THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

Edited by
HUGO GERNSBACK

January

NRA

Dream of a Short Wave Fiend

25¢ IN CANADA 30¢

Here It Is—Just What You've Wanted

A World-Wide, Short-Wave Radio Tours Map that Shows Location, Power and Frequency of All Stations at a Glance

COMPLETE TECHNICAL BULLETIN FOR THE TRANSMITTING AMATEUR

The DeForest Amateur Radio Division of the RCA Radiotron Company has prepared a comprehensive technical bulletin on amateur transmitting tubes. Full information is given on the application, installation and operation of popular amateur transmitting types. Of special interest to the transmitting amateur is the new RCA-800. Send for information on this and other transmitting types, enclosing 10c, to cover the cost of handling. Use coupon.

The New RCA-800

Here's a new short-wave map that is a real aid to the DX fan. All short-wave broadcasting stations operating on a regular schedule are included. And on these complete information is shown at a glance—location, power, frequency, operating time. Descriptions of the types of programs broadcast by each station are another feature.

No short-wave listener can afford to be without this new map. Send coupon below with 10c to cover handling.

Whether you listen, or transmit as well, you will find that the radio tubes manufactured and guaranteed by RCA are those best suited to your needs. Incorporating the latest engineering features, RCA tubes give you the best in radio tube performance.

RCA Radiotron Co., Inc.,
Camden, N. J.

☐ Please send Short-Wave, World-Wide Radio Tours Map. I enclose 10c (stamps or coin) to cover handling charges.

☐ Please send 464 booklet on amateur transmitting tubes. I enclose 10c (stamps or coin) to cover handling charges.

Name_____ Call_____

Address_____ City_____

RCA Cunningham Radiotron RADIO TUBES

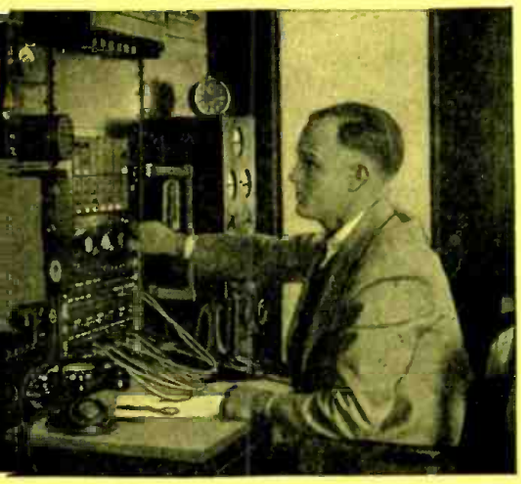
SHORT WAVE CRAFT is published monthly, on the 5th of every month; subscription price is $2.50 a year in the United States and possessions (in Canada and foreign countries $3.00 a year to cover additional postage). Entered as second class matter May 7, 1930, at the Post Office at Mount Morris, Ill., under the act of March 3, 1879.

Learn at Home to Make More Money

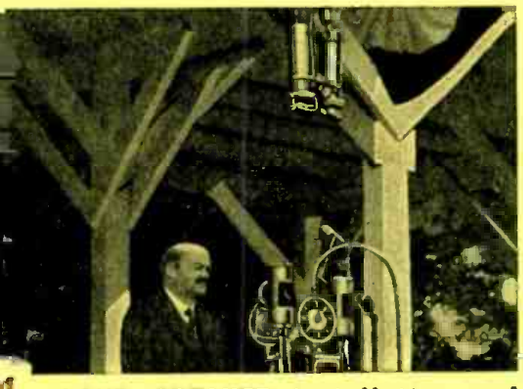
J. E. SMITH, *President*
National Radio Institute

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

I'll train You Quickly for Radio's GOOD Spare Time and Full Time Jobs



BROADCASTING STATIONS offer many fascinating, interesting, and good pay jobs to the trained Radio man.



LOUD SPEAKER installation and service work is another growing, money-making field for trained Radio men.

TELEVISION, the coming field of great opportunities, is covered in my Course.

Why slave your life away in a no-future job? Why skimp, why scrape, trying to pay your bills? I'll train you quickly for the live-wire field—the field with a future—RADIO. $40, $60, $75 a week—that's what many Radio Experts make. $5, $10, $15 a week extra money—that's what many of my students make in their spare time shortly after enrolling. My free book tells you about Radio's spare-time and full-time opportunities—about my tested training—about my students and graduates—what they are doing and making. Get this book. Be a Radio Expert. The Radio field is big enough to absorb many more properly trained men.

I'll train you for jobs like these

Spare-time and full-time Radio Servicing, Operating, Broadcast, Aircraft Radio, Commercial Land, Ship and Television stations, a Radio service business of your own. I'll train you for these and other good jobs in the manufacture, sale and service of Radio, Sound and Television apparatus. My FREE book tells you about the many money-making opportunities in Radio.

Save—learn at home in your spare time

You don't have to leave home and spend $500 to $1,000 to study Radio. I'll train you quickly and inexpensively right in your own home and in your spare time for a good Radio job. You don't need a high school or college education. Many of my successful graduates didn't even finish grade school. My amazingly practical 50-50 method of training—half with lessons, half with Radio equipment—gives you broad practical experience—makes learning at home easy, fascinating, practical and rapid.

(Continued on other side)

PLACE ONE CENT STAMP HERE

MR. J. E. SMITH, President
NATIONAL RADIO INSTITUTE
16th and U Streets, N. W.
Dept. 4AB3 **WASHINGTON, D. C.**

Many Radio Experts make $40, $60, $75 a week

(Continued from other side)

SET SERVICING has paid many N. R. I. men $200 to $1,000 a year for their spare time. Full-time men make as much as $40, $50, $65 a week.

Many make $5, $10, $15 a week Extra in spare time almost at once

My book shows how my special training, instruction material, plans, ideas and my twenty years experience training men for Radio careers has helped many students make $200 to $1,000 a year quickly in their spare time. My Course is famous as "the one that pays for itself."

Your money back if not satisfied

I'm so sure you will be satisfied with my training that I agree in writing to refund every penny of your money if you are not entirely satisfied with my Lessons and Instruction Service when you finish.

Find out what Radio offers you

Act today. Mail the post card below. My 64-page book will be sent free to any ambitious fellow over 15 years of age. It tells about Radio's opportunities—explains the eighteen star features of my Course—shows letters of what others are doing and making. There is no obligation. Put a one cent stamp on the post card and mail it now.

J. E. SMITH, President
NATIONAL RADIO INSTITUTE
WASHINGTON, D. C.

"Find Out What Radio Offers You
MAIL THIS NOW"

Mr. J. E. SMITH, *President*
National Radio Institute, Dept. 4AB3
Washington, D. C.

Dear Mr. Smith: Without obligating me, send your book which points out the spare-time and full-time job 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.)*

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

Address.....

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

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

Broadcasting engineer
Operator in broadcasting station
Maintenance man in broadcasting station
Superintendent in Radio factory
Engineer in Radio factory
Inspector in Radio factory
Radio operator on ships
Sales manager for Radio stores
Service manager for Radio stores
Buyer for Radio stores
Government Radio electrician
Government Radio supervisor
Operator of government Radio beacon stations
Aircraft Radio operator
Aircraft Radio dispatcher
Television engineer
Television transmitter operator
Television maintenance man
Engineer in commercial Radio land stations
Installation man on loud speaker systems
Serviceman on loud speaker systems
Automobile Radio installation and service man
Police Radio transmitter operator
Police Radio receiver serviceman

Here's Proof

$50 to $75 a week

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

"Made $6,000 in 2 years"

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

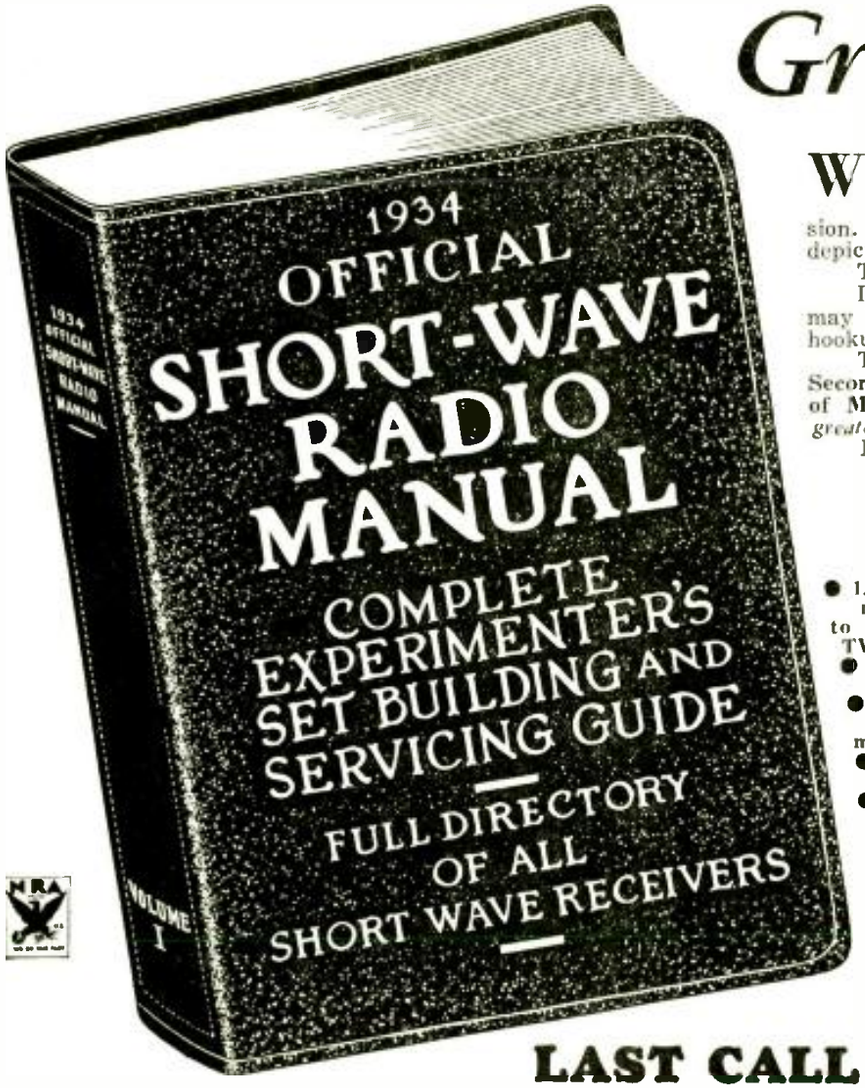
"$500 a Year in Spare Time"

"Although doing spare-time Radio work only, I have averaged about $500 a year extra in addition to my regular income. Full-time Radio work would net me many times that amount."—EDW. H. FAWCETT, Slough Road, Ladner, B. C., Canada.

"Good Position, Good Pay"

"I am Chief Operator at Radio Station WSMK. This is a good position, with good pay. I have advanced in Radio right along. I recommend N. R. I. to anyone who wants to be successful in Radio."—JOHN HAJDUK, JR., 3 Broxey Apts., Southern Hills, Dayton, Ohio.

Greatest Short Wave Book!



WE are pleased and proud to announce the greatest and most complete work on *SHORT WAVES* which has ever appeared in print.

There has been a big boom in short waves during the past two years in spite of the depression. Tremendous progress has been made, yet up to now there has not been an adequate book depicting ALL the progress that has been made.

THE OFFICIAL SHORT-WAVE RADIO MANUAL now fills this need completely.

It is a big book in which you will find EVERYTHING in short waves, no matter what it may be. It is not only a complete manual, but it is a veritable encyclopedia of facts, information, hookups, illustrations. It is impossible to explain the entire volume in a few sentences.

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

Here are the contents of the book:

14 VALUABLE FEATURES

- **1. THE LARGEST SECTION, featuring the most important short-wave receivers and how to build them, EVER ASSEMBLED BETWEEN TWO COVERS.**
- **2. Short wave amateur transmitters in all their phases.**
- **3. A complete Ultra Short Wave section featuring construction of 1, 3, 5 and 10 meter receivers.**
- **4. A complete Short Wave beginner's section.**
- **5. A large section devoted exclusively to short wave coil winding and all about it.**
- **6. The most complete section of commercial short wave receivers in print. Every important commercial Short Wave receiver (this includes all wave receivers) is represented WITH FULL SERVICING data. *Invaluable for Service Men.***
- **7. A large section devoted to A. C. short wave power packs and how to build them. from 1 to 7 tube receivers.**
- **8. A big section for the Short Wave experimenter on short-wave kinks—hundreds of them.**
- **9. A section on the important new art of short-wave therapy (treatment of diseases by short waves).**
- **10. A section devoted exclusively to Short wave converters. This includes how to build them, as well as commercial models with FULL SERVICING DATA.**
- **11. An important section on Short Wave antennae and noise eliminating procedures.**
- **12. The most complete section of Short Wave Superheterodynes in print. This section includes both how to build as well as commercial models of receivers. The latter with full service data.**
- **13. A section on amateur 'phone transmitters and how to build them.**
- **14. A Short Wave Physics section on theoretical Short Wave data for the advanced experimenter, as well as student.**

THE OFFICIAL SHORT-WAVE RADIO MANUAL contains hundreds upon hundreds of illustrations and hookups that are invaluable to you as a short-wave enthusiast. It contains a veritable "gold-mine" of information.

Over 200 big pages
Over 1,000 illustrations
Size 9x12 inches
Flexible, loose-leaf binder

LAST CALL

SPECIAL PRE-PUBLICATION OFFER: You now have the opportunity to order this book before it comes off the press and save money. The price of the new OFFICIAL SHORT-WAVE RADIO MANUAL will be $2.50 as soon as it comes off the press (late in October). No reduction in price will be made later. To you who order this book before publication the price is $2.00.

As soon as the OFFICIAL SHORT-WAVE RADIO MANUAL is published the pre-publication price will be immediately withdrawn. It is to your advantage to order your copy today.

IMPORTANT!

Inasmuch as this is the first time that such a monumental work in short waves has been published, Mr. Hugo Gernsback has consented to personally autograph the first one thousand copies, all of which are numbered. If you wish an autographed copy of the Manual, place your order immediately.

Clip—Mail This Coupon Today!

SHORT WAVE CRAFT, 1-34
96-98 Park Place,
New York, N. Y.

Gentlemen: I enclose herewith my remittance of $2.00 for which please send me one copy of the 1934 OFFICIAL SHORT-WAVE RADIO MANUAL, at the pre publication price of $2.00. I understand that the price of the book will be $2.50 as soon as it is published. (Send remittance, check or money order. Register letter if it contains cash or currency.)

Name .....

Address .....

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

IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Mitchell • Granger • Hill • Shuart • Victor • Silver

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

Contents for January, 1934

FEATURES IN NEXT ISSUE

The "Globe-Girdler" 7, by L. Victor, W2DHN, and E. Kahlert, W2BHZ. A dandy band-spread superhet for "fan" or "ham" use.

Stability in Receivers—How To Attain It, by Curtis E. Malsberger.

A Brand New 5-Meter Receiver, Using 3 of the New Tubes, by George W. Shuart, W2AMN.

3 Tubes-5!—Not a Reflex! In the new "Wonder" Receiver: Works loud speaker! By Harold Mitchell.

A French Prize-Winning Transmitter.

250-Watt Crystal Controlled Transmitter.

Certified Circuits

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

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

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

OUR COVER

• OUR cover illustration this month portrays a "Short-Wave Fan's Dream." As our artist has cleverly depicted, even the bed has become transformed into a short-wave receiver. Undoubtedly if the truth were known, many short-wave fans have experienced just such a dream under the spell of hearing the DX stations in Europe.

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. . . SHORT WAVE ESSENTIALS

FOR MEMBERS OF THE SHORT WAVE LEAGUE . . .

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

A FEW WORDS AS TO THE PURPOSE OF THE LEAGUE

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

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

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

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

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

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

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

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

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

SHORT WAVE LEAGUE LETTERHEADS

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

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

A—50c per 100

OFFICIAL SHORT WAVE LEAGUE LOG AND CALL BOOK

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

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

B—25c per copy

RADIO MAP OF THE WORLD AND STATION FINDER

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

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

GLOBE OF THE WORLD AND MAGNETIC COMPASS

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

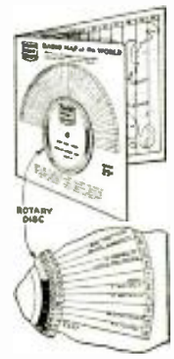
D—Globe of the World ..... Prepaid **$1.25**

SHORT WAVE LEAGUE LAPEL BUTTON

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

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

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



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

G—15c for 25

F—25c each

E—35c each

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE (1-34)
98 Park Place, New York, N. Y.

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

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

I own the following radio equipment:

Transmitting .....

Call Letters .....

Receiving .....

Name .....

Address .....

City and State .....

Country .....

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

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

.....

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

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

(1-34)

HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Short Waves In Space

An Editorial By HUGO GERNSBACK

● IT seems to be pretty well proven that radio waves, up to a certain wavelength, are reflected from the Heaviside Layer. The action is here as though, instead of radio waves, we had to do with light waves, and the Heaviside Layer may be compared to a highly polished mirror surrounding the entire earth at a distance of about 80 miles. This is the best explanation of why the radio waves can be made to go half-way round the world, from transmitter to receiver. Radio waves from several thousand meters down to about five meters act in this manner; that is, the waves are seemingly reflected by the Heaviside Layer, which is composed of *ionized* gases, making a more or less conductive mirror which confines and guides the waves. But when we come to the shorter waves, from 5 meters downwards, a new phenomenon occurs, and the Heaviside Layer does not work any more as it did with the longer waves. As the wavelength is decreased, the Heaviside Layer seemingly becomes less and less effective. As we go downward in the wavelength range, we come to a point in the ultra-short-wave spectrum, from 2 meters downwards, where the Heaviside Layer has no further effect, and the waves are no longer refracted like the longer waves.

The waves now begin to act as if, instead of the highly-polished mirror, the former reflector has now become transparent, as if without its silver coating; and the very short waves instead of being reflected and refracted from point to point, pass right through the transparent mirror out into space. There are indeed some mirrors made with a very light silver coating, through which light will pass; so that you can see the light right through the mirror. This analogy holds true with the Heaviside Layer, when it comes to ultra short waves; and this is the reason why, when we work with ultra short waves, it is no longer possible for us to get a signal originating much beyond the horizon.

Thus, if you have a transmitter on the ground, and a receiver about 25 miles away, it is necessary that the two shall be able to "see each other." If the transmitter or the receiver is placed beyond the horizon, so that the curvature of the earth intervenes, no transmission is possible normally. There are some exceptions to this, as Marconi has pointed out, since he has found it possible to go as far as some 137 miles and still have reception. What the exact action is, in this case, we do not know today; but even Marconi admits that most of the energy goes right out into space and is lost. Only a small portion of the radio wave is received. It may be refracted in the air, just as sunlight is refracted in the atmosphere when it is possible to see the rays of the sun, although the sun has set below the true horizon.

Scientists, however, are pretty well agreed that, when it comes to ultra-short waves, most of their energy actually escapes into space, beyond the confines of the earth.

What happens to these ultra-short waves, as they travel through interplanetary space, never to return, no one, of course, knows at the present time. They are assumed to obey the same physical laws as light rays, which we see all about us, coming from space. As the propagation of the ultra short waves is at the same rate of speed as that of light rays (*i.e.*, 187,000 miles a second) it will be seen that, if there is sufficient energy behind the waves, those directed towards the moon, for instance, will arrive on our satellite within 1¼ seconds. If directed toward our nearest planet, Venus, the ultra short waves would arrive in some 2½ minutes—at the time of opposition, when the distance between the two planets is about 26 million miles. But this requires a sufficient amount of energy; because, if the energy behind them is too small, the distance reached by the waves will not be very great.

The ultra short waves may experience in open space other adventures of which we know absolutely nothing today. Scientists, for a number of years, have received so-called "echoes" from short-wave transmissions; the "signal" of the transmitted wave came back again sometimes after several seconds had elapsed since it was transmitted. This would call for another "ionized layer," far beyond the atmosphere of the earth, even beyond the orbit of the moon. That such an invisible sphere, millions of miles away from the earth, may exist is not impossible. It need not be, of course, an atmospheric layer; because at such distances from the earth we have almost a perfect vacuum. Yet there may be a "shell" of electro-magnetic force extending several million miles away from the center of the earth, of which we are, as yet, quite ignorant. Such a "shell" might be created from the combined effect of the earth's magnetism and the sun's magnetic field, and this terrestrial magnetic shell might have the necessary properties to reflect the ultra-short waves. This, at least, would account for the long-time echoes, which have actually been verified by a number of experimenters.

If this theory does not hold water, we are forced back upon the "dust-particle" theory. It is well known that the earth is continuously bombarded by microscopic meteorites, which actually fall by the million on the earth every day. Most of these meteorites are so small that they can only be called particles of dust; but this process goes on day after day, year after year. It is conceivable that, due to the action of the gravitational field between the sun and the earth, as well as the moon, there might exist such a dust shell, which would account for the echo action of the ultra-short waves. Of course, one guess is as good as another at the present time, and only long experiment by physicists will give the actual clue to the present riddle.

It seems that study of the action of short waves, in open space, will help us tremendously in our astronomical knowledge in years to come. Not only that but, from a practical standpoint, we are assured that, when rocket transportation comes, and when it becomes feasible to send rockets from the earth to the moon, and perhaps to other planets, it will be possible to effect radio communication by means of ultra-short waves, between the earth and the "space-flyers"—a thing that was not believed a few years ago, but which seems to be pretty well established today.

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WHEN Little America SPEAKS

By H. WINFIELD SECOR

● OVER 10,000 miles of land and sea short waves will carry the voice of Little America. The first broadcast from Admiral Byrd's Antarctic Expedition was picked up from his vessel, the *Jacob Ruppert*, as it proceeded toward its destination down the west coast of South America. Regular weekly broadcast programs will be picked up from the Byrd Expedition while the ship is carrying his party of hardy adventurers to Little America, also from Little America itself after the radio, scientific, and food supplies have been landed on the ice and quarters established. The party expects to be able to support their antenna at Little America from the towers erected by the last expedition, but in the event that the severe Antarctic storms have blown them down, material for new towers is being carried by the new expedition.

The good ship *Jacob Ruppert* carries a remarkable assortment of radio transmitting and receiving equipment, most of it being of the short wave or high frequency type. The radio stores contain over 2000 pieces of transmitting and receiving equipment, weighing about three tons. Among other short-wave apparatus carried by the Byrd Expedition there are 10 transmitters, 14 receivers, 143 transmitting tubes, 440 receiver tubes, 115 quartz crystals, 23 microphones, 2 complete recording machines, and 55 measuring instruments.

Little America Will Talk to Us

Admiral Byrd's Second Antarctic expedition is carrying a complete 1000 watt transmitting set, which will enable programs to be broadcast from Little America to the Columbia Broadcasting System, and, through their central distributing plant, located in New York City, to fifty-nine key broadcast stations scattered across the United States. The Byrd broadcasts from Little America will also be sent via Columbia's short-wave station W2XE across the ocean to Europe, as well as Northward over Canada, and Westward across the Pacific. The broadcast from Little America can also be heard in various other countries, including Australia, where the signals from the 1000 watt transmitter may be picked up direct.

Weekly Programs from Byrd

So, every Saturday night at ten o'clock when Little America is put on the air thousands of listeners will hear the voices of Admiral Byrd and others in his expedition "way down south" in Little America, where the temperature may be anywhere from 50 to 80 degrees or more below zero. Admiral Byrd's first expedition was well equipped with short-wave communication apparatus, but only official messages were sent by code from Little America and no broadcast programs emanated from the expedition itself. Elaborate plans have been worked out by the engineers of the Columbia Broadcasting System, with the help of experts of the Radio Corp. of America and T. S. McCaleb of Harvard University. A great deal of credit for the whole program, as finally worked out, is due to Edward King Cohan, technical director of the Columbia System.

● SHORT WAVE listeners will hear the voices of Admiral Byrd and members of his expedition as they speak each week from *Little America*. This is, without a doubt, the most ambitious short-wave engineering feat ever attempted. The Columbia Broadcasting System, who have the honor of presenting the voice of *Little America* over 59 of their broadcast stations in this country, during the sojourn of the expedition in the Antarctic, are to be highly complimented. The airplanes and even the dog-sleds to be used by Admiral Byrd will all be fitted with short-wave transmitters and receivers.

How Little America Will Transmit Programs

The programs from Little America will not be picked up directly over the 10,000 mile gap to New York, but the 1000 watt transmitter and directive antenna at Admiral Byrd's quarters will carry the voice about 4000 miles to Buenos Aires, S. A., where a *relay station* has been arranged for. From this point another powerful short-wave transmitter will take up the work and instantly hurl the broadcast northward, where it will be picked up at the R. C. A. Communications receiving station at Riverhead, L. I. The program will then be transmitted over an 80 mile telephone circuit to New York City where the C. B. S.'s main studio and distribution center is located at 485 Madison Avenue. From here the program will be sent over the leased telephone wire circuit to fifty-nine broadcast stations of the ninety-odd in the Columbia System.

Broadcasts to Little America

Admiral Byrd's men will hear plenty of music, songs, and talks whenever the operators care to tune them in most probably, as those on the last expedition heard many broadcast stations, including those in Australia and other countries. If special programs are to be broadcast to Admiral Byrd's expedition at Little America, they will usually be staged in the Columbia studios in New York City, the program being transmitted by wire to the R. C. A. transmitting station at Rocky Point, Long Island. The powerful short-wave *beam* stations located in Europe, particularly the German. French, English, and Spanish stations will undoubtedly be heard regularly in Little America. In the event that trouble is experienced in the reception of special programs intended for it, the programs can be relayed by short waves through other stations in the same way as the programs emanating from Little America are handled, via the relay station at Buenos Aires for example.

Radio Equipment on the Jacob Ruppert

The radio equipment installed in the operating room on board the *Jacob Ruppert* is almost parallel with that found on an important naval vessel. First, we have the highly important code or "CW" transmitting and receiving equipment, which handles the official business of the expedition via the Mackay radio system. The special "broadcast" program emanating from the ship are transmitted by a special phone transmitting set using 1000 watts and employing large vacuum tubes, of course. One of the principal receivers installed on board the *Jacob Ruppert* is one of the famous National AGS communications type receivers. This type of receiver proves particularly valuable for operation on an expedition of this kind as it provides single dial tuning. A complete set of the special AGS coils, covering all conceivable wave bands, is included and mounted just above the receiver as the photo shows. Just above the receiver at the right of the panel, as shown in the picture, are four control knobs. These control the current in the four microphones installed in the ship's broadcasting studio, which is a small room about 6 x 8 feet and adjacent to the radio control room. So scarce is space for anything on board the ship that there are four bunks in the studio and four of the radio crew have their sleeping quarters here.

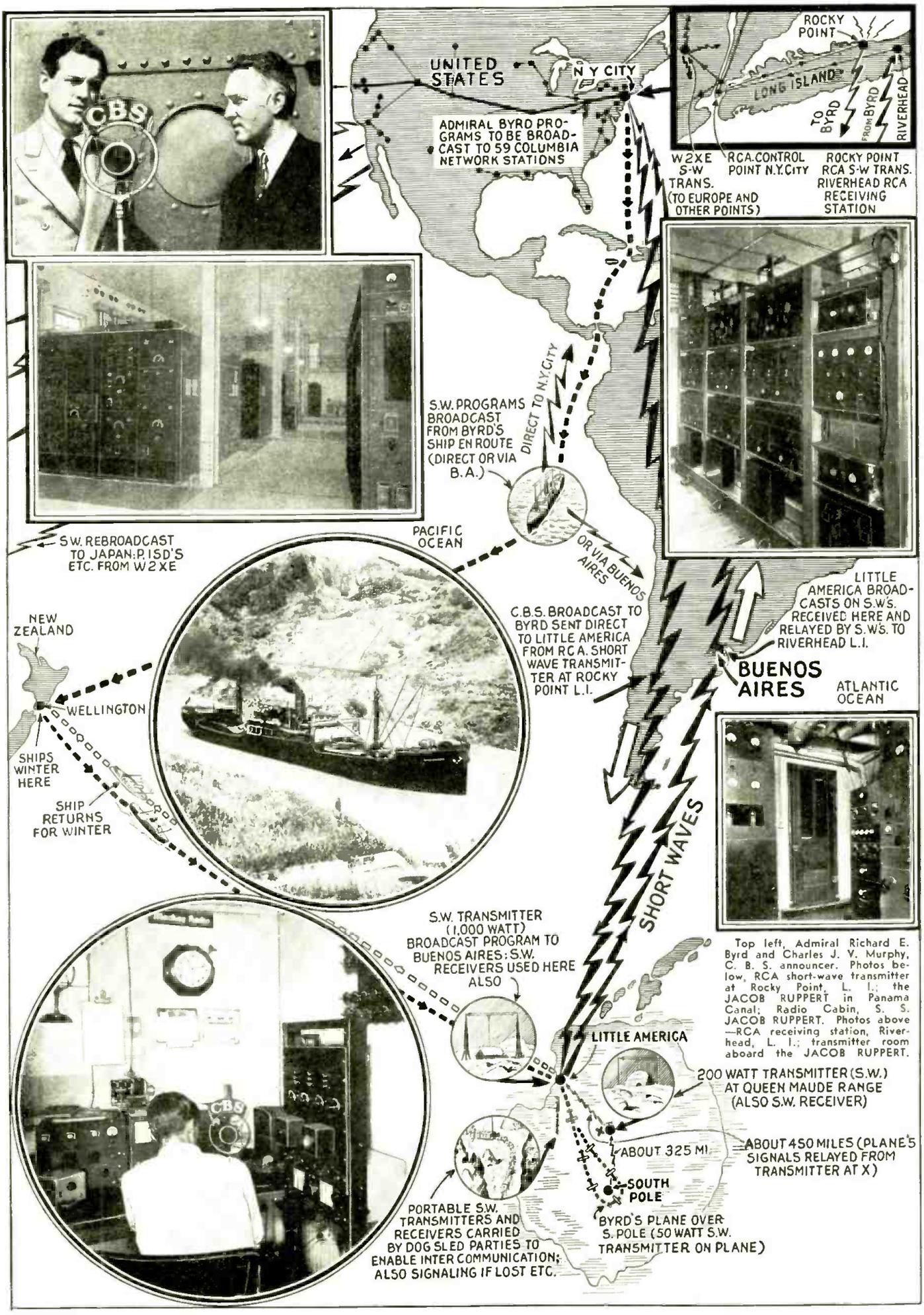
The ship's equipment includes receivers designed for reception on the broadcast, as well as the longer waves.

Trained Broadcast Men With Expedition

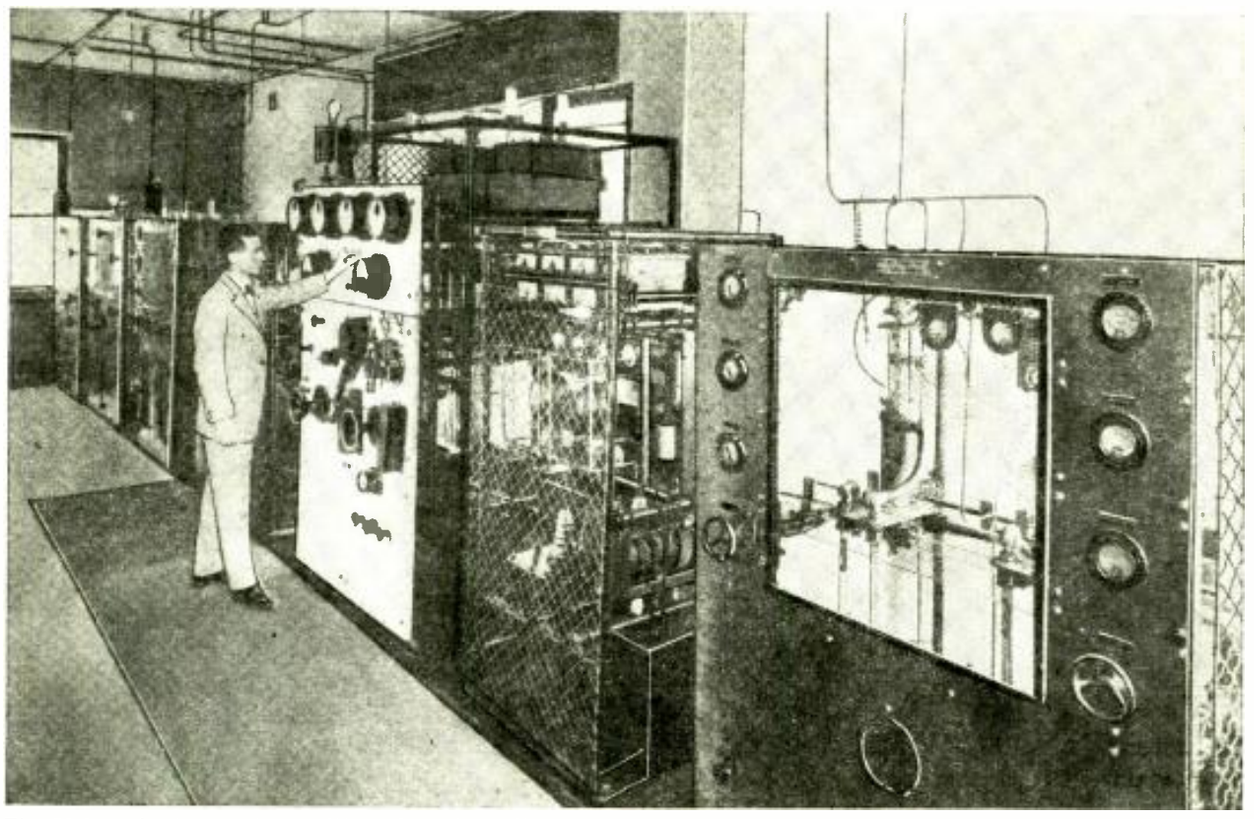
Those of our readers who have a bent for adventure will undoubtedly envy the two men the Columbia Broadcasting System sent with the expedition and who will stay with it during the two years' sojourn in the frigid wastes of the Antarctic. These two men are John N. Dyer, engineer, and Charles J. V. Murphy, who will act as production man and announcer.

It is really remarkable to see how completely the whole Byrd radio pro-

(Continued on page 551)



Top left, Admiral Richard E. Byrd and Charles J. V. Murphy, C. B. S. announcer. Photos below, RCA short-wave transmitter at Rocky Point, L. I.; the JACOB RUPPERT in Panama Canal; Radio Cabin, S. S. JACOB RUPPERT. Photos above—RCA receiving station, Riverhead, L. I.; transmitter room aboard the JACOB RUPPERT.



The 20 kw. short wave transmitter of station VK2ME, designed and manufactured in Australia by Amalgamated Wireless (A'sia) Ltd. and installed at A. W. S. Radio Centre, Pennant Hills, near Sydney, for use in the A. W. A. World-wide Broadcasting Service.

VK2ME—The Short-Wave VOICE OF AUSTRALIA

● THE short wave World-wide Broadcasting Service of Amalgamated Wireless is effected from Station VK2ME which is located at the A. W. A. Radio Centre at Pennant Hills, 14 miles from Sydney.

15 Transmitters at VK2ME

At Sydney Radio Centre, which comprises an area of 40 acres, more wireless transmitters are located under one roof than at any other place in the Southern Hemisphere. Here fifteen transmitters are situated, some of them working almost constantly.

The main mast is 400 feet in height and many aerials are suspended from it to smaller masts, each aerial system provides a different service.

The *studio* of VK2ME is situated at the headquarters of Amalgamated Wireless in York Street in the city of Sydney, and it is from here that all programs are transmitted via landlines to "Radio Centre," at Pennant Hills.

60 K.W. used for 1 Set

The largest transmitter installed at Sydney Radio Centre is the 20 k.w. combined telegraph-telephone transmitter. Actually over 60 k.w. is required to operate this transmitter. 22 large oil and air-cooled tubes are used and these are mounted in 7 separate units.

The transmitter of VK2ME was specially designed for Empire and World-wide broadcasting and the station is known as "The Voice of Australia."

On July 5th, 1931, A. W. A. inaugurated the first regular "world-wide" broadcasting service arranged in an entirely new way, inasmuch as different sections of the world were served by a program at a time most suitable for reception and relay in the respective countries. To accomplish this the transmissions are divided into four periods; the first session covers the western portion of North and South America; the second embraces the southern and eastern portions of Australia, New Zealand, Papua, New Guinea, Fiji, New Caledonia, the New Hebrides and other islands; the third covers Western Australia, China, Japan, Philippine Islands, the Straits Settlements and most of India, and the fourth serves Great Britain, Western Europe, South Africa, Rhodesia and Egypt.

VK2ME is on the air every week-end and uses a wave-length of 31.28 metres which has been proved suitable for long distance work.

VK2ME and 3ME are two outstanding short-wave stations in every short-wave fan's "log." Listeners in the eastern U. S. hear them regularly in the early morning hours. VK2ME is the official short-wave voice of Australia. These stations are the famous "mile-posts" by which listeners judge the DX range of their sets; as they are practically half-way round the globe they represent the prime tests for American receivers.

Time Schedule

It is well-known to radio engineers that at various times of the day radio stations are heard at particular places better than at other times. After about two years of experimenting, the company's engineers worked out the time of the day or night at which VK2ME is best received in various countries. In the light of this information programs are radiated at the following hours:

	Sydney Time	E. S. Time
1st Session Sunday	3-5 p.m.	12 m.-2 a.m.
2nd Session Sunday	7:30-9:30 p.m.	4:30-6:30 a.m.
3rd Session Sunday	9:30-11:30 p.m.	6:30-8:30 a.m.
4th Session Monday	1-30-3:30 a.m.	10:30 a.m.-12:30 p.m.

The program of VK2ME comprises both classical and popular musical

items, but jazz music is omitted. A few waltz compositions are broadcast and usefulness is added to the program by talks on many phases of Australian life. The Australian National Travel Association prepare many of these talks and there is an abundance of evidence that residents of many parts of the world have been favorably impressed with Australia as a place to be visited when opportunity affords.

VK2ME Heard in England Fine

Many "overseas" records have been effected through VK2ME, Sydney. To Australia fell the honor of transmitting the first Empire broadcast program on September 5th, 1927. The reception in Great Britain was remarkably successful, and the program was re-broadcast by the British Broadcasting Corporation to "crystal set" users and other listeners throughout Great Britain. It is estimated that over one million listeners heard the program!

This was followed on October 17th, 1927, by the second and what might be termed the first world-wide program through station VK2ME. This was the first occasion in Australia on which programs were transmitted on dual wavelengths—the normal wavelength of station 2FC, 422 metres for local reception, and that of the special experimental Station VK2ME, 28.5 metres, for overseas reception and re-broadcasting by the British Broadcasting Corporation.

The world-wide interest occasioned by the Eucharistic Congress in Sydney was increased by A. W. A. transmitting the proceedings to England and America through Station VK2ME, and the successful re-broadcasting in the latter country.

VK2ME Transmitted Program to Byrd

Another notable transmission was effected on January 10th, 1930, when the singing and talking portions of the Paramount "talkie" film, "The Love Parade," starring Maurice Chevalier, were transmitted from the Prince Edward Theatre, Sydney, to Admiral (then Commander) Byrd at the South Pole. The transmission was effected on the 20 k.w. overseas transmitter designed and manufactured in Australia by A. W. A.

About half an hour after the transmission, Commander Byrd signalled back via San Francisco and A. W. A. Radio Centre, Pennant Hills:

"2ME Sydney. As Paramount's most southern representatives, at Antarctica, we are pleased to report your fine broadcast of the Paramount Sound Picture, 'The Love Parade,' enjoyed and greatly appreciated. This is the first sound reproduction received here. Admiral Byrd and inhabitants of the Antarctica join us in thanking you for your program and best wishes.—Joseph Rocker and Willard Van de Veer, Paramount's Cameramen in Byrd's Antarctic Expedition."

Station VK3ME, Melbourne.

VK3ME, the Melbourne short wave experimental station of Amalgamated Wireless (A'sia) Ltd., has been in operation with regular programs for two and a half years, and during that time its transmissions have been intercepted in all parts of the world.

