** and clears a pathway to the radio transmitter, at the same time blocking the pathway from the radio receiver. When the subscriber stops talking the **Vodas** blocks the transmission path and permits the shore subscriber to hear anything coming from the radio receiver.

"When the person aboard ship talks, the received speech at New York operates the receiving side of the shore **Vodas** to disable (block) the shore transmitting side and thus prevent reradiation from its radio transmitter.

"A certain amount of time is taken to operate the voice operated mechanism, and while waiting for this operation syllables of speech might be clipped. The (time) delay network prevents this by slowing the speech in its travel, sufficiently to permit the **Vodas** relays to operate and let the syllables slip through."



Above—Area now covered by the "ship-shore" radiophone service of the A. T. & T. Co. A person anywhere in the U. S. or Hawaiian Islands can talk to any one of 21 ships now plying the Atlantic. Left—Diagram of the "Vodas".

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A new Transceiver that really gets out and lets you do things. One of the most powerful portable units ever offered in this class. Using a type 19 tube in a p.p. oscillator, it has a power output of approx. 2 watts (about 10 times the power of units in this class). More than enough is obtained for speaker operation if desired.

The Lafayette "30" is similar to above except that it uses a type 30 tube as the oscillator for transmitting with type 33 pentode as modulator providing a strong signal that is clearly understood.

Both models were developed after research in both laboratory and field. Entirely self-contained. Weight but 26 lbs. complete with batteries. Write for complete information.

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Talking To Ship At Sea

(*Continued from page 422*)

sion 63 to 70 meters. It is interesting to note that a different wavelength or frequency is used to carry the voice to the ship than that employed to transmit the voice from the ship For example, if 63 meters was the wavelength used to transmit from the Ocean Gate station to the ship at a given time, the ship used a wavelength of 70 meters to shore. At the shorter distances another but similar schedule of wavelengths is used.

You will probably assume that the transmitting and receiving apparatus aboard the ship is an exact copy of that used at the land station, but this is not the case, as the ship's set is not equipped with the *time delay* or *voice-operated relay* (Vodas). The telephone set used by the person aboard ship has two wires connected to its microphone and these connect direct with the radiophone transmitter in the ship's radio cabin. The two wires coming from the receiver connect with the ship's radio telephone service *receiving set*. Aboard ship two distinct aerials are used, one for the transmitter and one for the receiver. When the ship's passenger is listening to your conversation from the land station, an automatic relay cuts off the ship's carrier wave and, as soon as he speaks, the relay puts the carrier on the transmitting antenna.

On nearly all of the 21 ships sailing the Atlantic and fitted for ship-shore radio telephone service, the passenger makes or takes the call in a specially fitted cabin set aside for the purpose. On the *Empress of Britain* the passenger may call from his stateroom.

As in the case of various point-to-point transoceanic short-wave radio-phone circuits operated daily by the A. T. & T. Company, and now available to the public, the wavelengths used at different times of the day or night, and especially during the changes of the seasons, are selected and changed in accordance with the best results obtained. These frequency or wavelength changes follow roughly a regular schedule, being shorter at one season of the year and longer at another, all of the important points such as quality and strength of speech received, variations in strength due to a magnetic storm, sun-spots and other cosmic phenomena.

Over 50 "Foreign" Countries in Short-Wave Net

Thanks to *short waves* and cleverly engineered and balanced telephone wire circuits across the continents some fifty-three "foreign" countries are now available to the Bell telephone subscriber. A man may call from Sedalia, Mo., and ask to be put in telephone communication with a person in the Philippine or Hawaiian Islands, Dutch East Indies, and various locations in Europe, Africa, and Australia, or important centers in South America, ships-at-sea, as well as most of the Central American countries. In other words, *short waves*, plus wire phone circuits, now make 92 per cent of the world's telephones available to you.

It is almost unbelievable to think for a moment that today shore-to-ship service is available to any telephone subscriber in the U. S., Canada, Cuba and Mexico, as well as those in other countries, and this service is now offered to four islands in the Hawaiian group. In other words, a person can put through a telephone call from Honolulu by *short waves* to San Francisco, thence by wire to New York, by wire to Ocean Gate; and then by *short waves* to a ship practically anywhere in the Atlantic. The same person could also, of course, be switched on to the short-wave link to London and talk through the London station to any one in the British Isles or in most of Continental Europe. The same call may be switched from New York on to the Central American, Bermuda or South American circuits.

The following ships are now equipped with radio telephone for public service: *Albert Ballin, Deutschland, Hamburg, New York, Monarch of Bermuda, Queen of Bermuda, Bremen, Columbus, Europa, Homeric, Majestic, Olympic, Empress of Britain, Rex, Conte di Savoia, Leviathan, Aquitania, Caledonia, Isle de France, Resolute, Berengaria.*

Fun With 5-Meter Trans-Ceivers

(*Continued from page* 410)

anyway and a knob permits quick scanning of the entire five-meter band.

The three tubes in the Lafayette Transceiver actually do the work of five. Tubes V1 and V3 are both type 19 double triodes, V2 a type 30. The four switches marked S are all part of a single four-pole, two-position unit; the points marked T represent the transmit position; the points R the receive position. The variable resistor R1, which acts as volume control, is combined with the filament switch SW. C1, R1 and S are the only variable instruments in the whole transceiver.

The coil marked L1 looks a bit peculiar. It consists of two turns of ¼-inch copper tubing about 2 inches in diameter, with a split length of insulated flexible wire inside. The tubing acts as the plate coil, the inside wire as the grid coil, of a simple push-pull oscillator. The close coupling between the two coils makes this a powerful oscillator indeed.

Let us throw the changeover switch to the receiver position and see what happens. Tube V1 now acts as a self-quenching super-regenerative detector, with C4-R3 as the grid condenser leak combination. Transformer T1, with primary P1 functioning, acts as an ordinary amplifying transformer, working into V2 as first audio stage. V2 in turn feeds into T2 and V3, which act together as a complete class B audio output stage, the output transformer T3 operating the earphones. Simple, isn't it?

Now switch to the transmit position, and the same parts act altogether differently. V1 becomes a push-pull oscillator. Primary P2 of transformer T1 is cut in, and T1 becomes a microphone coupling transformer. V2 is now a speech amplifier, and V3 a class B modulator. The secondary of T3 is switched from the phones to the plates of V3, so T3 is now the modulation transformer. Simple again, isn't it?

In the receive position R1 is a volume control on the received signals. In the transmit position it is a mike gain control.

Two binding posts are provided on the top of the case for antenna or feeder connections. The writer has obtained his best results with a quarter-wave antenna consisting of a four-foot length of aluminum tubing, fitted at one end with a threaded brass insert that screws directly to one of the stand-off insulators. An eight-foot half-wave antenna has also been found good. The four-foot tube is convenient because it is shorter. It is especially valuable in a car in motion, as it whips around less.

For power supply, dry batteries are used throughout. Two standard No. 6 dry cells light the filaments. Three 45-volt B batteries energize the plates. A 7½ volt C battery furnishes bias for V2. A separate 4½ volt C battery is used for microphone current, one of the switch sections opening this circuit when the transceiver is in the receive position. A single set of batteries has withstood two months of experimental service, and still seems to be all right.

As for actual results—the writer worked more than 10 miles "blind", between 100 6th Ave., New York, and outlying sections of the city. Some of the contacts were made with stations apparently blanketed by steel buildings. In fact, one QSO was accomplished with this transceiver on the fifth floor of a 17-story steel building, and the other station about three miles uptown!

Parts List for the "Lafayette" Transceiver

C1—15 mmf. midget.
C2—.002 mf. mica.
C3—.002 mf. mica.
C4—.00025 mf. mica.
C5—.004 mf. mica.
C6—.0005 mf. mica.
R1—1 megohm.
R2—5,000 ohms.
R3—200,000 ohms.
R4—1.5 ohms.
L1—Tank coil as described.
T1—Special Lafayette double primary transformer.
T2, T3—Class B, A.F. transformers.
V1, V3—Type 19 tubes.
V2—Type 30 tubes

More Power on 2.5 Meters

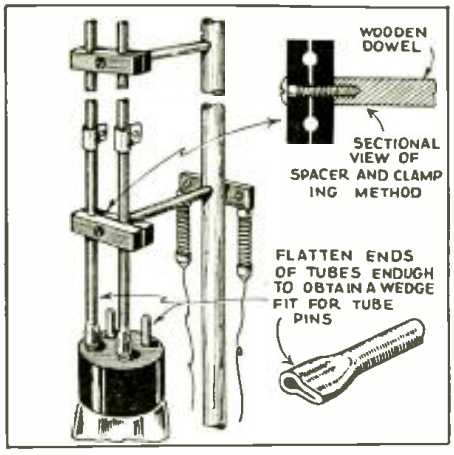
(*Continued from page* 399)

mitter is ideal; the addition of another tube only incurs additional losses in the circuit using open lines. Theoretically the lines having both ends open must be a half wave long. However this is not possible with the present-day tube construction, because the grid and plate of the vacuum tube actually becomes part of the line. Special tubes will no doubt be released in the near future. The match between the external part of the line and the tube is not perfect by any means, but the dimensions given are a fair compromise.

New 801 Type Tube Used

When designing his type of transmitter the new RCA 801 tube was used. The elements of the tube proved to be equal to approximately one foot of line. In other words subtract one foot from a half of the wavelength on which you intend to work. For 2.5 meters the line will be 36 inches long. This shows that the shortest wavelength at which this tube will function properly in the circuit described is 1.25 meters. Incidentally you will be surprised at the amount of R.F. generated by a transmitter of this type on 1.25 meters. Other types of tubes will require slightly different lengths of external line which will have to be determined experimentally.

Other types suggested and which are best



Details of 2.5 meter Transmitter.

suited are the 12A, 171, 201A, 245 and the 210. The 800, of course, is very fine for the higher powered "rig", the use of which will require a line slightly longer than the above-mentioned types.

Referring to the photograph we find that the voltage curve of the line has been plotted and photographed with the transmitter. Starting at the end of the line we find that we have a point of high voltage. As we proceed down the copper tubes we have a decrease in voltage, until we reach a point where the curve crosses the line; this is a point of minimum voltage and the distance between this point and the end of the line is exactly one-quarter of the wave-length on which the transmitter is operating. At this point the grid return and the plate voltage leads are connected, through the small R.F. chokes. This makes it easy to check the wave-length; it can be done with a yard stick. The length of the antenna is also governed by this distance—it is just twice this long for a half-wave radiator.

Construction Hints

Construction of the transmitter is not at all difficult. The drawing shows how the ends of the ¼ inch dia. copper tubes are squeezed together in order that they will *push on* the plate and grid pins of the vacuum tube. This eliminates long connecting leads from the line to the tube connections. The mounting which supports the oscillator consists of a ½ inch dia. dowel stick 36 inches long, set into a wood base-

board of 1 inch thick stock, six inches square. Two ¼ inch bakelite rods are doweled into the wood upright to hold the line and tube firmly. The drawing also shows the formation of the two bakelite clamps which are fastened to the ends of the ¼ inch rods. The vacuum tube hangs in an upside-down position and two small clips are used to make the filament connections. Other details can be gotten from the drawings. The two small R.F. chokes are made by winding number 28 enameled wire on a 5 meg. resistor form. The spacing between turns is equal to the diameter of the wire. The resistor should be wound full of wire. Use a resistor having an isolantite or porcelain body.

The grid-leak used is 15,000 ohms and the plate voltage should not exceed 300 for the 801 tube. The plate current will be 100 milliamperes with normal antenna coupling. Higher plate currents will damage the tubes. Other tubes of the receiving types will require correspondingly lower plate voltages and currents.

