THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

Edited by
HUGO GERNSBACK

1933

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See Page 460

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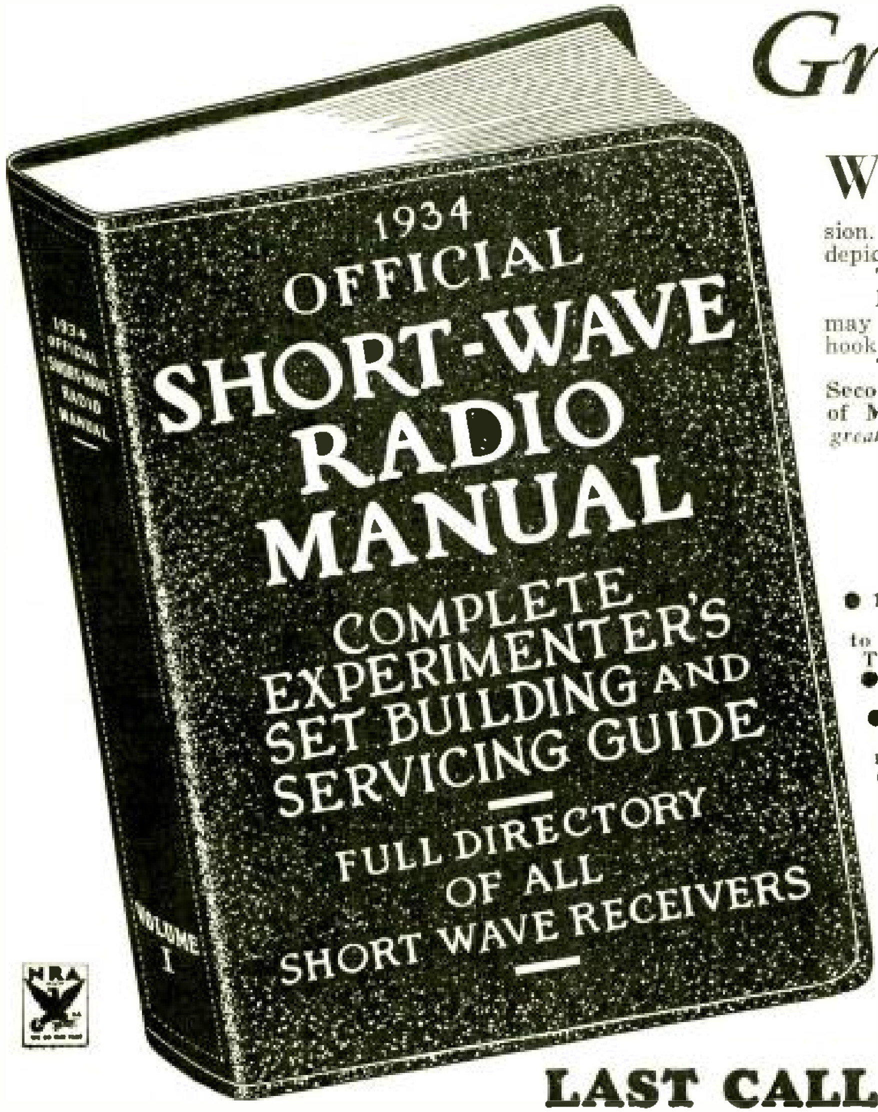

WE are pleased and proud to announce the greatest and most complete work on *SHORT WAVES* which has ever appeared in print.

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, 12-33
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.)

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IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Silver ● Victor ● Hadlock ● Mitchell ● Shuart

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

Contents for December, 1933

FEATURES IN NEXT ISSUE

The inside story of VK2ME and 3ME—the popular Australian short-wave transmitting stations.

A 250 watt crystal-control transmitter, by Alvin Abrams.

A Symmetrical Input Super-Regenerative Receiver, by H. Granger and H. H. Hill.