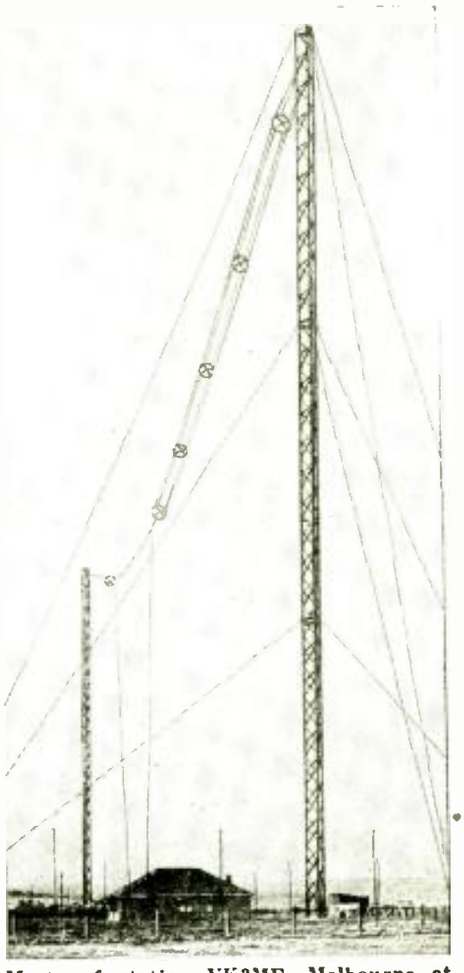
The station operates on a frequency of 9510 k.c. (31.54 metres) and conducts a schedule made up principally of recorded music, each Wednesday from 8 p. m. to 9:30 p. m. Eastern Australian Standard time, and each Saturday from 8 p. m. to 10 p. m. E.A.S.T.

In spite of the fact that the aerial power of the station is less than 2 kilowatts, VK3ME puts down a considerable field strength not only in Australia, but in many overseas countries, particularly the United States of America.

Prior to the commencement of a regular scheme of transmission, the station was used extensively for long distance experimental work, and in collaboration with the General Electric Company of America much valuable data was secured. A notable example of two-way working in which VK3ME and W2XAF, Schenectady, N. Y., took part, was the occasion on which the Rotary Club of Melbourne and the Rotary Club of Schenectady conducted a joint meeting some eighteen months ago. Loudspeakers in the respective club-rooms rendered the distant proceedings audible, and the signal from each end was of such strength and clarity as to render the experiment a complete success.

Since the regular service was inaugurated, some thousand or so letters have been received from listeners outside

(Continued on page 548)



Masts of station VK3ME, Melbourne at A. W. A. Radio Centre, Braybrook, Victoria, Australia.

The transmitter of station VK3ME, Melbourne, situated at Radio Centre, Braybrook, Victoria. This Australian-designed and manufactured transmitter is used in the World-wide Broadcasting Services of VK3ME.

The 2-Tube "CHAMP" In Which 2 Tubes = 3

$20.00 Prize Winner for October

By JACK WARING and HAROLD MITCHELL

Left—here we see the 2-tube "Champ" in action! Thanks to the new two-element tubes, this set actually lives up to its name and gives the same results as though 3 tubes had been used.

● INVARIABLY the Short Wave fan or Beginner prefers to "Break the ice," with a one tube or two tube short wave set, and it is because of this that the "2-Tube CHAMP" was designed.

In this compact little two tube short wave receiver we use only two tubes and yet we really get the results of three, and still better than that, many of the major foreign, and practically all of the local and domestic stations operate a speaker.

One of the many features of this set is that it uses one of the new tubes, the 6F7, in conjunction with a '37 type tube. The six volt tubes have been selected in preference to the conventional 2.5 volt tubes since all of us do not have 110 volt A.C. available. We may have to content ourselves with 110 volt D.C., or then again we may want to make it a portable affair. Therefore the power supply must be constructed to meet with your requirements or preference.

The 6F7 Tube

The new type 6F7 tube is a Pentode-Triode (really two tubes with a common filament), in one bulb. One of the many advantages in using this type tube is that you not only save the cost of additional parts, but valuable space as well. And you actually do get the result of two tubes.

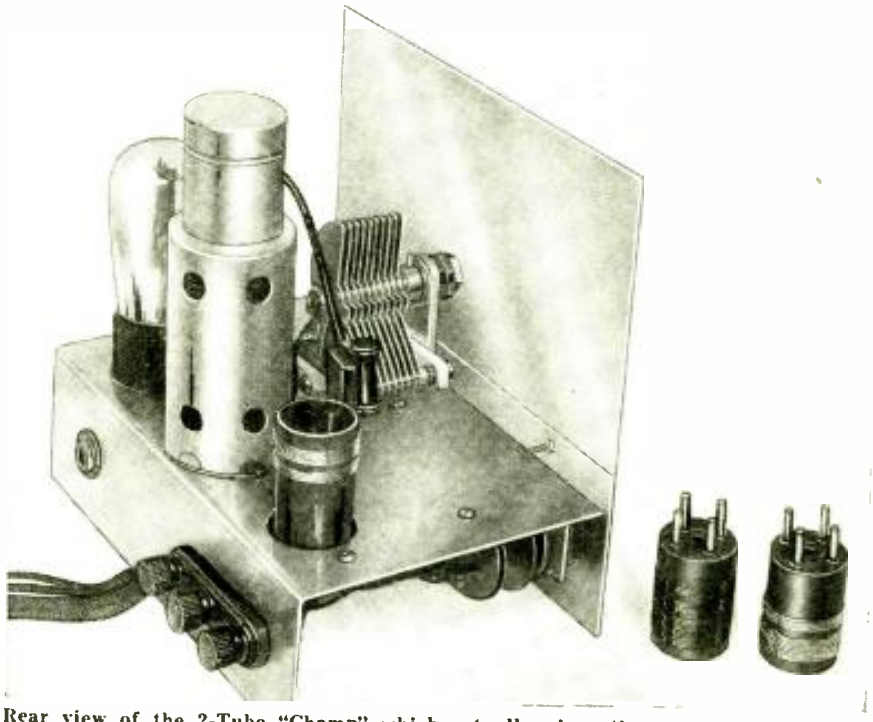
Description of Set

The set is built up of mostly National parts. The *pentode* portion of the 6F7 operates as the detector, and the *triode* portion as the first audio amplifier. Beginning with the high frequency end of the set we connect a lead from the antenna or aerial post to the stator plates of the antenna trimming condenser. This condenser has a capacity of .000025 microfarad, and its function is to adjust, or permit adjustment of the antenna circuit. From the rotor plates of this condenser, which incidentally is insulated from the chassis, we bring a lead to the grid side of the plug-in coil socket and to the stator plates of the main tuning condenser, which has a capacity of .00015 microfarad. From this point also we bring a lead to a .0001 mf. mica grid condenser which is shunted by a two megohm leak, or resistor. To the other side of this grid condenser and leak is connected the lead which goes to the control grid of the pentode portion of the 6F7 tube which is the terminal on the top of the tube.

The rotor plates of the main tuning condenser and the other side of the plug-in coil connects to ground. The screen-grid of the detector goes directly to the arm of the regeneration control at which point it is by-passed to ground with a half microfarad condenser. One side of the regeneration control which is a 100,000 ohm potentiometer, goes to ground and the other side goes to a 150,000 ohm resistor which in turn connects with the high voltage or "B" positive.

The cathode of the 6F7 tube is connected to ground through a five hundred ohm resistor which is by-passed with a tenth microfarad condenser. The grid of the triode portion of the "Six-F-Seven" tube goes to a one megohm resistor to ground and to a .01 mf. condenser. The other end of this condenser goes to the "B" positive terminal of the tickler winding of the coil socket through an R.F. choke.

The tickler coil end of the radio frequency choke is by-passed to ground



Rear view of the 2-Tube "Champ" which actually gives the same results as any ordinary 3-tube set; phones or loud speaker may be used.

through a .00025 mfd. condenser, and to the other end of the choke is connected a 250,000 ohm resistor the other side of which goes to "B" positive. The other side of the tickler winding, or the plate terminal of the coil we connect to the plate of the pentode section of the 6F7 tube.

The plate of the Triode portion is connected to a coupling condenser of .01 mf. and to "B" positive through a 250,000 ohm resistor. The other side of this coupling condenser goes to the grid of the '37 type tube socket and to a one megohm resistor to ground.

The cathode of the '37 type tube is now connected to a one thousand five hundred ohm bias resistor the other side of which is connected to ground.

To the plate of the '37 type tube we run a lead to one of the output terminals. The other output terminal goes to "B" positive.

"B" minus naturally goes to ground or chassis.

There is nothing very complicated about this set however, careful wiring is recommended for the success of this delightful little receiver, which is very easy to operate and it makes one of the dandiest little stand-by receivers you ever saw or heard, and is therefore ideally suited to the "Ham" that is particular.

There are no special adjustments to be made. After the wiring is completed, it should be carefully checked, and if correct, you are ready to tune in short wave stations, after having connected a suitable power supply.

Everyone is interested in obtaining the greatest output from a radio set using the least number of tubes. Here we have an ultra modern 2-tube receiver which has actually brought in European stations on a loud speaker. This set uses two of the latest style tubes and it makes an ideal "low-cost" set for the beginner, while the few parts used render its construction very simple.

The coils are wound on the National small type forms which are made of the new "low-loss" insulating material for high frequencies known as R-39.

The physical dimensions are: panel 7 x 6½, and the chassis 7 x 4 x 2. Both panel and chassis are made of aluminum.

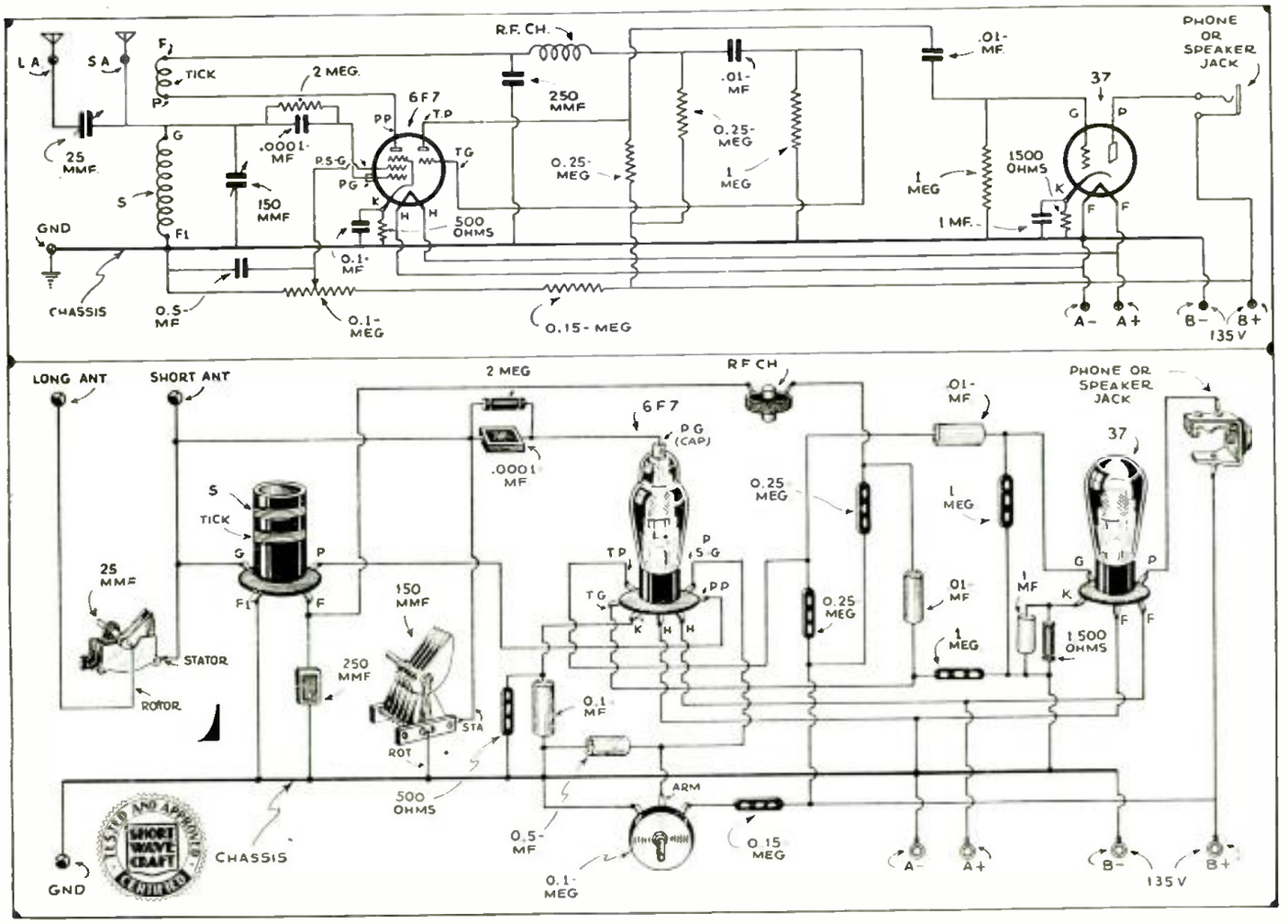
Parts List

1 National Dial type B
1 National R.F. Choke 2.5 M.H.
1 National Tuning condenser type SE-100 (100 mmf.)
1 National .000025 mf. Variable condenser
1 .0001 mf. condenser
1 .00025 mf. condenser
2 .01 mf. condenser
1 .1 mf. condenser
1 .5 mf. condenser
1 2 megohm resistor Lynch
2 1 megohm resistor Lynch
1 150,000 ohm resistor Lynch
1 100,000 ohm resistor Lynch
1 250,000 ohm resistor Lynch
1 1,500 ohm resistor Lynch
1 '37 type socket
1 6F7 type socket
1 UX blank socket
1 500 ohm resistor Lynch
1 100,000 ohm potentiometer; Acratest
1 chassis 7 x 4 x 2
1 panel 7 x 6½

Data for Winding Coils

Range in meters	Grid—size wire	Plate—size wire
14 to 22	6 turns 26 D.C.C.	6 turns 26 D.C.C.
20 to 40	12 turns 26 D.C.C.	8 turns 26 D.C.C.
40 to 80	25 turns 26 D.C.C.	12 turns 26 D.C.C.
80 to 200	45 turns 30 D.S.C.	15 turns 30 D.S.C.

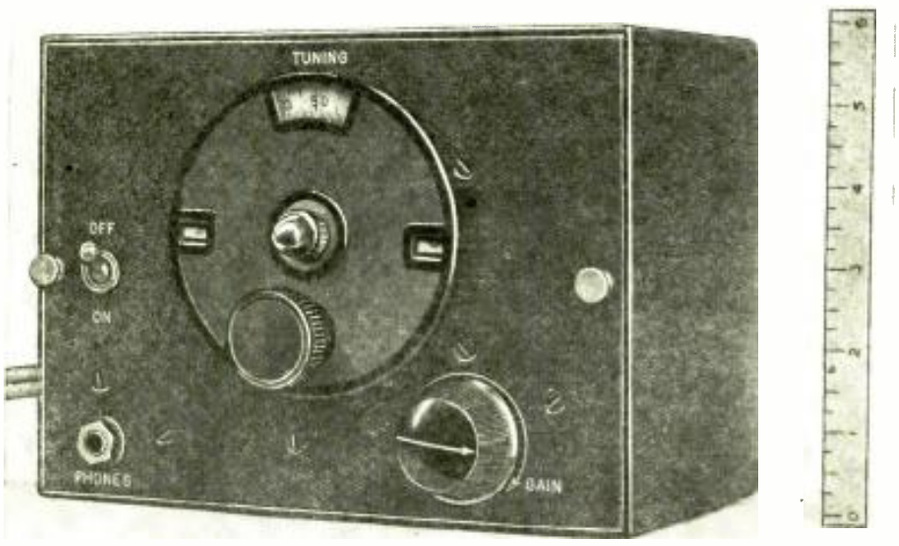
Leave 3-16 inch space between grid and tickler coils. Dimensions of coil forms—1½ inch long by 1 inch in diameter; National 4-pin, special low-loss R-39 insulation forms.



After all, most of us go into the short-wave game for the "fun" we get out of it. The 2-tube "Champ" is so simple to build and wire, with the aid of the picture diagram above, that it is really fun to build the set. And wait till you hear the distant stations roll in like a charm! Oh Boy!

A Symmetrical Input Super-Regenerative Receiver

By H. GRANGER and H. H. HILL



Front view of the "symmetrical input" super-regenerative receiver developed and here described by Messrs. Granger and Hill.

● THE super-regenerative receiver has some advantages, such as very high gain with few tubes, but in some cases, its inherent disadvantages, such as relatively high noise level, make the experimenter want something better. An effort is made herein to present a super-regenerative receiver that the average experimenter can build for use in the 56 megacycle band. A great many radio experimenters can not afford to build a super-heterodyne receiver for use on these high frequencies and at the present time, about the only thing remaining that is at all suitable for use at ultra high frequencies is the super-regenerative receiver. The new receiver described in this article has several novel features, is small, relatively cheap, and in it, all of the bad features of the ordinary super-regenerative receiver have been reduced and some have been entirely eliminated.

Consider the super-regenerative circuit shown in Fig. 1.

The point of maximum stable regeneration in a straight regenerative circuit is reached just below the point of zero input resistance. When the detector is in this condition, the incoming signal "triggers" the circuit into oscillation. Oscillations take place for a few cycles during each signal impulse and high amplitudes are obtained in the plate circuit. If the input circuit contains enough positive resistance to quench oscillations between successive signal impulses, the circuit is maintained at a high degree of sensitivity.

Theoretically, the super-regenerative detector is adjusted to the point of zero or slightly *negative* input resistance and, if the variation frequency is not applied to the detector, it will oscillate continuously and will not be in the most sensitive condition. This is due to the fact that oscillations are built up to considerable amplitude and, therefore, the incoming signal voltage is less effective in changing the plate current than is the case when the detector is held just at the point of oscillation, so that it is "triggered" into oscillation by the incoming signal, allowed to oscillate for a few cycles and then stopped oscillating by injecting a positive input resistance into the circuit.

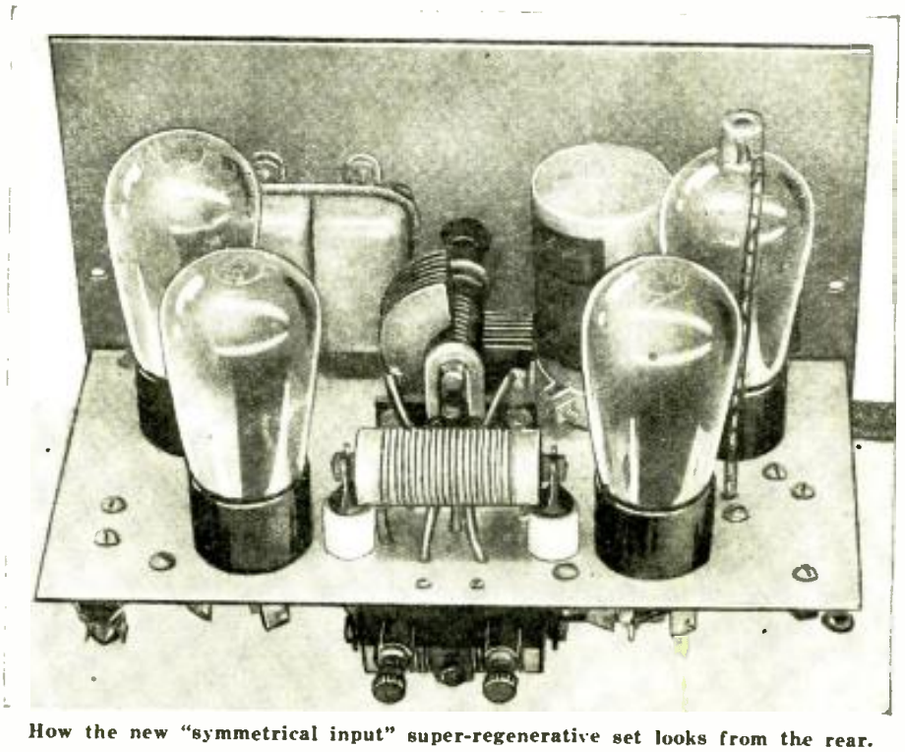
Conditions for Maximum Amplification

The conditions for maximum amplification in a super-regenerative circuit are such that the input circuit is at zero, or at a slightly negative resistance at the beginning of each signal impulse. Then after the signal has "triggered" the circuit into oscillation, there is some means of introducing negative resistance so that high signal amplitudes are rapidly built up in the plate circuit. When this signal disturbance has passed through, say fifty or so cycles, and the maximum amplitude, as limited by tube and power is reached, there is introduced a positive resistance in the input circuit to quench the oscillations and restore the circuit to a high state of sensitivity.

As stated above the super-regenerative detector in Fig. 1, theoretically is adjusted to zero or slightly negative input resistance. A low frequency potential from the variation oscillator is applied to the detector grid. At the beginning of each positive half of the variation frequency cycle the detector begins to become extremely sensitive and thereby is in condition for "triggering" by the incoming signal. The incoming signal impulse "triggers" the detector into oscillation and the plate current amplitude rapidly builds up to the maximum value determined by the tube characteristics and the variation frequency. During the negative half of the variation frequency cycle the detector is blocked (which is equivalent to the introduction of positive input resistance) and the circuit is practically dead. Thus, the detector is kept in the region of zero input resistance where it is extremely sensitive.

This may be stated in another way by the aid of Fig. 2.

The variation frequency shifts the operating point from a high negative



How the new "symmetrical input" super-regenerative set looks from the rear.

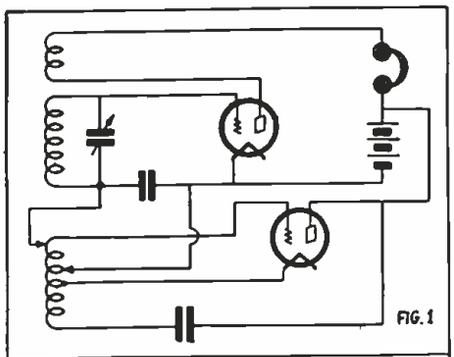


FIG. 1

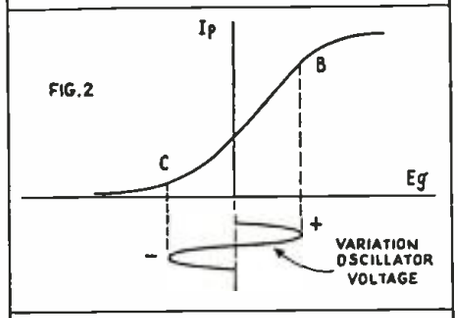


FIG. 2

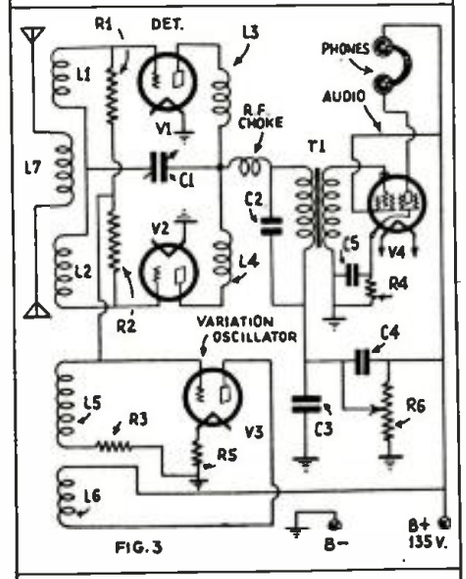


FIG. 3

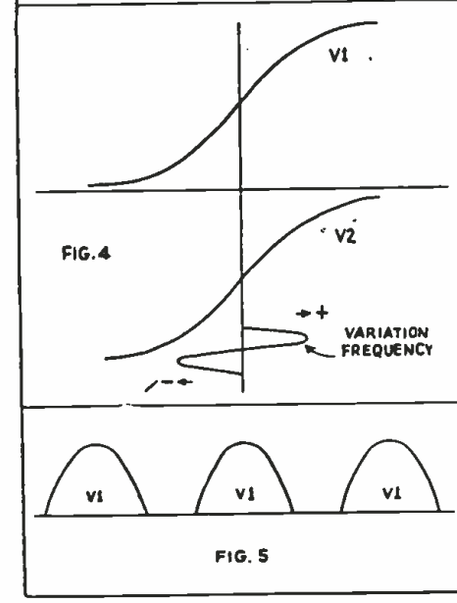


FIG. 4

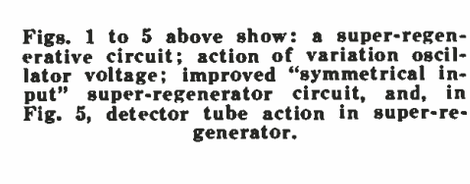


FIG. 5

Figs. 1 to 5 above show: a super-regenerative circuit; action of variation oscillator voltage; improved "symmetrical input" super-regenerator circuit, and, in Fig. 5, detector tube action in super-regenerator.

bias where the detector is blocked (Point C), to a point that gives high amplitude of plate current (Point B).

The variation frequency is governed by the following factors:

(a) The signal impulse in the detector plate circuit should be given time enough to increase to maximum, or near thereto, as limited by tube and power.

(b) The frequency of the variation oscillator must be such that the periods of regeneration are sufficiently close together that the sound variations of the voice frequencies as encountered in telephony are faithfully amplified.

(c) The frequency of interruption of regeneration must not be so low as to cause a disturbing hum or whistle.

From the above it can be seen that, for reasonable quality, the variation frequency must be relatively high. On the other hand, for code signals, the lower the variation frequency used, within limits, the greater is the amplification that will be obtained. This indicates that a compromise must be used for best results. A variation frequency of between 10 and 50 kilocycles is normally used for code work. If the variation frequency is much less than 50 kcs. for phone work, distortion results due to the fact that all components of the modulated signal are not amplified in proportion.

The super-regenerative receiver has been given but scant attention by short-wave experts, and except on the very high frequencies there have been a number of undesirable features manifested in this type of receiver. The authors of the present article have performed a lot of research on the super-regenerative receiver and they give the benefits of their findings herewith, together with a description of the super-regenerator circuit which they recommend. Not only is the improved super-regenerative circuit, which the authors advocate, very sensitive but the "noise-level" has been tremendously reduced—a most important factor!

Efficiency Increases Rapidly With Signal Frequency

It may be said in general that the efficiency of the super-regenerative receiver increases rapidly with the signal frequency. Mr. A. K. Laing, in *Radio News*, January, 1926, states that the amplification obtained at 3,000 kilocycles was nine times as great as that obtained at 1,000 kilocycles. Others have stated that the amplification due to super-regeneration at 8,000 kilocycles was approximately 100 to 1 over

(Continued on page 569)

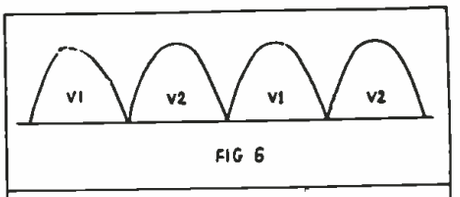


FIG 6

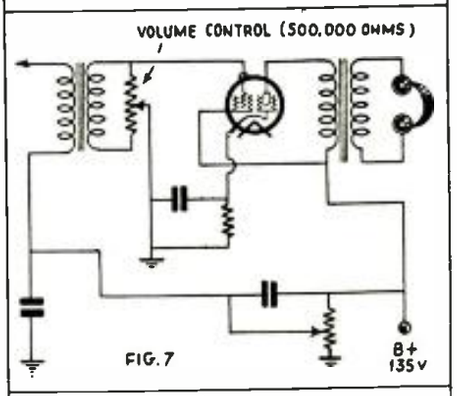


FIG. 7

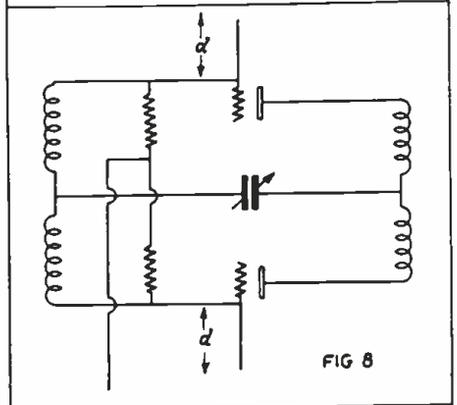


FIG 8

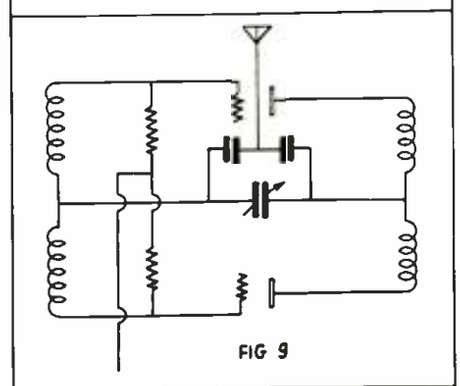


FIG 9

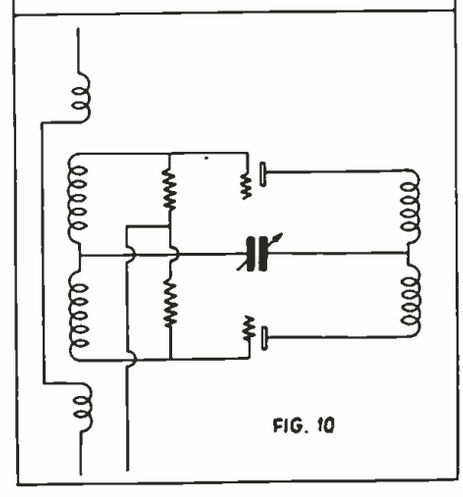
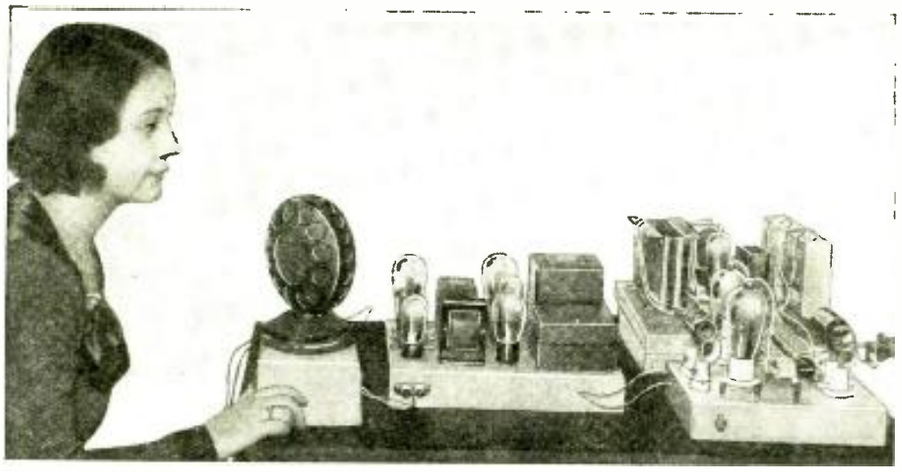


FIG. 10

Fig. 6, double detector tube action; 7, volume control and output transformer hook-up; 8, preferred antenna coupling; 9, another type of coupling, and 10, the final coupling scheme.

5 and 10 Meter Transmitter
Using the 800 or 825 Tubes

By
GEORGE W. SHUART,
W2AMN



The 5 and 10 meter transmitter ready for action; the mike shown happens to comprise an old "commercial" shell, enclosing a moderate-priced amateur type microphone unit.

Reports from many "Hams" during the past month indicate that interest in the 5 and 10 meter field is increasing by leaps and bounds. Several leading "Ham" station operators have complimented Mr. Shuart on the excellent quality and steadiness of the wave radiated by the 5 and 10 meter transmitter here described. Mr. Shuart has thoroughly tested this transmitter and has talked over distances exceeding 30 miles; the possible range is, of course, much greater than this.

● ACTIVITY has greatly increased on the five meter amateur band within the last few months and if past performances are to be considered there should be a constant further increase of interest throughout the winter.

Here in the East (around New York City) each week brings new stations to the five meter band and seldom does a single night pass with no active stations to be heard, whereas a few months ago one could listen for weeks at a time without hearing even a lone station calling CQ.

New equipment has been made available to the amateur within the last six months that should find high favor on the five and ten meter bands. Most prominent of these new apparatus is the new ultra-high frequency tubes, which give very high radio-frequency output at 60 megacycles. It has been a more or less popular opinion that low power was sufficient for the five meter band. In cases of excellent locations this has, in general, proven true. But, we do not all have large enough pocket-books to choose our location and have to be content with what we are fortunate enough to have. And it is in these cases that the greater power made available with the new tubes comes in and saves the day.

Higher Power Does Count!

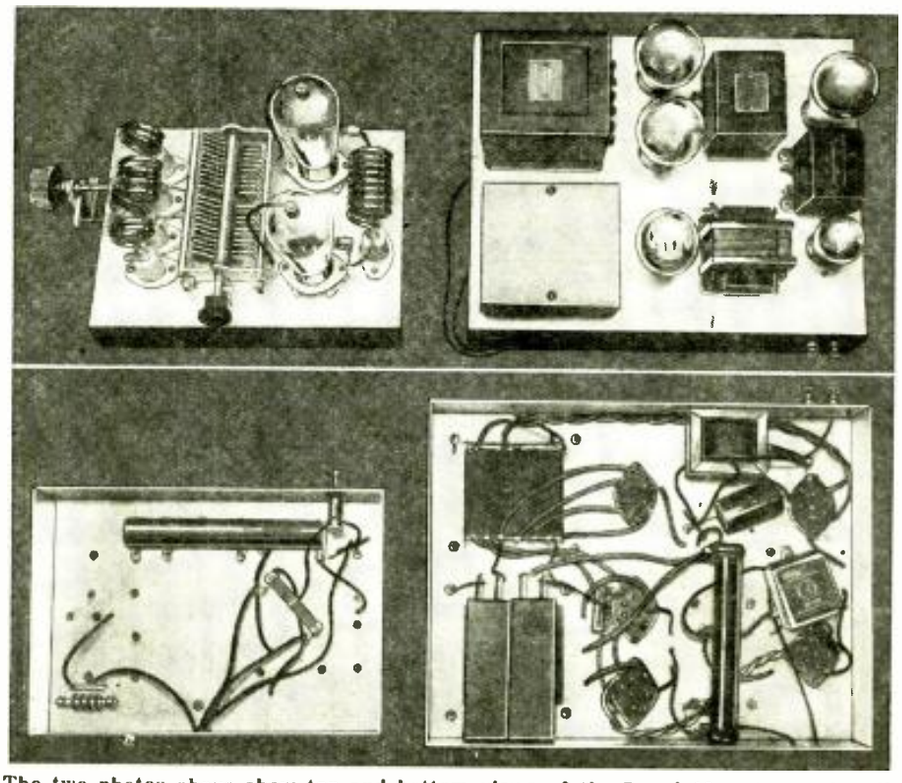
The writer has conducted tests on the five meter band with several types of transmitters of various power outputs and has found that higher power *does* actually give a greater communication range in all respects. We must bear in mind the fact that the present super-regenerative receiver used extensively on the ultra-high frequencies is a very insensitive piece of apparatus, especially to comparatively weak signals. A weak signal has a small chance of competing with the terrific hiss produced by the average super-regenerative receiver. Of course everyone knows that the ultra-high frequency receiver is doomed to take, should we say a gigantic step forward in design, but until then we will have to improve our transmission and let the other fellow worry about reception.

It is the purpose of this article to bring forth a transmitter, which, while not of the highest possible power, shall combine greater stability and considerably higher power and efficiency than any of our former transmitters and still be comparatively simple and not too costly to construct.

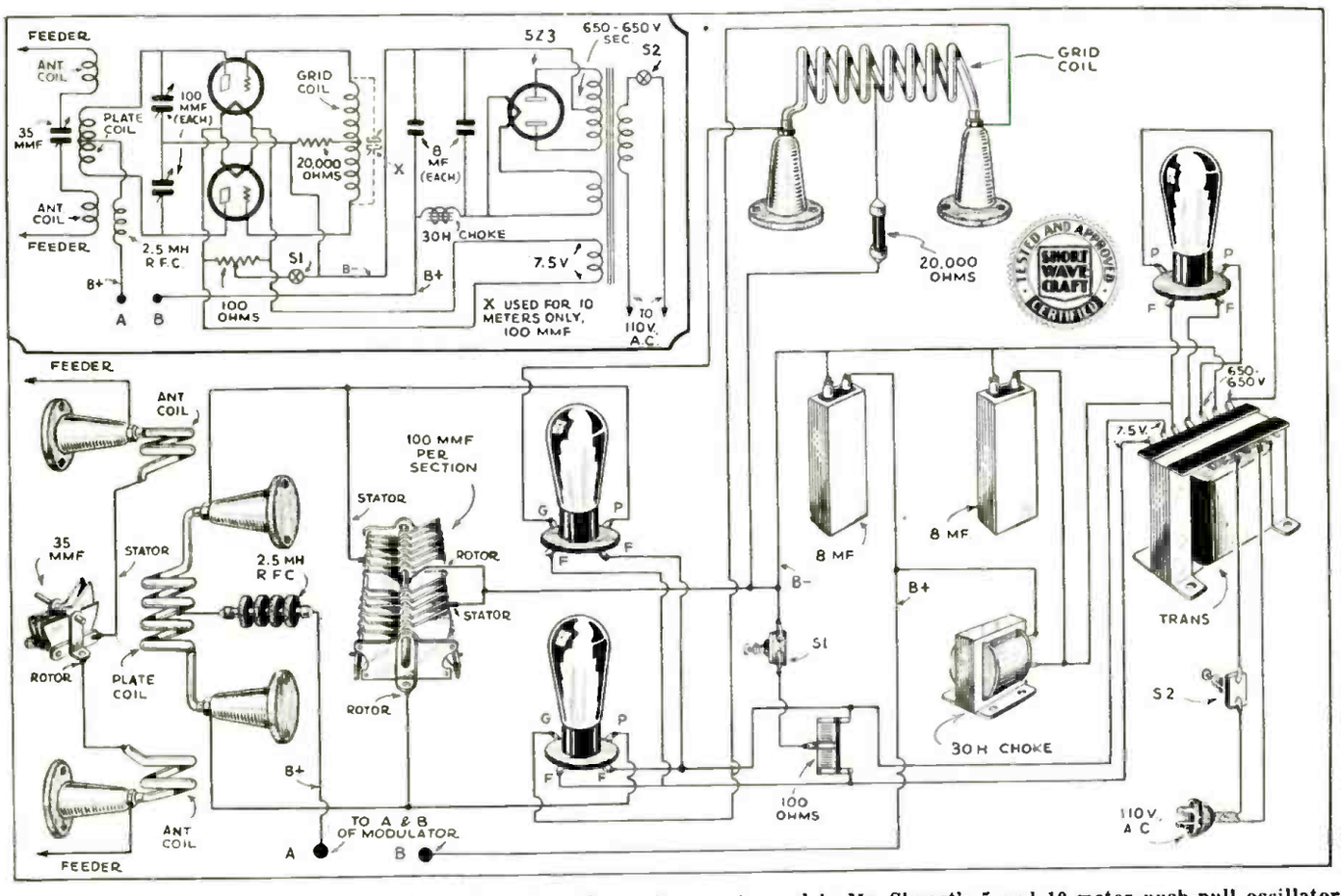
New Tubes Spell "More Power"

This transmitter is constructed to facilitate the use of the new RCA Radiotron type 800 (or Sylvania 825) tubes, which have at this writing, just made their appearance on the market. While these tubes are rated to stand around a thousand volts on the plate no attempt was made to operate them at this value, 650 being the highest voltage applied. With a thousand volts on the plates of these tubes, it would be necessary to have a master-oscillator-amplifier arrangement to main-

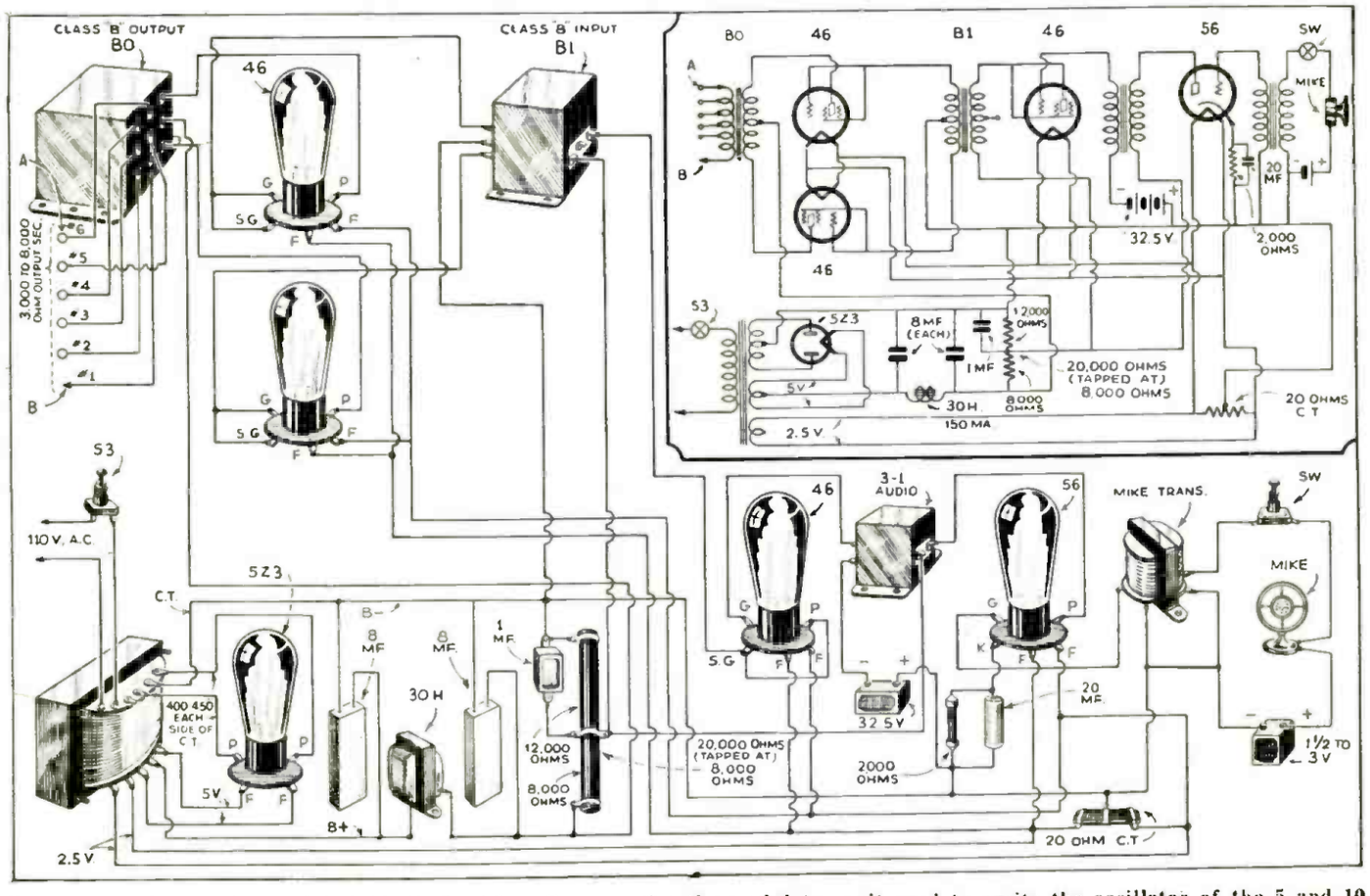
(Continued on page 552)



The two photos above show top and bottom views of the 5 and 10 meter push-pull oscillator and modulator, the latter having its own power supply "built in."