The antenna is a half-wave long and the feeder should be connected to a point having a distance from the center equal to one-eighth its total length; the length of the feeder is not important. Tap the feeder to a point on the plate side of the line either side of the R.F. choke. This connection should be slid up and down the copper tube until a point is reached where normal plate current exists, the value of which will be between 80 and 100 milliamperes. In order to change frequency the length of the line will have to be changed. It is suggested that those interested should choose the 2.5 meter band, because if some hams are operating on 2 and some on 2.5 meters, there is little chance of working each other because some will be out of the tuning range of the other's receiver. Get organized on these high frequencies and worthwhile developments are sure to follow. A recommended power supply and modulator are shown in the drawings.

Parts List

1—Transmitter mounting (see text).
2—Lengths ¼ inch copper tubing (see text).
2—Special R.F. chokes (see text).
1—15,000 ohm grid-leak (Ohmite).
1—75 ohm C.T. (center-tap) resistor. (Ohmite).
1—801 tube. R.C.A.-Radiotron.

2-5 Meter Set Works Speaker

(*Continued from page* 397)

PARTS LIST FOR RECEIVER

1—Portable carrying case, see text for details. Wholesale Radio.
1—6 mmf. variable condenser (large condenser cut down).
1—15 mmf. variable condenser. National.
1—100 mmf. condenser, mica. Aerovox.
1—.004 mf. condenser. Aerovox.
1—.005 mf. condenser. Aerovox.
1—.1 mf. condenser. Aerovox.
1—.01 mf. condenser. Aerovox.
1—15 mf. 25 volt. electrolytic condenser. Aerovox.
1—.5 meg. grid-leak. Ohmite.
1—500 ohm resistor. Ohmite.
1—25,000 ohm resistor. Ohmite.
2—250,000 ohm potentiometer. Electrad.
1—3:1 ratio audio transformer. Thordarson.
1—30 henry output choke.
1—5 prong Isolantite socket. National.
1—5 prong wafer socket. Na-Ald.
1—2.5 m.h. R.F. choke. National.
1—4 wire cable.
1—Small National vernier dial.
1—Antenna ground terminal strip.
1—56 or 2A5, RCA Radiotron (Sylvania).
1—76 or 41, RCA Radiotron (Sylvania).

HEINIE JOHNSON
Winner of the
First Short Wave Scout Trophy
Tells How to Build
"A S.-W. Receiver in a BOOK"
In the Next Issue!

When to Listen In

By M. HARVEY GERNSBACK

Daylight Time

May we again advise listeners that daylight saving time ended for the U. S. and Canada on about the last Sunday in September, and that many American and Canadian stations shifted their schedules to one hour later in standard time.

Germany Plans More Stations

The German short wave station has a new unit in construction which will soon be on the air on any one of 6 different waves. Germany will then have 3 transmitters on simultaneously. The new wavelengths and calls to be used (in addition to the present waves and call letters) are:

DJM, 6079 kc., 49.35 met.
DJN, 9540 kc., 31.45 met.
(We have reports of these 2 waves already being used for testing.)
DJO, 11795 kc., 25.43 met.
DJP, 11855 kc., 25.31 met.
DJQ, 15280 kc., 19.63 met.
DJR, 15340 kc., 19.56 met.

The new transmitter will be used in conjunction with special directional antennae for increasing the area served by the present German S-W station. The new station will be in operation, it is hoped, by the end of this year. The power of the transmitter is 50 kw. During the past month the German station has operated 3 stations at once every evening (using the old wavelengths, however). From 5:30-9:15 p.m. every evening DJA, DJC and DJD have broadcasted simultaneously. It is apparent that the new plant will soon be in operation. Probably the new aerial arrangements have not been completed. For October the evening broadcast to North America will *probably* take place on DJD and DJC from about 6:30-11 p.m. The other transmissions from the German stations are to be found in the station list.

Lima, Peru

There is a new station in Lima, Peru, which broadcasts nearly every evening. The wave used is 38.36 or 31.0 met. There seems to be a conflict about the call letters. One report gives OCN and another OA4AC. It is possible that both are correct. OA4AC is probably the call employed when the station is engaged in amateur traffic, while OCN is used for broadcast work.

Australia

VK2ME at Sydney (9590 kc.) broadcasts every Sunday in October from 12:30-2:30, 4:30-8:30 and 9:30-11:30 (all a.m.); in November the schedule is: Sundays, 1-3, 4:30-8:30, and 9-11 (all a.m.).

VK3LR, at Melbourne on 9580 kc., broadcasts daily except Sunday from 3-8 a.m.

Verifications

May we remind listeners that the RCA stations at Rocky Point, N. Y.; New Brunswick, N. J.; Bolinas, Cal., and Kahuku, Hawaii, will not verify reception reports. In accordance with federal laws they will send the writer a polite letter quoting the law as regards the maintenance of secrecy concerning any communications overheard by the listener and stating that it is therefore impossible to verify. The American Tel. & Tel. Co. stations at Lawrenceville and Ocean Gate, N. J.; Hialeah, Fla.; and Dixon, Cal., follow the same procedure. It is therefore useless to write to these stations for a specific verification.

Japan

In addition to the JVM mentioned last month there is a whole group of JV- stations at Nazaki, Japan. These stations are primarily for commercial service to all parts of the world but are used for broadcast service frequently. For checking purposes we list all the JV's and their wavelengths.

JVA—18910 kc.—15.86 met.—Service to Europe.
JVB—18190 kc.—16.49 met.—Service to D.E.I. and Phil. Is.

JVC—16050 kc.—18.69 met.—Inland and to Hongkong.
JVD—15860 kc.—18.91 met.—Inland and to China.
JVE—15660 kc.—19.16 met.—
*JVF—15620 kc.—19.21 met.—Inland and to Manchuria.
JVG—14910 kc.—20.12 met.—Europe.
JVH—14600 kc.—20.55 met.—Europe.
....—14540 kc.—20.63 met.—U. S. A.
JVI—13560 kc.—22.12 met.—D. E. I. (Dutch East Indies.)
....—12275 kc.—24.44 met.—Hongkong.
....—12155 kc.—24.68 met.—Inland and Hongkong.
....—12020 kc.—24.96 met.—China.
JVL—11660 kc.—25.73 met.—
*JVM—10740 kc.—27.93 met.—
*JVN—10660 kc.—28.14 met.—U. S. A.
JVO—10375 kc.—28.92 met.—Manchuria.
JVP— 7510 kc.—39.95 met.—Europe.
JVQ— 7470 kc.—40.16 met.—D. E. I.
JVR— 7390 kc.—40.60 met.—Inland and Hongkong.
JVS— 6990 kc.—42.92 met.—Inland and China.
JVT— 6750 kc.—44.44 met.—U. S. A.
JVU— 5790 kc.—51.81 met.—Inland and Manchuria.
JVV— 5730 kc.—52.36 met.—Inland.

Those marked with an asterisk (*) have been reported frequently.

Bombay

The new Bombay station VUB is operating on Wednesday and Saturday from 11 a.m.-12:30 p.m. The transmitter, despite all reports otherwise, is definitely located at *Kirkee* (not Durkee), India, 120 miles from Bombay.

Rome

12RO at Rome, as listeners have no doubt observed, has not been on the air since early June. It is reported that the station is being rebuilt.

PHI

PHI at Huizen, Holland, is now back on its winter wave of 25.57 met. or 11730 kc.

W2XE

The schedule of W2XE in N. Y. C. for the winter is 11 a.m.-1 p.m. on 15270 kc., 3-5 p.m. on 11830 kc. and 6-11 p.m. on 6120 kc.

W3XAL

The schedule of W3XAL is as follows: Daily 10 a.m.-4 p.m. on 17780 kc. and on Monday, Wednesday and Saturday from 4:30 p.m.-1 a.m. on 6100 kc.

W8XAL

W8XAL at Cincinnati, Ohio (6060 kc.), broadcasts from 7:30 a.m. to 8 p.m. and from 11 p.m. till 2 or 3 a.m. daily. When Daventry, England, returns to the 49 meter band on GSA (6050 kc.) this fall from 6-8 p.m. W8XAL will probably repeat its courteous gesture of last winter and sign off at 6 p.m. to enable American listeners to enjoy good reception of GSA.

The operators of W8XAL are to be congratulated for their consideration.

High Fidelity Stations

By September 15 the several new experimental broadcast stations should be on the air in the U. S. A. These stations are authorized to transmit a frequency range twice as great as the ordinary long wave broadcast stations in this country. The object is for experimental work in high fidelity transmissions.

Although these stations are not really S-W stations (they operate just below the regular broadcast band from 1530-1590 kc.) they are interesting because the average all wave or short wave receiver will pick them up. All are rated for 1 kw. power.

W6XAI—Bakersfield, Cal., 1550 kc., 193.5 meters.
W9XBY—Kansas City, Mo., 1530 kc., 196.1 meters.
W2XR—Long Island City, N. Y., 1550 kc., 193.5 meters.
W1XBS—Waterbury, Conn., 1530 kc., 196.1 meters.

Broadcast Pick Up Stations

Many broadcast stations arrange "on the spot" broadcasts from out-of-the-way places by using portable S-W transmitters erected at the point of interest. These portable transmitters can operate on any of the following waves: 1606, 1646, 1652, 2020, 2060, 2090, 2102, 2190, 2760, 2790 or 2830 kc. In meters, 186.8, 182.2, 181.6, 148.5, 145.6, 143.5, 142.7, 137, 108.7, 107.5, and 106 meters.

Java

There are several new Javanese stations in operation. All broadcast entertainment. YDA is in Bandoeng on 49.02 meters; YDB in Sourabaya is on 49.67 meters; YDB2 in Semarang is on 68.65 meters. In Batavia there are 2 stations: PK1KK on 62 meters and PK1AK on 40 meters. PK1AK works on Monday, Wednesday and Friday from 4:30-6:30 a.m. PK1KK works on Monday, Wednesday and Saturday from 7:30-9:30 a.m. Another station in Sourabaya is PK3GH on 60 meters. This station operates daily from 4:30-5:30 a.m. A station of unknown call is located at Lampur and operates on 47 meters each Monday, Tuesday and Saturday from 4:30-7:30 a.m.

Java time is 12 hours and 20 minutes ahead of Eastern Standard.

PK1WK at Bandoeng is now up on 85.96 meters from 4:30-5:30 a.m.

Schenectady

The winter schedule for W2XAF and W2XAD, which goes into effect on Sept. 30, follows: W2XAD, daily 2:30-3:30 p.m. on 19.56 meters; W2XAF (31.48 met.) daily 7:25-11 p.m. (Sundays till 12 midnight.)

Winnipeg

The winter schedule of CJRO and CJRX (48.78 and 25.47 met.) is as follows: Daily, except Sunday 8 p.m.-12 midnight. Sunday 8-10:30 p.m.

Daventry

On Oct. 7th the following schedule will go into effect for the Daventry transmissions. Trans. 1:

On Oct. 7 the following schedule goes into effect for the British stations: Trans. 1—2:15-4:15 a.m. on GSD and GSB; Trans. 2—6-9:00 a.m. (Sun., 6:30-9:00 a. m.) on GSG and either GSF or GSE. Trans. 3—9:15-10:45 a.m. on GSF and GSE; 10:45 a.m.-12:45 p.m. on GSE and GSB. Trans. 4—1-4 p.m. on GSD and GSB; 4-5:45 p.m. on GSB and either GSD or GSA. Trans. 5—6-7 p.m. on GSC and either GSD or GSA; 7-8 p.m. on GSC and GSA.

(All time quoted is Eastern Standard)

Best Aerial for "Europeans"

(*Continued from page* 398)

Asiatic reception, we run it from S.E. to N.W. due to the directional effect of the doublet being crosswise, or at right-angles to the wire.

Using this aerial system and a National FB7, plus two stages of added T.R.F. (tuned radio frequency) we can absolutely guarantee to let visitors hear England, France, Germany, Spain, and Italy daily, while Japan, China, and Australia "roll in sweet"!