Power Transformer Construction and Design Data, by O. K. Tipsel.

5 and 10 Meter Transmitter, Using Latest Type Power Tubes, by George W. Shuart, W2AMN.

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 shows the Victor 2-Tube Superheterodyne receiver. This interesting short-wave receiver embodies the "high-gain" and "fine tuning qualities" of the superhet, at a very nominal cost. It is fully illustrated and described on page..460

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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.

Application for Membership
SHORT WAVE LEAGUE

SHORT WAVE LEAGUE (12-33)
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 ....

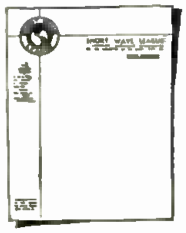
Country ....

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

SHORT WAVE LEAGUE 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**

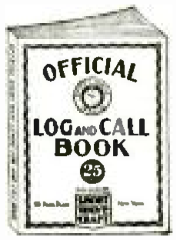


A—50c per 100

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**

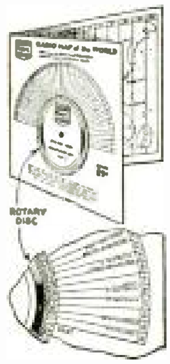


B—25c per copy

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**



C—25c each

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**

D—$1.25 each

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**

E—35c 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.

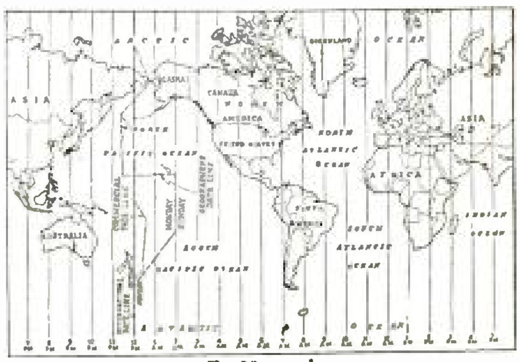
G—SHORT WAVE LEAGUE seals .... per 25, Prepaid **15c**

G—15c for 25

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**



F—25c each

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

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

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

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

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Please send me the following short wave essentials as listed in this advertisement:

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SHORT WAVE STATIONS LISTED IN THIS BOOK

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

Fairview, Oklahoma,
August 12/'33

My Dear Mr. Gernsback:

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

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

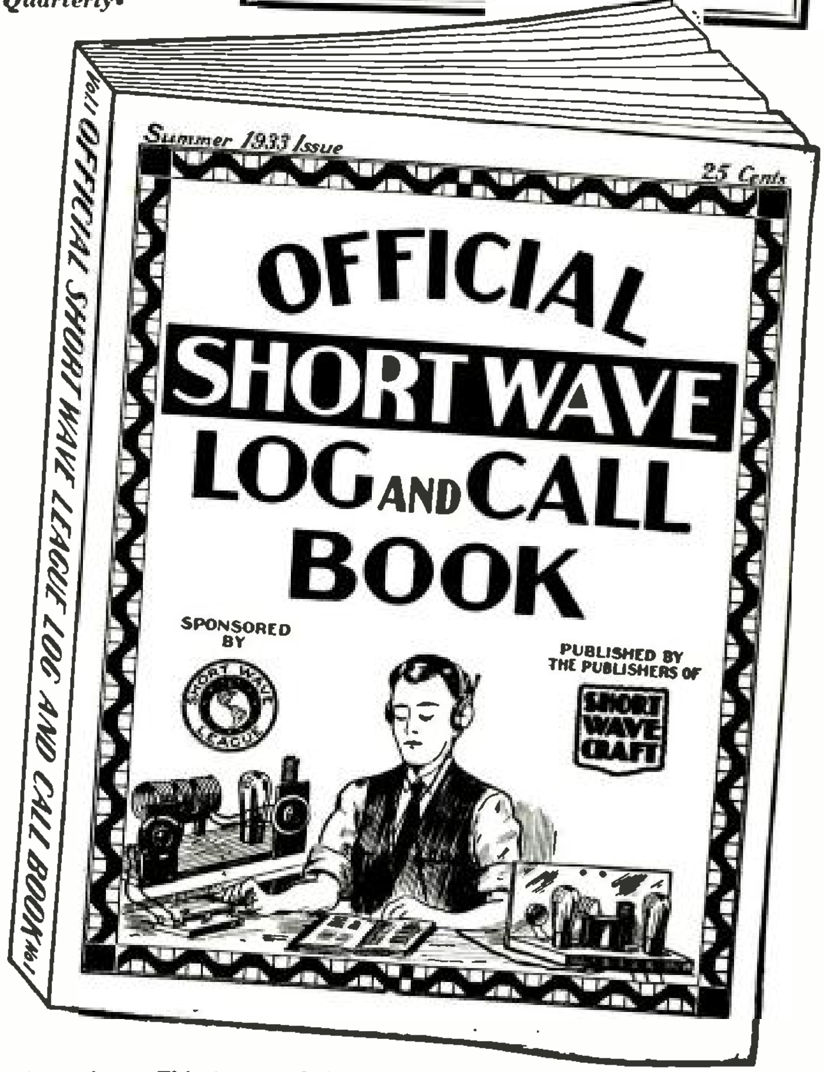
In all, Mr. Gernsback, I have grown to manhood reading your radio publications and I hope that my sons find them as interesting as I do as I have two small sized "Hams."