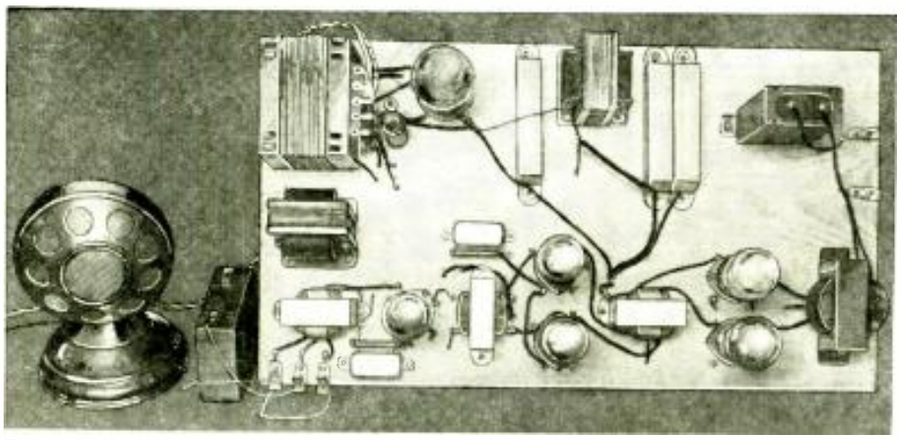
The schematic and picture diagrams above show how the various parts used in Mr. Shuart's 5 and 10 meter push-pull oscillator and power supply are connected together.



Here we have the schematic and physical wiring diagrams for the modulator unit used to excite the oscillator of the 5 and 10 meter push-pull transmitter.

Low-Power Modulator

By LEONARD VICTOR, W2DHN



Top view of the low-power modulator, together with microphone and battery shown at the left of the photo.

Last month Mr. Victor described how to build an improved amateur CW transmitter, with crystal control, which would conform with the latest rules of the F.R.C. In the present article Mr. Victor tells how to build a low-priced yet efficient modulator for use with it.

● LAST month's transmitter story described an 80 or 160 meter code transmitter that is exceedingly adaptable to *phone* work. This transmitter uses *crystal control* which obviates the worry about frequency modulation and allows the modulation of the stage following the oscillator. Also, with this transmitter, it is possible to put out a good strong carrier with 100% modulation, using quite inexpensive apparatus.

Any low-power rig must have excellent stability and very good quality. The transmitter described last month, coupled with the *modulator* unit described in this article, adequately meets all the requirements for good low-power operation.

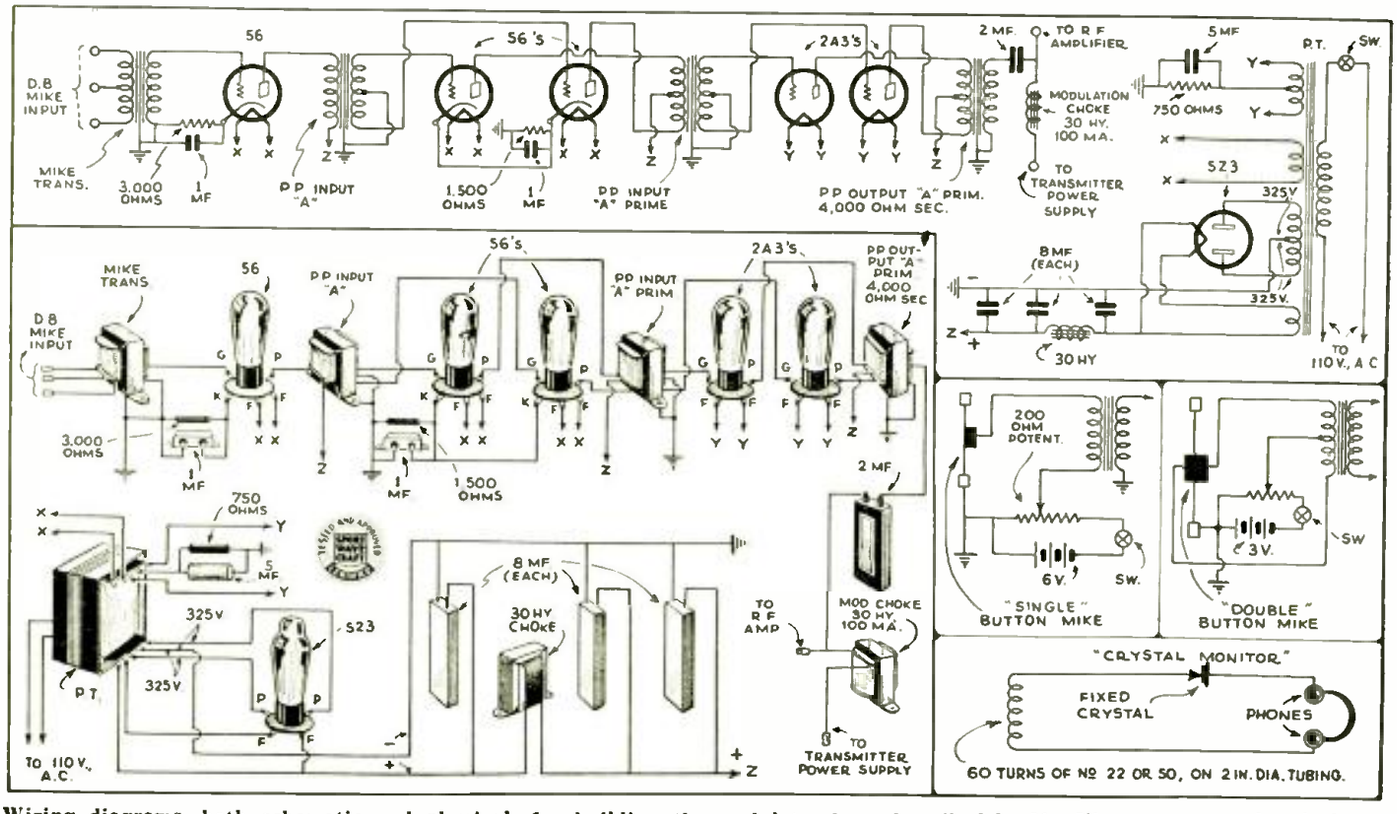
The radio frequency amplifier, using a type '46 tube, is capable of taking 20 watts of power while being fully modulated. Hence, our problem was to secure some modulator (which in reality is only a speech power-amplifier), which would deliver 10 watts of undistorted audio, with good quality, and still not use any costly equipment.

Ordinary audio amplification, known as class "A," is very low in efficiency. To get our needed ten watts of audio, it would be necessary for us to use more than 100 watts input, which is much more than the entire radio frequency end of the transmitter uses.

Recently, however, a new system of audio, known as *Class A Prime*, has come into common use. This system is a hybrid, somewhere between class A and class B in operation. Efficiency with Class A Prime is of the order of 35%, which is much better than the 8% to 10% efficiency obtainable with straight Class A.

One of the new tubes on the market, known as the 2A3, is admirably suited for "A Prime" operation. This tube is a triode, the big overgrown brother of the type '45. A pair of these tubes, operating in push-pull, will deliver between 10 and 12 watts of undistorted audio with only 250 to 300 volts on the plate. Second harmonic distortion with these tubes is very low.

At this point it might be advisable to again repeat the rules for matching the modulator to a radio frequency amplifier. *(Continued on page 554)*



Wiring diagrams, both schematic and physical, for building the modulator here described by Mr. Victor are reproduced above; also, details for connecting single and double button mikes.

SHORT WAVE SCOUTS

FIRST "TROPHY CUP" WINNER

● THE first monthly contest for the silver "trophy cup" to be awarded to the SHORT WAVE SCOUT who submitted the log containing the greatest number of short-wave stations, properly verified, closed November first. Due to the short length of time between the first announcement of the SHORT WAVE SCOUT Trophy Cup Contest and the date of the first contest closing, November 1, only two entries were received. The first prize goes to Heinie Johnson, who wins the SHORT WAVE SCOUT silver trophy cup for the contest which closed November 1; the second entry, received from Warren Mallory, who is awarded Honorable Mention in the October contest.

Mr. Johnson used the well-known "National 45" receiver, with an added stage of tuned radio frequency which he built in ahead of the regular chassis line-up. Mr. Johnson, the winner of the trophy cup in the first or October contest, employed transposition lead-ins connected to specially tuned doublets and he also had at his disposal a directional underground antenna system.

We are pleased to present the "logs" of Messrs. Johnson and Mallory herewith and we hope to have a greater number of interesting short-wave "logs" to present to you next month, the second contest closing December 1.

Messrs. Johnson and Mallory have now pointed the way and have hung up a target for all of you short-wave "fans" and "hams" to start shooting at—let us see if you can beat them, and incidentally, win one of the handsome Silver Trophy cups which SHORT WAVE CRAFT is offering in accordance with the following rules.

Presented to
SHORT WAVE SCOUT
Heinie Johnson
For his contributions toward the advancement of the art of Radio
by
SHORT WAVE CRAFT
Magazine

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 the month for which the award is made.

This contest will close every month for the next twelve months on the first day of the month by which time all entries must have been received in New York. Entries received after this date will be held over for the next month's contest.

A monthly trophy will be awarded to the short-wave scout who has logged the greatest number of "short-wave" stations during the month for which the award is made. In the event of a tie between two or more contestants, each logging the same number of stations, the judges will award a similar trophy to each contestant so tying. Verifications must be sent with the list of stations heard (the verification cards will be returned) and each contestant is entitled to report a maximum of ten per cent of the station calls listed, without verification cards. List of stations heard must be typed or written in ink; no pencil allowed. Send everything in one package prepaid. Use a single line for each station and state type of receiver used. Do not list "amateur" stations—only "commercial phone" stations; no CW or code stations! Address all entries to SHORT WAVE SCOUT AWARD, 98 Park Place, New York City.

On this page is illustrated the handsome trophy, which was designed by one of New York's 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 lettering on the wide lower silver band reads as follows:

First Trophy Cup Awarded To Heinie Johnson

Short Wave Scout Award,
New York.

Gentlemen:

Inclosed find my list for first award contest. I have inclosed verifications on all but two which have not arrived to date. I picked two that are easy to hear here for my allowed 10% of unverified.

I have reports in now on VK2ME-3ME-XETE and 27 others which should arrive soon, sorry can't count them but let's stick to the rules. Announcer read my name over HC2RL. I get everything that is "on the air" as a rule, but could not find DENNE when they were scheduled recently.

I use a "National 45" S-W receiver with an added stage of T.R.F. built in ahead; fed by transposed lead-ins from special tuned doublets and directional underground antenna system.

Have sent Daventry consistent reports on 5 carriers.

HEINIE JOHNSON,
Big Springs, Texas.

ENTRY FOR FIRST SHORT WAVE SCOUT AWARD

Station	Frequency	Schedule
GSE, Daventry, Eng.	11965 KC	7 to 8:45, 9 to 11, heard best at 10.
GSF, Daventry, Eng.	15140 KC	7 to 8:45, 9 to 11, heard daily at 8.
GSD, Daventry, Eng.	11750 KC	11 to 1, 1:15 to 5:45, heard daily at 1.
GSB, Daventry, Eng.	9510 KC	11 to 1, 1:15 to 5:45, heard daily at 5.
GSG, Daventry, Eng.	17790 KC	7 to 8:45, only heard and reported once.

One verification only—see letter on above reception report. All heard well.

PHI, Holland	16:83 Meter	7:30 to 9:30, daily, heard irregular.
EAQ, Spain	30 Meter	5:30 to 7 Sat., 1 to 3, Loudest on air.
VE9JR, Canada	25.6 Meter	Always on air at 7 p.m.
2RO, Italy	25.4 Meter	12 to 1:30, I hear that woman daily.
VE9GW, Canada	6095 KC	See Card Heard Evenings.
El Prado, Ecuador	45:31 Meter	9 to 11 Thurs., strong signal.
HVJ, Italy	15120 KC	Mornings, confirmnent not here yet.
FYA, France	19.68 Meter	Mornings, talks French until 10 daily.
W3XAU, Phila., USA.	60:60 KC	See card
W3XAU, Phila., USA.	31:28 Meter	See card.
W9XQ, Chicago, USA.	49 M. Band	See letter.
W9XF, Chicago, USA.	49 M. Band	See letter.
W3XAL, U. S. A.	49:18 Meter	Evenings.
W8XK, U. S. A.	25:26 Meter	Heard daily around p.m.
Q8XK, U. S. A.	13:93 Meter	Heard irregular in mornings.
W3XAL, U. S. A.	16:87 Meter	Daily, 10 to 4, see letter.
W8XAL, U. S. A.	49 M. Band	Mornings and evenings irregular.
W2XE, U. S. A.	25:36 Meter	3 to 5 p.m.
W2XE, U. S. A.	19:64 Meter	11 to 1.
W3XL, U. S. A.	46:70 Meter	Friday evenings, lately on air nightly.
DJB, Germany	19:73 Meter	Heard daily 8:30 to 10

Twenty-six Stations.

"Honorable Mention" Goes to Warren Mallory

The following are short-wave (verified) stations I received:

Call Letters	Freq. KC.	Schedule E.S.T. Location Identification sign.
EAQ	9,860 KC.	Daily from 5:30-7:30 p. m., Madrid, Spain, announced EAQ in English
GSD	11,750 KC.	Irreg. from 2:00-4:00 a. m. and from 9:00 a. m. to 8:00 p. m., London, England, Chimes of Big Ben heard
DJD	11,760 KC.	Daily from 10 a. m.-4:50 p. m., Berlin, Germany, at intervals piano notes are played over and over again.
DJB	15,200 KC.	Daily from 8:00 a. m.-1:40 p. m., Berlin, Germany, signal same as DJD

(Continued on page 549)

SHORT WAVE LEAGUE

HONORARY MEMBERS

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

Executive Secretary

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

He Favors "No Code" Below 5 Meters

Editor, SHORT WAVE CRAFT:

For the last year I have read code arguments pertaining to no code under five meters. I just finished reading the November issue of SHORT WAVE CRAFT. I have noticed no other argument than this—*"if others can learn the code why can't the rest?"* Perhaps they could learn the code but what good is it if they are going to use phone? I don't see why if some beginner wants to use phone in his coming station, a license should not be provided for phone just as there is for code. I am not saying that some "punk" with no idea what radio is all about should be permitted to do this, but that an examination very much like the present one, except for the code test be given him. If this test is "stiff" enough no "punk" will get a license.

I noticed a letter some time ago where the writer said something about going and asking the "old men" of radio how important code was. Well, if we are to forever remain back in the "code days," phone will never come into perfection. Why not give the "little fellow" a chance? The perfection of phone below five meters means a great deal. Besides, if the heads of the League should have said, "No code on all amateur bands"—that would have been different. The five-meter bands are not being extensively used and they would not interfere with the present "hams." What is more, the sending range of these experimenters would be limited. As far as saying how marvelous some of the "hams" are, why all you hear on some bands is "earsplitting" code. There is only one thing the matter with most present hams—THEY ARE SELFISH and do not want to see others get any privileges. If the hams would lend a little more cooperation maybe this "no code" business would get somewhere.

ROBERT MILLER,
646 North James St.,
Hazelton, Pa.

P. S. I am not afraid to sign my address like J. S. Waring, for fear of being "swamped" by protests!

Keep Code and Make "Exam" Stiffer

Editor, SHORT WAVE CRAFT:

I have been reading Short Wave Craft since the good old days when it cost "four bits," and I wish to say that I think that it has all the other magazines beat by the distance that you can send on twenty meters! But, I have one thing that I would like to get "off my chest."

I think that there should be a code law on any band. Any person who hasn't the ambition to learn the code would certainly not have the ambition to build a *decent* phone transmitter. The biggest share of those in favor with the "no code" exam are beginners, who think that the *tank* on a transmitter is where the water is kept to cool the tube. Hi.

In J. O. Roberts letter of the October number, he states that the "brass pounders" haven't the ambition to build a phone transmitter; now I ask you, what would a "rank beginner," who hasn't even enough ambition to pass the simple code test do? There are enough "bum" stations operating, without having a whole lot more even worse ones cluttering up the air with a bunch of "broad" phone stations! I think that the examination should be made harder instead of easier. In this same letter Mr. Roberts states that "anyone can rig up an oscillator or an osc.-amp, and zig-zag out into space"; evidently he has never tried to build one, or his note would be a bit more D.C. for C.W.

Get Your Button!

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

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

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

I have my license, and I don't see why anybody couldn't pass the same test, code included, as I did.

Well, now that I have that taken care of, I again wish to congratulate you on having such a "FB" magazine. More power to you.

MARVIN L. FARR,
775 Twenty-third Street,
Ogden, Utah.

Built Our Transmitter Successfully

Editor, SHORT WAVE CRAFT:

After reading the SHORT WAVE LEAGUE magazine for the past two years, I find that it is the craft for Hams to use. My dealer is a live wire and sees that I get my issue on time, as he knows I would be disappointed if it was a day late. So keep up SHORT WAVE CRAFT.

As a member of the LEAGUE just keep the SHORT WAVE CRAFT flag flying at all SHORT WAVE CRAFT readers' homes. I went to work on one of the transmitters that was described in SHORT WAVE CRAFT and built it; I successfully worked districts—W, 1, 2, 3, and 5, 6, 8 and 9 and VE 1, 2, and 3. This transmitter however so far worked 137 different Hams, from QSA5 to R4 to R9. I am getting started on Leonard Victor's rig and would like to hear from other members of the LEAGUE. Give me a call sometimes on 80 meters (3,600 kilocycles).

B. J. JONES,
265 Main St.,
Rockland, Me.

(Call letters not given.—Editor.)

"No Code" Would Increase Interference, He Says

Editor, SHORT WAVE CRAFT:

Although the movement discussed in your magazine for a codeless examination for amateur radiophone operation will probably die out anyway, I desire to add my voice in protest to it.

If one were merely sentimental an examination of this type could be opposed on the grounds that it would destroy all of the glorious traditions of amateur radio. And to those who sneer; every such thing must have traditions for creation of interest and enthusiasm.

Now to look at the matter practically. Amateur radiodom in the recent past was issued its 40,000th license, which is entirely too high a number for the narrow frequency bands which are now allotted to them. If the doors were thrown open to all comers the great increase in licenses would literally swamp the phone bands now in use, so that operation for anyone would become extremely difficult. There are some of the code-less "fans" (not HAMS you notice) who desire this feature for the 5-meter band only. They apparantly cannot realize the "bedlam" that would result in the crowded metropolitan areas like New York and Chicago if there were not some restriction to cut down the number of stations.

Another point deals with the large numbers; that of legislation. The government has already been forced to cut down expenses to an absolute minimum and as large an increase of applicants as would result from a code-less examination would greatly increase the cost of license legislation of our already over-taxed Commission.

Most of those in favor of Code-less Examinations have never become familiar with radio frequency oscillators or amplifiers of the types used in transmitters. They should therefore become familiar with them in C. W. use where improper adjustment will not cause as much interference as in radiophone use.

Many of the fans in favor of a code-less phone examination insist that code is a dying method of communication. These fellows might look up the disaster which occurred when the U.S. Navy gave phone a tryout for communication purposes. We all know the Navy has the most reliable and extensive system of communication in the world today.

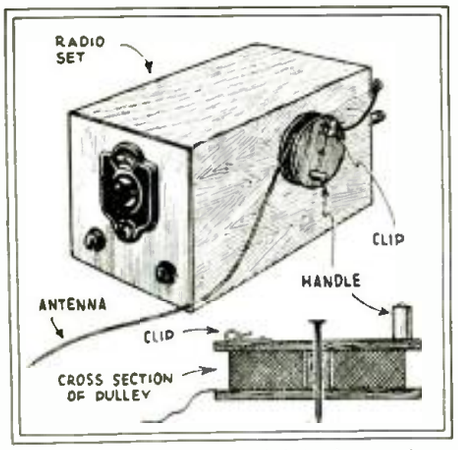
Just in case any of the fans think I am a confirmed C.W. man who knows nothing of phone; I have not only an amateur unlimited phone license, but a commercial Radio telephone First-Class license and Second Class Radiotelegraph license. Phone has been used here at my station in the past, although C.W. is used at present.

C. W. ARNOLD, (W4ZP)
2317 West End Ave.,
Nashville, Tennessee.

"Short-Cuts" for "Short-Wave" Fans

Antenna Reel

● HAVING recently built a portable two-tube Doerle receiver, with self-contained "A" and "B" batteries, in a wooden case and aluminum front panel, I desired a little better portable



A nifty idea for an aerial to be used on a portable short-wave receiver. By means of the handle shown the aerial can be quickly reeled up.

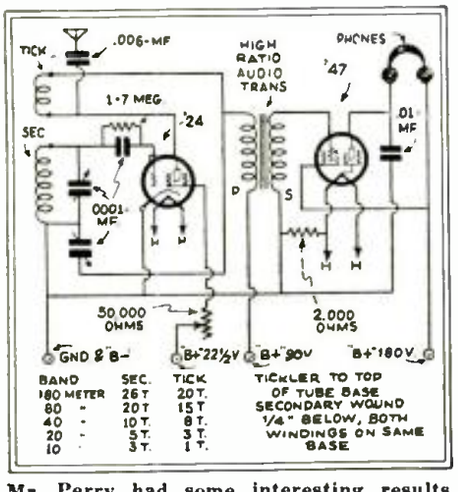
aerial to use with it. I looked in my junk-box and discovered an old King battery set. This was of the flat type and the surprising thing about it was that it contained sixty feet of No. 20 D.C.C. copper wire.

By fastening this to the side of the case, by means of a screw and putting a screw and brass collar on the spool for a handle and a Fahnestock clip for the beginning of the winding, I can reel out anywhere from one foot to sixty feet. I have a simple connection to the set by means of the flexible cord, which I snap into the clip after reeling out the desired length of aerial.

This straight wire type aerial works better, even though it is the small size wire, than many so-called "trick loops," "cages," etc.—*W. R. Scheetz.*

Antenna to "Plate"—A Novelty

● HERE is a circuit with the antenna coupled to the set through a fixed .006 mf. Cond. to the plate of the detector tube. This set works excep-



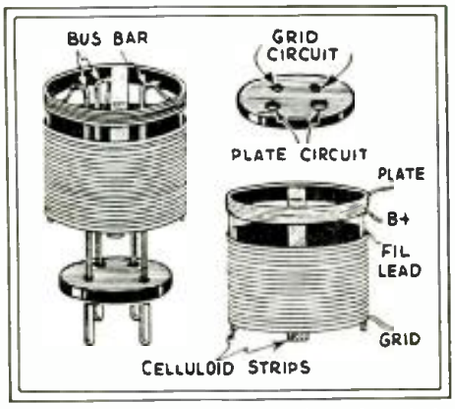
Mr. Perry had some interesting results with this unusual circuit, the antenna being connected to the plate instead of the grid circuit.

tionally well on any of the amateur bands as well as on the broadcast band and brings the stations in with a wallop that is sufficient for a speaker. It will oscillate with ease down as low as about five meters. It uses a 24 detector and a 47 pentode for the audio stage. Herewith is a sketch of the circuit which is self-explanatory, the coil data and all being furnished in the sketch.

So far as I know there is no circuit that works to any advantage or with any success at all with the antenna connected to the plate of a tube. However, this works well on any length antenna and does not seem to work unless the aerial is connected to the plate of the detector tube.—*P. H. Perry, Jr., W5NH.*

Low-Loss Coils

● I found a cardboard carton of two inches diameter and wound it first with thread. Then fitted over it a layer of waxed paper to prevent the dope sticking to the thread. Taking four strips of thin celluloid each about one-quarter of an inch wide and the length of the coil, I fastened these strips down long-wise over the wax paper with small elastic bands. The strips of celluloid are of course equally spaced apart. The coils are wound with No. 20 wire with the primarys space wound. After they are doped and dry the thread is pulled out from under the waxed paper and the coil slips easily from the form and they will be found to be quite rigid.



Ultra low-loss coil construction, the windings being supported on thin celluloid strips.

The tube-bases are sawed off flat, as in the sketch, and bus wire is soldered into each terminal. The coil is mounted in the center, suspended slightly above the base; the four leads are soldered to the bus bar; three of the bus bar leads are long enough to be level with the top of the coil when the ends of the leads are bent over. The grid lead of course is short and can be left straight up. The bus bar leads amply support the coil and at the same time supply a rigid handle to use when putting the coils in or out of the socket. This makes a coil about as nearly "low-loss" as I believe it is possible to make. It is practically free of the losses that are due to mounting on any kind of a form. I was amazed at the added efficiency of coils made in this manner and believe this bus bar stunt is entirely new. I adhered to the table of windings given for coils of 2 inch diameter, but in some cases added slightly to the tickler winding. The windings are for use with a .0001 mf. tuning condenser.

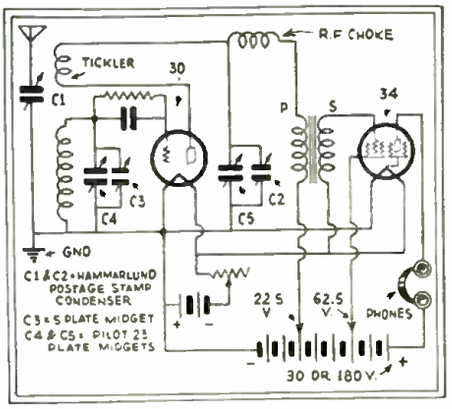
Primary	Secondary	Tickler	Wavelength Range
5	3	4	16-26
5	6	5	23-39
7	13	5	37-80
9	36	5	76-160*

*Not space wound.

I would like to add that contrary to general practice, though I notice Mr. Reinartz did the same thing in his set with two detectors, I use an "A" Positive grid return in my detector circuit and have found it more sensitive than the usually shown "A" Negative grid return in S.W. Circuits. I also remove any wax paper that has adhered to the inside of the coil.—*R. E. Johnston.*

Improves "Globe Trotter"

● SOME time ago, I constructed the 2-Tube "Globe Trotter" by Robert Hertzberg and have gotten some very good results from it. I have heard *amateurs* from every district in the United States and most of the police and broadcasting stations; also Canada, Mexico, South America, and Hawaii. This location is not very good as far as "DX" is concerned, so I think I have done fairly well.



Improvements in the 2-tube "Globe Trotter" are shown above, the new circuit providing "band-spread" and also "greater volume."

However, I have made two improvements in the circuit that I have found of great value. First, I have spread out the various bands by using a five-plate (about 25 mmf.) midget condenser with the twenty-three plate midget across the secondary and have inserted a Hammarlund equalizing condenser (about 30 mmf.; same as in aerial circuit) across the regeneration condenser. The latter allows regeneration on the four coils any place on the dial. Also, I have increased the volume very noticeably by using a 34 tube as an amplifier. These changes may help those who have constructed this set, to get better results.—*W. F. Frye.*

● IF you are interested in listening in on the ultra short-wave bands from 5 to 10 meters, you will do best to minimize losses in the plug-in coils by using isolantite forms; also isolantite tube and coil sockets as well as properly insulated variable condensers. Most important, too, all lead wires must be kept very short, especially in the grid circuit. Ultra short-wave type R. F. chokes should also be employed.

"SMOOTHING UP" • YOUR RECEIVER CONTROLS

Part II—Antenna Coupling Methods

By CURTIS E. MALSBERGER

In this second article, Mr. Malsberger describes some further improvements which will help to smooth up the operation of your short-wave receiver. Improved antenna coupling methods are discussed, together with circuits, and also improved methods of controlling volume.

● COUPLING the antenna to the grid of the first radio frequency tube has also caused quite some perplexity in the past, and in fig. 3, six methods are diagramed.

The circuit shown in fig. 3-A is not recommended due to the fact that the resistor cannot discriminate, even to the slightest degree, between the signal frequencies and any other type of unwanted noises, such as static, etc. A slight improvement is afforded by using a radio-frequency choke in the place of this resistor, as illustrated in Fig. 3-B. This choke may have a value of from 30 to 85 MH.

Figure 3-C is an elementary form of tuned input, and it is a very worthwhile improvement over the two previous systems. However it is a broadly tuned affair and not particularly advantageous in a modern short-wave receiver. The selectivity of this circuit can be improved somewhat if the antenna is connected to a tap on the coil L1, as is shown in Fig. 3-D. But there still remains a serious drawback in this method of coupling, due to too much of the antenna capacity and resistance being placed across the tuned circuit, thereby limiting the tuning range covered by a given coil and condenser.

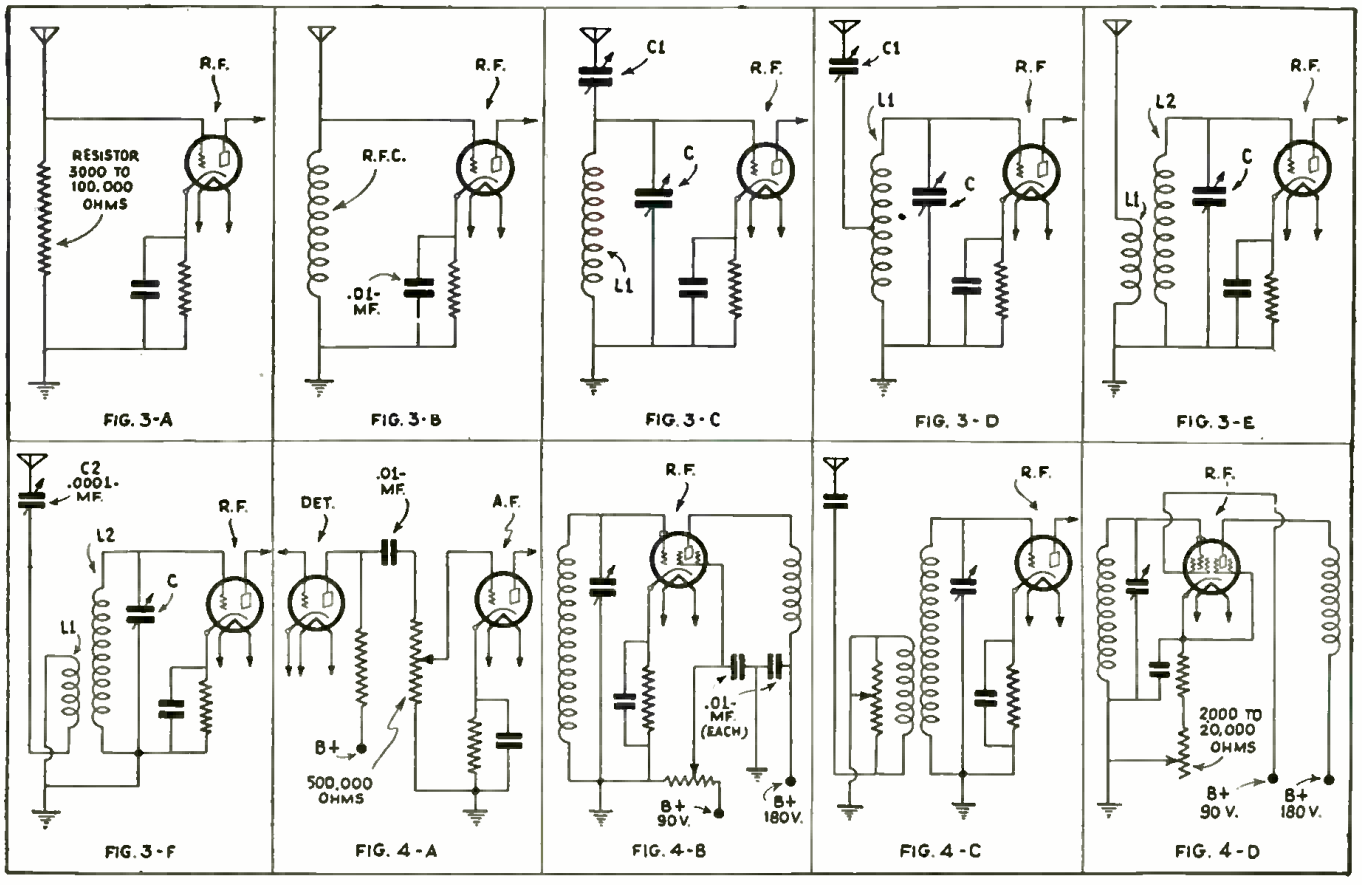
Furthermore it is difficult to match the tuning ranges of the detector and input circuits, and "single-dial" control is almost impossible.

Inductive coupling (Fig. 3-E) provides a more suitable means of eliminating this disadvantage. Selectivity can be increased by employing looser coupling between the two coils L1 and L2, and "ganged" tuning is made considerably easier.

An interesting modification of the system was developed for use in the new National FB7 receiver, and it is illustrated in figure 3-F. Here the primary is interwound between the secondary or grid coil turns and rather tight coupling results. However it will be noted that the antenna is connected to the bottom end of the coil L1 and its capacity has been limited by placing a small condenser in series. Thus the coupling is made almost purely *inductive*, thereby greatly eliminating antenna tuning effects. This system was by far the most satisfactory tried by the writer.

The Control of Volume

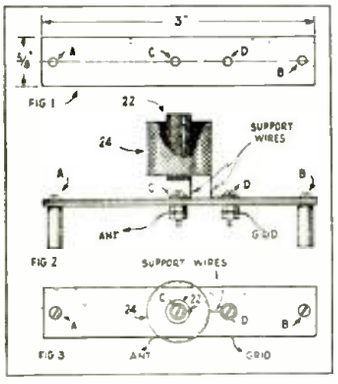
In the past it was commonly believed the regeneration control was a satisfactory means of controlling the volume as well. However, in multi-tube receivers, which are becoming daily more popular, several forms of distortion results from this procedure. A powerful signal will ofttimes overload the grid of the detector tube, and if the regeneration control, particularly if of the *screen-grid potentiometer* type, is retarded, further distortion is introduced by the reduction of the applied detector voltages. Therefore a more suitable solution must be found for this problem. *(Continued on page 556)*



Herewith Mr. Malsberger shows a number of the different antenna coupling circuits which he tried out and which he discusses in the accompanying text; the lower group of circuits, 4A to 4D inclusive, illustrate various methods of controlling volume.

ANTENNA CONDENSER $5.00 PRIZE WINNER

An antenna condenser may be made from the plate of a type '22 tube and the plate of some other screen-grid tube such as the '24 or '35. When the plates are cut from the tubes, leave the wire supports as long as possible. Take a piece of bakelite 2½ or 3 inches long and drill as indicated. A and B are the mounting holes. C is the hole for the screw which holds the '22 plate. D is for the '24 plate. The holes may be drilled to suit the maker. The other diagrams are self-explanatory. These plates must be handled carefully to prevent damage to them. I have used a condenser of this type for some time now, and it functions perfectly.—Albert Edwards.



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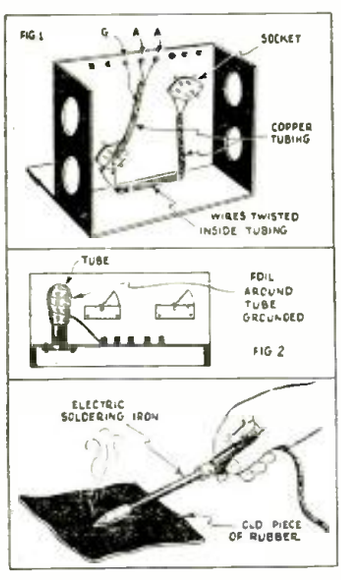
THREE KINKS IN ONE

In constructing an A.C. set I found that the filament wires, even though twisted, made quite a hum in the earphones or speaker. This was easily overcome by getting some old copper tubing and putting the twisted wires inside it. I then soldered a wire to the tubing and the ground. See sketch No. 1. Here's another—I was trying out a set and found that one of the



tubes needed shielding. Having no tube shields handy, I tried out this idea. I took the metal foil out of an old fixed condenser (any metal foil will do) and wrapped it around the tube, grounding one end of it. It made a very effective tube shield. See sketch No. 2. And still another one—I had to take the tinning off an iron used for soldering and, instead of filing it off, found that rubbing the iron on a piece of rubber did the job quickly. The iron must be hot, of course. See sketch No. 3.

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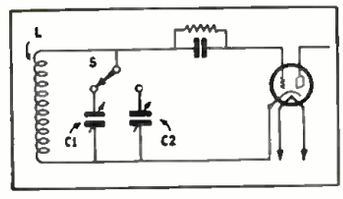
DUAL RECEIVER

For reception of "both ends" of a radiophone conversation, when both stations are working within the range of the same coil and condenser combination,



$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.

here's the trick to use. Coil L is the regular grid winding of a plug-in coil. Condensers C1 and C2 are both .0001 mf. max. capacity. Switch S is a selector switch.

In tuning for stations put switch S in place for using condenser C1. Tune C1 until a phone station is heard. Then throw switch S for condenser C2. With C2 find the "other end" of the conversation. After both stations have been found, all that need be done to hear "both ends" is to throw switch S back and forth between condensers C1 and C2, as each person speaks.—Robert Seitz.

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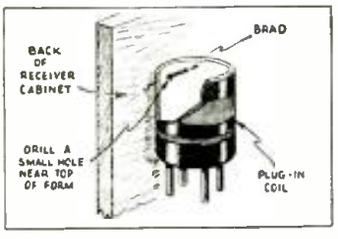


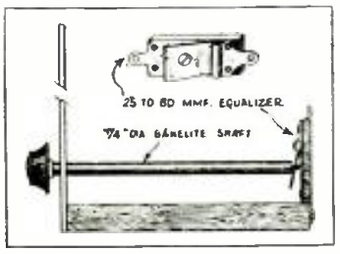
COIL SUPPORT

Being a "ham" I find it hard to keep plug-in coils handy, for they have a habit of rolling off the table on the floor. To overcome this three small brads, one-half inch long, were mounted on the back of the receiver. A small hole drilled near the top of the form serves to hold the coil. These coils are not only ready for use, but are out of the way.—L. Murphy.

▼ ▼ ▼

AERIAL TUNING CONDENSER

The small equalizer condensers used in capacitive antenna coupling can be adjusted from the front panel, by simply replacing the adjusting screw in the condenser with a screw of the same size, that has been inserted in one end of a ¼" bakelite rod. The head of the screw must be removed and about ¼" of the screw left protruding from the end of the rod. This makes possible the accurate for maximum signal strength and eliminates the "hand capacity" experienced when using condensers with metallic rotor shafts. —Harold H. Shugert.