It will be found that each set of coils cover only about 10 to 15 meters, but since the antenna is a complete circuit in itself, you can insert a 9 turn coil in one side and a 2 or 5 turn coil in the other side, and thereby cover that portion of the receiver dialing not covered effectively by matched coils. On some frequencies a single coil in one side with the other side vacant, will be effective: you are then coupling the two ends of the doublet through ground capacity of the .00035 mf. condensers only. Tuning will be very critical but the noise level will be raised to a noticeable extent. At this time the use of .00035 mf. condensers will be more effective. Leave them open when using matched coils in both sides.

Improving the Victor Two-Tube Super-Het

(*Continued from page* 395)

plate voltage *detunes* the circuit more than is permissible.

This was very impressively brought to light one day while comparing the performance of the original super-het with a well-known factory-made three-tube battery model. The battery model was running circles around the Victor, that day, both in ease of tuning and freedom from fading; operation being in the 20 meter band. The Victor was all A.C. operated at the time. Changing over to "B" battery plate-supply the results were just about 100 per cent the reverse, in fact the Victor worked so much smoother and better, that the "B" eliminator was very carefully checked for a defect. A check of the line voltage showed variations of 5 to 15 volts which would give variations of as high as 35 volts to the oscillator plate. Since we could not "steady" the line voltage, any remedy used would have to be applied to the oscillator.

Cathode Coil in Oscillator Circuit

A simple variation of electron coupling was finally adopted, and while it may be considered a "trick" circuit by some, it certainly has proven its worth in operation from unsteady A.C. lines. The remedy is as follows. Remove the tickler from the plate circuit of the 6A7 and place it directly in the cathode circuit of the same tube. Connect it in right next to the tube, in the lead that runs from cathode to the 250 ohm resistor and by-pass condensers. The lead which formerly ran to F1 of the tickler is now run directly to "B" positive. Be sure the circuit oscillates after the changes are made, and in case it does not, *reverse* the tickler leads at the coil, as the correct polarity must be maintained.

"Band-Spread" Dial Added

The next improvement was the addition of a band-spread dial, a virtual necessity for amateur work. In the picture, it is the right-hand dial, the center knob at the top is the detector trimmer condenser and the knob between the two dials at the bottom, the volume control. The Band-spread condenser used is a midget made over into a double-section affair, having a common rotor and two stators. Each stator section contains three plates, this giving about 65 degrees spread on the 160 meter phone band. Two plates per stator will give about 90 degrees spread, if one cares for that much. In hooking up the *band-spread* condenser, the rotor is grounded, one stator connects to the main detector tuning condenser stator, the other midget stator goes to the oscillator condenser stator.

To use the band-spread, set the right-hand dial at about 10. Tune the set as usual to the very high frequency edge of the band being used. From now on, all tuning over this band is done with the band-spread dial, stations formerly hard to tune in being brought in with a new sense and ease of control. A slight adjustment of the detector trimmer condenser may be needed as we tune from one end of the band to the other.

In most locations a certain level of *background noise* is encountered and any receiver using a *tone control* can usually reduce this noise to a satisfactory level, for general reception. However, the application of the step capacity or resistor and capacity method of tone control has the disadvantage of also reducing signal strength along with the noise. Summer static, plus a more or less constant background-noise level, made the tone control a much wanted feature. It was felt advisable to add one stage of audio, with the tone control, to give us better reception with less noise, plus the added advantage of more over-all "gain" for the receiver. A type 37 tube is used, resistance coupled to the 6F7, together with

a matching transformer in the plate circuit to couple to the headphones. This transformer is not needed but was used as it was at hand. The phones could just as well be placed directly in the plate circuit of the 37 as the plate current in only a few mills (milli-amperes). The tone control is of the four-point switch type used for replacement on broadcast sets, and is connected from the grid of the 37 to ground.

Looking at the front view of the set, the tone control is the right-hand knob; the audio stage being the tube and transformer at the right hand rear of the chassis. For amateur work in a "noisy" location the addition of this audio stage is greatly appreciated. In the author's receiver the 37 is impedance-coupled to a final audio stage using a 2A5, the primary of the audio transformer in the plate circuit of the 37 serving as the plate impedance, while a 500,000 ohm potentiometer is the grid resistor for the 2A5, the movable contact going to the grid, thereby giving us a volume control on the last audio. The headphones are left connected to the audio transformer and when used, the speaker is turned off by means of the last audio stage volume control.

R.F. Stage a Worthy "Added" Feature

Experiments with a stage of tuned R.F. ahead of the first detector removed all doubt as to its "justification" and left us with the firm impression that we had indeed been missing something worthwhile and did not know it. The *pre-selector stage* is the coil and tube on the left rear of the chassis, the tuning condenser being controlled by the upper left-hand knob on the panel. The R.F. circuit is given in Figure 1. Be sure to disconnect the ground lead to the detector "Ant" coil before hooking it up to the R.F. stage. A type 78 tube was used, although the type 6D6 could be used without any circuit changes.

As the set was to be used mostly for amateur work a 24 plate midget variable condenser was used to tune the R.F., but for all-around work a .00015 mf. size is recommended. A more elaborate set-up would be to use three-gang condensers on the main and band-spread tuning dials. In our case the midget covered the bands very nicely, all tuning over any one band being done with the band-spread dial and with slight adjustments of the R.F. knob.

Four-prong plug-in coils, of the same type as used in the detector and oscillator stages, are employed for the pre-selector stage, although a tapped coil might also be used in this position, if one wished to avoid using another plug-in coil. As for actual results after adding this R.F. stage, a decided increase of the signal-to-noise ratio was at once apparent, together with a very much better "over-all" *gain*, plus a distinct increase in *selectivity*—something most amateurs always want but never seem to have enough of.

Parts for 2-Tube Superhet

Two sets of standard S-W receiving coils Na-ald (Bud).
1—2-gang .00015 mf. variable condenser National (Hammarlund).
1—.000015 mf. variable condenser (Trimmer), National (Hammarlund).
1—.00075 mf. fixed mica condenser (Cornell-Dubilier).
2—.0001 mf. fixed mica condensers (Cornell-Dubilier).
1—.00025 mf. fixed mica condenser (Cornell-Dubilier).
1—.1 bypass condenser (Cornell-Dubilier).
2—3x0.1 mf. bypass condensers (Cornell-Dubilier).
2—465 kc. intermediate transformers (National, Hammarlund).
1—50,000 ohm, 1 watt resistor, Ohmite.
1—250 ohm, 1 watt resistor, Ohmite.
1—7,000 ohm, 1 watt resistor, Ohmite.
1—30,000 ohm, 1 watt resistor, Ohmite.
1—150,000 ohm, 1 watt resistor, Ohmite.
1—350 ohm, 1 watt resistor, Ohmite.
1—500,000 ohm, 1 watt resistor, Ohmite.
1—20,000 ohm, 1 watt resistor, Ohmite.
1—50,000 variable potentiometer, wire-wound, Electrad.
1—2A7 wafer socket, Na-ald.

1—6F7 wafer socket, Na-ald.
2—4 prong wafer sockets, Na-ald.
1—antenna ground strip, Na-ald.
1—phone output plug, Na-ald.
1—4 wire battery cable.

Parts List for Pre-Selector

1—set of 2 winding coils, 15 to 200 meters, Na-ald.
1—coil socket, 4 prongs, Na-ald.
1—6 prong tube socket, Na-ald.
2—.1 mf. by-pass condensers, Cornell-Dubilier.
1—140 mmf. tuning condenser, Hammarlund.
1—400 ohm resistor, Ohmite.
1—50,000 ohm resistor, Ohmite.
1—type 78 or 6D6 tube, RCA Radiotron (Sylvania).

Parts List for Audio Stage

1—100,000 ohm resistor, Ohmite.
1—500,000 ohm resistor, Ohmite.
1—2000 ohm resistor, Ohmite.
1—.01 mf. condenser, Cornell-Dubilier.
1—.1 mf. condenser, Cornell-Dubilier.
1—tone control, see text.
1—output transformer, optional. (Thordarson).
1—5 prong wafer socket, Na-ald.
1—37 tube, RCA Radiotron (Sylvania).

Plug-In Coil Data (Na-Ald; Bud)

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

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

Thor "RGH-5" Set

(*Continued from page* 412)

List of Parts

COILS:
2—Sets of six prong coils (8 coils).
2—Thor R.F. chokes.
1—NS14, 300 henry plate choke.
1—Thor power transformer, 700V-75MA.
1—Special speaker for parallel 2A5's.

CONDENSERS:
1—140 mmf., two gang condenser.
1—25 mmf., midget condenser.
2—Thor 8 mf., 450V electrolytic condensers.
4—.25 mf., 200 volt by-pass condensers.
2—.25 mf., 300 volt by-pass condensers.
1—.5 mf., 300 volt by-pass condenser.
1—.02 m.f. 300 volt by-pass condenser.
1—.01 mf., 300 volt by-pass condenser.
1—.002 mf., 300 volt by-pass condenser.
1—.0003 mf., 300 volt by-pass condensers (mica).
1—.0001 mf., condenser (mica).

RESISTORS:
1—10,000 ohm potentiometer, with switch.
1—10,000 ohm variable control.
1—25,000 ohm one watt.
1—5 megohm half watt.
1—500,000 ohm half watt.
2—300,000 ohm half watt.
1—100,000 ohm half watt.
1—40,000 ohm half watt.
1—15,000 ohm half watt.
1—350 ohm half watt.
1—4,000 ohm half watt.

OTHER REQUIREMENTS:
1—Thor RGH 5 chassis, coil shields, and panel.
1—Crowe No. 125 airplane dial, escutcheon plates and pilot light bracket.
4—Knobs.
2—58 tube shields.
2—58 tube shields.
6—Wafer sockets.
2—6 prong coil sockets.
3—Binding posts.
Resistor racks.
Line cord and plug.
No. 18 hookup wire.
Solder and hardware.

A New Sensitive Super-Het

(*Continued from page* 411)

ticular point to which this receiver will tune, from the lowest to the highest frequency. *Automatic volume control* is provided in this set and by a simple flip of a switch, the volume can be controlled either *manually* or *automatically*. The automatic control effectively reduces fading, present on many short-wave stations at times. Referring to the circuit diagram, you will find that 10 tubes are used. A 58 is used in the tuned radio frequency stage for increased sensitivity and reduction of image response, a 57 first detector and a 56 high-frequency oscillator. Two type 58's are used in the intermediate frequency amplifier which is tuned to 465 kc. Tuned standard Litz I.F. transformers are used. The C.W. beat oscillator is a 58 in the electron-coupled circuit. The duties of, second detector, automatic volume control stage and first stage of audio, are performed by the 2B7 tube. This feeds directly into the two 2A5 power amplifier pentodes. Needless to say the speaker can be driven to full capacity and the "foreign" stations fairly *shake the room!*

S. W. Scout News

(*Continued from page* 402)

almost every morning between 5:30 and 7:00 A. M., E.S.T. The carrier is rather jerky and fades very rapidly but the station nevertheless compares with VK3ME in every way. The wavelength is 10.740 kc.

There are several S.A. coming through very nicely at this post. The familiar "Hello America" can be heard regularly from HC2RL every time they are on the air. PRADO is received very well every Thursday night from 9:00 to 11:00 P. M., E.S.T. On August 12th this station was heard at 5:30 P. M. radiating a program intended for the Ecuadorian Colony in Paris. The wavelength used for this transmission was 15,300 kc. However, their regular frequency is 6,618 kc. The quality of both stations is surprising. On August 7th NEB came through very nicely. I write NEB, because that was announced, but I suppose it is customary to keep the long-wave station on the air and not "cut" for the SW station announcement, which actually was NEBT. HJ5ABB was heard lately, just above the noise level. Their announcements are "Achay hota thing—co ah bay bay". Usually a "crowing rooster" identifies this station. Address them Apartado 270, Cali, Col. The Brazilian government station continues to come in very strong. The best time to receive them is immediately after GSB signs off in transmission IV. The wave length 31.5 meters.