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

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

WE ARE happy to present to the thousands of short wave fans this new Log and Call Book, which enthusiastic readers of Short Wave Craft have urged us to publish. Here is a book that you will feel proud to possess because it reflects your patience and perseverance in logging distant stations. It is a record you will be proud of in days to come. That, however, is not all. The Log and Call Book is the finest and most complete book of its kind ever published. There is nothing like it on the market now, nor was there ever a book published like it before.

Published Quarterly!



PARTIAL CONTENTS

1. It contains the largest listing of short wave stations in the world, a much larger list in fact than the list published in SHORT WAVE CRAFT, or any other magazine. Due to space limitations, no regular magazine can publish all the world stations. There are so many short wave stations, such as telegraph stations, experimental stations, ship stations, and others, which normally cannot be included in any monthly magazine list, but frequently you hear these calls and then you wish to know from where they originate. The OFFICIAL SHORT WAVE LOG AND CALL BOOK gives you this information, besides a lot of other information which you must have.

2. A large section of the book is set aside where the calls can be listed in a proper manner. This log section gives the dial settings, time, date, call letters, location, and other information. Thus, when you hear a station, you make a permanent record which is invaluable.

3. Another section has squared-paper pages on which you can fill in your own frequency (wavelength) curve for your particular receiver. This helps you to find stations which otherwise could never be logged by you.

4. A distance chart showing the approximate distances between the principal cities of the world.

5. A meter to kilocycle conversion chart. Many of the short-wave broadcasters announce their frequency in the latter scale when signing off and many listeners do not know the relation between them.

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

7. The complete Continental code used in all radio work.

8. A list of International Call Letter Assignments; Around the Clock Listing Guide.

9. In addition to this, you will find included a map of the world, with time indications and a host of other useful information which aids you in logging distant stations thousands of miles away.

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

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

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96-98 Park Place,
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Gentlemen: I enclose herewith 25c for which send to me prepaid, immediately a copy of your new book OFFICIAL SHORT WAVE LOG AND CALL BOOK. (Send money order, check, cash or new U. S. Stamps. Register letter if it contains stamps or currency.)

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Address..

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

SW-12-33

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NRA MEMBER U.S. WE DO OUR PART

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

HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Short Radio Waves

An Editorial By HUGO GERNSBACK

● NEWCOMERS to the art of short waves frequently have an idea that short waves are something new—only recently discovered. This, of course, is an erroneous view, because the original short waves (about 1 to 3 meters in length) were discovered by Henrich Hertz in 1886.