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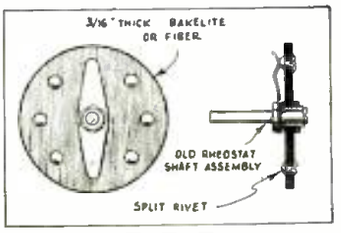
SELECTOR SWITCH

An improvised selector switch which may be used for changing short-wave coils, etc., and it was made from a few split copper rivets, together with a shaft and switch blades from old rheostats. The rivets were spaced equally around a red fibre disc about 3/16" thick. Many different arrangements of switching schemes have been illustrated diagrammatically in previous issues of this magazine, so there is no use in going into the various hook-ups which can be used as each experimenter will be able to work this out for himself. —Clarence Guthrie.



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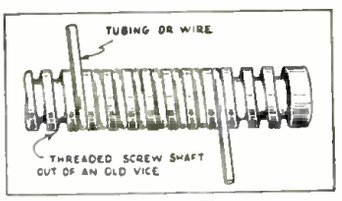
COIL FORM

The accompanying drawing shows a handy "form" on which to wind spaced short-wave coil windings, either of wire or tubing. This form is nothing more than the coarse-threaded shaft taken from an old vise. Sometimes a piece of closely threaded rod such as this, having about 4 to 6 threads per inch can be obtained around a machine shop, having previously performed as part of a lathe or other machine. If the threads are coarse enough, copper tube transmitting coils can be wound on it.—Carl Cook.



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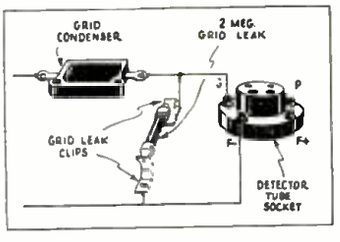
GRID-LEAK CONNECTION

There has always been a difference of opinion among amateurs as to the type of grid leak detection best suited for standard three element tubes. Some experi-



menters prefer the grid leak connected across the grid condenser and others believe that shunting it between grid and F− smooths out regeneration. With the layout illustrated in the drawing either method can be used, by just inserting the grid-leak in the proper pair of clips.—Dennis Delaney.

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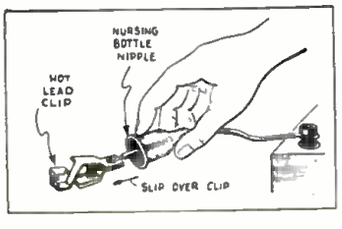
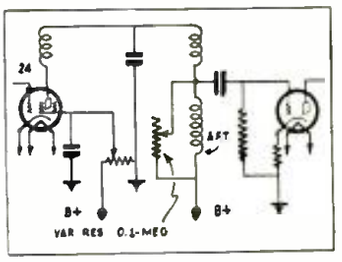
SHOCK-PROOF TEST CLIP

Almost everyone has been shocked clipping a connection onto a "hot" lead. A very simple shock proof lead may be made by slipping a nursing bottle nipple over the test clip. This will permit the clip to be used, but will give complete protection from high voltages.—M. W. Galser.



VOLUME CONTROL

When using an A.F. transformer as a choke I found that by shunting this impedance with an old Bradleyohm 100,000 ohm resistor, it made a very good volume control. You can also adjust it to cut the high note response. This control will not affect the regeneration control in the least. —Howard C. Rice.



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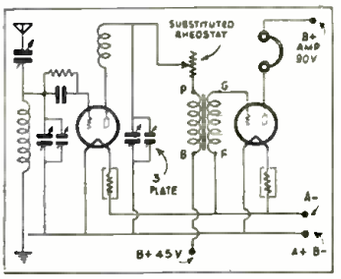
RHEOSTAT FOR R.F. CHOKE

I used a variable rheostat for the R.F. choke. The result was that when I changed my plug in coil, I could change the resistance for the best result. Any filament rheostat will work, but 6 ohms or less is best. I also used a 3-plate, double-spaced condenser, shunted across the 23 plate midget feed-back. With the 3 plate condenser, I could get much louder reception, without making the set regenerate. With one more stage of audio frequency, it gives "loudspeaker" reception with good volume.—H. Kurz.



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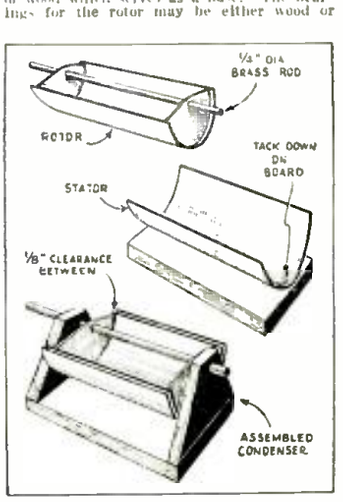
A "DEPRESSION" CONDENSER

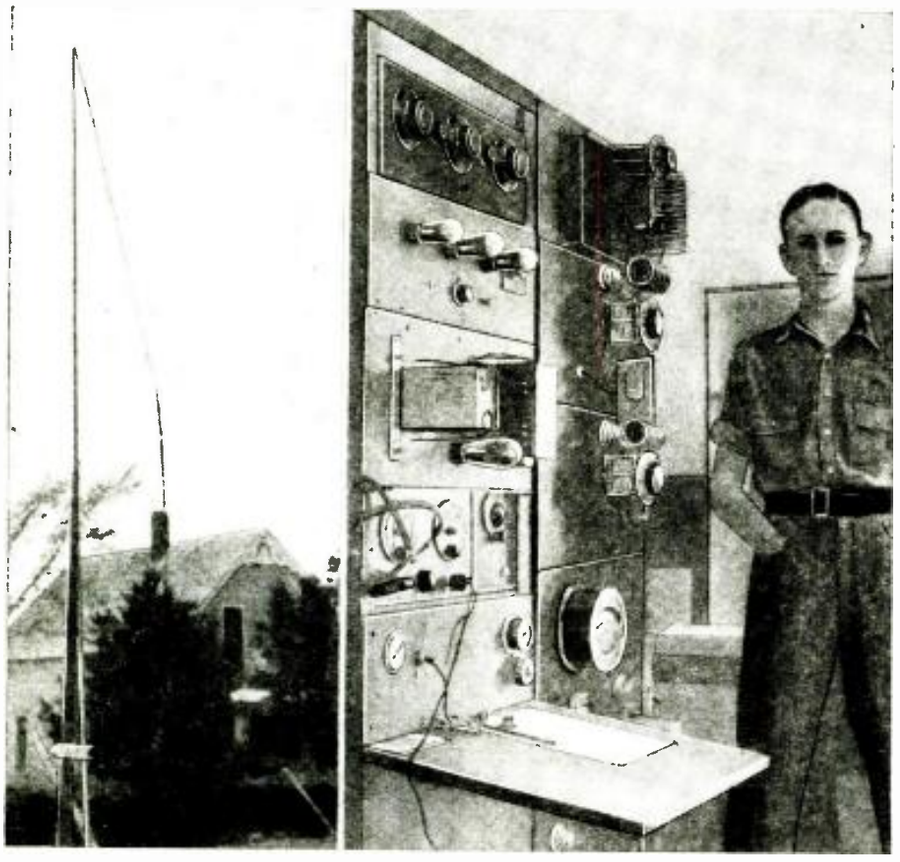
A variable condenser of small capacity may be made from two tin cans. Select a strong can for the rotor. If the cover is available, solder it in place to support one end of the shaft; if not, cut the can longitudinally down the center line, and then fit in a piece to take the place of the cover. Both ends of the can should be cut so that the shaft can be placed on the center line. For the shaft, a piece of ¼" round brass rod is suitable. The stator for this condenser is made from another can slightly larger than the one used for the rotor. The can is cut in half, and both ends are removed; it should then be tacked to a block of wood which serves as a base. The bearings for the rotor may be either wood or



metal. The distance from the base to the center of the shaft should be about ⅛ inch greater than the radius of the rotor. After assembly, bend the stator plate so that there is about ⅛ inch clearance between the two plates. A brush bearing on the end of the shaft serves as a connection to the rotor; solder a wire to the stator.—A. E. Gesteland.

SHORT WAVES and

THIS STATION HAS ALL THE TRIMMINGS



Photos above show the interesting antenna and station equipment of George Woznick at Loup City, Nebraska.

Editor, SHORT WAVE CRAFT:

Am enclosing a picture of my amateur station, W9JPN. I read your magazine and find it very interesting and helpful.

My transmitter uses a type 47 crystal oscillator, 46 doubler, and a 46 straight amplifier. Three separate power supply units are used, one for each stage, and all use the type 83 mercury vapor tubes. All of the transmitting equipment is mounted on the right-hand side rack. The left-hand rack contains the receiver, monitor, receiver power supply, batteries, battery charger, and an audio frequency oscillator with a two-stage amplifier, which is keyed with the transmitter so as to keep a check on all sending. The antenna is a 7 mc. voltage-feed Hertz. All transmitting is done on the 40 meter band.

Bob Woznick
Loup City. Nebr.

(A mighty fine station, Bob, and if it works as good as it looks, which it undoubtedly does, you must derive a lot of pleasure contacting "fellow hams" both in this country and abroad. It really is amazing when one stops to consider the immense amount of technique involved in the installation and operation of a good "ham" station, and all that we can say is that you fellows who have built and tuned up a good transmitter such as the one you have, deserve all the credit in the world. More power to you.—Editor.)

2-TUBE "GLOBE TROTTER" ROLLS UP SOME "LOG"

Editor, SHORT WAVE CRAFT:

Last spring I wrote you regarding a "2-Tube Globe Trotter" which I had constructed. I had been unable to make it work properly because of the coils, which I had purchased ready-made.

Finally, after much experimenting, I managed to get the right number of turns on the coils and since then have been having much pleasure from the set. I now have a total of eleven coils wound. The coils that I purchased although specified for the "Globe Trotter" had to be entirely rewound, as only one of them would work the set, and that not on the band specified.

The number of turns on the grid coil was all wrong, and I also had to greatly increase the number of turns for the tickler coil.

I now have the set mounted in a cabinet made of cigar-box wood and have added another stage of A.F. Also my set is peculiar, in that it has two antenna binding posts; one wired direct to the "postage stamp" antenna condenser in the conventional manner, the other to a small 5-plate condenser and then to the "postage stamp."

All coils below 80 meter phone, use the second binding post; I found the extra condenser was necessary to eliminate "dead-spots" and to make some coils work at all.

As for results, I can't kick.

And here, if you are interested, are my catches: 20 meters—GSF, Daventry, England; W8XK, Pittsburgh, Pa.; WNC, Deal, N. J.; KKZ, Bolinas, Calif. 25 meters—GBC, Rugby, England; GSD, Daventry, England; YVQ, Maracay, Venezuela; CGA, Drummondville, Canada. 31 meters—EAQ, Madrid, Spain; HBL, HBP, Geneva, Switzerland, 2 waves; W3XAU, Philadelphia, Pa.; W1XAZ, Springfield; DJA, Königswusterhausen, Germany; W2XAF, Schenectady, N. Y.; GSB, Daventry, England; HJP, Bogota, Columbia; WNC, Hileah, Fla.; W3XR, testing with W10XAA. 49 meters—W3XL, Boundbrook, N. J.; W8XK, Pittsburgh, Pa.; VE9HX, Halifax; W2XE, Wayne, N. J.; VE9BJ, St. Johns, N. B., Canada; YV1BC, Caracas, Ven.; W3XAL, Boundbrook, N. J.; W9XF, Chicago, Ill.; VE9GW, Toronto, Ont., Canada; W9XAA, Chicago, Ill.; W8XAL, Cincinnati, Ohio; W3XAU, Philadelphia; GSA, Daventry; W1XAL, Boston; DJC, Zeesen, Germany, VE9DR, Drummondville, Que., Canada. 63 mete —WOO, Deal, N. J. 74 meters—NAA, Time Signals, Arlington, Va.

Most of the American stations are very consistent, while GSA, DJA, and EAQ and GSB are the most consistent "foreign" stations, EAQ being heard every evening. In fact, I can usually get the American stations without using any antenna or ground, and can often do the same with the above mentioned "foreign" stations.

Besides these I have "logged," so far, 53 police stations, including UYR, Montreal, and UYW, Winnipeg, and others as far as the Pacific Coast. Also dozens of airports and airplanes which are hard to identify, because they give no call letters.

I have also heard considerably ship-to-shore conversations, and other unidentified stations.

As for the Amateurs, I have had all American districts except the seventh, and many in Canada; this on 80 meters. I have also listened to many on 160 meters and a few on 20 meters. Literally hundreds of them, all told. I also have two coils which work the B. C. band from 1500 to 1170 kc. and from 1200 kc. to 790 kc.

Many of these stations I have had on the loud speaker, including Daventry and Germany, but I generally use the head phones.

So I thank you, SHORT WAVE CRAFT—the "Globe Trotter" works. This is my first attempt at set building and for a while I was pretty discouraged, but now I am tickled!

More power to you, and I'll be looking for the next issue of SHORT WAVE CRAFT at the newsstand.

ARTHUR M. CROUSE,
12 Grant St.,
Warren, Pa.

(This is a very fine "log," Arthur, and it is really remarkable in view of the fact that only two ordinary old style tubes were used. We have had many excellent reports on the "Globe Trotter"; one of the good points about this receiver is that it costs but very little to build and operate.—Editor.)

LIKES WALLACE SET WE DESCRIBED

Editor, SHORT WAVE CRAFT:

I sure have good news for you, I have completed the *Powertone Wallace S-W Receiver* which you described in your September issue. Inside of one-half hour I had twenty different stations from New York to Iowa! What do you think of that for tuning them in? My receiver sure is a wow!

Be sure to include more news on how to assemble short-wave receivers in your next issue.

STEPHEN J. STERBANUS,
P. O. B. 292,
Elkins, W. Va.

(Glad to hear you had such good results so quickly with the Wallace receiver described in our September issue. We hope you find plenty of material in this issue describing how to assemble short-wave receivers, per your last paragraph.—Editor.)

LONG RAVES . . . Our Readers Forum

GETS 2,730 STATIONS!

Editor, SHORT WAVE CRAFT:

After finishing my first copy of SHORT WAVE CRAFT I became immensely interested in short waves and decided to build a receiver. I selected a diagram and started construction. The circuit is the Reinartz which is well-known among the "old-timers." It uses an '01A as detector and another '01A as a transformer-coupled audio amplifier. The results obtained with this set have been extraordinary!

The broadcasters that I have received are the following: VK2ME, VK3ME (verified), 1SOR, FYA, GSA, GSB, GSC, GSD, GSE, G5SW, DJA, DJB, DJC, DJD, I2RO, EAQ, EAR58, HBL, HBP, TI4NRH, HRB, YVLBC, PRADO, HJLABB, HJ2ABA, HJ3ABD, HJ4ABB, HJ4ABE, VE9GW, VE9DR, VE9JR, VE9HX, W1XAL, W1XAZ, W2XAF, W2XE, W3XAL, W3XAU, W3XL, W4XB, W6XN, W8XAL, W9XAA, W9XF.

Most of the listening is done on the 40 and 80 meter bands and I have also received some amateurs on the 20 and 160 meter bands. At the present time I have logged 2,165 amateurs in 24 countries, distributed as follows: United States, 2,021; Canada, 62; Cuba, 23; England, 13; Mexico, 11; Australia, 4; three each in France, Porto Rico, British West Indies; two each in Ireland, Spain, Germany, Belgium, Canal Zone, Costa Rica, Ecuador; one each in New Zealand, Alaska, Netherlands, Newfoundland, Colombia, Venezuela, Argentine, and Honduras. On 80 meter fone, XLG, XLQ and W6CNE have been heard.

Commercial code stations have been received from every continent. Total number is 210. I have received 24 police broadcasters as far west as St. Louis and St. Paul.

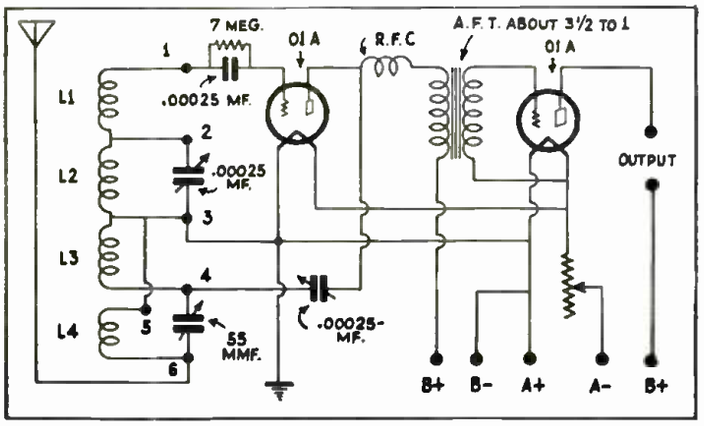
My total log of all stations received is 2,730! Can anyone beat this record with a pair of '01A's? I would like to hear from others who have tried this circuit.

	COILS			
	L1	L2	L3	L4
20 meters	4	2	2	
40 meters	8	4	4	
80 meters	8	8	4	4
160 meters	16	8	8	4
Broadcast band	32	16	16	8

The coils are wound on a three inch form with No. 24 D.C.C. wire. Six binding posts are placed directly behind the tuning condenser about one inch between each. These are for the coils. Where more than one lead goes to a binding post the leads may be twisted together to provide facility in changing coils. The specifications given for the coils may be found to be erratic, as when I first made the set the 20 meter coil worked from 28 to 49 meters. Upon experiment I made my own coils and the set worked down to 14 meters. This set is constructed with all broadcast parts. It may seem strange to tune short waves with a .00025 mf. condenser, but I have found no trouble at all in tuning at high frequencies. I believe that if this circuit were adapted to be used with the new "high-gain" tubes it would break all records.

CHARLES J. SAYKO,
330 Grier Avenue,
Elizabeth, N. J.

(Magnificent business, Charles, and the editors' heads are still swimming from looking at that total, which certainly caused us to rub our eyes in astonishment. 2,730 stations is some log—no mistake! Looks as if we are going to have some keen competition for the Short Wave Scout's "trophy cup" the first winner of which is announced in this issue. Better look over those rules again, for you should be able to walk away with one of these cups like nobody's business.—Editor)



Novel receiving circuit used by Charles Sayko who has heard all the famous world-wide short-wave broadcasters, including VK2ME and 3ME, all on 2-01'As.

HERE'S A REAL "HAM" STATION

Editor, SHORT WAVE CRAFT:

I am a constant reader of SHORT WAVE CRAFT and must say that I look forward to the arrival of each copy. My only suggestion for improvement is a little more advanced transmitter designs. This I believe would interest the amateurs who have passed the preliminary stages and are interested in multi-stage transmitters.

Efficient ham station, W5CFM, and W5HU, operated by J. N. Royall, Jr., at Corsicana, Texas.

You asked for photos of stations so here's mine. Note the nicely arranged 110 volt leads from the wall sockets to the transmitter. Hi.

W5CFM and portable W5HU have been on the air several years. The first transmitter was a single TNT 210 with 300 volts plate. Later came push-pull 210s with 600 volts plate. These were followed by the present transmitter which consists of the following:

Type '47 crystal oscillator, types '46 buffer-doubler, and a pair of 510 push-pull in the Class "C" amplifier. The input to the final stage is 100 watts. In addition there is a Class "B" modulator (not shown in the picture) for 100% modulation. This is operated as phone in the 75 meter phone band.

In the picture from left to right you see, "home-built" electron-coupled frequency meter-monitor, "Bug" and key, a National FBX single-signal receiver, and the "mike." On the table to the right is the transmitter and power supply units; there is a mercury vapor type rectifier for each stage.

The operator, "yours truly," is primarily interested in traffic work in the Army Amateur R. S. being a local net-control station in the eighth corps area. Occasionally I look for some DX but not often. Have worked all districts, VE's and an occasional ZL or VK.

Would like to express myself regarding the proposed "no code" requirement for 5 meters but have written too much now. Suffice it to say that I don't believe that any experimenter will be satisfied to remain on 5 meters, once he gets started. Then he will be forced to learn the code and after all "what's worth having is worth working for." 73.

J. N. ROYALL, JR.,
W5CFM-W5HU,
Corsicana, Texas.

(We doff our hats to you, J. N. R.—you surely have a very fine transmitting and receiving station. It is indeed interesting to note how you have developed the transmitter progressively, adding the latest type tubes and "crystal control" when these became available. Every ham aspiring to the highest honors should be proud to follow in your footsteps and become associated, when his experience and station equipment warrant it, with the Army Amateur net.—Editor)

HE HEARS ALL THE "BIG BOYS"!

Editor, SHORT WAVE CRAFT:

Herewith is a list of stations which I have received on an "old-timer," commonly known as the *Junk-Box* receiver. Most of these I have heard on the loud speaker, including some of the English amateurs.

So far I have been more than satisfied with this "battery-operated" set. I built the set in 1928 and got the hook-up from SHORT WAVE CRAFT.

I have been a faithful reader of SHORT WAVE CRAFT for the past years and I think it the most *understandable* radio magazine I have ever read.

List of Short Wave Broadcasting Stations

G2NM	Caterham, England
PCJ	Kootwijk Holland
VK2ME	Sydney, Australia
VK3ME	Melbourne, Australia
LSH	Buenos Aires, Argentine
LSJ	Buenos Aires, Argentine
LSX	Buenos Aires, Argentine
I2RO	Rome, Italy
HVJ	Rome, Italy

(Continued on page 549)

Power Transformer Data

and Method of Design

By O. K. TIPSEL

This is probably the first time so much valuable information has been assembled and presented in one article. The coil data, size of wire, number of turns, size of iron core, etc., are given for power transformers of 40, 50, 70, 85, and 100 watts. Cut this data out and paste it in your "data-book."

● WITH the ever increasing multiplicity of radio tubes and apparatus, charts are becoming a necessary, integral part of radio work. To Service Men, experimenters and others, a radio power transformer chart fulfills a distinct need. It saves hours of computation by giving the information directly in many cases, or by easy comparison in special cases. To illustrate how the results, which are for the maximum number of tubes indicated in the transformer chart, were obtained, a power transformer of 85 watt rating will be designed as follows:

FUNDAMENTAL DATA

The electrical requirements of transformer design are fully met when use is made of the equation.

$$\phi = \frac{\sqrt{2} \times E \times 100{,}000{,}000}{2\pi F N} \qquad (1)$$

where

ϕ = Total flux (magnetic force) in the core

E = Line voltage

F = Frequency

N = Primary turns

Inspection of equation (1) shows that if the line voltage, E, is increased, the number of primary turns, N, must be increased the same percentage to keep the same flux. If the transformer is to be used with 220 volts on the primary, the number of turns, N, must be double that for 110 volts, for the same flux. The secondary turns, however, remain the same in both cases.

For 25 cycle frequency, equation (1) shows that either the primary turns or the core area must be increased in the ratio of 60 to 25 above that required for 60 cycle frequency. In other words, a 25 cycle transformer will be satisfactory with twice the core area and 25% more turns on all the windings, compared with a 60 cycle transformer.

With 115 volts and 60 cycle frequency, equation (1) becomes

$$\phi = \frac{43{,}145{,}000.}{N} \quad \text{or} \quad \phi N = 43{,}145{,}000. \qquad (2)$$

Which indicates that no matter what number of primary turns, the resultant flux, ϕ, times the number of primary turns, N, is always equal to 43,145,000. This number, of course, varies with the voltage and the frequency.

The object in this computation is to arrive at a definite relationship between flux density per sq. cm., core area in sq. inches and primary turns, from which results may be tabulated for ready reference. The flux density is desired per sq. cm. because the manufacturers of standard laminations use this method of description. The core area is desired in sq. inches because it is more convenient to consider lamination dimensions in inches.

Let C = Core area in sq. cm.

And A = Core area in sq. inches.

Then, since there are 6.45 sq. cm. in one sq. inch,

$C = 6.45\ A$

But the flux density is $\frac{\phi}{C} = \frac{\phi}{6.45A} = B$

Whence $\phi = B \times 6.45 \times A$

Substituting this value of ϕ in equation (2) we have

$$B \times 6.45 \times A \times N = 43{,}145{,}000.$$

or $$A \times N = \frac{6{,}689{,}000.}{B} \qquad (3)$$

where A = Core area in sq. inches

N = Primary turns

B = Flux per sq. cm.

(Continued on page 563)

115 Volts — RADIO POWER TRANSFORMER CHART — 60 Cycles

Rating	40 Watt				50 Watt				70 Watt					85 Watt					100 Watt				
No. of Tubes	3 or 4				4 to 6				4 to 9					5 to 12					5 to 15				
Winding	Pri.	Sec.	F_1	F_2	Pri.	Sec.	F_1	F_2	Pri.	Sec.	F_1	F_2	F_3	Pri.	Sec.	F_1	F_2	F_3	Pri.	Sec.	F_1	F_2	F_3
Wire Size	26	34	20	18	25	33	20	16	23	32	21	19	16	22	31	20	19	15	21	30	20	19	14
No. of Turns	600	3600	28	14	515	3200	24	12	430	2700	20	10	10	346	2200	16	8	8	346	2200	16	8	8
Av. Turn Length	5″	6″	7″	7″	5¾″	6¾″	8″	8″	6½″	7½″	8¾″	8¾″	8¾″	7″	8½″	9½″	9½″	9½″	7¼″	8¾″	9¾″	9¾″	9¾″
Total Length	250′	1800′	16.4′	8.2′	246′	1800′	16′	8′	230′	1690′	14.4′	7.2′	7.2′	200′	1560′	12.6′	6.3′	6.3′	209′	1600′	13′	6½′	6½′
Resistance	10.	470.	.167	.05	8.	370.	.16	.032	4.5	277.	.18	.057	.028	3.2	200.	.127	.05	.02	2.6	165.	.13	.051	.016
Amperes	.40	.045 .060	2.	4.	.49	.055 .070	2.	6.	.66	.065 .090	2.	3½	7.	.83	.080 .110	3.	3½	9.	.94	.090 .120	3.	3½	12.
No Load Volts	115.	345. 345.	5.37	2.69	115.	360. 360.	5.36	2.68	115.	360. 360.	5.36	2.68	2.68	115.	360. 360.	5.32	2.66	2.66	115.	360. 360.	5.32	2.66	2.66
R I Drop		11/11	.33	.20		10/10	.32	.19		9/9	.36	.20	.20		8/8	.38	.17	.18		7/7	.39	.18	.19
Loaded Volts	115.	331. 334.	5.04	2.49	115.	350. 350.	5.04	2.49	115.	351. 351.	5.00	2.48	2.48	115.	352. 352.	4.94	2.49	2.48	115.	353. 353.	4.96	2.48	2.47
I^2R Loss	1.6	.94	.67	.80	1.9	1.11	.64	1.15	1.96	1.17	.72	.70	1.37	2.2	1.28	1.14	.61	1.62	2.3	1.33	1.17	.62	2.3
Core Size	$1\frac{1}{8}$″x$1\frac{1}{8}$″				$1\frac{1}{4}$″x$1\frac{1}{4}$″				$1\frac{1}{8}$″x$1\frac{1}{8}$″					$1\frac{1}{2}$″x$1\frac{1}{2}$″					$1\frac{1}{2}$″x$1\frac{1}{2}$″				
A X N	760				805				810					780					780				
Flux Density	9600				9100				9100					9400					9400				
Coil Length	$1\frac{3}{32}$″				$1\frac{3}{32}$″				$2\frac{1}{32}$″					$2\frac{7}{32}$″					$2\frac{7}{32}$″				
Coil Space	$\frac{9}{16}$″x$1\frac{1}{16}$″				$\frac{5}{8}$″x$1\frac{7}{8}$″				$\frac{13}{16}$″x$2\frac{1}{16}$″					$\frac{3}{4}$″x$2\frac{1}{16}$″					$\frac{3}{4}$″x$2\frac{1}{16}$″				
Watts Output	40.				49.				67.					84.					96.				
Total I^2R Loss	4.01				4.80				5.92					6.85					7.72				
Iron Loss	2.0				2.6				3.4					4.5					4.5				
Watts Input	46.01				56.40				76.32					95.35					108.22				
Transf'r Size	$2\frac{1}{4}$″x3″x$3\frac{3}{8}$″				$2\frac{1}{2}$″x$3\frac{1}{8}$″x$3\frac{3}{4}$″				$2\frac{3}{4}$″x$3\frac{1}{16}$″x$4\frac{1}{8}$″					3″x$3\frac{3}{4}$″x$4\frac{1}{2}$″					$3\frac{1}{4}$″x$3\frac{3}{4}$″x$4\frac{1}{2}$″				
Transf'r Weight	$3\frac{1}{2}$ lbs.				$4\frac{1}{4}$ lbs.				5.0 lbs.					6.0 lbs.					$6\frac{1}{2}$ lbs.				

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.

Photo above shows latest RCA-Victor short-wave and broadcast band receiver, utilizing 6 tubes.

RCA Victor Has New 6-Tube All-Wave Set

● ONE of the very newest and highly interesting short-wave and broadcast receivers is the new 6-tube, two-band, RCA Victor model here illustrated. This receiver is available in different style cabinets and by operating a switch it reproduces through its loud speaker either stations on the regular broadcast band, between 200 and 550 meters, or else a fine selection of foreign short-wave stations in the popular bands extending from 19 to 55.5 meters. Between the limits of the short-wave band available in this receiver at the throw of a switch are included four of the internationally assigned short-wave broadcast bands, located at 49, 31, 25, and 19 meters, respectively. Thus, in addition to providing fine entertainment from the American broadcasting stations in the usual band, this receiver permits direct reception of interesting programs from the principal short-wave broadcast transmitters located in all parts of the world. The short-wave facilities afforded by this instrument represent the very newest engineering developments. The short-wave feature is built in as an integral part of the radio chassis, not simply an adapter connected to an old-style broadcast receiver. Both tuning ranges are quickly interchangeable by means of a push-pull switch on the front of the cabinet. Other features to be found on this receiver are the vernier dual-ratio selector drive, permitting either rapid or fine adjustments independently, and secondly—there is the clock-type full-vision illuminated dial, which is calibrated directly in terms of frequency for both short and broadcast band ranges.

As the diagram shows, each of the two wave bands made available in this set have independent tuned couplers or inductances and when the two-way switch S-1, 2, 3, 4, 5, and 6 knob is turned, either the short wave or broadcast coils are connected into circuit. It will be noted that the new 2A7 tube is used for the oscillator and first detector, while the very latest circuit improvements incorporating automatic volume control with the second detector are provided, by utilizing a 2B7 tube. The loud speaker is energized by one of the newest power audio frequency tubes, the 2A5. The manufacturers recommend the use of an outdoor antenna from 25 to 75 feet long, including lead in and ground wire, and where this is not possible an inside antenna may be used. These sets are designed for operation on 110 volts, 60 cycle A.C. and sets for 220 volt A.C. circuits are available. This receiver has its power switch and tone control combined in one knob.

A brand new form of tuning time-chart has been developed for use with this receiver in which the program "time on the air" is plotted graphically; also Eastern Standard Time, as well as G.M.T. are given at the top of the chart to facilitate tuning in European stations. This set will win many friends, as a flip of the switch immediately takes one from the American Broadcast Band to the European and South American circuit. (No. 136)

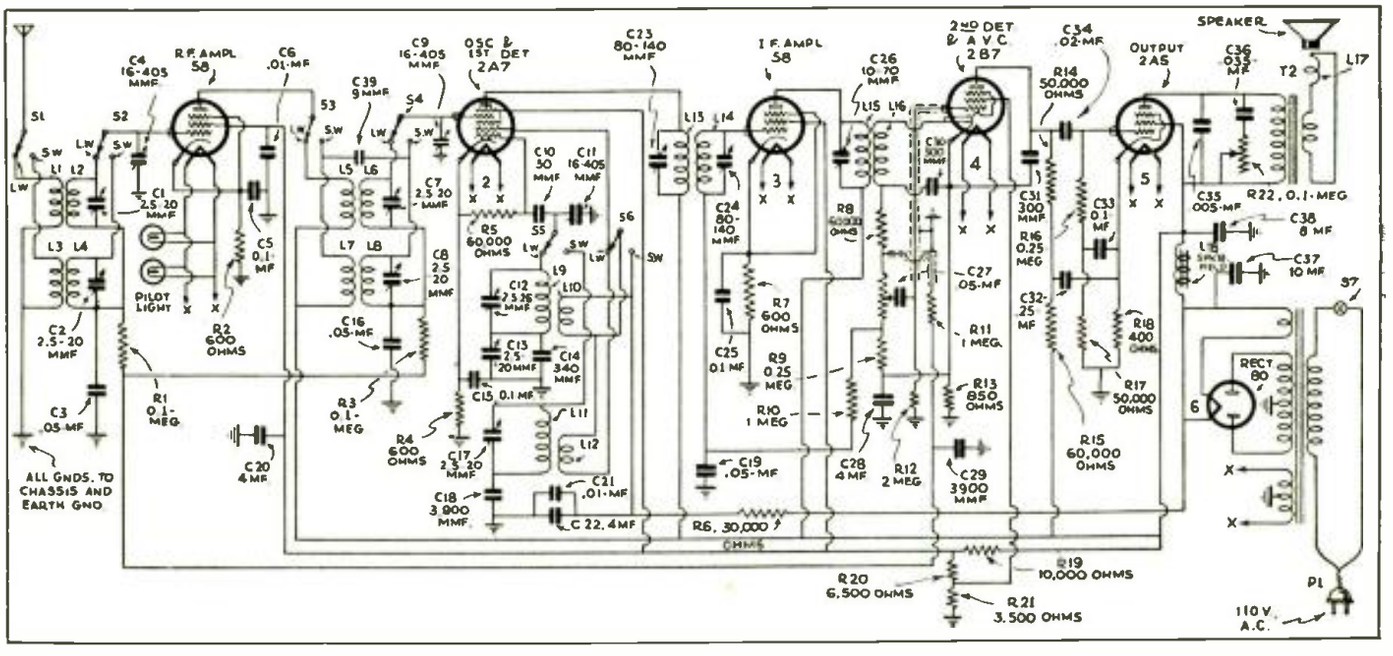


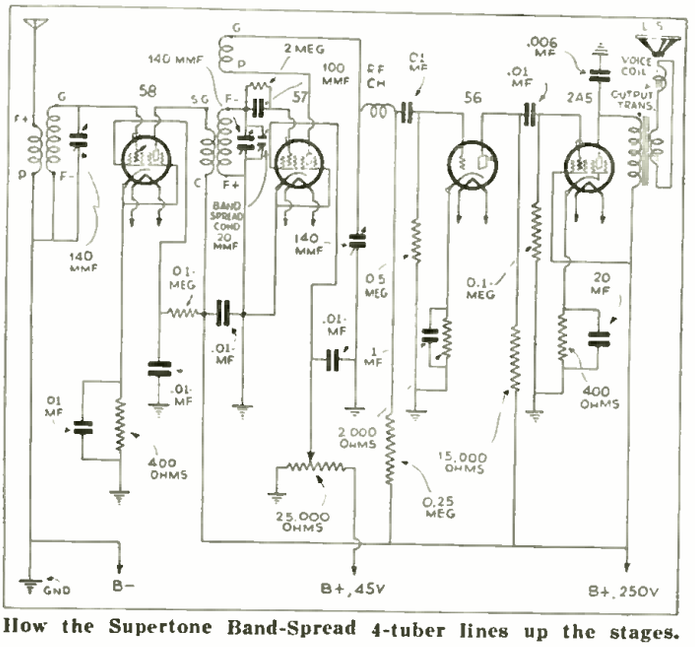
Diagram for the new RCA-Victor 2-band model, "short-wave" and "broadcast" 6-tube receiver.

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

4-Tube SUPERTONE Has Band-Spread

● THE receiver shown in the photo is principally the same as the set described on page 216 of the August, 1933, SHORT WAVE CRAFT. However, a very worthwhile improvement has been made in the matter of *band-spreading*. This is accomplished in about the simplest form the writer has ever seen. As can be seen from the wiring diagram, the receiver has two main tuning controls, one controls the tuning of the R.F. stage and the other the detector. As most of us know, the R.F. stage on a tuned R. F. short-wave receiver is usually rather broad in comparison with the detector tuned circuit and the most critical adjustment, of course, is the detector tuning condenser. It can be readily appreciated that if a small condenser around 20 mmf. were shunted across a 140 mmf. tuning condenser, the small condenser could be tuned over a considerable range without getting entirely out of resonance with the R.F. stage grid circuit and in this manner provide a very efficient and economical means of obtaining band spread. The method of tuning this receiver would be to tune the two 140 mmf. condensers together to a definite short-wave broadcast band, and then do all other tuning with the added 20 mmf. condenser. In the case of the famous 30 meter foreign broadcast band, it may be necessary to slightly retune the R.F. stage, but this is not a disadvantage or a very critical operation, for, as we mentioned before, this stage is rather broad. The rest of the set is the same as previously described in SHORT WAVE CRAFT and it uses a 56 resistance-coupled audio amplifier, which in turn is resistance-coupled to a 2A5 audio amplifier. This set gives remarkable volume on even the weakest foreign station and with the added advantage of the band-spread or vernier adjustment, should enable a much finer tuning adjustment on those weak stations, which on most sets are rather difficult to tune in. For the parts list of this receiver refer to page 254 of the August, 1933, issue of SHORT WAVE CRAFT and add to this list the 20 mmf. band-spread condenser.

Here's the new Supertone 4-tube Band-Spread short-wave receiver.



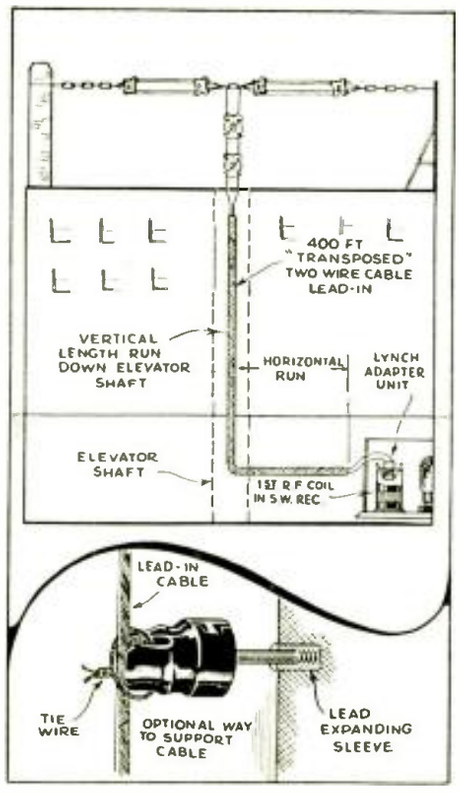
How the Supertone Band-Spread 4-tuber lines up the stages.

350 Ft. Lead-In "Cable" Works Fine!

● THE new Lynch short-wave antenna system, including a new transposition (sheathed) cable, including 350 feet of the latter, was very successfully used to enable the operators to transmit and receive signals over long distances, even though the apparatus was set up in the basement of Madison Square Garden in New York City. Due to the great amount of steel work in such buildings and the difficulty of erecting anything like a decent antenna this is the first time that satisfactory operation, especially of short-wave sets, has been permitted.

David Talley in a recent letter to Arthur H. Lynch, stated that it was necessary to erect a short-wave antenna at Madison Square Garden on the roof, nine floors above the basement. The sketch herewith shows how two cages, constructed with the Lynch special cage spreader (isolantite) insulators, were supported and a transposition lead-in brought down to the roof level, where the two transposition wires were joined to the two terminals of a 350 foot length of the new Lynch transposition lead-in cable, which was carried down the elevator shaft to the amateur radio station set up in the A. R. R. L. booth on the Exposition Floor in the basement of the Garden.

As Mr. Talley points out, it did not seem possible that they would be able to receive many worthwhile signals on account of the many electrical apparatus in operation in the building, but everyone was agreeably surprised when they found that they were able to carry on "two-way" phone, as well as CW (code) communications with amateur stations from Maine to Florida, and as far west as Chicago, without the slightest interference from "man-made" static.



This diagram shows how approximately 350 feet of the new Lynch two-wire "transposition" lead-in cable was used to permit successful short-wave transmission and reception to be carried on at the recent New York RADIO SHOW.

One of the main technical features to be pointed out in this connection is that heretofore it has been deemed impractical to try to conduct the lead-in currents through a sheathed cable for any great length of run, but with the new transposition arrangement of the two highly insulated wires in the new Lynch shielded lead-in cable, the two wires are twisted so that they transpose every nine inches. Mr. Talley, in his report, stated among other things that not only was transmission and reception equally good on the 80 meter amateur band, but it was equally so on the 40, 20, and even the 5 meter band!