At present a real treat can be had by listening to either GSD, DJD, or Pontoise on 25.2 meters. Your favorite type of entertainment, whether it be dance music from London, political propaganda from Germany, or classical music from Paris, comes in with local station volume. HBL and HBP continue to come in very strong on Saturday evenings from 5:30 to 6:15 P. M., E.S.T. The Belgium station ORK is heard with only fair volume. CTIAA is being received very well lately. They usually play records and announce about every 15 minutes. The identification signal is "cuckoo, cuckoo, cuckoo".

The Australians, VK2ME and VK3ME are coming in very fine. At present both are QSA5/R9. VK2ME, as many listeners know, radiates programs dedicated to various states of the Union.

Several new stations were heard at this post during this month. In the first case I write *new*, because this station is seldom reported. It is RAU, located in Tashkend, U. S. S. R. They can be heard in the early morning phoning "Moskva". The time was 6:00 A. M., E.S.T. The signal was fairly weak but quite intelligible. The frequency was 15,100 kc.

HI-FI Antenna System

(Continued from page 411)

impedance of the new Lynch "HI-FI" receiver Transformer is also approximately 70 ohms. The output impedance of this transformer may be selected by means of simple telephone tip-jacks to match receivers with either high or low input impedance. A third connection is provided on this transformer which enables the entire antenna plus the lead-in, to be utilized as a regular T type antenna, in areas where noise occurs on one band and not on the others.

The new type of all-wave antenna system employing a doublet for the horizontal portion of the antenna may be made to operate satisfactorily over all of the existing wave-bands as a result of some important developments in impedance matching transformers (fig. 2) combined with accurate fixed condensers. The fundamental system employed in this intricate network is shown in Fig. 1 and the theory of the operation of this complicated looking system is not very difficult to understand. It is common radio engineering knowledge that fixed condensers have a lower impedance at high frequencies than they do at low frequencies. Therefore, when the receiver is tuned to the high frequencies, that is, any of the short-wave bands, the impedance of the two small condensers shown in Fig. 1, offers the path of least resistance to the incoming radio waves which pass directly through the condensers to the low impedance transmission-line. From this line it goes into the receiver impedance matching transformer and then, by one of three distinct methods, directly to the receiver; for details see Fig. 3.

It is also well understood in radio engineering circles that a doublet antenna cut to a size which is most efficient on the short-wave band will not function satisfactorily when used in the broadcast band. For this reason the transformers shown at either side of the dotted line in Fig. 1 are utilized to carry the broadcast signal into the transmission line at a considerable gain over the signal which would be possible without these transformers. In this case the impedance of the transformer is very much lower than the impedance of the fixed condenser and the incoming broadcast signal passes through the transformer in preference to the condenser.

For the radio amateur, who is interested in both transmitting and receiving, these new Lynch Systems offer a new era in the field of long distance QSOs.

Regardless of the frequency for which a particular ham doublet is designed, its impedance is practically identical to the impedance of Lynch Giant Killer Cable. The only requirement for most efficient operation on any particular frequency is a ½ wave doublet, cut to suitable length for that frequency and the New "HI-FI" Receiver Transformer. In this case, the Giant-Killer Cable may be any length, irrespective of the fundamental frequency.

This arrangement makes it unnecessary to make any changes in the input circuit of the receiver.

Since Lynch Giant-Killer Cable has a break-down voltage of 2,500, the same doublet and transmission line may be used for both transmitting and receiving. To do this, a simple, double-pole, double-throw switch is used to throw the lower end of the Giant-Killer Cable to the Lynch "HI-FI" Receiver Transformer, in the receiving position and to the impedance matching network of the transmitter, in the transmitting position.

WARNING

Recently, an individual who names himself Robert Carey, Jr., has been traveling in the middle west, taking subscriptions to this and other magazines. This man is a swindler and all monies which he collected he kept for himself, giving a FAKE receipt.

Do not pay money to strangers for subscriptions unless he can produce a letter signed by the publisher of the magazine and show you other credentials.

Heads of Police Departments—If the individual referred to above should be apprehended, please telegraph us collect and we will immediately appear to prosecute him.

—THE PUBLISHERS.

"Break-In" Monitoring

(*Continued from page* 409)

The lead P1 from the monitor is connected to the plate end P2 of the amplifier choke (in this case, an audio transformer with windings in series) and the filament return is completed by a connection to the "B minus." In the case of receivers using two stages of amplification the lead P1 may well be connected to the plate side of the primary of the last transformer since one stage of audio has proved ample for all harmonic beats up to the eighth (20 meter band).

It is easily seen that the output from both the detector and the monitor is fed simultaneously into the same phones, the same "B" potential being used for all tubes.

When the transmitter key is pressed the detector of course is immediately blocked with excessive R.F. and the only signal heard will be the beat note when the monitor is tuned to the transmitter wave. The frequency corresponding to this dial reading we can now find from the calibration curve.

However, to make assurance doubly sure we let up the key, the detector immediately functions (unless the transmitter output is about a thousand watts, in which case it may be paralyzed for a few seconds) and we tune the receiver over the band till the beat from the monitor is heard. Frequency observation is highly important in these days of uncertain amateur privileges and this system of "check and double-check" is good insurance against having your license cancelled for off-frequency operation.

Assuming that the other station is located in the usual manner, i.e., after a CQ, a call, or on schedule, we now make use of the break-in monitoring system. Your monitor is tuned to your own transmitter while your receiver is tuned to the other station. Thus when the key is up you hear the other station (from your receiver) and when it is down you hear your own signals (from your monitor). No switches to throw, no plugs to fiddle with, no delay, merely pound the key or swing the "bug."

This method of operation has almost the speed and efficiency of a telephone conversation for ordinary "rag-chews," while for "traffic-handlers" it is practically indispensable. It has an application for the DX hound too, for he can immediately tell when the elusive "VK" or "ZL" "comes back" to someone else, and so save himself a lot of useless calling.

Obviously, of course, if the transmitters at both stations are on *exactly* the same frequency, both your receiver and your monitor would be on the same wave as the transmitter and in addition to hearing the other fellow's signals (key up) and the monitor-transmitter beat note (key down) the monitor-receiver beat note will also be heard (key up or down). However this condition occurs very rarely and in any case it is found that a shift of five kilocycles obviates any difficulty.

Harmonic Monitor Parts List

L1—18 turns No. 24 D.C.C. wire on a form 1.5 inches in diam.
L2—70 turns No. 24 D.C.C. on same form and spaced .25 inches from L1.
C1—50 mmf. midget condenser, with large tuning dial (25 mmf.). National.
C2—100 mmf. midget condenser, with knob for occasional adjustment. National.
C3—.002 mf. by-pass condenser. Cornell-Dubilier.
R.F.C.—Radio frequency choke 100 turns No. 30 D.C.C. on half-inch form; or National 2.5 M.H. R.F. choke.
T—Battery-operated tube (type '01-A, '99, '30, etc.). RCA Radiotron.
R—Filament rheostat for above tube. (A fixed resistor would be better.)
An aluminum panel, wooden base-board, screws, etc., to complete the job.

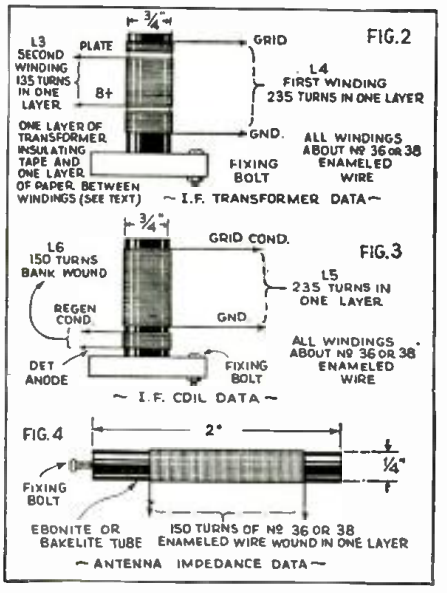
New 5-Tube Super-Het

(*Continued from page* 393)

able to place the two I.F. tubes in shielding cans, in order to reduce the I.F. noise level. A single shielding can, not shown in the photograph, fits over the shields at the back and completely screens both I.F. transformers and tubes.

The I.F. Coils

The I.F. transformer coils are not at all difficult to wind at home. Each transformer is wound on an old wire bobbin (spool), made of wood, with one end removed, the diameter of the former thus provided being about ¾". The data for the two transformers will be found in diagrams No. 2 and No. 3. Of the first transformer, L4 is wound first, in one even layer. This is covered by a single layer of transformer insulation tape, over which is wound a single layer of white paper of average newsprint thickness. Any color would work as well, but the white paper is very helpful in winding on the second layer of fine black wire and the wire is then easily wound on in an even layer. Turns data will be found in the two diagrams. On the second coil (the second I.F. coupling is not a transformer) the regeneration coil L6 is not wound over the coil L5, but is wound in a bunch (helter-skelter) on the former at the



ground end of the coil L5, with a separation of about $\frac{3}{16}$" between the two coils. All the coils *must* be wound in the same direction and must be wired up in the sequence shown in the diagrams. When winding the coils L3 and L4, make no mistakes about providing adequate insulation between the two windings, as the full B voltage exists between these two windings and poor insulation here would spell trouble.

Following is the parts list for this receiver:

R1 0.5 megohm.
R2 40,000 ohms.
R3 80,000
R4 4,000
R5 250,000
R6 2 megohms.
R7 2 megohms.
R8 10,000 ohms.
R9 80,000
R10 10,000
R11 0.5 megohm (volume control).
R12 10,000 ohms.
C1 .0003 mf., fixed
C2 .0003 mf., fixed.
C3 .00014 mf. (tuning condenser).
C4 .01 mf. by-pass.
C5 .05 mf. by-pass.
C6 .0003 mf. (pre-set), variable.
C7 1.0 mf. by-pass condenser.
C8 .01 mf. by-pass condenser.

C9 .0003 mf. (pre-set), variable.
C10 .0003 mf. (regeneration condenser).
C11 .0003 mf. fixed condenser.
C12 .0001 mf. fixed condenser.
C13 .1 mf. by-pass condenser.
C14 .01 mf. by-pass condenser.
C15 1.0 mf. by-pass condenser.
C16 1.0 mf. by-pass condenser.
C17 .01 mf. (tone control—optional).
4 4-pin tube sockets; Na-Ald.
1 5-pin tube socket; Na-Ald.
1 6-pin tube socket; Na-Ald.
1 Chassis as per specification; Blan (Korrol).
1 Illuminated disc drive.
1 Baseboard type 4-pin socket for plug-in coils.
1 5:1 audio transformer.
1 "On-Off" snap switch.
3 Formers and wire for coils as described.
Quantity hook-up wire and insulating sleeving.
Quantity nuts and bolts.
Battery cables for 7 connections.
1 pair binding posts, "antenna" and "ground."
1 R.F. choke (R.F.C. 2) (not a *short-wave* choke).

Bias Battery

The bias battery for the 34 type I.F. pentode tube is mounted directly underneath the chassis and consists of a small capacity 3-volt pocket lamp battery.

After having ascertained that the receiver is functioning, it is necessary to adjust the I.F. tuning condensers correctly. Set the condenser C9 about three-quarters of the way to maximum capacity and slowly adjust the condenser C6 until a sudden increase of general sensitivity is noticed. When these two circuits are in tune, they can be left alone for future use. The best setting for these condensers for local conditions will have to be found by experiment but the best results will generally be obtained by tuning to a low frequency (high condenser setting). On the other hand, they must also be adjusted to a point at which the second detector will produce easy oscillations when required so that these points must be borne in mind when setting these condensers.