For many years, short waves have been under investigation, and their properties have been pretty well understood. This, however, we are apt to overlook at times, and we also overlook a good deal of research work that has been accomplished in the past. Thus, for instance, when Hertz first made his original experiments, they actually were with ultra-short waves, recently brought to the foreground again by Marconi. There are, however, still shorter waves where the microscopic short radio waves actually merge into heat waves, and in this connection I present herewith an editorial published by me in the August, 1923 issue of RADIO NEWS, entitled "*Short Radio Waves*," which, even today, may prove of interest to some of the newcomers in radio.

The editorial follows here verbatim, as published 10 years ago:

"During the last decade we have as a rule employed for radio communications wave-lengths varying from 10,000 meters down to about 600 meters for commercial work. The broadcast era inaugurated about two years ago witnessed a reduction of this wavelength down to about 360 meters. Long before that time, American amateurs had been transmitting on a wavelength of 200 meters, and although our radio experts told us that very long wavelengths such as 10,000 meters and over were absolutely necessary for long distance work, such as "trans-oceanic," the amateur proved with his puny wavelength that he could span the ocean with facility.

Over three years ago, in an editorial, we mentioned and prophesied that the greatest wonders in store for radio lie in short wavelengths, and we seem to be just about coming to this. About a year ago Marconi made the announcement that he could send radio waves in any direction by means of parabolic wave reflectors. The wavelengths he used were about 20 meters or thereabouts. This was a great step in advance. Recently Dr. E. F. Nichols, director of the Nela Research Laboratories and his associate, J. D. Tear, went Marconi, one better and actually produced a wavelength of a little less than 1/100th of an inch! This is most extraordinary because for the first time radio waves have been made to overlap heat waves. Heat waves of 1/175th of an inch have been obtained in the laboratory, so that we have now actually merged radio waves into heat waves.

Just what this statement means to the future of radio seems impossible to even dimly discern today. One can make the wildest guesses and will probably hit far below the mark. For instance, if we say that the future radio generator may be an ordinary burning candle, this may sound like a wild dream, nevertheless the results of Nichols and Tear will make such a thing possible. If the radio waves can be converted into heat waves, or rather intermingled with them, there is no reason why the flame of an ordinary candle cannot be made to give out radio waves by some sort of transformation, which as yet we can only see dimly in the future.

On the practical side, the era of short waves is just dawning. Recent experiments of Dunmore and Engel, of the Bureau of Standards, have shown that an entirely new field may be opened by short wavelengths of about 10 meters or less. Such wavelengths can and will be used for house-to-house communication in low-power radio telephony. These waves can be directed in a beam so that they will only go in one direction. In other words, they can be directed just as a light ray is directed, by a search-light, with the advantage that the concentrated radio beams can be made to go much further than light rays.

Hertz, in his famous researches years ago, has shown that electro-magnetic waves—radio waves in other words—can be refracted exactly like light rays. By means of a huge lens made of pitch, Hertz actually focused a beam of radio waves upon a chosen spot. By means of a pitch prism he refracted his waves much as we refract light rays, through a crystal prism. Indeed Nichols and Tear used similar appliances; for instance, they used a focusing lens made of paraffin where Hertz used a lens made of pitch.