NEW MIDGET RECEIVER Has 60 to 550 Meter Range

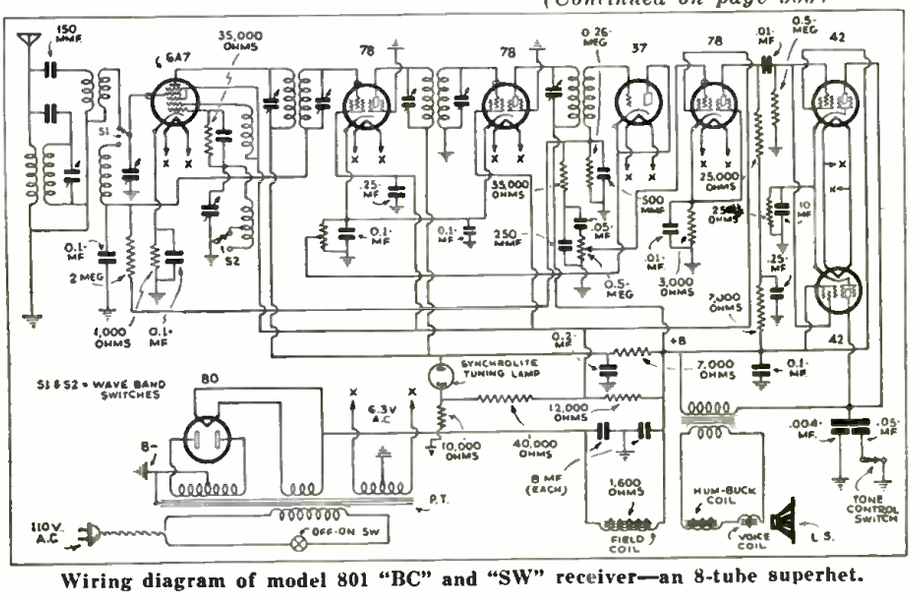
The DeWald midget broadcast and short-wave receiver tuning from 550 down to 60 meters. (No. 134)

● ONE of the best sounding midget radio receivers we have heard in some time is the model 801 DeWald, which covers the broadcast and short-wave band down to 60 meters. Another model tunes clear down to 15 meters and includes the broadcast band from 200 to 550 meters. This receiver is encased in a handsome walnut cabinet; the chassis is an 8-tube superheterodyne.

Among other features found in this very smooth working receiver we find 100 per cent automatic volume control, full-range tone control, visual neon tube tuning, electron coupled circuit, a pre-selector antenna circuit, high sensitivity and diode detection.

The model 801 uses a well selected set of high gain tubes and by careful design of the various coupling circuits used to link the stages, a very high amplification is obtained, together with a very well balanced circuit, so that a surprisingly fine quality of reproduction is obtained. A dynamic speaker of the latest type and of the proper impedance to work with the particular tube used in this set provides an extra fine quality of sound reproduction. Liberal sized condensers and chokes are used so that a minimum of noise results. Moreover the set occupies only a small space and will find favor for many requirements, including small apartments, cabins, study dens, etc. The size of the cabinet housing the model 801, and also its close relative, the model 811—which tunes down to 15 meters, is 16¾" high by 14½" wide, by 8¾" deep.

(Continued on page 566)



Wiring diagram of model 801 "BC" and "SW" receiver—an 8-tube superhet.

The LAFAYETTE S-W "Champion"

By HUBERT SHORTT and FRANK LESTER*

● THE Lafayette Short-Wave "Champion" is an all-pentode receiver using four of the newer type 2-volt tubes in an extremely sensitive tuned r.f. circuit. Naturally, a regenerative detector is used.

The r.f. tube is a 2-volt 34 type pentode possessing the same desirable variable mu features as the a. c. tubes of the 58 type. The detector tube is also a 34 tube. Regeneration is controlled by varying the screen-grid voltage. This method gives a very smooth even control. Resistance coupling is employed between the detector and the first audio stage and also between the first audio and the output stage. A 32 type pentode serves as the first audio tube, while the output tube is a 33 pentode. This has a power output of 700 milliwatts.

The two-gang variable condenser C1, C2 tunes simultaneously the secondary of the antenna coupler L1 and the secondary of the r.f. coil L2. An additional midget variable condenser C16, shunted across the primary of L1, provides for extra fine adjustments.

In accord with modern practice, the Champion is wired for use with "doublet" noise eliminating antennas such as the Lynch. Using an ordinary antenna system, the antenna is connected to binding post 3 and ground may be connected to post 2 or 1. If the doublet system is used, the two lead-in wires are connected to posts 2 and 3, thus making use of the isolated primary provided for this purpose.

It will be noted that the circuit is

(Continued on page 557)

*Wholesale Radio Service Company

The new Lafayette short-wave "Champion" receiver; it is of the two volt battery type.

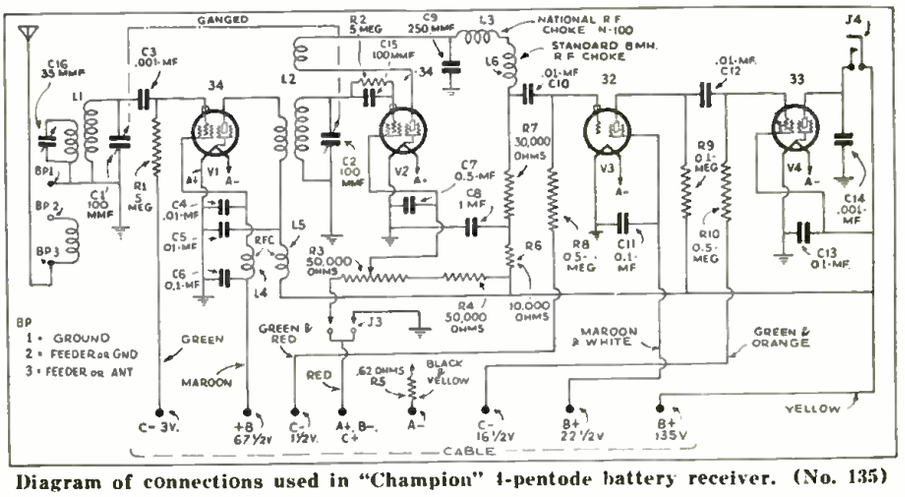


Diagram of connections used in "Champion" 4-pentode battery receiver. (No. 135)

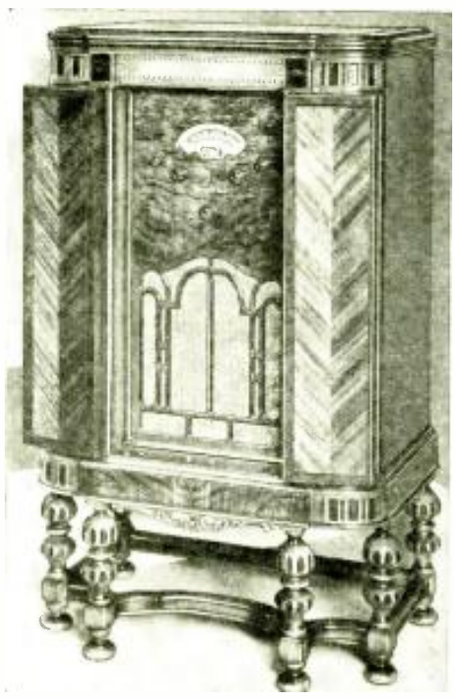
(Names and addresses of manufacturers furnished upon receipt of stamped envelope; mention No. of article.)

New ALL-WAVE Atwater Kent

Mounted in a very handsome cabinet, this 11-tube combination "broadcast" and "short-wave" superheterodyne receiver makes its bow to the short-wave minded American public. The Model 711 All-Wave receiver possesses automatic volume control, 4-point tone control, silent and shadow tuning, and with its auditorium type loud speaker it easily reproduces the trans-Atlantic short-wave stations with great volume.

● THE all wave receiver is becoming almost a household word today and the average purchaser of a radio set is now beginning to look for the *short-wave* feature. One of the best engineered, as well as handsome appearing all wave receivers that has so far made its appearance on the American market, is the new model 711 Atwater Kent, shown in the illustration and accompanying diagram. This receiver provides family entertainment from any one of the leading European or other DX short-wave stations, as well as all of the American broadcast stations on the 200 to 550 meter band. After all, the average purchaser of an all-wave receiver of this general type will ask himself the question, sooner or later, as to which receiver he should eventually buy—and why.

With regard to the A-K all wave receiver here illustrated, it may be said that a tremendous amount of careful technical research has been carried on in developing this receiver through many different forms, before the engineers were satisfied to release this receiver to the public. A lot of probationary work was carried on in connection with a short-wave converter of the same make with which many thousands of people became familiar, and the converter in question was one of the best that the editors ever tried out. With the experience gained with the short-wave converter, plus a lot of hard laboratory work and thousands of tests, the model 711 finally saw the light of day, so far as the public is concerned.

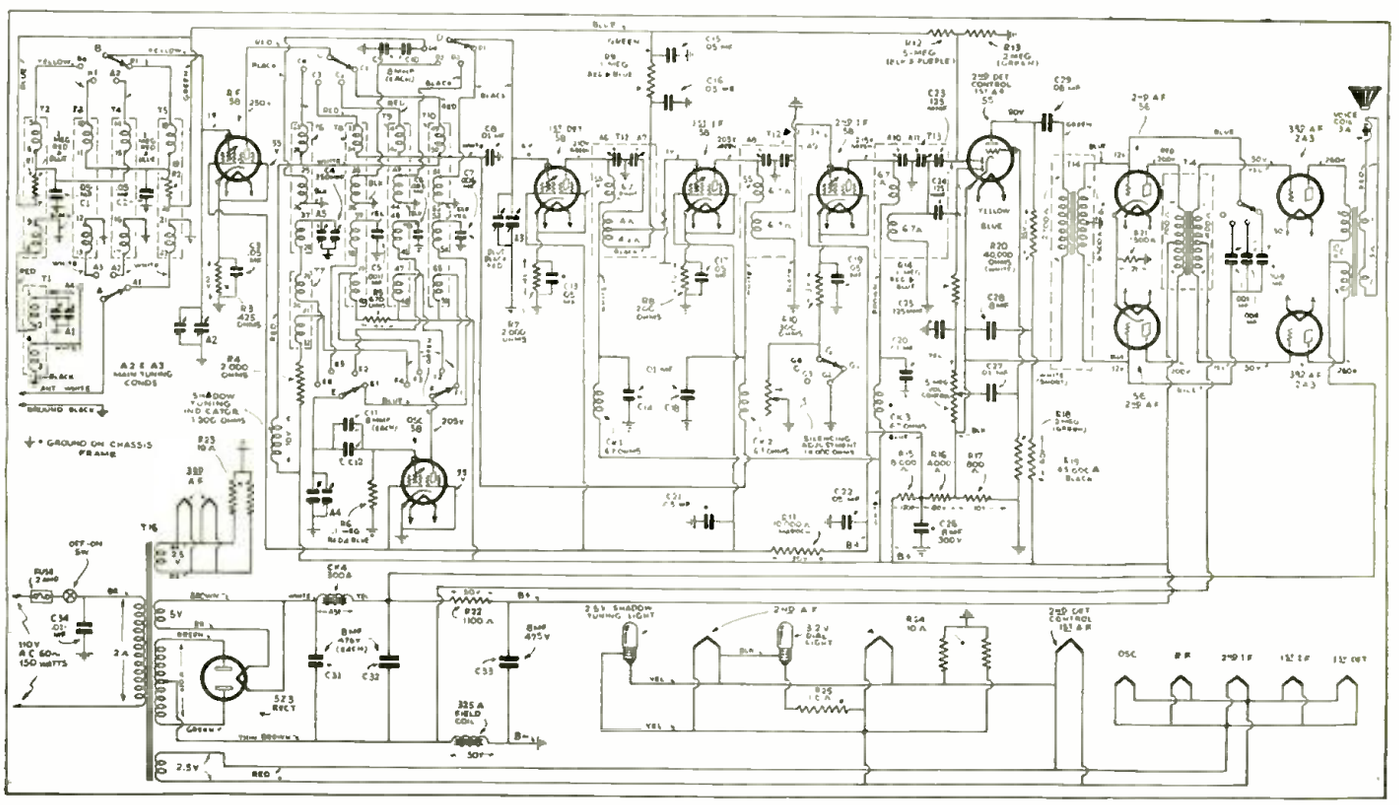


Note the handsome appearance of this newest Atwater Kent "Broadcast" and "Short-Wave" Superheterodyne Receiver. It has 11 tubes and a large auditorium type loud speaker. It provides all-wave tuning from 540 to 23,000 kc.

As the diagram herewith shows, each wave-band covered has its own set of compensated tuning inductances or coils, and the coil unit for any given band is tuned by means of the master condensers, A2, A3, thanks to the gang-switch ABC and D controlled by a single knob, which connects into circuit any coil unit for a given band at the turn of a knob.

High sensitivity and improved selectivity are afforded by the 58 R.F. stage, connected ahead of the 58 first detector. A separate 58 oscillator is employed and after the first detector we find two "high gain" I. F. stages. The signal is now fed into the second detector—first A.F. 55 tube. Then, the signal passes on through a push-pull second A.F. stage employing two 56's and the output of this stage is transformer-coupled into the third A.F. stage, in which a pair of 2A3's are used in a push-pull arrangement. The powerfully amplified signal, whether short-wave or broadcast, passes from the plate circuits of the third A.F. stage through a carefully designed output transformer into the thoroughly adequate auditorium-type loud-speaker.

The power supply of the model 711 All-Wave receiver is very ably taken care of by the utilization of the newest rectifier tube, the type 5Z3. Plentifully large condensers are used in the power-supply filter so as to insure the minimum of noise or hum.



The Model 711 A-K All-Wave Receiver is shown diagrammatically above. The various coils to cover the different wave-bands are switched into circuit as required by simply turning a knob.

New Norden Superhet Tunes 15 to 550 Meters

A new multi-wave, 9-tube, superheterodyne having a wave length range of 15 to 550 meters, built on a very compact chassis; it has built-in power supply. Band-spread is provided to increase ease in tuning in DX stations. Specially wound plug-in coils insure highest efficiency. Has tuning meters and A.V.C.; also CW beat oscillator for code reception.

Interesting control panel of the new Norden all-wave superhet; note the tuning meters.

● THERE have been a great many remarkable advances and improvements in the design of short-wave equipment but the new Norden Navy Model 34 incorporates some of the highest developments yet attained in radio engineering. The design makes it possible for nine tubes to accomplish the results of fifteen with even greater efficiency than was possible with previous designs. Definitely the day of the cumbersome receiver of many tubes is past. All good engineering tends toward simplification which is the primary essential in proper design and this is exemplified in the new receiver here illustrated.

Primarily a receiver must have the necessary sensitivity and selectivity to receive the desired station and to do so with the exclusion of all other interfering signals. It is well known that the superheterodyne method of reception has long been the standard used by the U. S. Army and Navy and commercial communication companies, where the requirements are reception over extremely long distances without interference from nearby stations. The engineers who designed this receiver first introduced the superheterodyne for popular use in 1924 and have since continuously advocated this principle of design; consequently the new receiver represents the composite experiences of a decade of research and engineering development in this type of receiver.

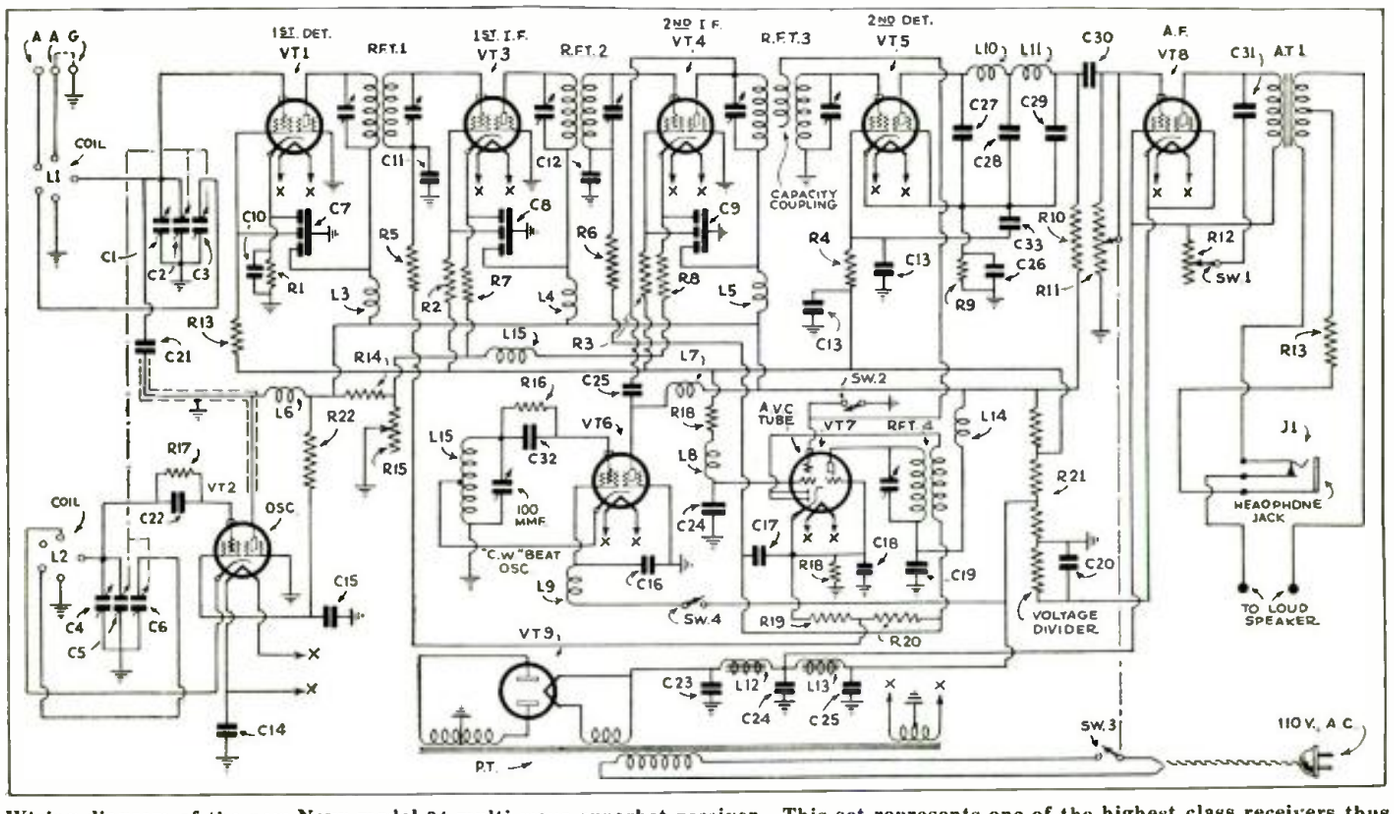
High Sensitivity and Selectivity

The new receiver has a sensitivity of less than ¼ micro-volt per meter throughout the entire frequency range, which permits the reception of the very weakest signals. The sensitivity of any receiver is limited by the proportion of *background noise* in relation to *signal strength*. Great care has been exercised in the design of this set to insure the highest possible ratio of signal-to-noise, so that satisfactory reception is possible even under adverse conditions. Actually this ratio is about 4:1 which is higher than any other receiver now available, the designers of this set state, and signals that are inaudible to other receivers are easily picked up with the Navy Model 34 with satisfactory quality and volume.

The question of *selectivity* has always been one of the serious problems in the design of receiving sets. If a receiver has been designed for this purpose exclusively, the quality or reproduction suffers proportionately. It is absolutely necessary that many other factors be taken into consideration

(Continued on page 548)

Alexander Norden, Jr., who sponsors the new 9-tube de Luxe multi-wave superheterodyne, here described.



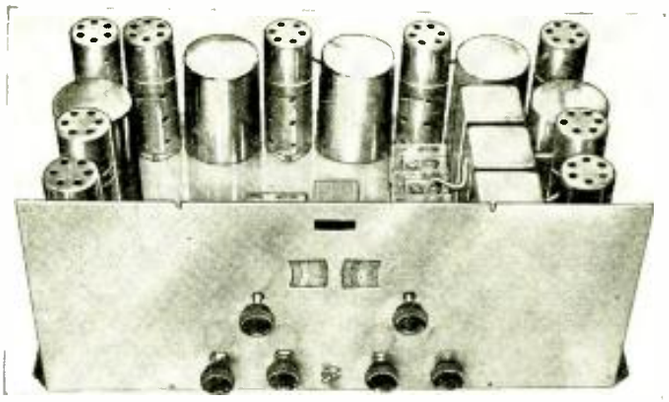
Wiring diagram of the new Navy model 34 multi-wave superhet receiver. This set represents one of the highest class receivers thus far offered to short-wave "fans" and "hams."

The Masterpiece II

Official All-Wave Receiver

Of the Byrd Antarctic Expedition

By McMURDO SILVER



The Masterpiece II, designed by McMurdo Silver, which covers all waves from 13 to 570 meters; It has "band-spread" tuning.

Here's McMurdo Silver's latest—the Masterpiece II, "All-Wave" Receiver. It has a wavelength range of 13 to 570 meters and possesses tremendous amplification, thanks to the 12 high-gain tubes employed. A special switch changes the coil connections for the various wave bands.

● IN AUGUST of this year the MASTERPIECE fifteen tube all wave receiver had been in service for nine months, and the excellence of the reports on its performance received from sets in all parts of the world indicated no need for improvement. But at this time came the request of Admiral Byrd for a number of these sets for use under the rigorous conditions of his second Antarctic Expedition. Certain suggestions were made by a famous eastern university acting as his radio advisor, as to details which it was felt would insure somewhat more satisfactory results under the unusually severe usage of the Expedition's two year stay in the Antarctic.

At the same time came the request from another great eastern university engaged in short-wave transmission phenomena research for exactly the same features requested for Admiral Byrd.

So the MASTERPIECE II was born—the original MASTERPIECE with the added features desired by these two great engineering schools and at the same time taking maximum advantage of certain simplifications made possible by new tubes introduced in recent months.

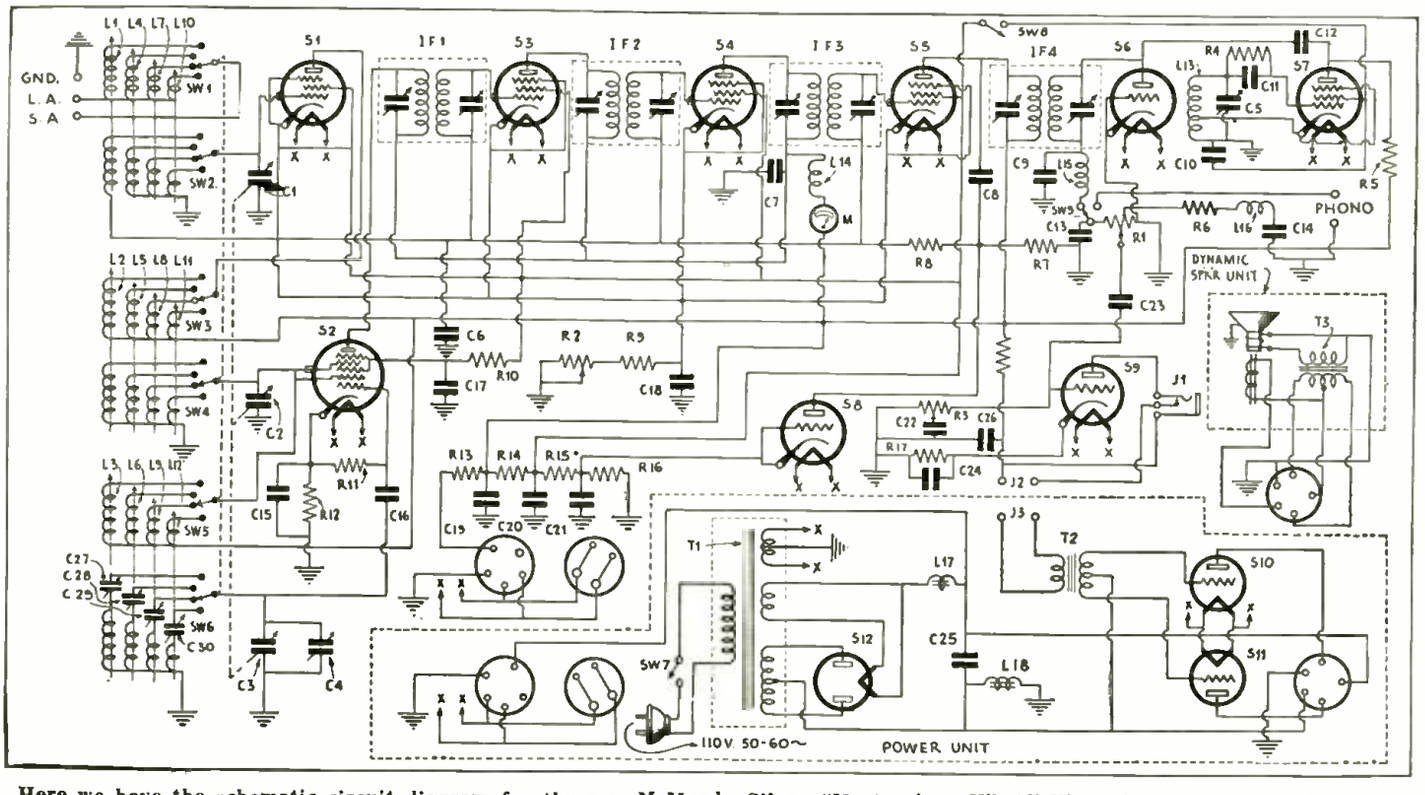
Better Performance Through Simplification

One year after the introduction of the MASTERPIECE it has, therefore, been felt that by analyzing a cross-section of comments and suggestions certain mechanical changes could beneficially be made. Certain simpler electrical means of attaining the same ends having been developed during 1933, these might also advantageously be incorporated at this same time.

As stated above, these changes are not essential design changes, for they alter the results obtained hardly at all. They are simplifications of an electrical and mechanical nature, calculated to render the results previously obtained easier to obtain, both for the novice and the experienced engineer alike.

To those familiar with the MASTERPIECE two changes are outstanding upon looking at the set. The first is the polished chromium shielding cabinet over the entire chassis. This contributes additional shielding over and above that had by the individual circuit elements, helping to eliminate extraneous noise, and also keeping dust

(Continued on page 560)



Here we have the schematic circuit diagram for the new McMurdo Silver "Masterpiece II" All-Wave Superheterodyne Receiver.

SHORT WAVE STATIONS OF THE WORLD

SECTION TWO

The lists that appear herewith comprise Section Two of the SHORT WAVE CRAFT index of the world's short wave stations, which has proved very popular with S. W. fans everywhere. As compared with Section Two published in the November, 1933, number, it represents many additions and corrections.

Section One of this list, which appeared in the December, 1933, number, contained a "grand" list of short wave relay broadcasting, experimental and commercial radiophone stations. It will appear in the February, 1934, number, with further additions and last minute corrections.

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

AIRPORT RADIO STATIONS

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

Group One

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

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

Group Two

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

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

Group Three

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

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

Group Four

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

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

Group Five

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

Atlanta, Ga.	WQPD
Big Spring, Tex.	KGUG
Brownsville, Tex.	KGUE
Burbank, Calif.	KGUR
Cincinnati, Ohio	WSID
Dallas, Tex.	KGUF
Douglas, Ariz.	KGUN
El Paso, Tex.	KGUA
Frijole, Tex.	KGUM
Indio, Calif.	KGUQ
Jackson, Miss.	KSDB
Little Rock, Ark.	KQUU
Memphis, Tenn.	WSDK
Nashville, Tenn.	WSDT
New Orleans, La.	WQDQ
Omaha, Nebr.	KGTS
Phoenix, Ariz.	KGUP
Robertson, Mo.	KGUT
San Antonio, Tex.	KGUD
Shreveport, La.	KGUK
Springfield, Ill.	WAEJ
Waco, Tex.	KGUH

Group Six

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

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

Group Seven

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

Detroit, Mich.	WAEI

Group Eight

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

Blythe, Calif.	KGUS
Houston. Tex.	KGUB

Group Nine

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

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

Group Ten

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

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

AIRPORT RADIO STATIONS—Alphabetically by Call Letters

The number in parenthesis following the location indicates the frequency group in which the station operates.

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

TELEVISION STATIONS

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

According to frequency and wavelength

1600-1700 kc. 176.5-187.5 m.

Dial:

W2XR—Radio Pictures, Inc.
Long Island City, N. Y.
1000 watts. 60 lines

W8XAN — Sparks-Withington Co.
100 watts
Jackson, Mich.

2000-2100 kc. 142.9-150 m.

Dial:

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

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

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

2100-2200 kc. 136.4-142.9 m.

Dial:

W3XAK—National Broadcasting Co.
5000 watts. Portable

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

W6XS—Don Lee Broadcasting Corp.
Los Angeles, Calif.
1000 watts

W9XAP—National Broadcasting Co.
Chicago, Ill.
2,500 watts

W9XAK—Kansas State College,
Manhattan, Kans.
125 watts

2200-2300 kc. 130.4-1364 m.

Dial:

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

2750-2850 kc. 105.3-109.1 m.

Dial:

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

W2XAB—Atlantic Broadcasting Corp.
New York, N. Y.
500 watts
(not in use)

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

Dial:

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

W9XE—U. S. Radio & Tele. Corp.
Marion, Ind.
1000 watts

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

W2XBT—National Broadcasting Co.
Portable
750 watts

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

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

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

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

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

W10XX—RCA-Victor Co.,
Portable and Mobile.
50 watts

W8XAN—Sparks-Withington Co.,
Jackson, Mich.
100 watts

POLICE RADIO ALARM STATIONS

By Frequency and Wavelength

2506 kc.-120 m.

Dial:

KGZE	San Antonio, Tex.

2470 kc.-121.5 m.

Dial:

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

2458 kc.-122.0 m.

Dial:

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

2450 kc.-122.4 m.

Dial:

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

2442 kc.-122.8 m.

Dial:

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

2430 kc.-123.4 m.

Dial:

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

2422 kc.-123.8 m.

Dial:

KSW	Berkeley, Cal.
WMJ	Buffalo, N. Y.
KGPE	Kansas City, Mo.
KGZC	Topeka, Kan.
KGPG	Vallejo, Cal.
WPDW	Washington, D. C.
WPFG	Jacksonville, Fla.

2414 kc.-124.2 m.

Dial:

WPDY	Atlanta, Ga.
KGPS	Bakersfield, Cal.
WCK	Belle Island, Mich.
WPDX	Detroit, Mich.
KGZA	Fresno, Cal.
WRDR	Grosse Pt. Vil. Mich.
WMO	Highland Pk., Mich.
KGPA	Seattle, Wash.
WPDA	Tulare, Cal.
KGZM	El Paso, Tex.
WPFH	Baltimore, Md.
KGZN	Tacoma, Wash.
WPFI	Columbus, Ga.
WPFM	Birmingham, Ala.
WPFR	Clarksburg, W. Va.
.....	Santa Barbara, Cal.
.....	Mount Pleasant, N. Y.
KGPD	San Francisco, Cal.

1712 kc.-175.15 m.

Dial:

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

1574 kc.-189.5 m.

Dial:

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

1558 kc.-192.5 m.

Dial:

WEY	Boston, Mass.
WKDT	Detroit, Mich.

1534 kc.-196.1 m.

Dial:

KGHO	Des Moines, Ia.

190 kc.-1570 m.

Dial:

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

Alphabetically By Call Letters

KGHO	Des Moines, Iowa	1534 kc.
KGJX	Pasadena, Cal.	1712 kc.
KGOZ	Cedar Rapids, Iowa	2470 kc.
KGPA	Seattle, Wash.	2414 kc.
KGPB	Minneapolis, Minn.	2430 kc.
KGPC	St. Louis, Mo.	1712 kc.
KGPD	San Francisco, Cal.	2414 kc.
KGPE	Kansas City, Mo.	2422 kc.
KGPG	Vallejo, Cal.	2422 kc.
KGPH	Oklahoma City, Okla.	2450 kc.
KGPI	Omaha, Neb.	2470 kc.
KGPJ	Beaumont, Tex.	1712 kc.
KGPK	Sioux City, Iowa	2470 kc.
KGPL	Los Angeles, Cal.	1712 kc.
KGPM	San Jose, Cal.	2470 kc.
KGPN	Davenport, Iowa	2470 kc.
KGPO	Tulsa, Okla.	2450 kc.
KGPP	Portland, Ore.	2442 kc.
KGPQ	Honolulu, T. H.	2450 kc.
KGPS	Bakersfield, Cal.	2414 kc.
KGPW	Salt Lake City, Utah	2470 kc.
KGPX	Denver, Colo.	2442 kc.
KGPY	Baton Rouge, La.	1574 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZA	Fresno, Calif.	2414 kc.
KGZB	Houston, Tex.	1712 kc.
KGZC	Topeka, Kan.	2422 kc.
KGZD	San Diego, Cal.	2430 kc.
KGZE	San Antonio, Tex.	2506 kc.
KGZF	Chanute, Kans.	2450 kc.
KGZG	Des Moines, Iowa	2470 kc.
KGZH	Klamath Falls, Ore.	2442 kc.
KGZI	Wichita Falls, Tex.	1712 kc.
KGZJ	Phoenix, Ariz.	2430 kc.
KGZL	Shreveport, La.	1712 kc.
KGZM	El Paso, Tex.	2414 kc.
KGZN	Tacoma, Wash.	2414 kc.
KGZP	Coffeyville, Kans.	2450 kc.
KGZQ	Waco, Tex.	1712 kc.
KGZR	Salem, Ore.	2442 kc.
KSW	Berkeley, Cal.	1712 kc.
KVP	Dallas, Tex.	1712 kc.
UYR	Montreal, Can.	1712 kc.
WBA	Harrisburg, Pa.	257 kc.
WBR	Butler, Pa.	257 kc.
WCK	Belle Island, Mich.	2414 kc.
WDX	Wyoming, Pa.	257 kc.
WEY	Boston, Mass.	1558 kc.
WJL	Greensburg, Pa.	257 kc.
WKDT	Detroit, Mich.	1558 kc.
WKDU	Cincinnati, Ohio	1712 kc.
WMB	W. Reading, Pa.	257 kc.
WMDZ	Indianapolis, Ind.	2442 kc.
WMJ	Buffalo, N. Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1574 kc.
WPDA	Tulare, Cal.	2414 kc.
WPDB	Chicago, Ill.	1712 kc.
WPDC	Chicago, Ill.	1712 kc.
WPDD	Chicago, Ill.	1712 kc.
WPDE	Louisville, Ky.	2442 kc.
WPDF	Flint, Mich.	2442 kc.
WPDG	Youngstown, Ohio	2458 kc.
WPDH	Richmond, Ind.	2442 kc.
WPDI	Columbus, Ohio	2430 kc.
WPDK	Milwaukee, Wis.	2450 kc.
WPDL	Lansing, Mich.	2442 kc.
WPDM	Dayton, Ohio	2430 kc.
WPDN	Auburn, N. Y.	2458 kc.
WPDO	Akron, Ohio	2458 kc.
WPDP	Philadelphia, Pa.	2470 kc.
WPDR	Rochester, N. Y.	2458 kc.
WPDS	St. Paul, Minn.	2430 kc.
WPDT	Kokomo, Ind.	2470 kc.
WPDU	Pittsburgh, Pa.	1712 kc.
WPDV	Charlotte, N. C.	2458 kc.
WPDW	Washington, D. C.	2422 kc.
WPDX	Detroit, Mich.	2414 kc.
WPDY	Atlanta, Ga.	2414 kc.
WPDZ	Fort Wayne, Ind.	2470 kc.
WPEA	Syracuse, N. Y.	2458 kc.
WPEB	Grand Rapids, Mich.	2442 kc.
WPEC	Memphis, Tenn.	2470 kc.
WPED	Arlington, Mass.	1712 kc.
WPEE	New York, N. Y.	2450 kc.
WPEF	New York, N. Y.	2450 kc.
WPEG	New York, N. Y.	2450 kc.
WPEH	Somerville, Mass.	1712 kc.
WPEI	E. Providence, R. I.	1712 kc.
WPEK	New Orleans, La.	2430 kc.
WPEL	Middleboro, Mass.	1574 kc.
WPEM	Woonsocket, R. I.	2470 kc.
WPEP	Arlington, Mass.	1712 kc.
WPES	Saginaw, Mich.	2442 kc.
WPET	Lexington, Mass.	1712 kc.
WPEV	Portable, Mass.	1574 kc.
WPFA	Newton, Mass.	1712 kc.
WPFC	Muskegon, Mich.	2442 kc.
WPFD	Highland Park, Ill.	2430 kc.
WPFE	Reading, Pa.	2442 kc.
WPFF	Toms River, N. J.	2430 kc.
WPFG	Jacksonville, Fla.	2442 kc.
WPFH	Baltimore, Md.	2414 kc.
WPFI	Columbus, Ga.	2414 kc.
WPFJ	Hammond, Ind.	1712 kc.
WPFK	Hackensack, N. J.	2430 kc.
WPFL	Gary, Ind.	2470 kc.
WPFM	Birmingham, Ala.	2414 kc.
WPFN	Fairhaven, Mass.	1712 kc.
WPFO	Knoxville, Tenn.	2470 kc.
WPFP	Clarksburgh, W. Va.	2414 kc.
WPFQ	Swathmore, Pa.	2470 kc.
WPFR	Johnson City, Tenn.	2470 kc.
WPFV	Pawtucket, R. I.	2470 kc.
WRDH	Cleveland, Ohio	2458 kc.
WRDR	Grosse Pt. Village. Mich.	2414 kc.
WRDQ	Toledo, Ohio	2470 kc.
WRDS	E. Lansing, Mich.	1574 kc.

SHORT WAVE QUESTION BOX

COST OF LICENSE

Eleutherios Vozeolas, Lowell, Mass.

(Q) I am a boy of 15 and I always like to have a transmitter. I have a hunch that SHORT WAVE CRAFT was the exact magazine I needed and boy, is it good to read. Before I go any further in building a transmitter I would like to know what the cost of obtaining an amateur license is?

(A) There is no cost to obtaining operator's or station license of the amateur class in the United States. However there usually is a fee of twenty-five cents for each license to cover the cost of notarizing, which makes a total of 50c for operator's and station license.

DIAGRAM FOR 49 IN CLASS "A"

John L. Schlener, Jr., Elmhurst, Ill.

(Q) Will you please publish a circuit for an audio stage using a type 49 tube?

(A) The circuit you desire is given on this page. The 49 is intended for class "B" push-pull operation. However when the grid adjacent to the plate is tied to the plate, it will function as a class "A" amplifier. This is the diagram that is shown.

(Q) Which is better, a 37 or type 27 for detection?

(A) There is no difference in the working of the two tubes. They are identical in characteristics, except that the 37 is intended for six volt D.C. operation, while the type 27 is to be used with 2.5 volts A.C. on the heater.

SHIELDING

Jack Najork, Northport, N. Y.

(Q) My set has a metal panel which is connected to a very good ground. Nevertheless I am bothered with capacity effects very much. Will you please suggest a remedy for this?

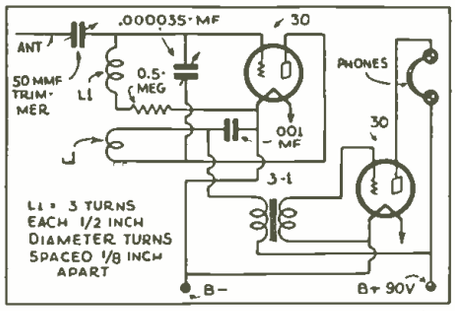
(A) Metal panels do not always entirely eliminate *body capacity* effects, due to the fact that the ground connection can only be made to one part of the chassis, leaving another section of the chassis at a much higher potential difference, at very high radio frequencies. About the best way to overcome your problem is to move your variable condensers and other instruments, which are probably causing the trouble, further away from the grounded panel; or if you wish to go to the additional labor and expense, provide another shield directly behind your present panel with a space between the two of about ¼ inch. This is known as *double shielding* and effectively eliminates all traces of *body capacity* effects.

SIMPLE 5 METER RECEIVER

John A. Burnham, Jr., Marblehead, Mass.

(Q) Will you please publish one of the simplest type of 5 meter receivers giving coil detail and various circuit constants?

(A) You will find shown on this page the diagram of a 5 meter receiver using type 30 tubes. No interruption frequency oscillator tube is used. The feed-back of the type 30 detector is increased until



Simple two tube 5 meter receiver using type '30 tubes

● **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.