U. S. Stations Heard in England

Using this receiver in England, the writer has received most of the usual short-wave stations, some at extraordinary volume. When reception conditions are at all good, many of the U. S. stations are heard at really good strength on a fairly large dynamic speaker, while some of the beam stations on the American and Canadian trans-Atlantic telephone circuits come in at absolutely "local station" strength at certain times.

Na-ald Plug-in Coil Data

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

Coilform—2¼" long by 1¼" dia. 4-pin base.

Shanghai Calling?

(*Continued from page* 394)

fere with other forms of radio communication. The receiving set in the *wired wireless* system would be the same as any ordinary receiver. The antenna post in the receiver should be coupled to the line, over which the transmission is taking place, through a condenser. Don't make any direct connections to *telephone* or *electric light lines.* All connections should be made through mica or high voltage condensers because of the danger which may occur if connections are brought out from *live* wires. We can't say just what the Electric or Telephone Companies will say about this. However, we just mention it as an interesting technical possibility.

Short Wave Scouts

(*Continued from page* 403)

VE9HX—6110 kc.—See card—Halifax, N. S., Canada.
VE9GW—6095 kc.—See card—Bowmanville, Ontario, Canada.
W1XAZ—9570 kc.—See card—Springfield, Mass.
W2XE—6120 kc.—See card—New York, N. Y.
W2XE—11830 kc.—See card—New York, N. Y.
W2XE—15270 kc.—See card—New York, N. Y.
W3XL—6425 kc.—Fridays, 5:30 p.m.-12:30 a.m. New York, N. Y.
W3XAL—6100 kc.—Saturdays, 5:30 p.m.-12:30 a.m.—New York, N. Y.
W3XAL—17780 kc.—Daily, 9 a.m.-5 p.m.—New York, N. Y.
W1OXCX—6350 kc.—See letter—Rapids City, S. D.
W3XAU—9590 kc.—See card—Philadelphia, Pa.
W3XAU—6060 kc.—See card—Philadelphia, Pa.
W8XK—6140 kc.—See card—Pittsburgh, Pa.
W8XK—11870 kc.—See card—Pittsburgh, Pa.
W8XK—15210 kc.—See card—Pittsburgh, Pa.
W8XK—21540 kc.—See card—Pittsburgh, Pa.
W9XF—6100 kc.—See card—Chicago, Ill.
WLL—17900 kc.—See letter—Rocky Point, N. Y.—R. C. A. Communications.
WQV—14800 kc.—See letter—Rocky Point, N. Y.—R. C. A. Communications.
WEA—10610 kc.—See letter—Rocky Point, N. Y.—R. C. A. Communications.
WEG—10380 kc.—See letter—Rocky Point, N. Y.—R. C. A. Communications.
WEF—9490 kc.—See letter—Rocky Point, N. Y.—R. C. A. Communications.
WQO—6725 kc.—See letter—Rocky Point, N. Y.—R. C. A. Communications.
WEI—8950 kc.—See letter—Rocky Point, N. Y.—R. C. A. Communications.
W2XBJ—8950 kc.—See Letter—Rocky Point, N. Y.—R. C. A. Communications.
WKK—21420 kc.—Mornings—Lawrenceville, N. J.—Phone.
WKF—19220 kc.—Early afternoon—Lawrenceville, N. J.—Phone.
WNB—10675 kc.—Forenoon—Lawrenceville, N. J.—Phone to Bermuda.
WNA—9162 kc.—Late evening—Lawrenceville, N. J.—Phone to England.
WLK—16270 kc.—Mornings—Lawrenceville, N. J.—Phone to England.
WOA—6755 kc.—Late evening—Lawrenceville, N. J.—Phone to England.
WOB—6755 kc.—Late evening—Lawrenceville, N. J.—Phone to England.
WOO—8570 kc.—Early evening—Ocean Gate, N. J.—Phone.
WOO—4750 kc.—Late evening—Ocean Gate, N. J.—Phone.
FYA—15243 kc.—Paris, France.
FYA—11880 kc.—Paris, France.
FYA—11720 kc.—Paris, France.

(Lack of space does not permit publishing list of unverified stations this month.)

Trophy Contest Entry Rules

● THE rules for entries in the **SHORT WAVE SCOUT Trophy Contest** have been amended and only 50 per cent of your list of stations submitted need be verified. If, for example, you send in a list of 100 stations with 50 verification cards, you will receive credit for the other 50 per cent or 100 stations total. The trophy will be awarded to the **SHORT WAVE SCOUT** who has logged the **greatest number** of short-wave stations during any 30 day period; (he must have at least 50 per cent verifs) this period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the August issue of this magazine.

In the event of a tie between two or more contestants, each logging the same number of stations (each accompanied by the required 50 per cent verifs), the judges will award a similar trophy to each contestant so tying. Each list of stations heard and submitted in the contest must be sworn to before a Notary Public and testify to the fact that the list of stations heard were "logged" over a given 30 day period, that reception was verified and that the contestant personally listened to the station announcements as given in the list.

Only commercial "phone" stations should be entered in your list, no "amateur" transmitters or "commercial code" stations. This contest will close every month on the first day of the month, by which time all entries must be in the editors' hands in New York City. Entries received after this date will be held over for the next month's contest. The next contest will close in New York City ,November 1.

The judges of the contest will be the editors of **SHORT WAVE CRAFT,** and their findings will be final. Trophy awards will be made every month, at which time the trophy will be sent to the winner. Names of the contesting **SCOUTS** not winning a trophy will be listed in **Honorable Mention** each month. From this contest are excluded all employees and their families of **SHORT WAVE CRAFT** magazine. Address all entries to **SHORT WAVE SCOUT AWARD, 99-101 Hudson Street, New York City.**

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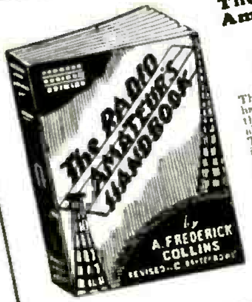


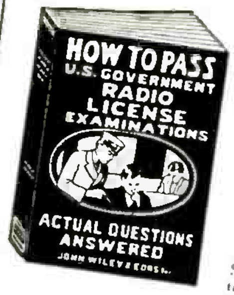
The Radio Amateur's Handbook

(New Revised Edition).
By A. FREDERICK COLLINS
Cloth covers, size 5¾x7¾". 394 pages. 116 illustrations

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

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

Your Price **$1.97**



How to Pass U. S. Government Radio License Examinations

By R. L. DUNCAN and C. E. DREW
Flexible covers, size 9½x7", 170 pages, 92 illustrations

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

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

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

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

Your Price **$1.89**

Electricity at High Pressure and Frequencies

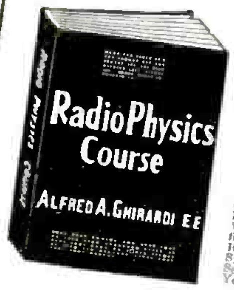
By HENRY L. TRANSTROM
Paper covers, size 5¼x7½ inches, 141 illustrations, 266 pages.

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

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

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

Your Price **$1.89**



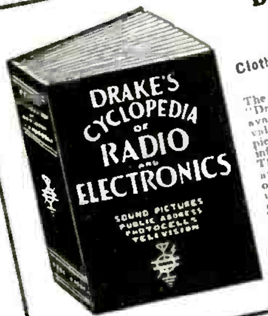
Radio Physics Course

(Second enlarged edition)
By ALFRED A. GHIRARDI
Cloth covers, size 7½x9¼". 992 pages, 552 illustrations, numerous tables

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

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

Your Price **$3.89**



Drake's Cyclopedia of Radio and Electronics

By H. P. MANLY (Fifth Edition)
Cloth covers, size 6x9 inches, 1048 pages, 1178 illustrations, 130 tables, 105 graphs.

The new, 1933 edition of that now very well-known volume, "Drake's Cyclopedia of Radio and Electronics," is now available. Included in this latest edition are further invaluable reference data on public address equipment, sound pictures, television, and photoelectric cells; also, up-to-date information on radio transmission and reception.

The new tubes and the new circuits are described in readily available form. Every technical detail of the great number of topics covered by this reference work is treated individually so that the reader no longer need be in the dark concerning any point.

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

Your Price **$4.88**

Principles of Radio Communication

By J. H. MORECROFT, Professor of Electrical Engineering, Columbia University
Cloth covers, size 9½x6", 988 pages, profusely illustrated.

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

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

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

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- No. 9 AUTOMOBILE RADIO AND SERVICING, by Louis Martin
- No. 10 HOME RECORDING AND ALL ABOUT IT, by George J. Saliba.
- No. 11 HOW TO BUILD AND OPERATE SHORT-WAVE RECEIVERS, by the Editors of SHORT WAVE CRAFT
- No. 12 HOW TO BECOME AN AMATEUR RADIO OPERATOR, by M. F. Eddy
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RADIO PUBLICATIONS
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"HAM" ADS

Advertisements in this section are inserted at 5c per word to strictly amateurs, or 10c a word (7 words to the line) to manufacturers or dealers for each insertion. Each word in a name and address to be counted. Cash should accompany "Ham" advertisements. Advertising for December issue should reach us not later than October 5.

QSL's 75c A 100 2 COLORS. W9DGH, 1816 5TH Ave. N., Minneapolis, Minn.

SWL's - QSL's, HAM PRINTING, MAC PRINT, 3533 Roland Ave., Baltimore, Md.

SHORT WAVE SETS BUILT TO ORDER cheap. Virgil Darnell, Emerson, Ga.

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

FOUR TUBE A.C., THREE TUBE BATTERY Short-Wave Receivers, Very Reasonable. Willard Kiesow, Morgan, Minn.

INSULATION, WIRE, VARNISHES, SUPPLIES, etc. Send 3c stamp for bulletin. AUTOPOWER, 414 S. Hoyne Ave., Chicago.

50 WATTERS $7.50 EACH, 211, 203A AND 845, with carbonized plates. Fully guaranteed. Amateur Service, Fairview, N. J.

PHOTO-CELLS — RELAYS — VERY LOW prices, free literature. Pese Scientific Products, 4918 - 13th Ave., Brooklyn, N. Y.

SPECIAL! ! A.C.-D.C. SHORT WAVE, PENtode, 2-tube Radio, 3 coils, Wired $3.50! Tubes $1.75. Robert Mielke, Ryder, No. Dak.

PAINLESS RADIO MATHEMATICS IN 13 ruler-charts. Batcher's Radiographs sent postpaid for 50c. Robert S. Kruse, Guilford, Conn.

FOR SALE—A RTI RADIO ANALYZER, HAS 3 jewel meters; Very Reasonable. Make offer. Harry Stengel, 224 Findlay St., Cincinnati, Ohio.

IMPROVE SHORT-WAVE RECEPTION WITH simple noise eliminator. Instructions, 15c. Radio, 2224 Woodstock, Pittsburgh (18), Pa.

WANTED—RCA PHOTOPHONE PICKUP OR speakers, wattmeter, etc., meters. Write details. W8FSP, 2095 W. 15th St., Cleveland, Ohio.

2ND EDITION KRUSE'S RADIOPHONE GUIDE, twice as big, completely revised, 2/3 of edition already sold, postpaid 50c. R. S. Kruse, Guilford, Conn.

VARIABLE CONDENSERS—.00035 MFD., PYrex Insulated. Low Loss, Good Condition, 35c each, 4 for $1.00. W8RW, 208 N. Main, Bluffton, Ohio.

RADIOS—ALL KINDS. DUAL WAVE, AUTO, regular. 11 models. World's cheapest. No-cost sample. Sensation. 20th Century Co., S-3080, K. C., Mo.