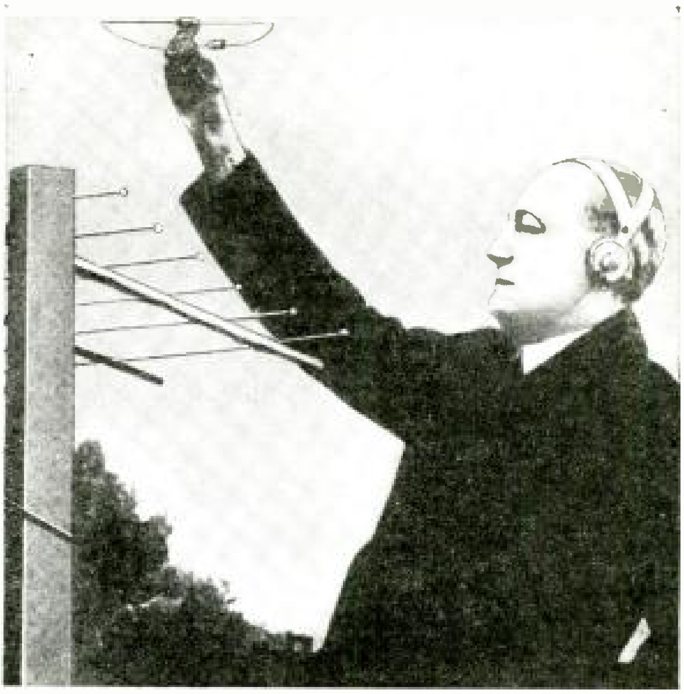
There is a tremendous field for research open to the amateur in the wavelengths between 10 meters and 1 meter, and entirely new fields will be opening up once we avail ourselves of these new wavelengths. For one thing, interference is practically done away with. Static, the enemy of all radio experimenters, entirely vanishes when such a wavelength as 10 meters is used. For communication between friends and for short distances, up to a few miles, a 10-meter wavelength is ideal and likely to bring out new and unsuspected phenomena. Unless all indications are wrong, there will be a general stampede down to the low wavelengths during the next few years. It will be accompanied by entirely new varieties of instruments which we cannot even conceive of clearly today. This is certain, mainly because the frequencies for the low wavelengths become truly enormous. Thus, for instance, the frequency for 350 meters with its number of oscillations is 856,628. On 200 meters, the frequency has already become 1,499,100 vibrations per second, while for wavelengths of 10 meters, the frequency has gone up to the tremendous value of 29,982,000 oscillations per second."

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

This is the December, 1933, Issue—Vol. IV, No. 8. The next Issue Comes out December 5th

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

MARCONI'S Ideas on Wave Propagation



This photo shows Senator Marconi holding a resonance indicator in his hand, in proximity to one of his new ultra short-wave antennas, used in his experiments in Italy.

● IN a recent interview with Senator Marchese Guglielmo Marconi in New York, he answered a number of interesting questions, especially on the topic of the day—the "micro waves." Senator Marconi said that scientists had discovered now that the tiny micro waves, those a few inches in length for example, are not limited to *optical distances* as originally believed, and his recent experiments have shown that curvature of the earth is no barrier. The Senator said that it was useless to make any predictions today as to how far we may eventually transmit on the ultra short or micro waves, as new scientific developments might change our old outlook on this new field over night. One thing that Senator Marconi stressed very strongly, and even staked his reputation on, was that the micro waves are *not* affected by static. He stated that he had listened to signals on the micro waves during a thunder-storm and that the static did not bother the reception. Marconi stated, in answer to our question, that he did not believe that radio waves would supplant our present wire telephone networks in large cities, but that the radiophone *would* rather supplement the present subscriber *wire* telephone systems.

In answer to another question we asked as to whether or not the micro waves used in his recent experiments, where the receiver was out of sight of the transmitter and a mountain intervening, traveled over or through the mountain, Senator Marconi stated that if the mountain were of some dry, non-metallic substance, then the waves may have penetrated *through* it. But if the mountain were of a conducting nature, the micro waves, he believed, most probably reached their destination by reflection or refraction from some one of the upper atmospheric layers, such as the Heaviside.