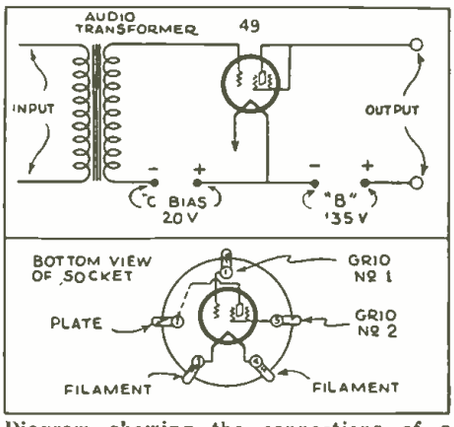


Diagram showing the connections of a '49 as a class "A" amplifier

"squedging" occurs. In this manner the type 30 tube can be made to provide its own interruption frequency oscillations.

NOISY RECEIVER

Milton Cecalek, Houston, Texas

(Q) I would like to know what could possibly cause terrific crashing in my short-wave set. My set uses one type 24 and 27. The noise is irregular and may even stop for a couple of weeks or so. I have already ruined one power pack trying to find the fault. Then I built another one and no improvement was noticed. I have tested everything from A to Z and secured a service man's help—but with no result. The noise is barely noticeable when the set is not regenerating, but when regenerating, increases to an unbearable degree. I am a senior E. E. student and I think, to my knowledge, I have done everything possible. You are my only salvation.

(A) The first thing we suggest is that you disconnect your antenna to determine whether or not the noise is actually in the receiver. It may be that you are picking up some electrical disturbance and no amount of rebuilding your receiver would overcome this in any way. However upon doing this if the noise still continues you can rest assured that it is in the receiver itself. Many sizzling and crackling noises have been traced to *noisy* (cheap or cracked) resistors and faulty or leaking by-pass condensers. Many times the terminals on condensers and resistors are not securely made and at times through vibration become loosened and cause a terrific crashing noise in the receiver. We suggest that you carefully check this over by process of elimination and we feel sure that you will overcome your difficulty.

LOW POWER TRANSMITTER

H. G. Dunn, Grizzly Flats, Calif.

(Q) I have 110 volts D.C. local source of power. Is there any simple way of stepping this voltage up to a suitable value for a transmitter.

(A) There is no practical way of increasing your 110 volts D.C. unless you use some sort of converter to change your D.C. into A.C. which can then be stepped up through the use of a suitable power transformer.

(Q) Would heavy-duty "B" batteries be a feasible source for supplying 300 to 400 volts for transmitting?

(A) Heavy duty "B" batteries would serve very nicely but due to the fact that the average transmitter, running with 400 volts on the plate of the tube will draw around 50 mills (milliamperes), this would be a rather expensive arrangement.

(Q) What circuit and tube would you recommend for my initial set? I live in a rather isolated section, at least fifty miles from the nearest "Ham."

(A) As a starter we would suggest that you employ a single type 201A tube with from 135 to 250 volts on the plate, supplied by B batteries. The circuit we recommend would be the tuned-plate, tuned-grid type. Excellent results have been obtained from low-power transmitters of this type where care has been exercised in designing the antenna system. Remember that in low-power transmitters the antenna system has to be as near perfect as possible if any efficiency is to be obtained.

(Q) What issues of SHORT WAVE CRAFT will give the best dope on transmitters?

(A) Transmitters suitable for amateur use can be found in the September, October, November, and December issues of SHORT WAVE CRAFT.

TESTING POWER TRANSFORMERS

Edward Nohe, Baltimore, Md.

(Q) How can the primary and secondary of a power transformer be located and how can the voltages be found without a meter?

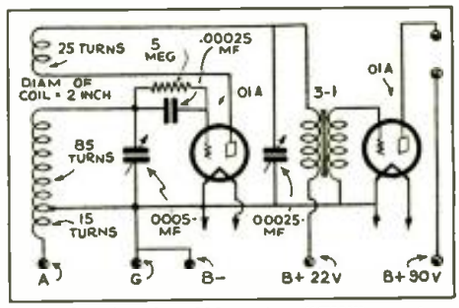
(A) It is very difficult to locate the different windings of a power transformer without some sort of measuring or indicating equipment. The primary of power transformers is usually wound next to the core and may have from two to five leads. The most convenient method of testing a power transformer is to use a 40 watt 110 volt lamp bulb in series with the 110 volt line and apply the voltage to what you think is the primary. Placing the bulb in series with the line will prevent any catastrophe in case you should apply the line voltage to the wrong winding. Some sort of a meter of course will be necessary to measure the voltages of the various winding after the primary has been located.

600 METER RECEIVER

Charles L. Culley, W5DOK, Boyce, La.

Will you please publish a circuit diagram of preferably one and not over two tubes for a receiver suitable for reception on the commercial frequencies around 600 meters? I would like something simple to be built from the average junk-box.

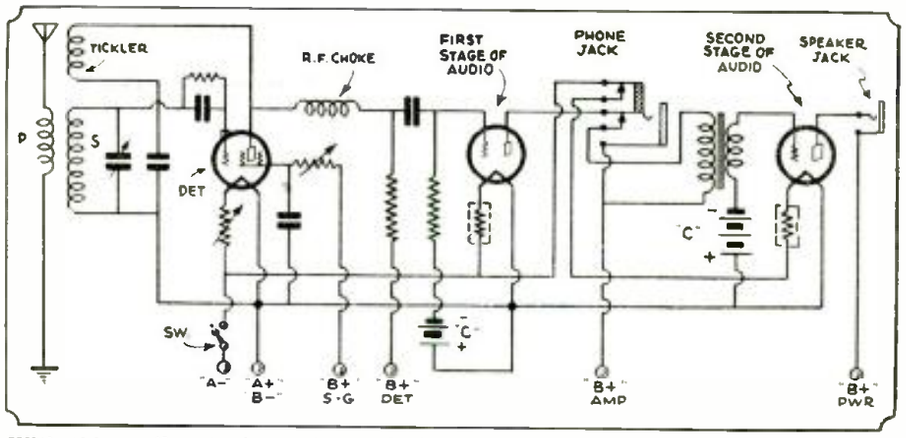
(A) The diagram shown here will perform very nicely for CW code, up to approximately 800 meters.



The circuit of a 600 meter "CW" receiver

Improved Filament-Control Circuit

● IN the usual filament-control jack circuit employed in d-c. short-wave sets, the jacks are wired so that the filaments of all of the tubes in the set are turned off when the headphones are not plugged in. When the headphone plug is put in the first jack, the detector tube is lighted; when the loud speaker plug is in the second jack, both the detector and amplifier tubes are lighted. However, two filament-control jacks are hardly necessary if a filament switch is employed. Instead, a single filament-control jack connected as shown in the diagram will make the set less complicated. This is an improvement over the usual filament-control jack circuit in that it is less expensive, easier to wire, and that when the headphones are plugged into the phone jack the filament of the last amplifier tube is turned off. When the phone plug is removed, all of the tubes are lighted and the loud speaker is in use. This arrangement is handy because it saves the operator the trouble of having a separate plug on the loud speaker. Headphones are not satisfactory for reception on more than one stage of audio amplification anyway, because the volume is usually too great. Binding posts or phone-tip jacks can be provided as connectors for the loud speaker. The phone jack can be placed in the output of the detector tube, instead of in the first stage of audio amplification, if preferred; although the latter connection, which is given in the diagram, is better.—*George Mark.*

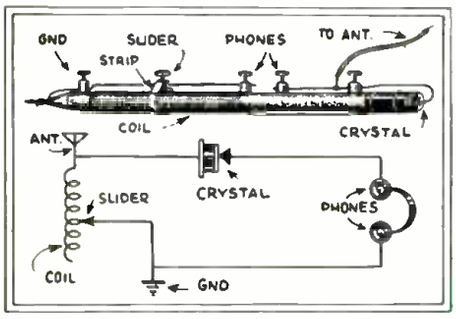


With this easily wired circuit, employing a single "filament-control" jack, the last audio tube is cut out of the circuit when headphones are used.

A "Lead Pencil" Receiver

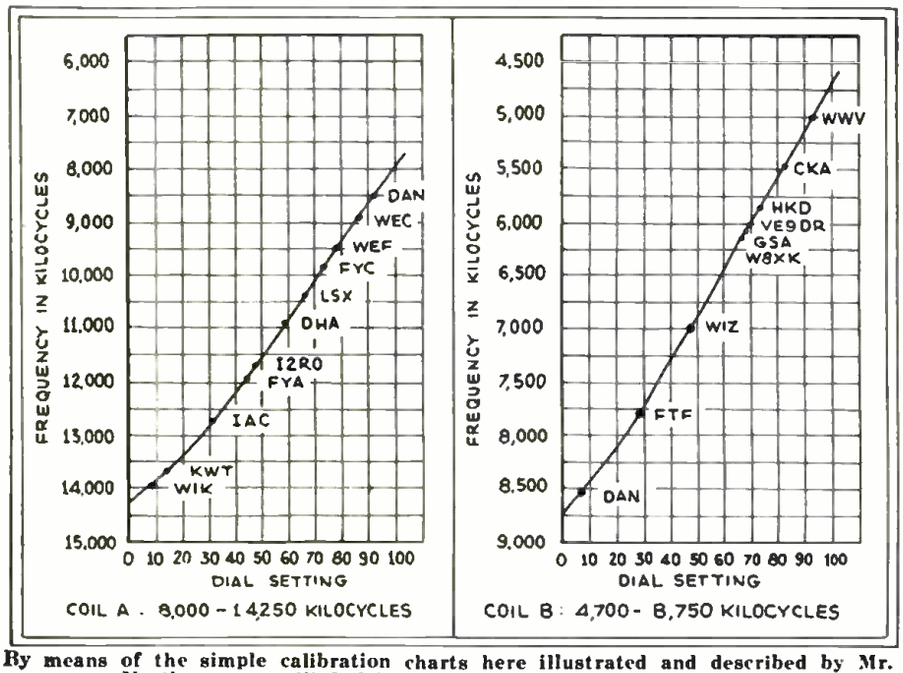
● BOYS will be boys, so why not be a boy again and build this pencil radio set? Just an ordinary everyday lead pencil, about eight or ten feet of No. 30 enameled wire, a crystal, and head set, with a few binding posts thrown in for good measure will do the trick. Be sure to use a pencil that has an eraser attached in a tin housing. Remove the eraser and fasten your crystal to the tin housing, either on the end or on the side. Your tuning slide can be made out of a square piece of bus-bar wire. To use this set out of doors fasten a piece of copper wire two and ½ feet long by ⅛ inch thick to the bottom of pencil, this will be convenient to ground the set and bring it up to the right height, so that you can tune in while sitting on a park bench; if the park bench is made of iron that will serve nicely as an antenna.—*A. F. Kuenzel.*

This crystal receiver can also be used in offices in cities where there are plenty of broadcasting stations. A good antenna in this instance is a small disc of metal placed under a regular desk phone base, connecting the antenna lead from the set to the disc.



How to build a receiver on a "lead pencil."

Receiver Calibration As An Aid to "DX" Reception



By means of the simple calibration charts here illustrated and described by Mr. Northrup, you will find it a cinch to locate any distant station.

● ONE of the most interesting things about short-wave radio is the field it presents in the way of reception over very long distances. Many listeners have found that the only way to accomplish this with any degree of consistency is to go at it in a systematic way. Of course there is always a large element of chance in DX reception, but if the listener will spend a few hours in preparing a calibration system for his receiver, he will be amply repaid in the ease with which he can locate new stations. Many keep a log of their reception, with the dial settings corresponding to the stations heard. This is all well and good, and a very good way to simplify retuning a station, but it is not much help in locating those elusive ones not yet heard.

The method of calibration described herein is not at all new or original; in fact it is used by thousands of amateurs and short-wave listeners. But for the benefit of the beginner it may prove helpful. It was made for a simple regenerative set using two tubes in a straightforward circuit. No great degree of accuracy is claimed—on the contrary it is rather a rough approxi-

(Continued on page 570)

New Norden Super-het

(Continued from page 541)

when designing a receiver in order to preserve true tone quality. In this receiver the cardinal principles of simplicity of design, coupled with the very highest quality of insulation and materials have been carefully observed; consequently this receiver is able to differentiate between signals of different frequencies to the highest advantage imaginable. Actually the selectivity is less than 10 kilocycles even at the upper end of the broadcast band with a field strength of approximately 10,000 to 1.

By employing variable condensers of different capacities on different frequency bands, the Model 34 achieves great ease of tuning, even at the highest frequencies (shortest wave lengths). Thus the usually congested short-wave broadcast bands no longer present a problem with this tuning system. The continuous *band-spread* tuning arrangement provides ample separation of all stations, regardless of frequency and is so arranged, for example, that stations on the 25 meter band will occupy as much as three degrees on the band-spread tuning dial, thus illustrating the unusual ease of tuning of this instrument.

This set uses one 2B7 tube in a special circuit, which actually represents a stage of intermediate amplification as well as the control of the radio frequency amplification of the set. The control grid current for the automatic volume control tube is obtained through means of a separate winding in the last intermediate transformer, thereby eliminating drain on the detector grid. A switch cuts the "AVC" in or out of circuit, a desirable feature for CW reception.

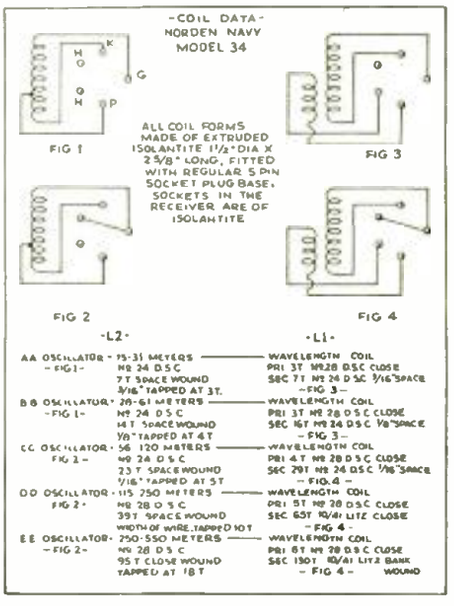
High Quality Audio Amplifier

This set is capable of supplying approximately 4 watts into the loud speaker, which is more than sufficient for reproduction in the largest room. Excellent reproduction has been insured with complete low frequency compensation and equalized high frequencies by the use of proper reactance condensers and inductance in relation to the loud-speaker transformer. This results in true tone reproduction at all levels of volume.

The new Navy Model receiver chassis is exceedingly compact and it is possible to build this instrument into very small space. The dimensions of the chassis are 20" x 13" x 9" which is approximately half the size of previous designs. This chassis includes the complete receiver, together with its power supply.

Bill of Material for Modern Navy Model 34

L-1 Antenna Inductance specially wound on threaded isolantite forms
L-2 Oscillator Coil specially wound on threaded isolantite forms
L-3. 4, 5, 6, 7, 8, 9, 14 8 M.H. Chokes
L-10, 11 85 M.H. Chokes
L-12, 13 Power Filter Chokes
L-15 C.W. Oscillator Coil
C-1 W.L. Tank Condenser .000138 mf. cap.
C-2 W.L. Band-Spread Tuning Condensers .0000125 mf. cap.
C-3 Auxiliary W.L. Band-Spread Tuning Condenser .000029 mf. cap.
C-4 Oscillator Tank Condenser .000138 mf. cap.
C-5 Oscillator Band-Spread Tuning Condenser .0000125 mf. cap.
C-6 Auxiliary Oscillator Band-Spread Tuning Condenser .000029 mf. cap.
C-7, 8, 9 Three-Section .1; .1; .1 mf. By-Pass Condenser Block
C-10, 14, 15 .003 mf. By-Pass Condenser
C-11, 12, 13, 16, 17, 19 .005 mf. By-Pass Condenser
C-18 .1 mf. By-Pass Condenser
C-20 8. mf. By-Pass Condenser
C-21 .0000006 mf. Coupling Condenser
C-22 .0001 mf. Condenser
C-23, 24, 25, 8. mf. Filter Condensers
C-26 1. mf. Audio By-Pass Condenser
C-27, 28, 29 .00025 mf. Filter Condenser
C-30 .02 mf. Blocking Condenser



C-31 .05 mf. Audio By-Pass Condenser
C-32 .0001 mf. Grid Condenser
C-33 .5 mf. Condenser
R-1, 4, 9, 13 25,000 ohms Fixed
R-2, 3, 18 15,000 ohms Fixed
R-5 1. Megohm Fixed
R-6 500,000 ohms Fixed
R-7, 8 200 ohms Fixed
R-10, 16 100,000 ohms Fixed
R-11 250,000 ohms variable Potentiometer
R-12 3,000 ohms Fixed
R-14, 17, 22 50,000 ohms Fixed
R-19, 20 125,000 ohms Fixed
R-21 6,950 ohms Fixed
J-1 Headphone Jack
P.T.-1 Power Transformer
A.T.-1 Audio Output Transformer
R.F.T.-1, 2, 3 Intermediate Frequency Transformers 465 K.C.
R.F.T.-4 A.V.C. Transformer
S.W.-1 Audio Tone Switch
S.W.-2 A.V.C. Switch
S.W.-3 Power Switch
S.W.-4 C.W. Oscillator Switch
V.T.-1, 5 Type 57 Tube, RCA Radiotron
V.T.-2, 3, 4, 6 Type 58 Tubes, RCA Radiotron
V.T.-7 Type 2B7 Tube, RCA Radiotron
V.T.-8 Type 2A5 Tube, RCA Radiotron
V.T.-9 Type 80 Tube, RCA Radiotron

VK2ME—Short-Wave Voice of Australia

(Continued from page 521)

Australia, and many notable reception feats have been recorded; the chief of which was that of Mr. E. H. Scott of 4450 Ravenswood Avenue, Chicago, who, for twelve months, missed only three of our regular schedules.

VK3ME is located at the Amalgamated Wireless Victorian Transmitting Centre at Braybrook, about 6 miles west of Melbourne.

American Engineer Repairs Radio on Danish Ship

● RECENTLY the Danish freighter Hoeg Trader, bringing a cargo of Russian pulp to the Port of Albany, had to cross the Atlantic without the comfort of her regular radio transmitting set, even though English and Norwegian experts had endeavored to repair it during the ship's calls in foreign ports. Thanks to the ingenuity of Ted Chadek, radio engineer of "Uncle Dave's Radio Shack," Albany, the trouble with the transmitter was finally located, a high voltage break-down to ground having been one of the ailments, besides a burned-out grid-bias resistor.

Short Waves and Long Raves

(Continued from page 535)

EAQ	Madrid, Spain
CN8MC	Rabat, Morocco
FYA	Paris, France
XDA	Mexico City, Mexico
HRB	Tequcigalpa, Honduras
NRH	Heredia, Costa Rica
VRY	Georgetown, British Guiana
HKC	Bogota, Colombia
HKM	Bogota, Colombia
HKA	Barrinquilla, Colombia
HC1DR	Quito, Ecuador
HBC	Berne, Switzerland
VE9BY	Windsor, Ontario, Canada
VE9CL	Winnipeg, Manitoba, Canada
VE9GW	Bowmanville, Manitoba, Canada
CJRX	Winnipeg, Manitoba, Canada
DJB	Konigswusterhausen, Germany
DJA	Konigswusterhausen, Germany
DHC	Nauen, Germany
HKD	Barrinquilla, Colombia
HKO	Medellion, Colombia
CMCI	Havana, Cuba
PRBA	Brazil, Rio De Janiero
YVQ	Maracay, Venezuela
PRAH	Buenos Aires, S. A.
HSP2J	Bangok, Siam
TGA	Guatemala City, Panama

Foreign Calls 20 Meter Phone

G5BY	Croyden, England
G6AX	Rochdale, Lanc., England
G5QC	Wolverhampton, England
CM2JM	Havana, Cuba
PY2BQ	San Paulo, Brazil
TI3LA	Contombo, Costa Rica
OA1B	Negritos, Peru
X1B	Mexico City, Mexico

(NO NAME),
18 Woodlawn Street,
Springfield, Mass.

(Too bad you forgot to sign your name, but we are mighty glad to publish your letter, together with the very fine list of world-wide short-wave broadcast stations you have heard.—Editor)

Short Wave Scouts

(Continued from page 529)

12RO	11,810 KC.	Daily from 11:30 a. m.-12:15 p. m. and from 1:15-6:00 p. m., Rome, Italy, Lady announcer.
KDKA	11,870 KC.	Daily from 4:30-9 p. m., Pittsburgh, Pa.
VE9GW	6,095 KC.	Mon., Tues., Wed., Thurs., 3:00 p. m.-12 Md., Fri., Sat., 8:00 a.m.-12 Mid. Sunday, 12 noon-9 p. m., Bowmanville, Ont., Can.
W2XAD	15,330 KC.	Mon., Wed., Fri., 3-4 p. m., and Sun. from 2-4 p. m., Schenectady, N.Y.
VE9JR	11,720 KC	Irreg. from 9:30 a. m.-10 a. m., Winnipeg, Can.

I have also received the following stations where I sent in a report, but there was not sufficient time for them to "verify" my report.

FYA	11,705 KC.	Daily from 11:15 a. m.-1:15 p. m., Pontoise, France.

Play their national anthem at the beginning and end of each program.

VK3ME	9,510 KC	Wed. from 5-6:30 a. m. and Sat., from 5-7 a. m., Melbourne, Australia, announced station in English every four minutes.
XETE	9,600 KC.	Daily from 2:30-5 p. m. and 6:30 p. m.-12 midnight. Mexico City, Mexico; Chimes were played, at intervals a man announced XETE in English
YV3BC	6,150 KC.	Daily from 10:30 a. m.-1:30 p.m., and 4:30-9:30 p.m. A new station on short waves, Caracas, Venezuela.
VK2ME	9,590 KC.	Sundays from 12:30-2:30 a. m., and 4:30-8:30 a. m. and 9:30 to 11:30 a. m., Sidney, Australia; Laughs of kookaburra bird.
GSE	11,865 KC.	Irreg. from 9-12 noon, London, England. Chimes of Big Ben.
XDC	9,340 KC.	Irreg. Heard testing from 3:00-5:00 p. m., Mexico City, Mexico.
GSB	9,510 KC.	Irreg. from 1-8 p. m., London, England. Chimes of Big Ben.
CGA	9,350 KC.	Irreg. heard from 6 p. m.-6 a. m., Drummondville, Canada.
GSF	15,140 KC.	Irreg. from 7 a. m.-3 p. m., London, England. Chimes of Big Ben.

18 Stations.

The set used was a home-made "Doerle" 2-tube short-wave set, using two RCA Radiotron 230 type tubes. I built this set from the description given in SHORT WAVE CRAFT.

Warren Mallory, 915 15th St.,
Boulder, Colo.

REGENT 4-Tube S-W Receiver

● ONE glance at the photograph will immediately reveal that a definite step has been taken to dress up our present day short-wave receivers. Broadcast receivers have received their beauty touches and there is no reason why shortwave sets should be slighted.

This is a 4-tube receiver employing a type 58 regenerative detector, a type 58 resistance coupled first stage audio and a type 2A5 resistance coupled power amplifier which drives a full-sized dynamic speaker on all of the various foreign shortwave stations. The power supply unit, consisting of a type 80 rectifier, standard power transformer, having a 5 volt and 2.5 volt windings, furnish the rectified A.C. which in turn is filtered by the field of the dynamic speaker and two 8 mf. electrolytic condensers. This filter serves to eliminate even the slightest trace of hum and very clear reception can be obtained.

Examining the circuit diagram further will show that a telephone jack is provided in the output of the 58 audio stage to provide earphone reception. Standard plug-in coils are used and cover a range of from 15 to 550 meters, five separate coils being used to accomplish this feat. The 58 resistance coupled audio stage is capable of delivering tremendous gain with very low tube and interstage noises and will drive a 2A5 to full output, which means that foreign broadcast stations can be tuned in with regular broadcast receiver volume. Looking at the front of the set the tuning control is located at the right and consists of an accurately calibrated dial located behind an artistic escutcheon plate. In the center is located a six inch dynamic speaker behind the fancy grilled opening in the cabinet. To the left is located the regeneration control condenser. Condenser control of regeneration is used for smooth action which makes tuning on the very high frequencies very simple. The cabinet is 14" long, 10" high and 10" deep, and is beautifully finished in crackled lacquer which gives a decidedly modernistic appearance.

It is necessary in a receiver of this type to shield a type 2A5 power amplifier tube in order to fully eliminate any trace of feed back. Most short-wave set constructors are familiar with the fact that if a 2A5 with its extremely high output with low signal voltage is left out in the open near other tubes or other parts of the set where possible feed back may exist a very definite high pitched audio feed back will occur or else there will be a thin ringing sound to the voice or music being reproduced. In all cases this tube should be effectively shielded. This set housed in its cabinet has practically the same appearance as the present day broadcast receivers and, incidentally, this provides a very efficient broadcast receiver, when one does not care to listen in to the short waves, by plugging in the broadcast band coil. This is also an excellent feature as many times the short-wave bands become extremely noisy or unusable for various other reasons and amusement can easily be furnished by the utilization of the regular broadcast band.

It is not necessary to go into minute circuit details as the diagram clearly shows all connections and all values of resistors and condensers. However, we must stress at this point in constructing any short-wave receiver that only the best of parts be used and so connected that the leads are as short as possible. This will eliminate any stray capacities and feed back between leads which may at times render the set inoperative at certain parts at a given short-wave band. The resistor values specified in the circuit diagram should be closely adhered to because they have been carefully worked out to give the best results commensurate with quiet operation. In wiring short-wave receivers it is necessary that all connections are thoroughly cleaned before an attempt is made at soldering. Don't try to solder a connection where the insulation on the wire interferes in the least with the operation. Use a hot and thoroughly tinned soldering iron with pure rosin core solder and wherever possible remove all surplus rosin as soon as the solder has cooled enough to allow wiping.

PARTS LIST

1—Black crackled wood cabinet. Try-mo
1—Drilled and punched metal base. Try-mo
1—100 mmf. Ant. Series condenser. Hammarlund (National)
1—set of 4 plug-in coils wound (15-200 meters) Na-ald (Gen-Win; S.W. & Television Corp.)
1—.0001 fixed mica condenser
1—3 meg. grid-leak Lynch
2—variable .00014 mf. condensers. Hammarlund; (or National 150 mmf.; or Cardwell)
1—R. F. choke. 5 to 10 M. A. National or Hammarlund.
2—R.M.A. 7500 ohm resistors. Lynch.
2—R.M.A. 100,000 ohm resistors. Lynch
4—R.M.A. 250,000 ohm resistors. Lynch
1—R.M.A. 2 Meg. resistors. Lynch
2—.01 mf. condensers. Flechtheim
1—.1 mf. condenser (400 volts)
2—8 mf. Electrolytic condensers (500 volts). Flechtheim
1—Electrostatically-shielded power transformer. Try-mo
1—AC on-off switch. R. T. Co.
1—Special slow motion vernier dial. Try-mo
2—knobs
2—58 series tube shields. Hammarlund (National)
1—2A5 tube shield. Hammarlund (National)
1—Coil socket. Na-ald
2—58 sockets. Na-ald
1—2A5 socket. Na-ald
1—80 socket. Na-ald
1—6" tapped-field, 1800 ohm to match 2A5 output, dynamic speaker. Try-mo
1—roll hookup wire
1—kit of assorted hardware
1—A.C. cable (cord and plug)
2—58 tubes; RCA Radiotron (Arco)
1—2A5 tube; RCA Radiotron (Arco)
1—280 tube; RCA Radiotron (Arco)

Coil Data

Wave Band in meters	Grid turns Size wire	Tickler turns size wire	Spare between Grid and tickler
15 to 22	5 No. 22, S.C.C.	7 No. 26, enam.	1/4 in.
20 to 40	10 No. 22 S.C.C.	10 No. 26 enam.	7/32 in.
40 to 95	21 No. 22 S.C.C.	15 No. 26 enam.	5/32 in.
90 to 200	50 No. 26 enam.	25 No. 26 enam.	3/32 in.
Broadcast coil	136 No. 32 enam.	59 No. 30 enam.	1/16 in.

Coil form—1 1/4 in. in diameter by 2 1/8 long.

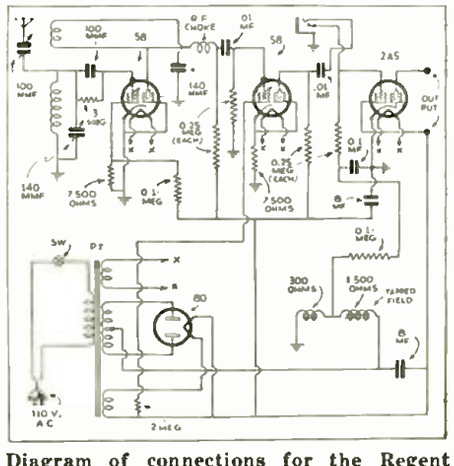
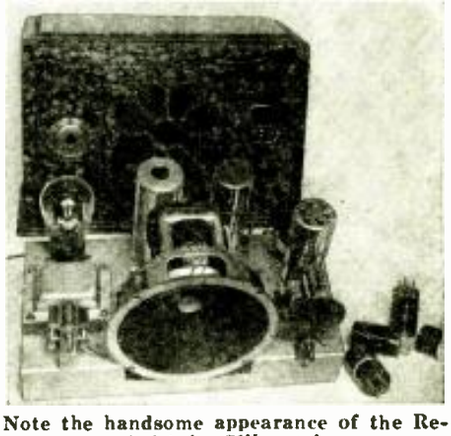


Diagram of connections for the Regent 4-Tube Receiver.



Note the handsome appearance of the Regent 4-tube SW receiver.

Little America Speaks

(Continued from page 518)

gram system has been worked out, the personnel, even including a trained announcer who will write the introductions and continuity for every program. Mr. Murphy will have the honor of introducing Admiral Byrd and other officers of the party. During the progress of the ship to Little America, microphones placed on deck will pick up the sound of the sea, and the barking of the Eskimo dogs housed on the ship's decks, 150 dogs being carried by the expedition.

The opening part of the program will emanate in the WABC studio; the 15 minute program from Little America will be placed in the center of the main program and it will close with a finale from the New York studio.

Accurate time is very essential, of course, for any scientific expedition, such as Admiral Byrd's and specially checked and cased chronometers will provide accurate time, which is also quite essential with regard to the broadcasting from Little America as there is seven hours difference in its time compared to New York. Aside from the regular weekly broadcasts from Little America, special broadcasts may be made and sent over the network from time to time whenever important news develops. Two circuits carrying code messages by short-wave will be in operation at practically all times between Little America and New York. Programs will be broadcast from time to time over the selected short-wave transmitting station W2XAF of the General Electric Company at Schenectady, New York.

Airplane Short-Wave Equipment

Admiral Byrd expects to fly again over the South Pole with a large Curtis-Condor plane and the Columbia engineers expect to be able to pick up this message from the plane while in flight and also over the South Pole and broadcast these over the network of American stations. The plane will carry a 50 watt transmitter, the power for operating it being supplied by the plane's regular generator, with a light-weight dynamo and gasoline-engine driven unit standing by. Other 7½ watt transmitters are carried by the expedition for use on the smaller planes, the power for operating them being supplied by storage batteries carried aboard the planes.

It is very interesting to note how the messages are to be relayed from the big Curtis-Condor plane in which Admiral Byrd expects to fly over the South Pole. As the power of transmitter is rather limited, a special short-wave relay station will be located at the Queen Maude Range. Here the message from the plane will be received and instantly re-transmitted by a 200 watt transmitter to the base station at Little America. The receiver will be connected to the 1000 watt short-wave transmitter at this point and the messages from the plane will hurtle on through space 4000 miles to Buenos Aires. Here as with the regular programs from Little America the messages from the planes will be picked up on a receiver connected to a short-wave transmitter and sent on their northward flight to Riverhead, Long Island. The message will then proceed as explained previously over a wire circuit to New York and thence over the network to various broadcast stations.

The short-wave receivers to be used on the planes are of the National SW-3 type, while the transmitters are of the W. E. Co., type. Dog-sled crews have a habit of getting lost, especially when a blizzard blows up out of nowhere as it frequently does in the Antarctic, and if this should happen the dog-sled party will be able to signal the base station as to their whereabouts for small 1 watt transmitters are to be carried by each dog-sled, as well as a receiver. Not only can each dog-sled party communicate with headquarters, but they can also talk to each other.

5 and 10 Meter Transmitter

(Continued from page 526)

tain frequency stability and it would be necessary to have a rather expensive *modulator* system.

With 650 volts on the plates of two of these tubes in a push-pull circuit, a very powerful and steady signal can be radiated, and can easily be modulated with a pair of 46's operated in class "B" push-pull. In the transmitter here described, every effort has been made to reduce losses, due to poor insulation, to an absolute minimum. Nothing but the highest grade parts with excellent insulation have been used. *Why use inferior insulation on a tube that has its grid and plate leads brought out on the glass envelope, for the sole purpose of improving their insulating qualities and to reduce the inter-element capacity.*

The Push-Pull Oscillator

The push-pull oscillator is mounted on a 7x10x2 inch aluminum chassis, in order that the filament and plate supply wiring could be isolated from the portions of the circuit carrying radio frequency currents. This isolation is really necessary if stable and efficient operation is to be obtained. **Remember, we are working on 60 megacycles, not 3.5.** And if there should be the slightest trace of R. F. in the filament circuit the chances of ruining the tubes are very great.

No filament by-pass condensers were used because without them, there was no trace of RF in the filament circuit. And the use of them provides a possible chance of the filament circuit being tuned to the frequency, or a harmonic of the frequency at which the transmitter is being operated. If no trouble of this sort is experienced without filament condensers *leave them out.* The switch shown in the filament center-tap lead is provided as a means of turning the oscillator on and off. If the switch were to be placed in the plate circuit, there would result a very heavy spark and in most cases it would continue to arc, due to the action caused by the modulation choke or the modulator output transformer secondary; at the center tap however there is only the slightest trace of a spark.

All inductances are provided with bananna type plugs, in order that they can be changed easily. The stand-off insulators are equipped with jacks to accommodate these plugs. Be sure to use a good plug which makes a very *tight* contact, or losses will result at this point. A glance at the photographs and diagrams will give any further details and no more need be said of the oscillator at this point.

Oscillator Power Supply

The *power supply* for the oscillator should be capable of delivering around 650 to 675 volts at least one hundred milliamperes, although the highest plate current drawn by the oscillator was 90 mills. (M. A.) It should be well filtered in order that the quality of the voice will not be impaired by a "hum" on the carrier. A *brute force* filter was used because of its simplicity and effectiveness. Some might shudder when they see a 2 mf. condenser used directly across the mercury vapor tubes, but there is really no danger in this, because the tubes are operated well under their peak voltage rating. The type 866 can be used at this point in place of the 871's or 888's, whichever you wish to call them, that are shown in the diagram. A type 5Z3 can also be used here with much less "hash" (noise caused by vaporization of the mercury) in the receiver, but this tube will be considerably overloaded and long life cannot be expected from them. However, they are not expensive and the reduction in noise might make their use worth while. The filter choke is of the common variety, rated at 30 henries and 150 mills. (M. A.) The power transformer has a high voltage secondary with 650 volts each side of

center-tap, which with the filter system and rectifier tubes used, gives around 650 volts at 90 mills (M. A.) pure D.C. This transformer also has a 2.5 volt winding for the rectifier tubes and two 7.5 volt windings, which are hooked in parallel to supply filament voltage for the oscillator tubes. So much for the oscillator *power supply*.

The Modulator

A good modulator unit is just as important as the oscillator, because it is the modulator that is responsible for the voice being super-imposed upon the R.F. carrier wave.

The most economical modulator is the class "B" type, which has become very popular with the "Hams." The one shown here uses a 56 class "A" speech amplifier transformer, coupled to a 46 Class "A" driver, which in turn furnishes excitation for the two 46's in class "B" push-pull. The plate voltages for the tubes are as follows—250 for the 56, 250 for the 46 "A" and about 450 for the 46's in Class "B." With these voltages on the various amplifier tubes it is possible to completely modulate the R.F. oscillator with 650 volts at 90 milliamperes input. Here also good equipment is necessary if full output is to be obtained from the tubes, with anything like BC (broadcast) quality.

The *output* transformer used in this modulator has a secondary with taps varying from 3,000 to 8,000 ohms impedance and provides a very flexible unit, which can be coupled to almost any output load efficiently and thus permit a maximum transfer of audio voltage. The method of calculating the load impedance of the oscillator is—*Plate voltage divided by plate current.*

It is to be remembered that the microphone is responsible for the quality of voice fed into the modulator. Use nothing but the highest grade single-button, or preferably a good double-button mike for the best quality.

With the values shown in the diagrams the plate current of the oscillator should be 60 mills (M. A.) without the antenna coupled, and 90 mills with the antenna coupled loosely to the plate "tank." Do not exceed this value, or the tubes will loose their activeness; higher plate currents also make it difficult to obtain 100 per cent modulation. If everything is connected properly, an indicating device such as a Christmas tree bulb or an R.F. ammeter connected in the antenna will show a decided increase in brilliancy (or deflection) as the microphone is spoken into. Careful adjustment is absolutely necessary if maximum results and a good percentage of modulation are to be obtained. The writer has seen an adjustment in a five meter transmitter so slight as to cause the frequency to shift only 100 KC, bring the signal strength from R3 up to R8. Cooperation with another amateur is very necessary, for his reports checked against your adjustments is the only definite proof of the value of your efforts to obtain an optimum adjustment.

The radiophone described has been in operation about three months and the author has received an R8 to R9 report from most every station contacted. And the writer wouldn't part with it for—well, you build it and set your own price!

Parts List (Oscillator Circuit)

1—double-section Cardwell variable condenser 100 mmf. per section with micalex insulation (featherweight).
7—stand-off insulators with pin-jack receptacles (Johnson; Fleron).
1—35 mmf. midget tuning condenser, Hammarlund (National).
2—4-prong isolantite sockets, National (Hammarlund).
1—No. 100 National R.F. choke (2.5 mh.).
1—20,000 ohm grid-leak (10 watts or more).
1—100 ohm center-tap filament resistor.
1—single pole, single-throw snap switch.
1—set of coils—see coil table.
2—type 800 RCA Radiotron tubes (Sylvania 824).
1—aluminum chassis, 7"x10"x2" deep.

(Continued on page 569)

Low-Power Modulator

(Continued from page 528)

1. Determine the audio output of the modulator (in this case 10 watts).

2. Determine the output impedance, or loud resistance into which the modulator works best. (The load resistance for the secondary of the 2A3 output transformer is 4000 ohms.)

3. Find a value of voltage and current twice the audio output of the modulator that produces the correct value of load resistance. Ohm's law is used to determine the correct current and voltage values. The law is: "Current, in amperes equals voltage divided by resistance."—(I=E/R). Hence, if we substitute 4000 ohms, the proper load value for R, a few simple arithmetical calculations will indicate what value that equals 20 watts power input, approximately, also satisfies the requirements of proper load resistance. Power input in watts is determined by multiplying the plate voltage by the plate current in amperes. For example, 300 volts times .07 amperes, (70 milliamperes) equals 21 watts, which forms an approximate load resistance of 4000 ohms. In like manner, the proper values of power input to a radio frequency amplifier can be determined for virtually any values of voltage, current and impedance.

The modulator is actually a three-stage audio amplifier. The first stage uses a '56 tube, transformer coupled into two type '56 tubes in push-pull. These tubes are likewise transformer coupled into the two push-pull output tubes. The plates of the output tubes connect to a special 2A3 output transformer, the secondary of which works into a 4000 ohm load. An extremely heavy grid swing is necessary on the 2A3's, which is the reason for the use of two preceding audio stages.

The unit is built on a board 21" long by 12" wide. Two one inch under supports allow space under the board for wiring. On the front end of the board, from left to right, the layout is as follows:

Microphone transformer, first audio tube, push-pull input transformer, two second audio tubes, push-pull interstage transformer, output tubes, and special output transformer.

The layout on the back edge of the board, from left to right, is:

Power transformer, rectifier tube, 8 mf. filter condenser, filter choke, 16 mf. filter condenser, and 2 mf. output condenser.

In all audio work, only the best of equipment should be used, especially when another's ears are to hear the result. Ground all the audio transformer frames, and also the power transformer frame. This will help to eliminate hum, and the motor-boating that sometimes occurs with more than two stages of audio. The modulator is a relatively simple unit, and, provided good parts are used, and the diagrammatic and pictorial representations accompanying this article are carefully followed, no trouble will be experienced in getting the unit in operation.

Inasmuch as the microphone is the starting point of the transmitter, and can ruin the quality of the transmission, no matter how good the rest of the apparatus is, it might be well to interject a word as to its care and operation.