SHORT WAVE LISTENER'S CARDS. NEW design, brings results. 100, $.75. Also QSL's. Samples Free, Sooooooo, W8ESN, 1827 Cone, Toledo, Ohio.

BLUEPRINT, DATA 18 CRYSTAL SETS—Tubeless; 1850 Mile; Selective; Speaker, 25c Coin. Modern Radiolabs, 151-A Liberty, San Francisco.

PLUG-IN COILS. 15-210 METERS. WOUND on 4-prong tube bases, 30c set. Regular forms, 50c; 6-prong, 75c. Postpaid. NOEL, 809 Alder, Scranton, Pa.

TWO TUBE DOERLE OWNERS! HAVE YOUR set electrified using latest tubes, $1.50. Satisfaction guaranteed. Others changed accordingly. Virgil Darnell, Emerson, Ga.

KENPLEX—1 TUBE — 3. KIT, COILS—$7.00; wired, tested—$9.00; Diagram—$.25; Questions answered—3 for $.25. C. D. Kenyon, 1205 Medical Arts Bldg., Cleveland, Ohio.

WRITE US BEFORE YOU BUY. WE CARRY complete line of used receivers, meters, parts, etc. All good. Prices by return mail. No order too small. Virgil Darnell, Emerson, Ga.

HUMLESS POWER PACKS ABSOLUTELY guaranteed, 250 volts 40 mills. 2.5 volts 3.75 amperes $4.50, regular $8.00. Harry Raske, 1516 West Lehigh Avenue, Philadelphia, Penna.

GOVERNMENT GIVES FREE RADIO OPERAtors training for service on aircraft, ships. Salary, expenses paid. Information booklet, how to qualify, apply, 20c. Federal Equipment Co., Box 344F, Indianapolis, Ind.

BELIEVE IT OR NOT: JAPAN ON LOUD speaker, without antenna or ground. Marvelously sensitive 5 tube receiver. Construction data 35 cents, silver. Morrison, 1263 North New Hampshire, Los Angeles, Calif.

ONE TUBE DX TRANS-CEIVERS $2.95. Guaranteed, new, and complete; foreign reception, local transmission. Crystal Controlled Transmitters $3.75 up. Wave Meters only $1.95. Burks Radio Company, 1448 W. Decatur, Decatur, Illinois.

"Fringe Howl"

(*Continued from page 397*)

tone with a high background rush or hiss. This is overcome by increasing the size of the by-pass condenser previously mentioned from .006 to .01. A .01 will give a very pleasing tone and the signal will sound more natural than with smaller condensers.—H. D. Hooton, W8KPX.

In Next Issue!

A REAL S-W "POCKET" RECEIVER

Picked up European Stations in actual tests.

* * *

SIMPLIFIED RADIO CONTROL for Model Boats, etc.

* * *

A LOW-POWER DE LUXE TRANSMITTER

S. W. and Long Raves

(*Continued from page 405*)

I've built different sets described in your magazine and find all to work OK. I've built the 3-tube "Signal Gripper", Globe Trotter, the Oscillodyne and a couple more. I'm still using the Oscillodyne; added a 1-tube audio stage, so now it's a 2-tube set and it sure has lots of "pep". Am getting fair DX and amateurs on both phone and CW (code).

GEORGE GOULD,
Box 556, Yorkton, Sask., Can.

(*Good work, George.—Editor.*)

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Table Model

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SPECIALS—PLUG-IN COILS, 10-200 METERS. Set of Four $.50—Forms $.08,—R.F. Chokes 2-4-8 Mh. $.20 each. Short Wave maps $.10, SWL's $.60, 100. Short Wave Accessories. 121 Derby St., Valley Stream, New York.

SHORT-WAVE COILS—SPECIAL COMPLETE set for four short form 50c. Four prong long forms space wound $1.00. Long six prong $1.50. Write for prices on Super and Band Spread coils. Sussdorff & Kusterman Radio Laboratories, 297 DeKalb Ave., Brooklyn, N. Y.

OHM'S LAW CALCULATOR — LIGHTNING Slide Rule; solves all problems of Voltage, Current and Resistance, Power, Wire Sizes, etc. Range: 1 micro-amp. to 1000 amps; 1 micro-volt to 10,000 volts; 1 micro-ohm to 10 megohms; 1 micro-watt to 10 megawatts; wire sizes 0 to 36 B. & S. gauge. Introductory price $1.00 prepaid. The Dataprint Co., Box 322, Ramsey, N. J.

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

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GEN-WIN POLICE AND SHORT WAVE ADAPTER

Convert your broadcast set into a short-wave set tuning from 80 to 200 meters. Get exciting police alarms from stations thousands of miles away. Airplane communications while planes are in flight. Amateur phone and international code communications. The biggest thrill and fun for so little money. Installed in a jiffy. Plugs directly into the detector tube socket. Specify the detector tube in your set, or if uncertain as to detector tube, advise make and model number of set when ordering.

	Price
No. 190—for '30, '40, '99, '12A, '200A or '201A Detector Tube	$1.39
No. 191—for '32 or '34 Detector Tube	1.39
No. 200—for '27, '37 or '56 Detector Tube	1.39
No. 201—for '24, '35, '51, '36, '39 or '44 Det. Tube	1.39
No. 206—for '57, '58, '77, '78, 6C6 or 6D6 Det Tube	1.39

GEN-WIN SHORT WAVE COIL KIT

The GEN-WIN Short Wave Plug-in coils have stood the test. They have been in great demand for the past three years, and are still selling strongly to the thousands of discriminating experimenters who appreciate the remarkable results they are getting from these excellent coils. The GEN-WIN Short Wave coils can be used in any one of the many circuits published each month in Short Wave Craft magazine. The coils have plate and secondary windings so designed that they will oscillate over the entire short wave band, 15 to 225 Meter with .00014 or .00015 Mfd. Condenser.

	Price
No. 404E—4 prong—4 coil kit (15-225 meters)	$1.50
No. 404B—4 prong—Broadcast coil (200 to 550 M.)	.55
No. 406E—6 prong—4 coil kit (15-225 meters)	1.95
No. 406B—6 prong—Broadcast coil (200-550 M.)	.65

ALL-WAVE COIL KIT—Range 25 to 550 Meters

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

	Separately
All Wave Tuner (as illustrated)	90c
All Wave R. F. Coil	75c

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

GENERAL WINDING COMPANY
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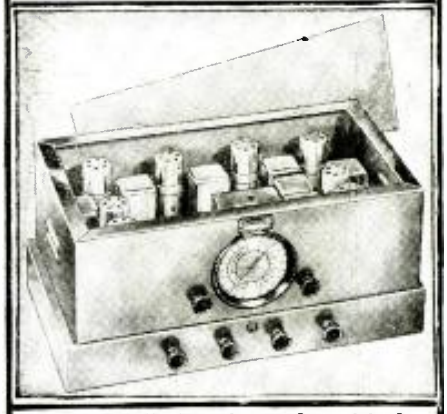
254 W. 31st St. Dept. 11-S NEW YORK, N. Y.

THE SHORT-WAVE SET YOU ALWAYS WANTED



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Write for details, No. 80-S

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Balanced Doublet System. Anyone can install. Outstanding efficiency in operation. Local noises eliminated. Priced most attractively. Ask your nearest jobber or write us for complete information.

PORCELAIN PRODUCTS, Inc.
FINDLAY, OHIO

Which Audio Should I Build!

(*Continued from page* 407)

utilized. But upon examination of the circuit requirements, it will be found that the triodes available do not have the required gain. Here a pentode type tube can be used triode connected as indicated in Fig. 5. The amplification factor under these conditions will be plus 20 and due to the plate impedance being around 12,000 ohms, standard audio transformers can be used as the *coupling medium* to the power stage. The frequency characteristic will be governed by the transformer used and the tube will act as a triode in every respect. The bias resistor should have a value of 2,500 ohms and the plate voltage can be between 180 and 300 volts. Any type of audio coupling can be used with this tube as a triode, if resistance-capacity coupling is used a plate loading resistor of 100,000 ohms will be satisfactory. The grid resistor of the following stage can be from 250,000 to 1,000,000 ohms, depending on the tube used.

A Simple 4 to 6 Watt Amplifier

A new tube known as the 2B6 offers short-wave fans high-power output with low plate voltages. A brief resume of the action of the tube and a study of the circuit diagram of Fig. 7 indicates the possibilities. This tube has good sensitivity and power output and can be used in many receivers in place of 45's, where the improved output will give greater volume with lower signal input levels.

Average Electrical Characteristics for 2B6

HEATER		
Voltage	2.5	volts
Current	2.25	ampere
OPERATING AS CLASS "A" AMPLIFIER		
INPUT SECTION		
Plate (Max.) P1.....	250	volts
Grid G1.	—24	volts
Plate Current	4.0	Ma.
Amplification Factor	7.2	
Mutual Conductance.....	600	umhos
Plate Resistance.....	12.000	ohms
Load Resistance.....	8,000	ohms
Grid Resistor should not exceed	1.0	meg
OUTPUT SECTION		
Plate (Max.) P2.....	250	volts
Grid G2.	2.5	volts
Plate Current.....	40	Ma.
Amplification Factor.....	18	
Mutual Conductance.....	3.500	umhos
Plate Resistance.....	5.150	ohms
Load Resistance.....	5.000	ohms
Signal Volts.....	27	volts
Power Output.....	4.0	watts
Measured between plate and B. Current in cathode lead approx.	3.0	Ma.

Volts r.m.s. for rated power.
5% total harmonic distortion.

Fundamental Explanation

The new 2B6 embodies *two* sets of *triode elements* mounted in tandem, using a *common heater* but *electrically separated cathodes*. An examination of Fig. 7 will show the simplicity of the tube and circuit. In this diagram, the left-hand set of triode elements represents the small input; and the right-hand set the large output. The voltage across R0 (Fig. 7) would put this grid at a high positive bias with respect to its cathode. This is nearly off-set by the drop in R1. Thus, the *output* grid bias is the difference between these two voltages. This bias is normally 2.5 volts positive with respect to its cathode. Therefore, the grid conductance is appreciable, causing the input plate current to divide, part flowing through the *output* grid resistance and part through R0. Consequently the current for determining the *input* grid bias should be measured between the input cathode and R0, not between *input* plate and B—. The average d-c current through this resistor is 3.0 ma. This resistor also forms part of the input section's load resistance, so it must not be shunted by capacitance. The complete load

(*Continued on page* 444)

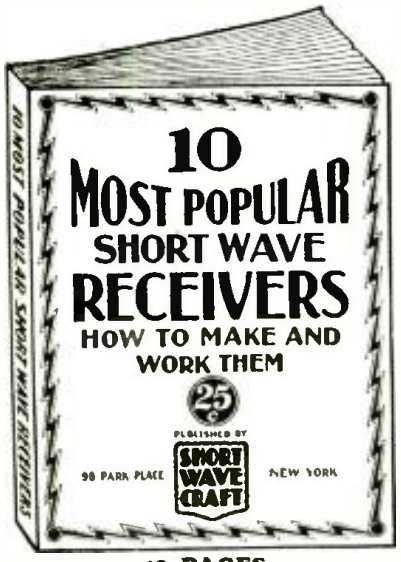
The 4 ESSENTIAL SHORT WAVE BOOKS

'ROUND THE WORLD FANS USE THESE GREAT SHORT WAVE BOOKS

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

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

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



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

CONTENTS

40 PAGES
OVER 75 ILLUSTRATIONS

IMPORTANT

THERE IS NO DUPLICATION BETWEEN THIS BOOK AND OUR OTHER VOLUME—"HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS." ALL THE MATERIAL PUBLISHED IN THE NEW BOOK HAS NEVER APPEARED IN ANY BOOK BEFORE.