Another question we propounded to Senator Marconi was whether or not he thought it was the *space* or the *ground* wave which finally carried the signals over great distances, such as the 15 to 20 meter waves which bridge the Atlantic Ocean. Senator Marconi said that he believed it was the *space* wave, as all of the observed phenomena, such as fading, obeyed the mathematical laws which governed such a form of transmission. If it were the *ground* wave that persisted as Dr. Nikola Tesla believes, the space wave attenuating to zero at a relatively short distance from the transmitter, then we would not be observing the characteristic fading and other phenomena which we have in the past, and which, as aforementioned, accompany the transmission by *space* short waves.

8 Meter Police Radio Demonstrated

● EIGHT to ten meter waves are coming strongly to the front for the consideration of police departments for the purpose of signaling to radio-equipped police scout cars, patrol wagons, etc. One of the main reasons why the police radio experts are intensely interested in the 8-meter waves, for example, is that on the higher waves such as 120 to 180 meters, these waves reach out and are picked up all over the country by sensitive short-wave sets and broadcast receivers fitted with S-W converters. Usually what is needed for police work is a short-wave transmitter which will have a more or less restricted radius of activity, and this reduced zone the new 8 to 10 meter police systems provides, within limits, for of course, the exact range cannot be limited to a mile or so in a given radius. Other very important factors which have been discovered in connection with these 8 to 10 meter police short-wave systems recently tested, are the almost total absence of static, and during the tests made with the R. C. A. experimental transmitter shown in the accompanying photo, a very interesting discovery was the fact that no "dead spots" were manifested.

Experimental 8-meter transmitter used in demonstrating the value of ultra short-waves before the Newark, N. J., Police Dept. Paul F. Godley appears at the left with the "mike," while the engineer at the right of the photo is Edmund La Port.

In some of the tests made on the 8 meter waves, the reception took place on board a police scout car; the car was at one time located in a narrow street between two tall steel-frame buildings in the city of Newark, N. J., a location which provided nothing but a "blind" or "dead spot" for cars fitted with ordinary broadcast receivers; even WOR, the local broadcasting station failing to register. This was a very remarkable demonstration of what the 8 to 10 meter waves can do, as it has been considered by numerous investigators heretofore that with waves as short as these it was usually desirable and necessary to try and have the receiver within "optical sight" of the transmitting antenna, or something approaching that ideal condition.

In the Newark tests with the R. C. A. experimental transmitter which was demonstrated by Mr. Paul F. Godley, seen at the left in the photo, and Edmund La Port, the transmitter was tuned to approxi-

(Continued on page 493)