There are some very good *single-button* microphones on the market, and admirable results can be obtained with them, but extreme care should be taken in the choice of the instrument. The single-button microphone transformer should have an impedance of 200 ohms. Not more than six volts should be used on a single button, unless the manufacturer's instructions specify a higher voltage.

Recently, some very fine *double-button* mikes have been put on the market at prices almost as low as those charged for singles. If it can in any way be afforded, a double-button mike is an excellent thing to use, as it produces a great improvement in quality. The double-button mike transformer is necessarily center-tapped, and is usually of 200 ohms, impedance, per button. A double button microphone should never be used on more than 3 volts, unless the manufacturer so specifies.

Never move or jar a microphone while it is connected to the battery, and always remember that it is an extremely delicate piece of equipment that should be handled with care. The best "approach" is to talk across the face of the microphone, as this minimizes breath hiss. If a double button mike is used, have "ma," or the "YLF," (young lady friend), sew a little cloth cover to put over it. This will keep out dust and dirt, as well as protect the diaphragm from corrosion by moisture condensed from the speaker's breath.

Tuning Hints

The R.F. end of the set is tuned up in the normal way, as decribed last month, with the exception of the fact that the *modulation choke* is in series with the positive lead. Load up the antenna to exactly 70 milliamperes, making sure that there is 300 volts on the plate of the amplifier. The oscillator is run at the full voltage of the power supply, somewhere between 350 and 400 volts. Now "fire up" the modulator and check in the monitor; the voice of the person speaking into the mike should be heard clearly and distinctly at zero beat in the monitor. A diagram is shown for a little crystal monitor to be used to check on the quality of the transmitter. A small flashlight bulb connected in series with the antenna lead, should flicker up much brighter than normal when a person speaks into the microphone. It may be necessary to use a 45 volt battery as grid bias for the 46 amplifier instead of the resistance. A circuit diagram shows how to connect and bypass it.

The milliammeter in the lead to the plate of the R. F. tube should never swing more than 4 or 5 mills (M.A.); a larger swing than this indicates distortion. Cut down on the battery current until there is only a slight swing, if any. Keep the transmitter and modulator as far from each other as possible to prevent R. F. pickup in the audio end.

A little careful tuning, testing, and checking in the monitor will do a lot to get a good signal that makes or breaks a fellow's reputation on the air.

As one old-timer said: "It's more the operator, and what he does, than the apparatus itself, that makes a good station."

Let's hope you are all the kind of op's, and build up the kind of stations that would make any "old timer" proud. 73's.

Parts List

Microphone transformer, National. (Also R. T. Co.)
3—5-prong sockets, Eby.
3—4-prong sockets, Eby.
Push-pull input transformer, National. (R. T. Co.)
Push-pull interstage transformer, National. (R. T. Co.)
2A3 output transformer, National. (R. T. Co.)
2 mf. 1000 volt paper condenser, Flechtheim.
1—Power transformer, National. (R. T. Co.)
3—8 mf. 500 volt electrolytic condensers, Flechtheim.
2—30 henry 100 mill. chokes.
1—3000 ohm 1-watt resistor, Lynch (International).
1—1500 ohm 1-watt resistor, Lynch (International).
1—750 ohm 10 watt wire-wound resistor.
2—1mf. 200 volt paper condenser. Flechtheim.
1—50 volt 5 mf. electrolytic condenser.
1—Microphone; (Amplion; Lifetime; Miles; Mayo; Maylux).

Don't Miss Mr. Victor's Next Article in the "AMATEUR TRANSMITTER" Series!

5 and 10 Meter Gossip

By GEORGE W. SHUART, W2AMN

● THE reason this column did not appear in the December issue was because there were no stations to be heard on the 5 and 10 meter bands (at least in our vicinity), and it looked as though most of the amateurs had forgotten that these two valuable bands existed. The 10-meter band has remained as quiet as ever, with only one or two stations to be heard during the week-end, testing and calling CQ. However, on 5 meters, there has been a considerable increase in activity and a great number of stations can be heard any evening; also, quite a few new stations have appeared on the band, indicating that the general trend is back to 5 meters.

* * *

Among the popular stations that can be heard here in the East, around New York City, any evening, are:

W2AG	W2DZO
W2CUZ	W2EQT
W2DFU	W2GOW
W2ESP	W2DB
W2BMK	W2QF
W2GE	W2VH
W2AMF	W2CRT

* * *

Most of the above listed stations produce a very strong signal at the writer's receiving station located in Hillsdale, New Jersey, and practically all of them have been worked from W2CBC (portable call of W2AMN). New receivers are making their appearance on 5 meters, which include the screen-grid detector tube and certainly do provide a much more sensitive job than those formerly using triodes.

* * *

The 57 which is a pentode screen-grid tube seems to function better than any other type tube previously used as a 5 meter detector, and is very sensitive to weak signals. The circuit employing the type 57 as an electron-coupled detector tube can be so adjusted to give an extremely low hiss level. It is highly recommended that those operating on 5 meters or contemplating building a 5 meter receiver incorporate this tube in their proposed receiver. When this tube is employed a much higher interruption frequency can be used without lowering the audio output of the set and also results in the decreased hiss level. This is accomplished, of course, by reducing the number of turns on the interruption frequency transformer, primary and secondary.

* * *

Superheterodynes have not yet received very much consideration on the 5 meter band, but we believe that in the near future this will be the predominating receiver and it will have approximately a 1500 kc. intermediate frequency amplifier.

A good line-up for the receiver mentioned previously and used at W2CBC is a type 57 detector, type 56 "I.F." oscillator and a type 2A5 audio amplifier, feeding a dynamic speaker. Due to the low hiss level and high sensitivity, excellent quality can be produced from even the weakest 5 meter station and this certainly is an improvement, as most 5 meter receivers do not give anything like the quality obtained by other types of receivers.

* * *

The writer would be very pleased to receive comment on any subject pertaining to 5 meter transmission and reception and worthwhile information will be presented in this column. Address your correspondence to "5 and 10 Meter Gossip Column" in care of SHORT WAVE CRAFT.

NOTICE!!

The Editors are looking for GOOD Set Construction articles! Let's see what you've got! Send articles or synopsis describing set to Editor for quick decision.

Byrd Expedition Gets Candler Trained Operators

● IF there ever was a stiff competitive examination conducted for radio operators, where speed and accuracy in sending and receiving code signals were tremendously important, it was in the test conducted some time ago to select radio operators for the second Byrd Antarctic Expedition. The operators aboard the ship in the latest Byrd expedition now en route to Little America are Candler trained operators, which is certainly a fine badge of distinction conferred upon Mr. Candler and his system of training radio operators not only to send dots and dashes with lightning speed, but more important still, signals which are evenly spaced and which can be read with comfort and accuracy by other well-trained operators.

There is no "royal road" to learning the art of radio operating and this applies particularly to the code phase of the game; it takes time and patience to learn how to send the code dots and dashes fast and accurate, as to spacing and length of each dot and dash, but more important still is the calibre and system back of the school that teaches one. If the system is wrong or faulty, then no matter how fast the student may send, the chances are that he will use his own intuition in spacing the dots and dashes, and that means that every man will space them to suit himself, generally speaking.

Beginner's Code and Theory Class

● **PROVIDED sufficient inquiries are received, Mr. L. Victor, operator of amateur station, W2DHN, and author of the "Beginner's Transmitter" series now running in SHORT WAVE CRAFT, has offered to conduct a class over the air to help beginners obtain their radio operator's license. Mr. Victor is at present constructing a half kilowatt 160 meter phone set and this rig should be able to reach from 200 to 300 miles outside of the New York area. Those interested should write a letter to Mr. Victor, in care of SHORT WAVE CRAFT, enclosing a stamped addressed postal. If there is sufficient interest manifested notification will be given in the pages of this magazine when and on what frequency these classes will be held. Suggestions are requested in regard to the time at which the class should be held. Those located outside the zone mentioned above should write to Mr. Victor and if sufficient interest is shown, other transmitting stations will be scheduled for code classes.**

"Smoothing Up" Your Receiver Controls

(Continued from page 532)

Figure 4 illustrates four methods of controlling the volume. The first diagram Fig. 4-A. shows a 500,000 ohm potentiometer as replacing the more usual grid-leak in the first AF amplifier. This method provides a satisfactory control in small receivers, but no provision has been made to prevent the detector from overloading, and it is desirable to find a method whereby the signal strength can be reduced before it reaches the detector tube.

This has been accomplished successfully with the methods shown in Fig. 4-B and C, the preference being for the method in fig. 4-C. However, both of these systems do cause *detuning* to some extent and are therefore to be avoided if possible.

Figure 4-D shows a very successful method. Here detuning effects as well as overloading of the detector tube is avoided. A potentiometer of from 3,000 to 20,000 ohms will prove quite satisfactory in this position.

The "Champion" S-W Receiver

(Continued from page 539)

carefully isolated at all necessary points by means of properly by-passed short-wave r.f. chokes. Both the screen-grid circuit and the plate circuit of the r.f. tube are isolated in this way. Radio frequency current is kept out of the audio portion of the circuit by means of the r.f. chokes L3 and L6. The r.f. chokes are bank wound for maximum efficiency.

The mechanical design and placement of parts in this receiver has been worked out with the idea of making all leads as short as possible. In other words, the Champion is custom-built throughout.

Each stage is shielded individually and the entire receiver is built into a metal cabinet. Both the r.f. tube and the detector are also individually shielded. As a result, this receiver possesses stability seldom found in a short-wave receiver.

New-Type Coils an Important Feature

Coils L1 and L2 are six-prong plug-in type coils. Coil L1 has the special isolated primary for use with special "noiseless" antennas. Coil L2 is wound with primary, secondary and tickler. The two coils furnished with the receiver cover the 20 meter band. Additional 35, 50 and 100 meter coils are available. The low-loss construction of these coils is especially noteworthy. They are solenoid wound on 1-½ inch diameter "grooved" isolantite forms. The wavelength range is plainly printed on the handle of each coil, thus affording quick wavelength changes.

A single-throw, double-pole jack switch J3 serves as the "on-off" switch for the B and C batteries and also connects the chassis to A plus, thus completing the filament circuits.

The loud speaker is connected to the output by means of the twin jacks, J1, J2. A special 8" permanent-magnet dynamic speaker is recommended for use with the Champion. This requires no external field excitation. A highly efficient magnetic speaker may be substituted if desired. A jack, J4, is provided at the rear for earphone reception

The attractive crystalline finish steel cabinet does not show finger marks. The cabinet measures 12½ inches wide by 6 inches deep by 8¾ inches high. The construction is such that all shielding is a part of the cabinet, since the entire job is spot-welded. A vernier dial of the drum type is provided.

The Lafayette Champion is especially designed for operation with a two-volt "air-cell" battery for supplying the filaments. A "B" supply of 135 volts is required. A long, color-coded, eight-wire battery cable is supplied with the receiver.

Set Is a "Champion" Distance Getter

This receiver is capable of bringing in real distance on a loud speaker and it does this consistently. Foreign stations, police calls, ships at sea, airplane messages, trans-Atlantic phones—the entire array of short wave stations comes in as the dial is turned.

Hints on Operation

There are three controls on the Lafayette Champion. Facing the front of the chassis, the control on the left hand side is the *antenna trimmer*. This trimmer controls a special selector winding, which is interwound with the secondary and results in a highly efficient and selective radio frequency transformer. The control knob in the center is the *station selector* control. The knob on the right hand side is the *volume and regeneration* control. The "on-off" switch is in the center.

For a start, it is best to turn the regeneration control until the set "spills over" or a distinct hiss is heard. Adjust the antenna trimmer, by visual inspection, until the plates are approximately half way in. By rotating the station selector, a series of whistles and squeals should be heard as many stations, code, telephone, television, etc., are received. Adjust the trimmer for the loudest hiss.

Turn the dial knob slowly until a continual whistle is heard, (interrupted whistles indicate code stations). This is probably the carrier of a short-wave telephone station, and if modulated by speech or voice, these sounds will be heard above the squeal. Tune until the squeal is the loudest. The squeal can now be cleared by backing down the regeneration control until the receiver stops oscillating. A slight readjustment of the tuning dial may be necessary as the regeneration control is moved. Adjust the volume to suit by means of the regeneration control.

The trimmer adjustment is not critical, and need only be set for each set of coils, except for the reception of very weak signals, which necessitate careful adjustment, all around for best reception.

"Champion" Coil Data

The coils used on the "Champion" short wave receiver are identical. Coil data follows:

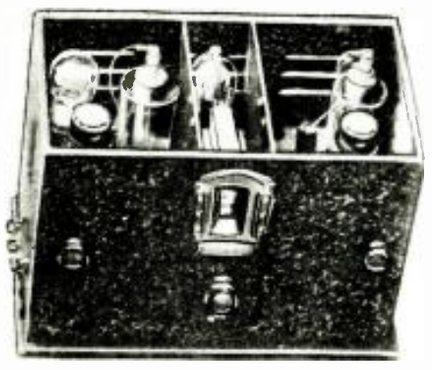
14 to 24 meters
3 turns of No. 26 double silk wire in slot at the bottom. This is the primary.
6 turns of No. 24 enamel interwound with the secondary. This is the tickler.
6 turns of No. 14 enamel. This is the secondary.

23 to 41 meters
3 turns No. 26 double silk—primary.
10 turns No. 24 enamel—tickler.
12 turns No. 14 enamel—secondary.

38 to 70 meters
3 turns No. 26 double silk—primary.
13 turns No. 32 double silk—tickler.
20 turns No. 18 enamel—secondary.

65-115 meters
4 turns No. 25 double silk—primary.
22 turns No. 26 double cotton—tickler.
35 turns No. 20 enamel—secondary.

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



Another view of the Lafayette "Champion" short-wave receiver.

Improved plug-in coils of the 6-pin type, the wire being wound on grooved isolantite forms. The wavelength rating appears in a protected label set into the knob.

A Reliable "Station Finder"

By Sol Perlman, E.E.
Technical Advisor, N. Y. Chapter, International S.W. Club

● THE wavemeter is an instrument definitely associated with radio measurements. Its importance and usefulness has long been known by the Transmitting Amateur, hut its application to receiving has not been so wide-spread. With the inception of the use of short wave transmission, the Oscillator-Wavemeter became of increasing importance to the listener. Its aid in locating the short wave stations and determining the wavelength of the unknown stations has made it an important accessory to the short wave DXer.

The author will describe in this article a simple and effective oscillator-wavemeter, how to construct it and how to calibrate it. An oscillator-wavemeter is a miniature radio transmitter and the signals that it emits can be tuned to the various wavelengths by adjustment of the dial. The oscillator-wavemeter to be described here is of the harmonic generator type; that is, in addition to generating a signal on the fundamental wave, it also generates a signal on a large number of harmonic wavelengths. "A harmonic" is an equal portion (which may be ½, ⅓, ¼, 1/7, 1/10, 1/14, etc.) of a fundamental wavelength.

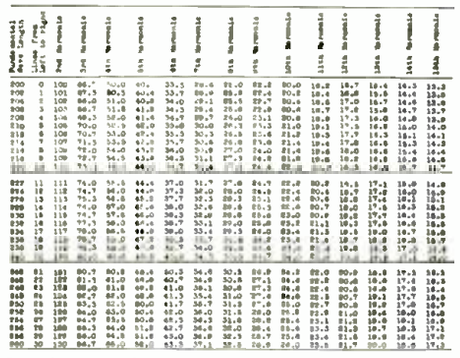
In order to positively identify the signal from the oscillator-wavemeter and render it useful to the owner of any type of receiver (regenerative, non-regenerative or superheterodyne) it incorporates an audio oscillator generating a note of a distinctive pitch to modulate the signal of the oscillator-wavemeter. The coil-condenser combination was chosen to tune in the broadcast band because it could readily be calibrated and the calibration checked at a future date for errors and variations due to change of tube, etc. The Federal Radio Commission's regulations demand that all broadcast stations maintain their frequency within 50 cycles for which they are licensed. Precision of frequency means only a variation of 50 in 550,000 cycles of 1 part in 11,000 (better than 0.01 % of one per cent). The oscillator-wavemeter being a measuring instrument, precision is its most important characteristic. An oscillator-wavemeter depends for its precision on three factors, the design, the construction and the care with which it is used. Simplicity in design lends itself to precision. The fewer components in its construction, the lower factors to vary its precision. The choice of the harmonic generator principle was made because it reduces the oscillator-wavemeter to the use of one coil.

In its construction, rigidity is an important consideration. A variable condenser that has good bearings, heavy plates and no end play should be chosen. The dial should be readily readable and if it is of the vernier type, it should not be prone to slippage. The coil should also be rigid in its mounting and the wiring should not be slip-shod. The oscillator-wavemeter serves the following purposes: it will, if accurately calibrated and used, locate the setting on a dial where a station of known wavelength should be heard and it will determine the wavelength of a station of unknown wavelength whose identity you want to find out. The station that you want to hear may be too weak to be readily heard as you twist the dial, but if you had an oscillator-wavemeter, you set it for a definite wavelength and tune for its signal. When the receiver is tuned for the signal of the oscillator-wavemeter, your receiver is more or less accurately set to receive that station. After switching off the oscillator-wavemeter, a slight readjustment of the receiver dial should bring in the station if it's on the air. To locate the wavelength of an unknown station you are hearing, you tune the wavemeter to zero beat with incoming signal and, referring to the calibration chart, you immediately find its wavelength.

Looking at the diagram of Fig. 1 you will see that the circuit indicates that the os-

cillator is of the simple "tickler" feed-back type and the audio oscillator is of the same type. The radio frequency oscillator is modulated by the audio oscillator in the plate supply circuit and is commonly called "Heising" modulation, after the name of its inventor. From the picture of the finished oscillator-wavemeter you can readily observe the simplicity of its construction. The fact that the entire units is mounted on the panel makes it compact and easy to wire. The leads are short; the unit can be readily checked for errors. The material for its construction is reasonable in price so that every short wave "fan" can readily afford to own one. The list of materials are as follows:

1—7"x10" Aluminum Panel
1—4" dial (Vernier), National (or other make)
1—toggle switch
2—National sockets
1—500 mmf. variable condenser (General Radio) National (Hammarlund)
1—Oscillator (revamped "broadcast" coil to suit condenser used to tune it)
2—25,000 ohm 1 watt resistors (Lynch)
1—.001 mf. mica condenser
1—.00025 mf. mica condenser
1—.1 mf. tubular condenser
1—8 ohm filament flat strip resistor
1—Cabinet to take 7"x10" panel
1—2 ft. length of 4 wire battery cable and 4 lugs



Fundamental wavelength and harmonic chart. Manufacturer of the Station locator supplies an elaborated chart, whereby a large number of the shorter wavelengths can be determined.

2—230 tubes; RCA Radiotron, Arco.
1—45 volt "B" battery
1—1½ volt dry cell
1—sheet of cross-section paper for calibration chart

Note that the coil is a revamped "broadcast" coil. That is, that the primary winding is removed, a sheet of this paper (foolscap) is wrapped over the tuned winding and a winding having about ¼ or ⅓ of the tuned winding is put on. The new winding must be wound in the same direction as the tuned winding.

When the unit is complete the following simple tests are made to determine if the oscillator-wavemeter will work. Hook up the batteries to the "O-W" and then put the tubes in their sockets. Snap the switch. Connect a pair of earphones between the B plus wire and the B plus of the B battery and listen for a tone. If the audio oscillator is working, a distinctive low-pitched tone will be heard. If it is not, reverse the primary connections to the audio transformer. If still no tone is heard then the audio transformer may be "open-circuited," or some part of the wiring is wrong. As to the audio tone, the size of the audio tube's grid-leak and grid condenser may be varied for a more suitable tone.

To test the entire unit for signal, the unit is placed near a broadcast receiver and the receiver is switched on to receive a station (any frequency). A wire is connected from the B plus terminal of the B battery to the antenna post of the receiver in order to feed the signal from the "O-W" to the receiver. The "O-W" is switched on and the dial is turned until a whistle is heard in the receiver mixed with the distinctive low-pitched note and the radio program. If the whistle is not heard, check the wiring, the proper connection of the terminals of the tickler coil and the voltage for the operation of the tube at its socket. Now that it is made certain that the "O-W" works correctly, the next and most important procedure is to calibrate it.

Starting the dial of the broadcast receiver at the 1500 kc. end, a station is tuned in and brought to its peak setting. Then the dial of the "O-W" is tuned *s-l-o-w-l-y* until the distinctive low-pitched note is heard and then the whistle of the "O-W" heterodyning the signal. The dial of the "O-W" is turned *s-l-o-w-l-y* until

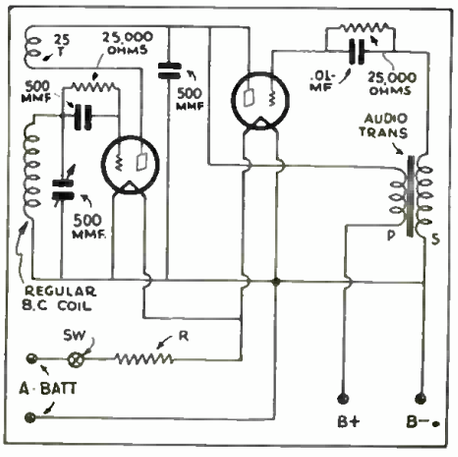
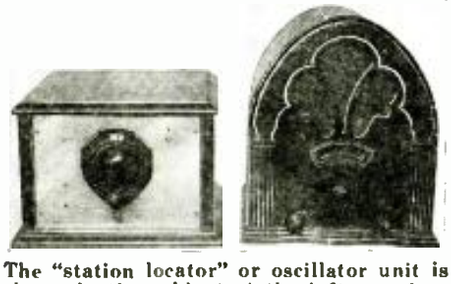


Diagram of connections for the "station finder" devised by Mr. Perlman.

the heterodyne whistle is brought to zero beat. The broadcast station wavelength and the dial setting of the oscillator-wavemeter are tabulated for a number of broadcast stations tuned in. This table should appear as shown below:

W.L.	KC	Dial	W.L.	KC	Dial
200	1500	10	297	1010	35
207	1450	12	319	940	40⅓
214	1400	14	349	860	47½
222	1350	16	370	810	53
231	1300	18	394	760	59½
240	1250	20½	422	710	67
254	1180	24	454	660	77
265	1130	27	492	610	89
295	1100	29	518	580	99

The information in the table of calibration points of the "O-W" dial is then plotted on the Calibration Chart. For example, 1300 kc. corresponds to No. 18 of the oscillator-wavemeter dial. 1300 kc. is 231 meters. Reading from right to left 231 meters is 16.5 divisions over. Reading up 18 divisions for the No. 18 of the dial a point is marked on the chart. In this manner a number of points are marked on the chart. Then the successive points are joined by a line. The successive short lines joined together form the calibration curve of this instrument. Note the table of wavelengths showing the fundamental wavelengths in the broadcast band of the successive harmonics shown up to and including the 15th. It is the information contained in the table of wavelengths which eliminates much of the mathematics necessary to determine the dial setting of the oscillator-wavemeter for any wavelength sought.



The "station locator" or oscillator unit is shown in the cabinet at the left; receiver at right.

The Masterpiece II

(Continued from page 542)

and dirt out of the set. It further permits of the most advantageous physical location of the parts upon the chassis in terms of electrical efficiency, something, as can be seen from Figure 2, that makes for both mechanical and electrical symmetry.

Band-Spread Tuning Arrangement

The use of two dials instead of a single tuning dial is the second change referred to. The receiver is completely tuned by the right-hand dial and its single knob, as was the first MASTERPIECE. The second dial is simply a vernier, or *band-spread* tuning dial to permit the short wave bands such as the 6000, 9500 and 12,000 kc. short-wave broadcast bands being spread out over a whole full dial scale for easy tuning. It may likewise be used to spread the five amateur bands for easy tuning—*or even small segments of the broadcast band.* It is purely a vernier, not a second tuning control. It need not be used at all in operating the set, yet its use makes for much easier tuning of the short-wave bands.

Tuning of the short-wave bands in the first receiver was made easy by a 28:1 dial ratio. This was necessarily slow to tune with over any range, but even more important, did not permit of spreading the different short wave stations far enough apart on the dial scale itself to make for easy reading for the eye. With this new band-spread dial, the main tuning dial need only be set at, say 6.2 for the 6000 kc. or 50 meter short wave broadcast band, and all the stations in this band will be found spread out nicely on the vernier dial—actually making short-wave tuning easier than is broadcast band tuning on ordinary receivers.

Tuning is not rendered easy by any high ratio tuning dial, which will necessarily be mechanically stiff. By the use of 6:1 automatic take-up gear drives with opposed gears (an equivalent of the beautifully smooth helical gear control) the mechanical operation not only is smooth and entirely free of slippage, wear or backlash, but the control knobs turn with extreme ease and absence of effort. Tuning is thus made faster, easier, simpler, and easier to read. This simple mechanical change is invaluable, and in the hands of a novice can make all the difference between skipping over foreign short wave stations or having them actually easier to find than broadcast band stations.

Handiness of Control Increases Enjoyment

The control knobs are, looking at the polished chromium front panel, upper two, the main tuning knob and dial at the right and the vernier or band spread dial and knob at the left, with the visual tuning meter at the top center. The four lower knobs are left to right, audio volume level control, manual tone control, at the lower center the audio beat oscillator toggle switch, interstation noise suppressor or sensitivity control, and the four position wave-change switch.

In any sensitive receiver using a perfect automatic volume control system, sensitivity will rise to a maximum in the absence of a carrier signal, and local noise is bound to be heard between stations. In the daytime, this is particularly annoying when many channels are bound to be dead, and noise will be heard as the set is tuned between the stations normally heard in the daytime.

A New Kind of Sensitivity Control

A special squelch tube was used in the first MASTERPIECE connected to function as a valve refusing all signals and noise below a certain level when it was in use. By this means the set could be tuned from station to station with dead silence between stations when desired. This arrangement had two disadvantages. It required an extra tube, and its cut-off level had to be set at some arbitrary point—it could not easily be set to agree with

(Continued on page 561)

the different local noise conditions found in different locations. Also, it was found that many stations constituting good noise-free entertainment, would, in the course of their normal and continuous slight fading, fade across any arbitrarily established cut-off level, resulting in a periodic cut-off of reception, or if fading was rapid, in choppy, distorted reception when the squelch circuit was in use.

An r.f. (radio-frequency) sensitivity control has been substituted for the squelch circuit, which was a switch like valve and has been eliminated, therefore. This sensitivity control can be adjusted to suppress any prevailing condition or level of local noise, which is obviously advantageous, and eliminates entirely the possibility of choppy reception of stations fading slightly across the cut-off level of any automatic squelch or valve circuit. It permits of adjustment when desired, of the r.f.—i.f. (i.f.=intermediate frequency) gain to the exact degree desired, almost wholly independently of the actual loud speaker volume desired, and over all ordinary operating ranges, has no effect on the automatic volume control action, or on the operation of the audio volume level control.

The use of the better r.f.-i.f. sensitivity control eliminates the arbitrarily adjusted squelch tube, and together with three new and meritorious tubes recently introduced, permits of the elimination of a total of three tubes net, allowing somewhat better results to be obtained than with the original fifteen at first employed.

The Complete Circuit

Thus the revised tube circuit line-up is: '58 r.f. stage, 2A7 combined first detector and electron-coupled oscillator (the first combination tube so far introduced which gives actually better results than separate tubes performing the same functions), three '58 i.f. stages (the third stage used for selectivity, not for gain—its additional gain cannot be used), '56 first audio stage, 2A3 pushpull Class A fifteen watt power output stage and 5Z3 rectifier.

It can be seen that from the original tube complement the '56 oscillator and '57 first detector have been replaced by the even better 2A7 tube, which performs both functions with higher gain and the desirable frequency stability and uniform output of the electron-coupled oscillator. Thus one tube is eliminated, and the performance is improved a bit. The next tube eliminated is the squelch tube, referred to previously.

Two '80 rectifiers were originally used. The new 5Z3 thermionic high vacuum rectifier, having the same power capacity as two '80s, allows one of the original two rectifiers to be dropped, thus effecting further simplification.

Actually, however, the improved and simplified receiver uses twelve tubes, the twelfth tube being a '58 in the added third dual tuned i.f. stage. The entire i.f. (intermediate-frequency) amplifier is *air-tuned*, making for permanency of setting in all climates, for the first time at no loss of selectivity. This tube is added only because it is the simple and obvious means of coupling the two extra tuned circuits added to the i.f. amplifier to set the selectivity up to absolute 9 kc.

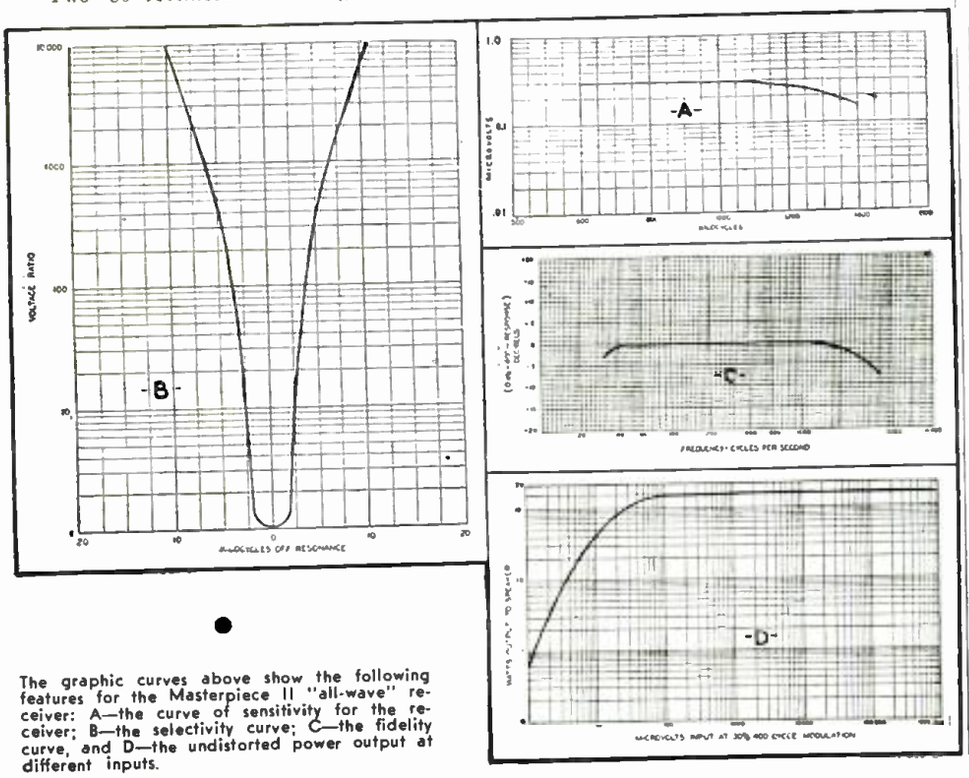
A tuned or *transposed* antenna or lead-in system may be used when desired by virtue of separate antenna coupling coils for each of the four bands.

A tuned r.f. stage is used on both broadcast and short wave; the additional gain of this stage cuts down *oscillator hiss* and results in a very fine signal-to-noise ratio. It also eliminates the *repeat spot* or *image interference* so common in many improperly designed superhet receivers.

BOOK REVIEW

"Theory of Thermionic Vacuum Tubes," by E. Leon Chaffee, Ph.D. Published by McGraw Hill Book Company. 652 pages. Size 9¼"x6". Price $6.00.

This extremely valuable book will find favor among all radio experimenters as it contains a wealth of definite information covering every conceivable characteristic of thermionic vacuum tubes. Some of the outstanding chapters are Molecules, Atoms and Electrons; Conduction of Electricity; Emission of Electrons; Practical Sources of Emission and some General Physical Aspects of Vacuum Tubes; Metal Filaments having an Absorbed Monatomic Film of an Electropositive Metal. Fundamental Considerations Pertaining to Triodes; Dynamic Measurements of Triode Coefficients; Effects of Gas in a Triode; Methods of Reducing Energy Interchange between Grid and Plate Circuits of a Triode (Neutralization); Theory of Operation of Non-linear Circuits with Large Electrical Variations, with special reference to detection with large signals. The book is profusely illustrated with curves, circuits, and formulas and there does not seem to be a single point not touched upon by the author of this book.



The graphic curves above show the following features for the Masterpiece II "all-wave" receiver: A—the curve of sensitivity for the receiver; B—the selectivity curve; C—the fidelity curve, and D—the undistorted power output at different inputs.

When to Listen In

By M. HARVEY GERNSBACK

● SINCE last month there have been three changes in the operations of the British Empire stations at Daventry, England. In transmission 1 the present schedule is: 3-5 a. m. daily on GSD, 11,750 kc. and also on either of these two: GSF, 15,140 kc. or GSC, 9,585 kc. In transmission 4 daily: 1:15-5:45 p.m. on GSC and either GSD or GSA, 6,050 kc. In transmission 5 daily: 6-8 p.m. on GSC and GSA.

* * *

The German S-W stations at Zeesen, Germany, are now transmitting on a new schedule, as follows daily: 8 a.m.-1:40 p.m. on DJB 15,200 kc., 10 a.m.-4:50 p.m. on DJD, 11,760 kc.; 2-6 or 7:30 p.m. (varies from day to day) on DJA, 9,560 kc., and from 5-9 p.m. on DJC, 6,020 kc. Daily at 10 a.m. a program résumé for the coming week is given in German and English on DJB and DJD.

* * *

More information on the Russian station mentioned last month as operating near 25 meters is available now. The call is RNE and it operates on 12,000 kc. or exactly 25 meters. I have heard no reports of reception in this country but from Europe come reports that it has been heard announcing in English that it was sending special programs for the benefit of listeners in the U. S. A. The schedule is unknown but it has been heard at 8:30 a.m. and at 12:30 p.m. (Eastern Standard Time).

* * *

On its last trip to the U.S.A. and the Century of Progress at Chicago the airship, *Graf Zeppelin*, was heard broadcasting special programs to the N.B.C. en route. It came over very clearly on several occasions when it was still over South America. The call letters used were DENNE. The transmissions were on 9,900 kc. Other listeners report hearing it around 6,000 kc. also.

* * *

HC2RL at Quayaquil, Ecuador, S.A., broadcasts on 6,670 kc. or 45 met. on Tuesday from 9:15-11:15 p.m. and Sundays 5:45-7:45 p.m. It is operated by Dr. Robert Levi, P. O. Box 795, Quayaquil, Ecuador, S.A. This information comes from James M. Coleman of New Orleans, La.

* * *

I have had several reports of a police radio station at Montreal, Canada. The call is UYR and it operates on 1,712 kc. Information comes from M. J. Cooper at Adrian, Mich., and others.

* * *

HIX on 5,950 kc. is on the air Tuesday and Friday at 8:10 p.m. and Sunday at 7:40 a.m. Address is: Secretaria D. E. de Hacienda, Trabojo y Comunicaciones, Estacion Radiofusora HIX, Santo Domingo, Rep. Dominica, Central America.

* * *

IAC at Piza, Italy, a commercial phone station is heard calling Italian ships on 17,760 kc. from 6:30-7:30 a.m.; on 12,800 kc. later in the morning, on 8,380 kc. irregularly; and on 6,650 kc. in the evening.

* * *

VE9DR at Drummondville, Que., Can., relays CFCF of Montreal on 6,005 kc. daily from 8 a.m.-12 midnight, and on Sundays from 12:15-11:15 p.m.

* * *

Another new European station is LCL at Jelöy, Norway. It relays the Broadcast station at Oslo, Norway. It operates on 6.990 kc. or 42.92 meters. It seems to be on the air during the day anywhere from 8:30 a.m. till late afternoon.

* * *

Last month we printed the schedule of W3XAL at Bound Brook, N. J., operating on 17,780 kc. This schedule was received direct from the N.B.C. but does not seem to be correct. At present the station operates daily except Saturday from 10 a.m.-4 p.m.

Power Transformer Data

(Continued from page 536)

Equation (3) establishes the relationship desired, and holds good for any 115 volt, 60 cycle transformer. Using values of B from 7,400 up to 10,000, the corresponding values of A x N may be calculated, using equation (3), and the results tabulated as shown in the Flux Table. B is the theoretical flux density. In actual practice this density is not possible, as burs and scale on the laminations use up approximately 10% of the area.

COIL DESIGN

115 Volts 60 Cycles

A flux density of 10,000 lines per sq. cm.* is often used for power transformers. For cooler operation, a density of 9400 will be used in our transformer. The theoretical density, B, then is 8550, since 8550 plus 10% is 9400, in round numbers. (The aforementioned values apply only when silicon steel is used for the core.) From the Flux Table and opposite B = 8600 we find A x N = 780. The product of the core area in sq. inches and the primary turns, then, must be 780.

To find the number of primary turns, a square core area using lamination in Fig. 2, will be tested. Since the center tongue width is 1½", the core area is 1½" x 1½" =2.25 sq. in.; and 780 divided by 2.25 = 346 primary turns.

Laboratory testing and experience has shown that when the I^2R losses of the primary and the heavy ampere filament windings are about two watts each or less, and the losses of the secondary and the other filament windings, about one watt each or less, an 85 watt transformer with 9400 flux density will operate reasonably cool. With 84 watts output, the input watts are 95.35 as shown in the chart, and the primary current .83 ampere. For 2 watts loss in the primary, then, at .83 ampere, the primary resistance must be close to 3 ohms. Having found the number of primary turns and resistance, it is now necessary to find the size of wire, and test the lamination coil space. With 1½" x 1½" sq. core, the average turn length of the primary winding is 7 inches, and 346 turns would require 200 ft. of wire. From the Wire Table we find that size 22 wire of 200 ft. length has 3.2 ohms resistance.

The next step is to see how much of the coil space is used up by 346 turns of No. 22 enamelled wire. The coil space is ¾" x 2¼" = 1.69 sq. in. Allowing half the space for insulation, clearance and winding margins, the net wire space is .845 sq. in. From the Wire Table, 346 turns of No. 22 enamelled wire require .266 sq. inches, (346 divided by 1300). This is about one-third the total net wire space and leaves plenty of room for the secondary and filament windings. The primary, therefore, will be 346 turns of No. 22 enamelled wire.

The number of secondary turns is found by using the equation which expresses voltage relation between primaries and secondaries of transformers, namely,

$$\frac{N^1}{N} = \frac{E^1}{E} \text{ or } \frac{346}{N} = \frac{115}{720}$$

Whence N = 2166 turns

2200 turns will, therefore, be used in the secondary.

With an average turn length of 8½ inches, 2200 turns would require 1560 feet of wire, and it should have a resistance of such value that the I^2R loss is not much

(Continued on page 566)

*1 sq. inch contains 6.45 sq. cm. Hence 10,000 lines per sq. cm. = 64,500 lines per square inch.

FLUX TABLE, 60 V.

β at 110 V.	A x N	β at 115 V.
7400	864	7750
7600	842	7950
7800	820	8150
8000	800	8360
8200	780	8600
8400	762	8800
8600	744	9000
8800	727	9200
9000	711	9400
9200	696	9600
9400	681	9840
9600	667	10.000
9800	653	10.250
10,000	640	10.450

Actual Density = β + 10%.
A = Core Area in Sq. inches.
N = Primary Turns.
β = Flux Density per sq. cm.

These tables will be found very useful by the student of transformer design, especially the table of turns per inch of enameled magnet wire.

ENAMELED WIRE TABLE

Size	Dia.	Ohms per 1,000 ft.	Turns per in.	Turns per sq. in.
14	.0670	2.527	15	225
15	.0600	3.186	16	266
16	.0535	4.018	18	324
17	.0475	5.066	21	440
18	.0420	6.388	24	580
19	.0370	8.055	27	730
20	.0340	10.158	29	840
21	.0305	12.809	32	1020
22	.0275	16.150	36	1300
23	.0250	20.367	40	1600
24	.0220	25.683	45	2025
25	.0200	32.383	50	2500
26	.0175	40.838	57	3250
27	.0155	51.495	64	4100
28	.0110	64.934	71	5010
29	.0123	81.883	81	6600
30	.0113	103.245	88	7750
31	.0102	130.176	98	9600
32	.0092	164.174	109	11900
33	.0082	207.000	122	14900
34	.0075	261.099	137	18800
35	.0068	329.225	147	21600

Diameter and Ohms from Gen. Elec. Table.

Turns per in. = $\frac{1}{\text{dia.}}$

—Tipsel.

MODERN SHORT WAVE RECEIVERS—

The OSCILLODYNE 1-Tube Wonder Set

If you have never operated a short-wave set, this is the one with which to start! If, on the other hand, you are already a hardboiled short-wave fan and are aware of the shortcomings of the average short-wave set, the *Oscillodyne* will instill you with new confidence. It is a set which will convince you that foreign stations CAN be tuned in whenever they are on the air.