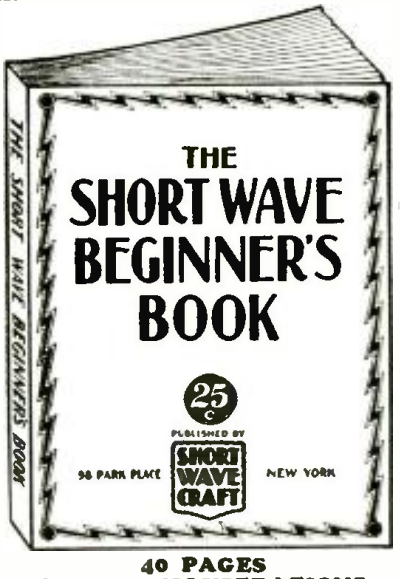
25c

The Short Wave Beginner's Book

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

The book is profusely illustrated with all sorts of photos, explanations and everything worthwhile knowing about short waves—the book is not "technical." It has no mathematics, no "high-faluting" language and no technical jargon. You are shown how to interpret a diagram and a few simple sets are also given to show you how to go about it in making them.

It abounds with many illustrations, photographs, simple charts hookups, etc., all in simple language It also gives you a tremendous amount of very important information which you usually do not find in other books, such as time conversion tables, all about aerials, noise elimination, how to get verification cards from foreign stations, all about radio tubes, data on coil winding and dozens of other subjects.



Partial List of Contents

40 PAGES
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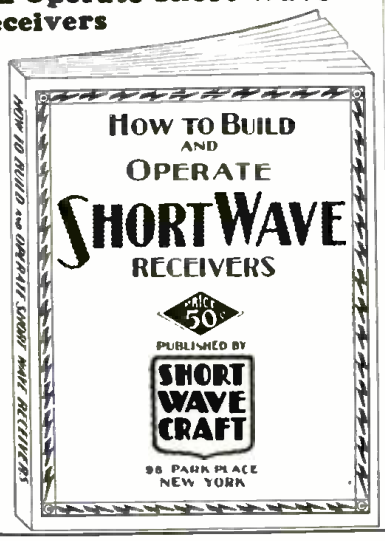
How to Build and Operate Short Wave Receivers

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

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

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

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



Over 150 Illustrations
72 Pages 7x10 Inches

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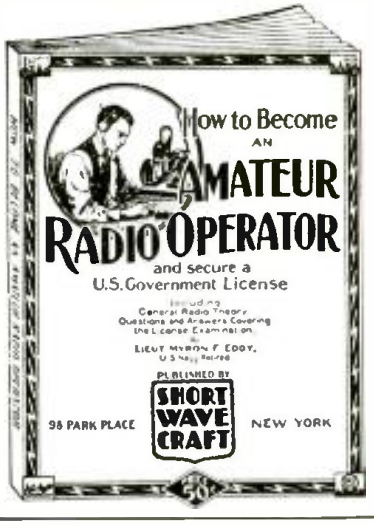
How to Become an Amateur Radio Operator



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

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

Partial List of Contents

Over 150 Illustrations
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These Books are Authentic For All Short Wave Work and LOW in Price

COUPON TODAY!

Which Audio Should I Build!

(*Continued from page 442*)

is the parallel combination of R0 and the grid impedance of the *output* section. Degeneration in resistor R1 is prevented by capacitor C1.

The circuit of Fig. 7 shows the use of this new tube in a "high gain" 4 to 6 watt Audio Amplifier. Some coupling means must be made between the output of the short-wave receiver detector and the input of the amplifier. For circuits to be used in this connection we suggest that you refer to Fig. 6.

The first stage of this amplifier uses a 57 as a voltage amplifier. This in turn is resistance coupled to the input triode section of the 2A6 tube.

There is one interesting point in the power supply unit and that is the use of the 1,500 ohm resistance, as part of the filter unit. This resistance is used in conjunction with two 8 mfd. electrolytic condensers and if it is desired to use a speaker of the dynamic type in conjunction with this receiver, the 1,500 ohm resistor can be removed from the circuit and the speaker field substituted. In the commercial models available, speaker fields having a value of 1,000 to 2,500 ohms can be used quite satisfactorily. However, the best speaker field resistance for this particular circuit would be about 1,800 ohms. As most of the small speakers which should be used with this equipment are supplied with an output transformer, it is not necessary to include such a device in the amplifier chassis, this making the amplifier unit very compact in size. It is important that the .1 mf. condenser be connected from one end of the power line to the chassis or the B minus ground connection of the various tube and rectifier circuits. This also is the means of grounding off the power supply and minimizing hum. A simple reversal of this plug will provide the most quiet operating conditions. This is one of the most simple forms of "high gain" 4 to 6 watt amplifier.

• • • SHORT WAVE ESSENTIALS

FOR MEMBERS OF THE SHORT WAVE LEAGUE • • •

A FEW WORDS AS TO THE PURPOSE OF THE LEAGUE

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

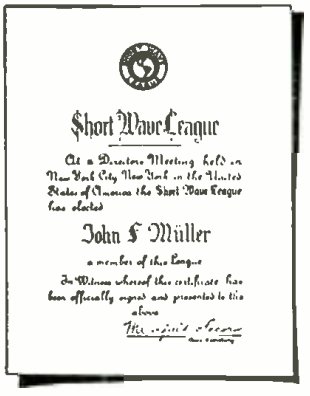
Dr. Lee de Forest, John L. Reinartz, D. E. Replogle, Hollis Baird, E. T. Somerset, Baron Manfred von Ardenne, Hugo Gernsback, Executive Secretary.

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

FREE MEMBERSHIP CERTIFICATE

As soon as you are enrolled as a member, a beautiful certificate with the LEAGUE'S seal will be sent to you, providing 10c in stamps or coin is sent for mailing charges.

Members are entitled to preferential discounts when buying radio merchandise from numerous firms who have agreed to allow lower prices to all SHORT WAVE LEAGUE members.



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

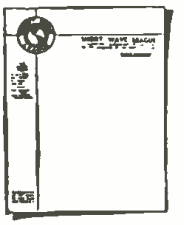
They cannot be bought by anyone unless he has already enrolled as one of the members of the SHORT WAVE LEAGUE or signs the blank on this page (which automatically enrolls him as a member, always provided that he is a short wave experimenter, a short wave fan, radio engineer, radio student, etc.).

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

SHORT WAVE LEAGUE LETTERHEADS

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

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

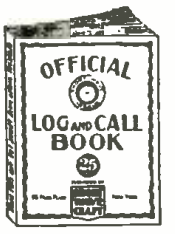


A—50c per 100

OFFICIAL SHORT WAVE LEAGUE LOG AND CALL MAGAZINE

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

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



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RADIO MAP OF THE WORLD AND STATION FINDER

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

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

GLOBE OF THE WORLD AND MAGNETIC COMPASS

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

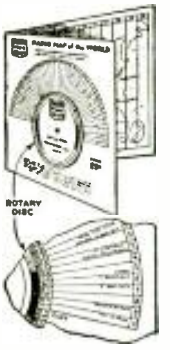
D—Globe of the World ..... Prepaid **$1.25**

SHORT WAVE LEAGUE LAPEL BUTTON

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

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

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



C—25c each

SHORT WAVE LEAGUE SEALS

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

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

SHORT WAVE MAP OF THE WORLD

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

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

D—$1.25 each

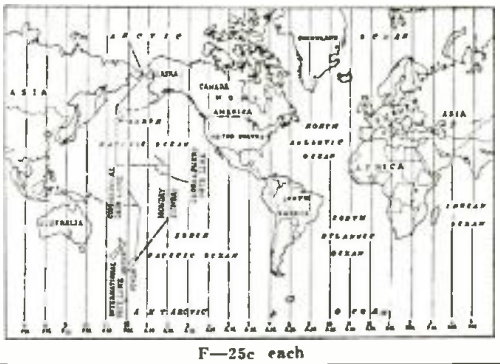
PLEASE NOTE THAT ABOVE ESSENTIALS ARE SOLD ONLY TO MEMBERS OF THE LEAGUE—NOT TO NON-MEMBERS.

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

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

SHORT WAVE LEAGUE 99-101 Hudson St., New York, N. Y.

G—15c for 25



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E—35c each

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE 11-34
99-101 Hudson Street, New York, N. Y.

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

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

I own the following radio equipment:

Transmitting .....

Call Letters .....

Receiving .....

Name .....

Address .....

City and State .....

Country .....

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

SHORT WAVE LEAGUE, 99-101 Hudson Street, New York, N. Y.
Gentlemen:
I am already an enrolled member in the SHORT WAVE LEAGUE ☐
I am a new member and attach my application to this coupon ☐
Please send me the following short wave essentials as listed in this advertisement

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

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11-34 City and State .....
Country .....

OFFICIAL DOERLE WORLD-WIDE Receivers

Presenting the Advanced Doerles!—

THE NEW *Advanced* "DOERLE A.C. Five"

15 to 200 Meters

With Built-in Dynamic Speaker

Nothing Else to Purchase $26.93

Complete—Nothing Else to Buy—15 to 200 Meters.

Well, you Doerle Enthusiasts, isn't this what you've been waiting for? A powerful 5-tube Doerle Receiver, complete with its hum-free power supply and dynamic speaker; all mounted on a single chassis and contained in a beautiful, black, crystalline-finished metal cabinet! **Two tuned stages, two A.F. stages with powerful 2A5 output and perfectly matched dynamic speaker; all contribute to the enormous power and superlative performance of this "top notcher" of the Doerle line.**

During its initial test, in one sitting, this receiver pulled in on its loud speaker, at good room volume, the following enviable log: DJD, DJC, and DJA, Germany; J1AA, Japan; GSD and GSC, England; CJRX, CJRO and VE9GW, Canada; EAQ, Spain; HJ3ABF, Bogota, Colombia; XDA, Mexico; FYA, France; WQO and WEF, testing with the Byrd Expedition and a whole flock of amateurs in practically every radio district of the United States. After that we could no longer keep our eyes open, so we "signed off" to bed.

The receiver employs a 58 as RF amplifier, a 57 as detector, a 56 as first audio amplifier, a 2A5 as power output tube and an 80 as full-wave rectifier. The antenna is coupled inductively to the first tuned circuit through the medium of the three-winding, 6-prong plug-in coils used in the first RF stage. This effectively eliminates the bothersome antenna trimming condenser. Provisions are made for plugging in earphones. The entire set measures, 11⅞" wide x 8½" deep x 8½" high. Ship. Wt. 19 lbs.

No. 332—The Official "Doerle A.C. Five," self powered, ready to use, complete with tubes, 2 sets of plug-in coils and dynamic speaker, as illustrated. YOUR PRICE $26.93

- Dynamic Speaker
- 8 Plug-in Coils
- 15 to 200 Meters
- 2 Tuned Circuits

Nothing Else to Buy $25.23

New "DOERLE A.C. Four"

And here's the "understudy" of the DOERLE A.C. FIVE described at the left. This DOERLE A.C. FOUR is, in practically every respect, the same as the Five-Tube Set except that it has one A.F. stage less and uses an external dynamic speaker. Most of the short-wave stations will come in with good volume on the loud speaker. The more distant ones, however, will have to be tuned in with earphones, for which a jack is provided. Its two tuned circuits, together with its single A.F. stage and perfectly matched dynamic speaker, all contribute to the exceptional performance of this receiver.

If you are a regular short-wave fan, you probably know about the world-famous DOERLE 3-TUBE A.C. SIGNAL GRIPPER; about its fine performance and about the many thousands of unsolicited testimonials lauding it to the skies. Well, this DOERLE A.C. FOUR is that same receiver, with its special hum-free power supply mounted on the same chassis and all housed in a beautiful, black, crystalline-finished metal cabinet.

The receiver employs a 58 as R.F. amplifier, a 57 as detector, a 56 as first audio and output tube and an 80 as full wave rectifier. The antenna is inductively coupled to the first tuned circuit through the medium of the three-winding, 6-prong plug-in coils used in the first R.F. stage. This effectively eliminates the bothersome antenna trimming condenser. The dynamic speaker connects to the set through a convenient plug and socket arrangement. Provisions are also made for plugging in earphones. The entire set measures, 11⅞" wide x 8½" deep x 8½" high. Ship. wt. 19 lbs.

No. 333—The Official "Doerle A.C. Four," self-powered, ready to use, complete with tubes, 2 sets of plug-in coils and dynamic speaker, as illustrated. YOUR PRICE $25.23

The New Competitive Doerle Receivers !

EVER since we brought out our Doerle sets in 1932, unscrupulous competitors have tried to "crash" our legitimate business. They have tried their best to copy the Doerle circuit design and other features of these, now justly famous, sets. They have palmed these sets off as genuine Doerles, and where they could not do so openly, for fear of prosecution from us, they have used various other subterfuges by dubbing their sets as "12,500 Mile Sets", etc.

It should be realized by all that we can produce these sets just as cheaply as the next one **IF WE WISH TO SACRIFICE QUALITY.** We can use lighter chasses, we can use surplus stock resistors and fixed condensers, and other lower priced materials, but up to now we have consistently refused to do so. We feel, however, that we owe this explanation to our customers, and for those who wish to get lower priced sets we now wish to announce that you can buy them **from us too, and AT A LOWER PRICE THAN FROM OUR COMPETITORS.** Even at these low prices, however, we could not afford the risk of cheapening the main parts. We still use HAMMARLUND TUNING CONDENSERS and other equally well known components.

Mind you, the sets we offer here are not as rugged as our standard Doerle sets, on which we never spare and skimp, but if you must have a low-priced set that will do the work, and do it well, here are the sets.

Those competitive Doerle receivers may be likened to low priced automobiles, as compared with the more expensive ones. Both types will get you places, yet one will outlast the other and will be easier to handle.

Two-Tube Doerle 12,500 Mile Short-Wave Sets

Lowest Price $4.60

The excellent performance of these 2-Tube Doerle receivers has already become traditional. Mass production of chasses, the use of good "over-flow" parts from manufacturers and tube-base plug-in coils, makes it possible for us to sell these competitive receivers at the **LOWEST PRICES ON THE MARKET.**

NO. 349 2-VOLT BATTERY MODEL DOERLE KIT

This receiver uses 2 of the new economical 30 tubes. Batteries required are 2 No. 6 dry cells (or a 2 volt storage cell) and 2-45 volt "B" batteries. Sold complete with instructions and diagram. Shipping weight 5 lbs.

YOUR PRICE, Less Tubes $4.60

Pair of Matched 30 Tubes $1.30

NO. 350 ALL-ELECTRIC-A.C.-D.C. DOERLE KIT

This model requires no battery or power pack at all. It works anywhere and on any type of current at 110 volts. Has a self-contained power supply. Uses 3 type 37 tubes. Shipping weight 8 lbs.

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Three Matched 37 Tubes $1.85

NO. 351 STRAIGHT A.C. DOERLE KIT

This model uses either 2 56's or 2 27's. It may be used in conjunction with our own power pack, listed below. The set may also be run on a 2½-volt filament transformer or a "B" eliminator or, instead of the "B" eliminator, 2 45-volt "B" batteries. Shipping weight 6 lbs.

YOUR PRICE, Less Tubes $4.60

Pair of Matched 56 or 27 Tubes $1.30

NO. 352 COMPETITIVE A.C. POWER PACK KIT

A compact power unit delivering 2½ volts at 5 amps for filament supply and 250 volts D.C. at 50 mils for plate supply. Requires a type 80 as rectifier.

YOUR PRICE, Less Tubes $4.70

Rectifier Tube ..... $ .40

WE WILL WIRE AND TEST ANY OF THESE KITS WHEN ORDERED FOR $1.25

The Fultone II—

This receiver takes advantage of the new screen grid and power pentode tubes which impart to it greater sensitivity and greater volume. Uses a 32 screen grid tube as detector and a 33 tube as power pentode output. Both of these tubes are of the 2-volt type requiring 2 No. 6 dry cells (or a 2 volt storage battery cell) for operation. The receiver is complete with plug-in coils covering the range of from 15 to 200 meters. All parts are mounted on a metal chassis and contained in a black crystalline metal cabinet. The receiver is extremely simple to operate and very stable. It is an ideal set for the beginner. Shipping weight 9 lbs.

NO. 353 FULTONE II RECEIVER KIT

YOUR PRICE $5.60

Set of Matched Tubes $1.75

Set of Batteries, including 2 No. 6 Dry Cells and 2 45-Volt "B" Batteries $2.56

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• Index to Advertisers •

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

3.1 Meter Receiver

(*Continued from page* 408)

and Lg a single turn, both of the coils having a diameter of .8 inch and when the variable condenser C1 has a maximum value of about 65 mmf. The connections are naturally made as short as possible. The practical construction of the receiver is shown in Fig. 14. The grid leak R1 equals 2 megohms. The R.F. choke CH has a total of 100 turns and is wound in groups in the manner of the R.F. choke CH3 of the transmitter (Fig. 8). The fear that a plain choke is here not sufficient and that probably a filter system for the R.F. currents would be required, appeared to be without foundation.

Disturbances in the A. F. amplifier due to "sneaking in" of radio frequency currents were not observed. The R.F. choke CH is connected over the primary of the A.F. transformer Tr (1:4 ratio), which is in series with the adjustable resistor, R2, equal to 50,000 ohms and the coil L2 of the local oscillator to the common plate voltage, plus Va12 of both tubes V1 and V2. (C2 equals .003 mf.; C3 equals 1 mf.) The local oscillator tube V2 is of the 112 type. Of the two honeycomb coils used in the local oscillator, L1 has 500 turns and L2 250 turns; C4 equals .001 mf. The coils are mounted in an adjustable coil holder and the spacing between them can be varied within large limits. Thus the amplitude of the generated A.C. can be adjusted for the maximum sensitivity. The A.F. circuit is of the normal type; R3 equals .1 megohm.

Care must be taken in building this receiver to have the connections of the regenerative circuit as short as possible. Fig. 14 shows the photograph of the receiver built by the author. The regenerative tube is mounted vertically. Next to its left is the condenser C1. The coils L4 and Lg which are made of silvered copper wire, are mounted on a little bridge and just below this one is located the variable condenser C1.

(To be concluded.)

Stop Graying Hair

(*Continued from page* 393)

job was wired, you could see no faults. . . . you were ready to tune in the world!

Now for a try at that Circuit of Errors nearby, for your solution of what's wrong. How many mistakes can you find in it? There are seven—at least seven!

THE ERRORS IN DIAGRAM:

Bottom of grid coil should go to GND.

Grid coil should be the larger.

Should have by-pass cond. (¼ or ½ mf.) between B PLUS and filament.

Tuning cond. *rotor* (arrow) should go to GND.

.00025 mf. cond. should go to GND.

Grid leak should be shown as resistance, not inductance.

Grid cond. should be .0001, not .01 mf.

What British Are Doing With 5 Meters

(*Continued from page* 394)

cal conditions and some day it may lead to the solution of whether or not certain types of hills which exist between transmitting and receiving stations are beneficial or detrimental. We have seen cases where a hill between the transmitting and receiving station was a decided benefit. This, of course, is contrary to the popular belief. We know of one particular case where 65 miles was covered with a fairly low-powered 5-meter transmitter and over this distance four or five ranges of high mountains exist. So far, there are two groups of critics. Some say that the hills are detrimental and others say they are not. We hope that in the near future accurate tests will prove either one or the other to be true and do away with this controversy. — *Courtesy "Wireless World".*

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FOR SHORT WAVE ENTHUSIASTS

AT UNPRECEDENTED LOW PRICES

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There is a graduated "Meridian" scale of black enameled metal with the 9" and 12" globes. An additional feature is the movable hour scale found at the north pole—this facilitates determining the hour in any part of the world.

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

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Each world globe contains a listing of over 7,500 cities in nations the world over—spellings conform to international geographic standards—all globes are of 1934 production. GET ONE OF THESE FINE WORLD GLOBES TODAY!

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Laboratory—19th and Campbell Streets, Kansas City, Mo.

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( ) World Globe No. 147 @ $4.15
( ) World Globe No. 47 @ $0.90
( ) World Globe No. 139 @ $3.25

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

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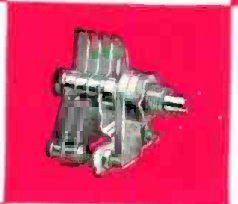
Shown below are a few representative examples of National Radio Products. The list prices given are subject to 40% discount when purchased through an authorized NATIONAL CO. distributor. National Velvet Vernier Dials, Transmitting and Variable Condensers, R. F. Chokes, Amateur Receivers (SW-3, SW-58 and 34, FB-7A, FBX-A, AGS and AGSX), Short Wave Power Units, and Short Wave Accessories are built to strictly maintained standards of precision and workmanship, and are universally used in Short Wave and Amateur Radio. The full line is described and priced in our new and complete Bulletin No. 220. Write for your copy today, enclosing 6c to cover mailing costs.

STD Midget Condenser
Double condenser, 180° SLW plates, 50 mmf. per section. Air gap, .026. Isolantite insulation. Constant-impedance rotor connection, insulated front-bearing. List price **$3.50.**

Type "N" Dial
Solid German silver 4" precision dial with original and matchless Velvet Vernier mechanism. Machine divided scale and vernier read to 1/10th division. Ratio 5-1. List price **$6.75.**

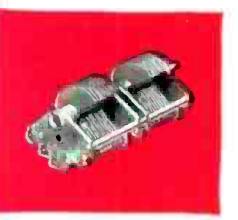
Air-Dielectric Condenser-Tuned IF Transformer
Standard in National FB-7A and FBX-A Amateur Receivers. 450 to 550 kc. tuning range. Also made in 175 kc. model. List price ea. **$5.**

STN Midget Condensers
For neutralizing 245, 247, 210 and similar tubes in amplifier, buffer or doubler stages. Isolantite insulation. Max. cap. 18 mmf. 3000 v. breakdown. List price **$2.00.**



SEH Midget Condenser
Like half of 2SE Condenser but with more plates and air gap of .0175. Caps. 200, 250, 300 and 335 mmf. List prices (respectively) **$3.75, $4., $4., $4.25.**

2-SE Midget Condenser
Isolated rotors, electrically independent, prevent interstage coupling through common rotor and frame circuits. Isolantite insulation. 270° SFL plates. 100 mmf. per sect. Air gap .026. List price **$5.00.**



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National Isolantite Sockets reduce socket losses to a minimum. Made in either 4, 5, 6 or 7-prong styles and also special 6-prong for National coils. Ea. **$.60.**

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SEU Midget Condenser
Heavy, double-spaced, polished, round edge, 270° SFL plates. Air gap .055. Isolantite insulation. 15, 20 and 25 mmf. capacities. List prices (respectively) **$2.50, $2.75, $2.75.**

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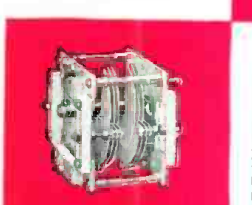

EMP Condenser
Split-stator condenser for receivers and low power push-pull transmitters. 1200 v. breakdown. Air-gap, .023. Standard size 100 mmf. per section. List price **$5.00.**

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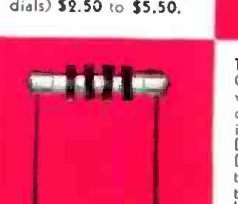

Type R-152. RF Choke
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