We have acquired the **sole rights** from the publishers of *Short Wave Craft* to manufacture *exclusively* the Official *Oscillodyne* 1 Tube Set, as described in the April, 1933 issue. **Read what the editor of Short Wave Craft says in that issue:**

A REALLY NEW CIRCUIT

We are pleased to present to our readers an entirely new development in radio circuits. Under the name of the "*Oscillodyne*," Mr. J. A. Worcester, Jr., has developed a fundamentally new circuit. This circuit which is of the regenerative variety, sets like a super-regenerative set although it does not belong in that class. Its sensitivity is tremendous. The editor, in his home on Riverside Drive, New York City, in a steel apartment building, was able to listen to amateurs in the midwest, *using no aerial and no ground.* With the ground alone, a number of Canadian stations were brought in, and with a short aerial of 40 feet many foreign stations were easily pulled in.

Here, then, is a set which brings in stations thousands of miles away; a set which frequently brings in Australia, loud enough to rattle your phones, and with power to spare; a set which, if you do not wish extreme distance, will bring in stations several thousand miles away *without aerial or ground.*

ABSOLUTELY FOOL-PROOF

This set, as we sell it, may be had either completely wired, or in kit form. There is absolutely nothing to go wrong with the *Oscillodyne.* Simple directions and blueprints show you how to build and operate the set for best results. **It may be used either on A.C. or with batteries.** If A.C. is employed, a type 227 tube is used in conjunction with a suitable A.C. power pack (such as the one listed on the opposite page.) 2½ volts will be required for the filament of the tube, and 90 volts for the plate. If batteries are employed, a 237 tube should be used in conjunction with either a storage battery or four No. 6 dry cells and two 45 volt B batteries.

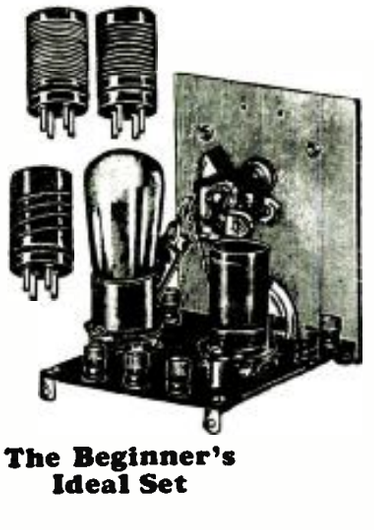
Oscillodyne Wonder Set

The set is exactly as illustrated here, size of aluminum panel is 6" high by 4½" wide, base 5½" long by 4½" wide. List of materials used:

No. 2146. Official One-Tube Wonder Set, completely wired and tested as per above specifications. YOUR PRICE **$7.21**

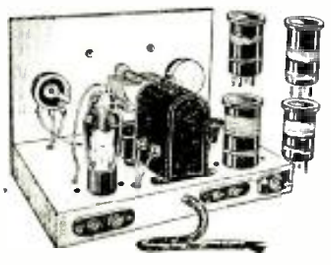
No. 2147. Official One-Tube Wonder Set, but not wired, with blueprint connections and instructions for operation, complete shipping weight 3 lbs. YOUR PRICE **$6.36**

No. 2148. COMPLETE ACCESSORIES, including the following: one 6 month guaranteed Neontron No. 237 tube; one set of standard matched headphones; four No. 6 Standard dry cells; two standard 45-volt "B" batteries, complete shipping weight 22 lbs. YOUR PRICE **$5.51**



The Beginner's Ideal Set

The Twinplex One Tube "Double-Action" Receiver



Real Two Tube Performance

It may seem paradoxical when we say that this 1 tube receiver is a 2 tube set, but actually that is so. The type 53 tube employed is the latest to be placed on the market. It contains, in one glass envelope, TWO ENTIRELY INDEPENDENT RADIO TUBES which have only their cathodes in common. Hence this receiver is a **REAL** 2 tube set.

This "2 tube" Twinplex can now be constructed for the same money required to build a 1 tube receiver.

In operation this set is exactly the same as 2-tube regenerative receivers. The results obtained during a week of testing have been exceedingly good. Some of the foreign stations received during this period include EAQ, GBS, GSA, DJC, HKD and OXY. FOR A MAN WHO IS FIRST STARTING IN SHORT WAVES, THIS TWINPLEX RECEIVER IS THE "BEST BET."

The receiver is UNIVERSAL in operation, that is it may be operated either with batteries or an A.C. 110-volt power pack. A plate potential of 180 volts is required. The heaters require 2½ volts either A.C. or D.C.

Only high grade parts such as Hammarlund Condensers, etc., are used in the constructions of this set. All component parts are mounted on a cadmium-plated metal chassis, measuring 9 x 6¾ x 5½ in.

This set is available in two forms namely, completely wired ready to use, and in kit form. A complete set of instructions and blue-prints are furnished with each set.

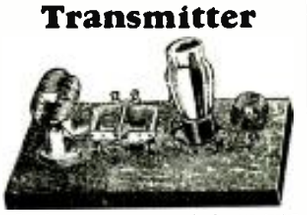
No. 2115 Twinplex 1 Tube Short Wave Receiver Wired, but less tubes and accessories. Ship. wt. 9 lbs. YOUR PRICE **$9.50**

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

No. 2117 ACCESSORIES ONLY—FOR A. C. OPERATION—Including 1 special Num-Free A. C. Power pack, 1-80 Rectifier tube, 1-53 Tube and one set of matched head-phones. YOUR PRICE **$10.35**

No. 2118 ACCESSORIES ONLY—FOR BATTERY OPERATION—Including 1-53 Tube, 3-45 volt B Batteries, 4 No. 6 Dry Cells (arranged in series—Parallel) and 1 set of matched head-phones. Ship. wt. 15 lbs. YOUR PRICE **$6.25**

One Tube "Push-Pull" Ten Meter Transmitter



Paradoxical as it may sound, this ten meter transmitter EMPLOYS A SINGLE TUBE IN PUSH-PULL ARRANGEMENT. Heretofore the word "push-pull" automatically implied the use of two tubes, yet here we are with a one tube push-pull transmitter.

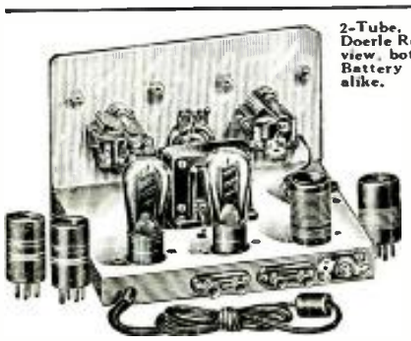
It is the advent of the new type 53 tube, which makes this feat possible. The tube is actually "TWO" tubes, in one glass envelope.

This transmitter is not a high power job, for high power is not necessary in ultra short wave work. When properly coupled to a suitable antenna system such as a single-wire-fed Hertz or the familiar "Zeppelin" antenna, it will, under favorable conditions, girdle the globe. The circuit is of the tuned-grid, tuned plate type and utilizes a solenoid of solid copper ribbon as the plate coil. All component parts are of the highest possible quality, since R.F. losses in ultra short wave work are fatal.

May be used for phone work, directly without the use of a microphone transformer), by hooking a single button mike in series with the grid return lead.

There are any number of uses to which a compact unit of this type may be placed. For instance it can be used as a master oscillator for multi-stage high frequency transmitters OR two such units may be connected together to produce a complete master oscillator—R.F. amplifier transmitter. Neutralizing condensers must be used when operated as an R.F. amplifier. Will work either with batteries or A.C. power pack. Requires 350 volts "B" supply and 2½ volts "A." A key circuit is in the cathode lead. The transmitter on its neat bread-board measures 11" long x 8½" wide x 6" high overall. Furnished complete with a set of 10 meter coils. Shipping weight, 6 pounds.

No. 10-M Versatile 10 Meter Transmitter Less Tube. Your Price $4.51



2-Tube, 12,500 mile Doerle Receiver Rear view, both A.C. and Battery Model look alike.

Specifications of Doerle Sets

No. 2174. Electrified 2 Tube 12,500 Mile Doerle Receiver, completely wired and tested, less tubes. Measures 9" long x 6" high x 6 1-8" wide. Shipping wt., 5 lbs. YOUR PRICE **$10.46**

No. 2175. Electrified 2 Tube 12,500 Mile Doerle Receiver in kit form, less tubes, but including blueprints, and instructions. Ship. wt., 5 lbs. YOUR PRICE **$10.26**

No. 2176 Complete set of tubes for above: either one—57 and one—56 for A. C. operation, or one—77 and one—37 for battery operation. YOUR PRICE **$1.91**

No. 2177 Electrified 3 Tube Doerle Signal Gripper, completely wired and tested; less tubes. Measures 10½" long x 7" high x 5 1-8" wide. Ship. wt., 7 lbs. YOUR PRICE **$15.21**

No. 2178. Electrified 3 Tube Doerle Signal Gripper in kit form, including blueprints and instructions; less tubes. Shipping wt., 7 lbs. YOUR PRICE **$13.76**

No. 2179. Complete set of tubes; either one—58 one—57 and one—56 for A. C. operation or one—78 one 77.— and one—37 for battery operation. YOUR PRICE **$2.81**

BATTERY SETS

No. 2140. TWO TUBE 12,500 MILE 2-VOLT DOERLE SHORT WAVE RECEIVER, completely wired and tested. Ship. wt. 5 lbs. YOUR PRICE **$9.91**

No. 2141. TWO TUBE 12,500 MILE 2-VOLT DOERLE SHORT WAVE RECEIVER KIT, with blueprint connections and instructions. Ship. wt. 5 lbs. YOUR PRICE **$8.71**

No. 2142. COMPLETE ACCESSORIES, including 2 No. 230 tubes; one set of standard Headphones; 2 No. 6 dry cells, 2 standard 45-volt "B" batteries complete. Ship. wt. 22 lbs. YOUR PRICE **$5.51**

No. 2143. THREE TUBE 2-VOLT DOERLE SET, completely wired, ready to use YOUR PRICE **$12.86**

No. 2144. THREE TUBE 2-VOLT DOERLE SET IN KIT FORM, with blueprint connections and instructions. Ship. wt. 7 lbs. YOUR PRICE **$11.51**

No. 2145. COMPLETE ACCESSORIES, including 2 No. 230 tubes; and one type 34, one set of standard Headphones; 2 No. 6 dry cells; 3 standard 45-volt "B" batteries; 1 B. B. L. 9 inch Magnetic Loudspeaker. Shipping weight, 32 lbs. YOUR PRICE **$11.26**

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100A Park Place, New York, N. Y.

YOUR CHOICE

of either one of books illustrated herewith—FREE OF CHARGE—with the purchase of any of the short-wave receivers listed on these pages.

Book No. 866 explains in a thorough manner the ways and means of obtaining an amateur transmitting license. Furthermore, all government rules regulating amateur transmissions are reviewed. Book 830 is a comprehensive compilation of the most prominent short-wave receiver circuits published during a period of two years. Build up your radio library with one of these books.

Power Transformer Data

(Continued from page 563)

over one watt. Since the load current is 110 Ma., the current on each side of the center tap is about 80 Ma. With one and a quarter watt loss, $1\frac{1}{4} = .08^2R$, or $R = 196$ ohms. From the Wire Table, No. 31 wire 1560 feet long has a resistance of 200 ohms which is close enough.

The secondary may be 2200 turns of No. 30, with a quarter of a watt less heat in that winding.

The filament windings are determined in the same way, with attention given to the operating volts and I^2R loss. The number of turns for the five volt winding is 16, found as follows:

$$\frac{N}{346} = \frac{5.32}{115}$$ allowing .32 voltage drop.

Whence N = 16. With an average turn length of 9½ inches the wire length is 12.6 feet. For 1.14 watt loss at 3 amperes the resistance is .127 ohms, and the wire size is No. 20. When using the 5Z3 tube, the loaded voltage is slightly below normal (4.94); while with the 280 tube, the loaded voltage is 5.07.

The number of turns for the 2½ volt windings is 8 turns, since the five volt winding is 16 turns, and the no load voltage is 5.32 divided by 2 or 2.66 volts. The wire size should be such that the voltage drop in 6.3 feet length of wire will bring the loaded voltage near to normal. No. 19 wire for the 3½ ampere winding has a resistance of .05 ohms to give a loaded voltage of 2.49, and an I^2R loss of .61 watts. For the 9 ampere winding, No. 15 wire of .02 ohms resistance gives a loaded voltage of 2.48, and an I^2R loss of 1.62 watts.

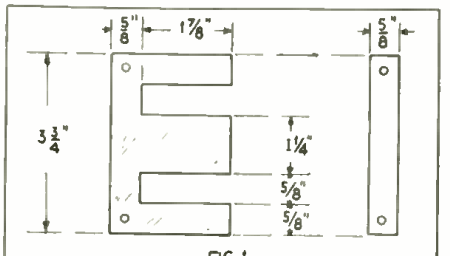


FIG. 1

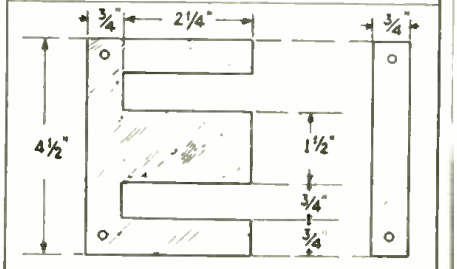


FIG. 2

New DeWald Set

(Continued from page 539)

Oscillator Coils

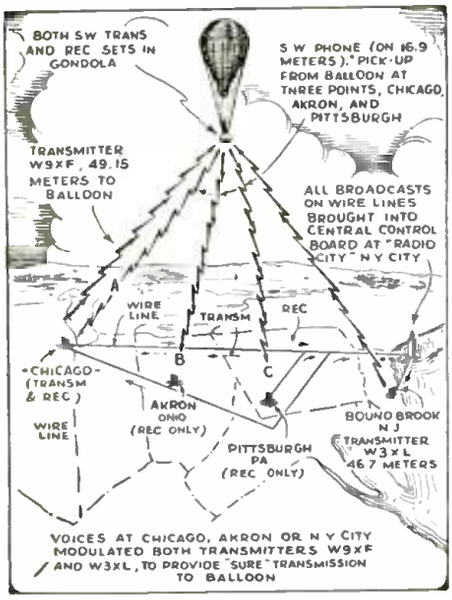
Tickler.....37 turns No. 38 enameled wire.
Grid.....approximately 74 turns, No. 32 enam. tapped at 37 turns wound on ¾" tube with 1/64 space between the two windings all close wound.

Detector Coils

Short Wave
Antenna..... 8 turns No. 32 single cotton covered.
Grid .....30 turns No. 32 enam.
Coils wound in same direction on a ⅞" form. Antenna coil is wound over the ground end of the grid coil, all coils close wound.

Detector Broadcast coil
Antenna coil..1.52 mh. No. 38 enam.
Band pass.....245 mh. No. 40-7 strand litz.
Grid.....212 mh. No. 40-8 strand litz
Above coils are universal wound and mounted on a ½" dowel stick, spacing between grid and band pass coil is ¼ inch.

Short Waves Link Lieut. Settle To Ground



How Short Waves were used to link the stratosphere balloon to the ground.

● LIEUT. Commander T. G. W. Settle, U. S. N., and Major Chester L. Fordney of the U. S. Marine Corps, who recently attained the remarkable altitude of approximately 59,000 feet in a sealed metal gondola attached to a giant balloon, were kept in practically continuous radio contact with the earth, thanks to short-wave transmitters and receivers. The accompanying diagram shows how short-wave phone to and from the balloon was carried on under the auspices of the National Broadcasting Company. Two-way conversation was carried on and voices originating in Chicago, Akron, or New York City, were caused to simultaneously modulate two transmitters, one at Chicago and the other at Bound Brook, New Jersey. S-W phone messages from the balloon gondola were picked up at any one of three listening posts—Chicago, Akron, or Pittsburgh, and carried over wire (telephone) lines to N. B. C. Headquarters in Radio City, New York, from which point it was again sent over wire lines to the various broadcast stations constituting a special national hook-up.

Useful "AMATEUR BULLETIN" FREE!

● Every short-wave "ham" and "fan" will find extremely interesting and valuable the new AMATEUR BULLETIN, Number 935, a 12-page publication which we shall be glad to send you upon request. The articles and illustrations contained in this bulletin describe a brand new way of building a handsome appearing receiving and transmitting set at a nominal cost and with a minimum of labor. All of us are anxious to have our radio sets appear to the best advantage and the handsome designs of cabinets, panels, and dials portrayed in this book are indeed an inspiration to every short-wave set constructor. We shall be glad to send you a copy of this bulletin No. 935, without charge upon request. Be sure to print your name and address clearly.

Service Department
SHORT WAVE CRAFT
98 Park Place
New York City

A Symmetrical Input Super-Regenerative Receiver

(Continued from page 525)

amplification with no super-regeneration. Still others state that the amplification obtained in a super-regenerative receiver is roughly proportional to the square of the difference between the signal frequency and the variation frequency, but that this does not hold true at the extremely high frequencies.

Briefly the advantages and disadvantages of the super-regenerative receiver may be summed up:

Advantages

(1) Receiver may be built very compact.

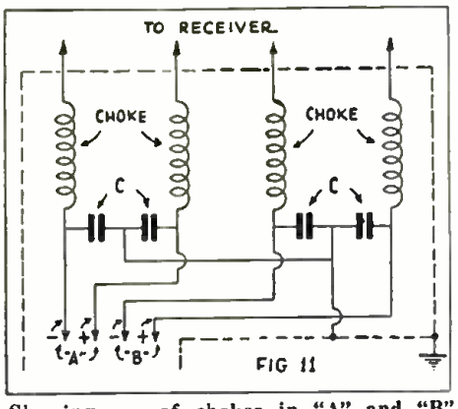
(2) Good amplification can be obtained ahead of the audio amplifier at frequencies too high for the present day radio frequency amplifier.

(3) The super-regenerative receiver gives a broad, flat-topped response curve which is a real advantage for some kinds of work.

Disadvantages

(1) All super-regenerative receivers are inclined to have a high noise level. This is the characteristic noise in a regenerative circuit but amplified, and increased due to rectification of the variation frequency.

(2) There probably will be interference between adjacent super-regenerative receivers due to reradiation.



Showing use of chokes in "A" and "B" leads.

(3) A certain minimum signal voltage is required in order to "trigger" the detector. In other words, the super-regenerative receiver is inefficient for reception of weak signals.

A 4-Tube Improved Super-Regenerator

The diagram of Fig. 3 shows a receiver which has several unique features and is an improvement in super-regenerative receivers. The receiver consists of a symmetrical input back-to-back detector, a variation oscillator, and one stage of pentode audio.

V1, V2, V3—237 type tubes. R. C. A. (Arco).
V4—238 type tubes. R. C. A. (Arco).
R1, R2—50,000 ohms, resistor. All Lynch.
R3—500,000 ohms. resistor.
R4—1,000 ohms, resistor.
R5—2,500 ohms, resistor.
R6—50,000 ohms, resistor.
C1—100 mmf. Hammarlund Midget variable. (National).
C2—.002 mf. condenser.
C3—.5 mf. condenser. All Flechtheim.
C4—.5 mf. condenser.
C5—50 mf. condenser.

L1, L2, L3, L4 and L7 are wound on ¾ inch victron or other tubing with numbers of turns to suit the frequency desired. Care must be taken to make the input circuit symmetrical. With the number of turns on each coil as shown below the frequency range of the receiver was from 54 to 61 megacycles.

L1—3 turns.
L2—3 turns.
L3—7 turns.
L4—7 turns.
L7—4 turns.

By changing the turns of various coils, frequencies from 40 to 185 megacycles have been covered with this receiver.

L5 and L6—Made by separating the winding of a No. 125, 250 mh, Samson choke into two separate coils with a ratio of 1 to 3. The coil L5 has roughly three times the numbers of turns as coil L6. The variation frequency is approximately 100 kcs.

The approximate number of turns for L5 is 1,200 and for L6, 500; in most cases it is necessary to tune each of these coils with a .001 or .002 mf. fixed condenser. More specifically the constructor may use

(Continued on page 571)

5 and 10 Meter Transmitter

(Continued from page 553)

Oscillator "Power Supply" Parts

1—power transformer, 650-0-650, 2.5, 7.5 volt filament. R. T. Co.
1—30 henry 150 mil. filter choke. National.
2—2mmf. 1000 volt filter condensers, Flechtheim.
2—4 prong sockets, National.
2—type 871, 872 or 866 mercury vapor rectifier tubes. RCA Radiotron, (Arco).

Modulator Parts List

1—Microphone, Universal. (Single or double button.) Amplion; Lifetime; Miles; Mayo.)
1—Microphone transformer, Universal. (Single or double button type.)
1—3:1 ratio audio transformer. National (or other make).
1—Class B input audio transformer, National.
1—Class B output audio transformer National. (With tapped secondary.)
1—Power transformer 450-0-450, 2.5, 2.5 windings, 5V. National.
2—8mmf. 500 volt electrolytic condensers, Flechtheim.
1—1mmf. 400 volt by-pass condenser, Flechtheim.
1—20 mmf. 25 V., electrolytic condenser, Flechtheim.
1—20,000 ohm resistor, tapped at 8,000 ohms.
1—2 000 ohm 2 watt resistor, Lynch.
1—20 ohm center-tapped filament resistor.
4—5 wafer sockets, Eby.
1—4-prong wafer socket, Eby.
1—aluminum chassis 13"x10"x2".

Tubes for the modulator unit are:
3—type 46 RCA Radiotron.
1—type 56 RCA Radiotron.
1—type 5Z3 RCA Radiotron.

Coil Data

5 Meters

Antenna—2 turns each (make two).
Grid—8 turns, ⅛ inch space between turns.
Plate—4 turns. ¼ inch space between turns.

10 Meters

Antenna—same as for 5 meters.
Grid—same as for 5, but tuned with a 100 mmf. condenser.
Plate—6 turns, ⅛ inch space between turns.

*All coils are 1 inch inside diameter and wound with ¼ inch diameter copper tubing.

Receiver Calibration

(Continued from page 547)

mation—but the writer claims it to be very helpful and accurate enough for most purposes.

Take several sheets of standard cross-section paper having 10x10 squares to the half-inch—one sheet for each plug-in coil will be required. Along the short side (horizontal), number the dial settings for the tuning condenser so that each dial division will be allotted one tiny square. Along the long side (vertical) will be numbered the frequency in kilocycles to such a scale as will fit the size of the sheet well. If desired, wavelength in meters may be used for the vertical scale instead of frequency in kilocycles, but the latter is recommended for the simple reason that most call-books give a listing of stations by frequency rather than wavelength. If you should prefer, however, to use meters for units, keep in mind that wavelength is inversely proportional to frequency and your curves will slant in the opposite direction to those shown.

Now plug in one of the coils and tune in a station near the middle of the dial scale. When the station has been identified, look up the frequency in a call-book, and log the dial setting. Now locate stations near either end of the dial scale, and log their frequencies and dial settings. By now you can estimate what scale you wish to use on the cross-section paper for the frequency units, using that particular coil. Several more stations should be logged, as evenly spaced along the dial as possible. When you have eight or ten, plot the points on the sheet, and if you have collected your data carefully you will find you can draw a smooth curve through all the points. If one or two points seem *out of line*, recheck them, as you probably have made a mistake in logging them. The points at which the curve intersects the dial extremities, referred to the frequency scale, will show the range of the coil. The shape of the curve will depend largely on the characteristics of the tuning condenser. Some condensers will give a curve which is very nearly a straight line—others may produce a decidedly curved line. The above procedure may then be followed for each of the remaining coils. Sample curves for two different coils are shown in the sketch.

Now a few words as to the tuning methods used. Let it be said here that obviously the more care exercised in tuning in the "marker" stations, the more accurate will be the calibration. It is of vital importance that the calibration be made under exactly the same conditions that will exist when the calibration is used for reference later. Any change in the antenna system or in the coils will of course render the calibration worthless. An antenna that is too slack will sway in the wind and cause an appreciable variation of conditions. Be sure that the regeneration control is set very close to the critical point each time that a "marker" station is logged. If phone stations are used for calibration purposes a good plan is to identify the station with the detector just below oscillation, as usual, then advance the regeneration until the detector just oscillates, and retune the carrier wave to the point of resonance. If commercial or government CW stations are used for "markers," the detector should, of course, be just oscillating.

In some receivers a small three-plate midget condenser is shunted across the main tuning condenser to act as a vernier control or band-spreader. If this is the case, it is well to set this vernier at a fixed point, say at the midpoint of its dial scale, and tune with the main condenser while calibrating. Then to refer to any frequency later, it is necessary merely to set the vernier as before, set the main tuning condenser to the dial reading taken from the calibration curve, and then do the final tuning with the vernier, which will only have to be varied slightly.—*Nicholas C. Northrup.*

A Symmetrical Input Receiver

(Continued from page 569)

a wooden form made from a piece of 1¼ inch diameter wood or bakelite rod. Two ¼ inch wide by ½ inch deep grooves are cut in a piece of this rod, the grooves being ½ inch apart. In one groove wind 1,200 turns of No. 36 S. S. C. wire "scramble" wound (helter skelter fashion, i. e., not in even layers). In the second groove 500 turns of No. 36 S. S. C. wire are wound.

The choke consists of 45 turns of No. 40 D. S. C. copper wire on a slotted form with three slots. The overall length of the form is about ¾ inch.

T1, the audio transformer may be any good transformer.

Reasonable care must be used in construction and wiring of the receiver. Some of the details are shown in the photographs.

Input Tubes Work "Back-to-Back"

The *input* works with the tubes "back-to-back." Tubes V1 and V2, forming the detector, oscillate very easily at these high frequencies.

On one half of the variation frequency cycle, Tube V1 say, is operating and tube V2 is practically dead insofar as the incoming signal is concerned. The tube capacities of tube V2; Cg, Cp, Cm; are in a parallel arrangement with C1. This parallel arrangement is in a series combination with the tube capacities of V1. On the other half of the variation cycle Tube V2 works and Tube V1 is practically dead insofar as the incoming signal is concerned. Conditions as regards the tube capacities and C1 are now reversed.

This method of series tuning makes it quite easy to tune at these high frequencies and still cover a reasonable range without having the circuit too critical.

In addition to tuning, C1 serves a most important purpose. At the lower end of the frequency range for any coil, more external coupling is required between plate and grid circuits. This requires more capacity. At the higher frequency end, less external coupling is required between plate and grid circuits, necessitating less capacity. From this it can be seen that the external coupling between plate and grid circuits, and tuning are both controlled by C1, and, fortunately, the coupling requirements are similar to the tuning requirements; that is, less capacity is required in each case at the high frequency end of the coil.

Noise Level Greatly Reduced

As shown in Fig. 3, the resistance of R3 is 500,000 ohms while R1 and R2 are each 50,000 ohms. Suppose on a signal of a certain amplitude an output of a certain value is obtained. Now, if one detector tube, say V2, is removed from the socket, the value of R3 must be reduced to about 100,000 ohms in order to get the previous value of output voltage. Also, the noise level is considerably increased. This means that with the symmetrical back-to-back detector, oscillations are easily obtained so that a lower variation frequency amplitude is needed for good operation. As a large part of the characteristic noise in a super-regenerative receiver is due to the variation frequency, a lower variation frequency amplitude will result in a lower noise level. In the present receiver this lower noise level is obtained and at the same time, the receiver is very sensitive.

On one test the receiver shown in Fig. 3 gave a signal of 55 volts with a noise level of 0.3 volts. An older type receiver with a single detector tube gave a signal of 50 volts with a noise level of 0.7 to 1.2 volts. The signal noise ratio with the symmetrical input receiver was 183.3 to 1.0 and with the single detector tube receiver was between 71.4 to 1 and 41.6 to 1.

(Continued on page 573)

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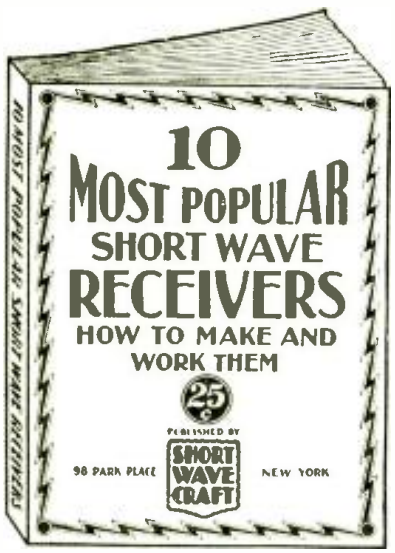

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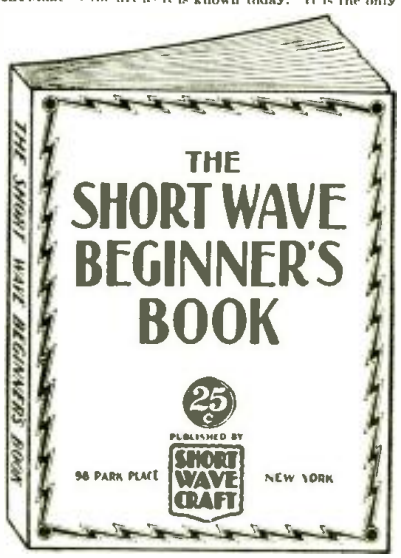

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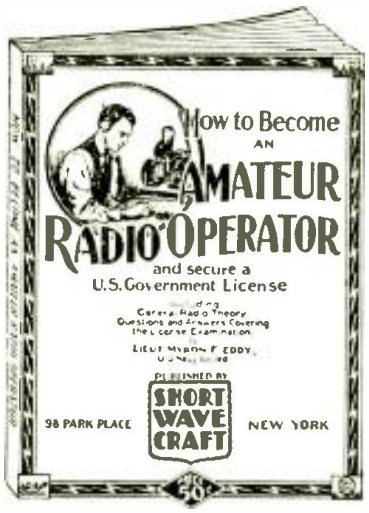

We chose Lieut. Myron F. Eddy to write this book because his long years of experience in the radio field have made him prominent in this line. For many years he was instructor of radio telegraphy at the RCA Institute. He is a member of the I.R.E. Institute of Radio Engineers, also the Veteran Wireless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

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From the above data, the symmetrical input receiver appears to be at least three times as good as the other type considering the noise level. In each case the input was the same and the frequency was about 60 megacycles.

550 Gain by Super-Regeneration

On another test at about 60 megacycles, using a local oscillator, the signal was 0.1 volt with the variation oscillator out of the circuit. With the variation oscillator in the circuit the signal was 55 volts. This shows that there was a gain of 550 due to super-regeneration. Under similar conditions the gain due to super-regeneration in the older type receiver was about 62.5.

A brief analysis shows why the new symmetrical input receiver should give higher sensitivity than the older single tube detector receiver. Fig. 4 may be used to explain operation for the older single tube receiver as well as for that of the symmetrical input receiver.

Suppose only a single detector tube, V1, is used. On the positive half of the variation frequency cycle the tube is in a very sensitive condition as regards the incoming signal. During the negative half of the variation frequency cycle the tube is blocked and the receiver is praetically dead. The responses may be pictured as in Fig. 5.

Now, suppose another tube is added to the detector circuit as shown in Fig. 3. During one half cycle, say the positive half as shown in Fig. 4, Tube V1, operates in a very sensitive condition; while tube V2 operates in a sensitive condition Tube V1 is blocked. In this case the response may be pictured as in Fig. 6.

This means that with the two tubes in operation, the time during which the receiver is sensitive is greatly increased over what it is when only one tube is used. This allows the use of a higher variation frequency with correspondingly better quality, while at the same time the receiver retains high sensitivity.

Advantages of "Symmetrical Input"

The advantages of the symmetrical input super-regenerative receiver over the older types of single input tube receivers may be summarized:

(1) With the system of tuning shown in Fig. 3, a reasonable frequency range is covered with each coil.

(2) The external coupling between plate and grid circuits is controlled by the tuning condenser. The required tuning capacity and the coupling capacity are similar, that is, at the low frequency end of any coil, more tuning capacity and more coupling capacity are necessary than is the case at the high frequency end of the same band.

(3) With the input arrangement as shown in Fig. 3, a lower "trigger" (signal) amplitude is required for operation.

(4) The receiver is maintained in the sensitive condition over a much greater portion of the time. This makes it necessary to use a lower amplitude of variation frequency with a corresponding reduction in noise level.

(5) For the same reason as given in (4), above, a higher variation frequency can be used, while high sensitivity is still retained. This improves the quality.

(6) With the two tubes, a higher detector output results.

A later model of this receiver will incorporate a volume control and output transformer as shown in Fig. 7.

With this type of receiver at these frequencies considerable trouble has been experienced with antenna coupling. A close coupling must be used in order that sufficient signal voltage is impressed on the grids to "trigger" the detector on the weaker signal.

This coupling shown in Fig. 8 is satisfactory if the antenna lengths, "d" are proper.

This type of coupling, Fig. 9, was quite satisfactory in regard to efficiency of coupling but the type of antenna tends to affect the tuning.

The type of coupling shown in Fig. 10, is believed to be superior to that shown in Fig. 3, and is being used at present.

R. F. Filter Used in Battery Leads

In using this receiver it was found that considerable "pick-up" was due to the battery leads. It was desired to eliminate this so a radio frequency filter was incorporated and made a part of the battery leads entering the set. There are four entering leads and in each of these a radio-frequency choke was inserted, consisting of 20 turns of No. 18 enameled wire, wound on a threaded victron (or other) form ½ inch in diameter. The thread pitch was 16 to the inch. In addition the chokes were each by-passed to ground with .005 mf. condenser. All four chokes and all four condensers were placed in a separate shielded compartment and the battery leads were shielded back to the batteries.

This filter helps to eliminate battery lead pick-up and constitutes a considerable improvement.

Fig. 11 is a diagram of the filter.

Ch—20 turns, No. 18, on ½ inch form.

C—.005 mfd.

To effectively eliminate all pickup from batteries the leads must be choked and bypassed by means of a shielded filter, the leads themselves must be shielded, and the batteries must be placed in a shielded box.

It is believed that the "symmetrical input" receiver described above is an improvement in super-regenerative receivers and offers possibilities where a relatively cheap and small super-frequency receiver is required.

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

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

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

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English Short-Wave News

By "Megacycle"

● TO COMMENCE these notes it is thought that mention of the complete "fade-outs" on the 25 meter band for perhaps a week at a time is the most important phenomena. Reference to last month's report will show that during August—and indeed all summer—this particular channel has provided our main source of programmes if not "long-distance" listening. The sudden change is all the more remarkable for the fact that the usual telephony and telegraphy stations on either side of the band were apparently unaffected. Those short-wave enthusiasts who have been listening for the past five years or so will find on reference to their "log books" that the 25 meter channel has only shown up to real advantage this year, and it is significant that this summer—in England at any rate—has been the best since 1921.

Lond distance reception on the 16m. (meter) channel has been confined to W3XAL on the 16.87 m. To be precise this station was logged on September 4, 13, 28, and 29. On September 29, 3XAL was tuned in at 15.00 G. M. T. at full loud-speaker strength free of all "mush" and fading. According to schedule in England this station comes on the air at 17:30 G. M. T. but perhaps some American listeners will know of a change in schedule. PHI, the Dutch transmitter on this band is never heard in London, presumably because we are within the skip distance.

Turning our attention to that most variable of bands—the 19 m. channel—conditions have been as is usual in the spring and autumn, very variable. The Vatican City transmitter on 19.84 m. is received regularly on the 10:00-10:15 G. M. T. schedule but unfortunately this is the only station on this channel so consistent. The only long distance transmissions on this band are the U. S. A. group. W2XAD on certain evenings of his scheduled transmission is completely inaudible whilst two evenings later a complete programme may be enjoyed. Instances of this occurred on Sept. 8, at 20.00 G. M. T. when a talk on "road safety" was easily followed on the loud-speaker and again on September 29 when syncopated piano pieces at 20.30 G. M. T. were "local" in *quality* and *volume!*

For the past month Rome 25.4 m. has been delivering a perfectly strong carrier in England, but the modulation is about the worst that has ever been heard. Reports from all over England confirm this point and U. S. listeners cannot help but have experienced the same trouble. It appears as if Rome is inverting all audio frequencies like a commercial telephone station. Continuing with the 25 m. band Zeesen (Germany) has deteriorated from a usual R 9 strength to R 2-3 but was again received at R9 on September 29. On certain evenings during September Zeesen and in fact no local European 25m. transmitters were even audible—a very rare occurence. W8XK, the Pittsburgh transmitter on this band, has been also very variable but on some evenings remarkable field strengths have been obtained. On September 6 a program was enjoyed from this station from the time of opening up to 02.00 G. M. T. when for obvious reasons listening had to be discontinued. Receptive conditions on that evening were remarkable as far as U. S. A. transmissions—code and telephony—were concerned, and it would be interesting for American listeners to consult their "logs" to see if the same abnormal conditions similarly affected the east to west route. On the night in question W2XE (49.02 m.) was picked up for the first time and held for quite an hour.

It is difficult to say what station has yielded the most consistent satisfacory signal because there has been so little to listen to that one is inclined to state that all transmissions have been poor. However EAQ (30 m.) must be awarded the palm—with CNR (23.29 m.) a good second—for really good signals at a time when no other station appeared above the R3 mark. Particular mention of EAQ appears on the log on September 8 when the program value was almost "local" in intensity and quality. On September 9 at 19.30 G. M. T. similar conditions prevailed on this band and EAQ was once again the star—and only—transmission. It is a pity, now that winter conditions are rapidly approaching, that the 30 m. band is so comparatively empty. European listeners find very little other than EAQ, CT1AA, and W2XAF—who opens very late—to listen to. W3XAU on 31.28 m. is scheduled to operate from 13:00-04.00 G. M. T. daily but this station has not been heard for the past eight months. Confirmation that the station is still operative would be welcomed.

The 50 meter band, which is usually a certain channel for entertainment when all else fails, has towards the end of the period under review, deteriorated to such an extent that even Moscow 50 m. has fallen to R2 on certain occasions. OXY (49.4 m.) has disappeared entirely in a jumble of heterodynes and code transmissions towards the end of September.

Mention was made in these notes last month of the controversy raging among European S. W. listeners as to whether or not Moscow is broadcasting on 50 and 25 m. or only 50 m. The 25 meter transmission is never heard without the 50 m. program also being audible and according to the author's careful checks the programs are always identical. Several S. W. listeners have reported differing programs but this is not confirmed by the writer. It has been noted, however, that the 25 m. transmission is often much more powerful than the corresponding 50 m. transmission, but this does not detract from the validity of the *first harmonic* theory. Added to this, is the evidence supplied by Moscow during the opening announcement on Sunday, September 10th—heard both on 50 m. and harmonic 25 m.—at 15.00 G. M. T. when the 1841 m. and 50 m. transmissions only were mentioned. At any rate the problem is of real interest and American listeners may care to air their views in the matter. In closing this subject it is understood that a listener claims to have heard an announcement to the effect that the "mystery" transmission on 25 m. is actually RNF on 24.96 m. and is not therefore a harmonic!

Leaving the regular broadcast channels CNR (Rabat) on 23.39 m. on the Sunday transmission from 12.30 G. M. T. has provided musical programs of unsurpassed brilliance, free of all fading and interference. American listeners should certainly make a point of listening for this transmission as a welcome change from their home programs. The hour of transmission is certainly rather early—especially for Sunday listening—but the transmission does not cease till approximately 16.30 G. M. T. which should provide a good breakfast program. The same station broadcasts again on 37.33 meters at 20.00-21.00 G. M. T. on Sundays, but in England this transmission seldom approaches—either in quality or volume—the 23 meter transmission.

American listeners should make a point of listening on 42 meters where a new European relay station has commenced operations with the regular Oslo programs. Transmissions are experimental at the moment but appear to be consistently received at 19.00 G. M. T.

Telephony has been found productive of some long-distance reception but American listeners will be interested to hear that SUZ (21.7 m.) Cairo was received on September 29 at 15.00 G. M. T. at a strength seldom experienced on anything but medium wave broadcast. SUZ has not been heard previously in this location. PLF, Java, on approximately 17 meters is heard on Wednesdays at 20.00 G. M. T. giving a test concert of gramophone records and is received in England with *wonderful volume and clarity!*

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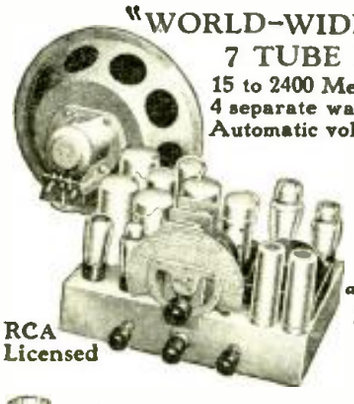

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