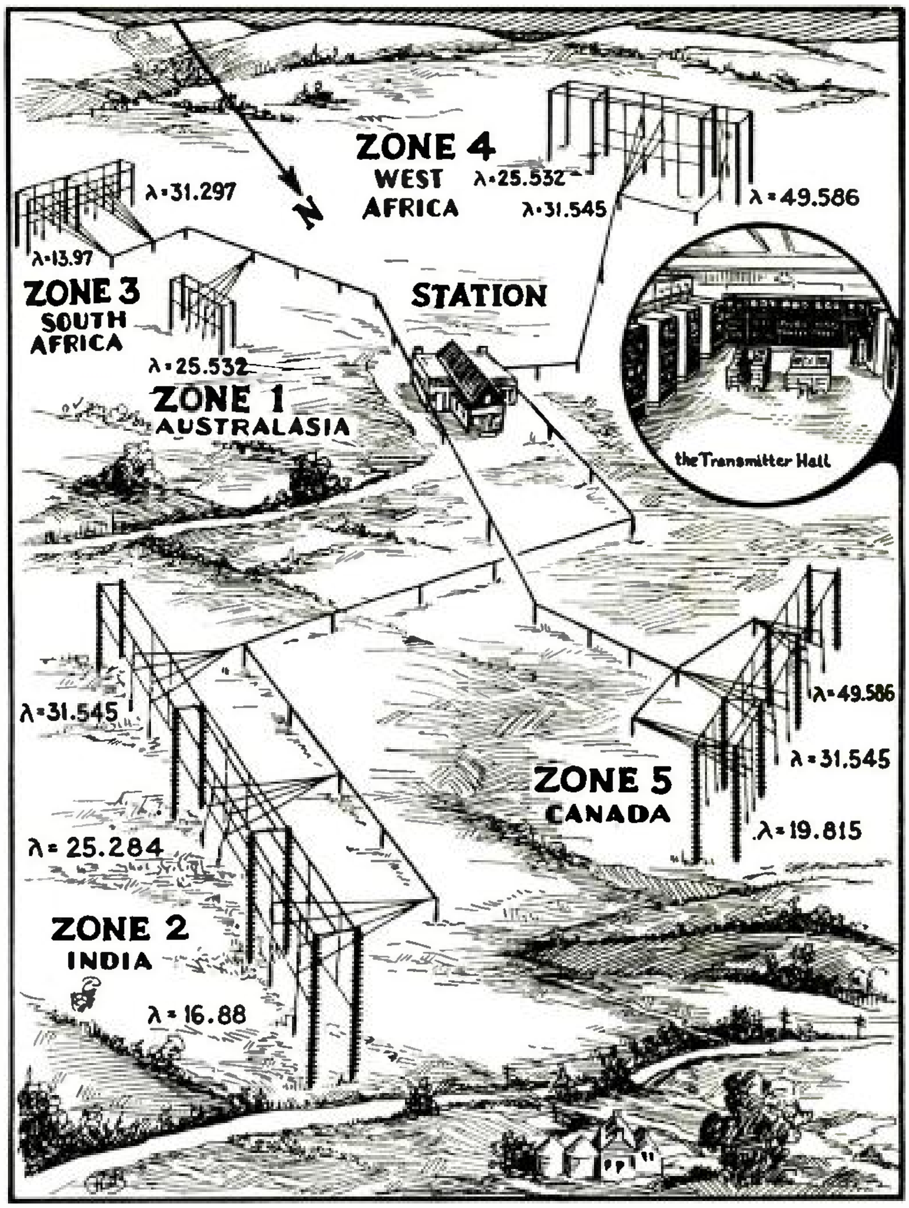
DAVENTRY, ENGLAND . . .
SHORT-WAVE HUB of the EMPIRE

● DAVENTRY, England, is today a veritable bee-hive of short-wave activity, and in fact it is the "short-wave hub" of the British Empire. Few towns in the world have become so famous as the little old-world village of Daventry, which with its 3,608 inhabitants, became internationally famous in the short span of six years.

Not only has Daventry become one of the marked spots on the face of our globe, to all short-wave fans, so far as its position on the map is concerned, but the very name itself is fast becoming a household word with short-wave fans, as the English announcers mention it many times daily in their short-wave radiophone introductions. The

One of the world's most important short-wave stations is that located at Daventry, England, and the accompanying picture shows graphically the remarkable arrangement of directive antennas. By means of this elaborate aerial system, powerful short-wave signals can be broadcast to all parts of the British Empire. An elaborate network of feeder lines carry the short-wave signals from the centralized transmitting apparatus to the various antennas. The final amplifier unit employs four 15 kw. tubes.

powerful short-wave transmitter located at Daventry is one of the most popular with American short-wave fans, and one of the principal reasons for its signals reaching American stations with such great strength is due to the cleverly designed directive beam antennas, the elaborate arrangement of which is shown in the drawing at the right. In these new type short-wave aerial arrangements, used for projecting signals over distances of thousands of miles, the direction of maximum activity or strongest signal is at right angles to the antenna. By connecting the short-wave transmitting apparatus with the desired antenna, erected at a certain geographical position with respect to the points of the compass, the signal intended for any respective corner of the British Empire can be "sent home" at once.



An interesting bird's-eye view of the powerful short-wave transmitting station located at Daventry, England, veritably the "short-wave hub" of the British Empire. An elaborate feeder-line network carries the short-wave signal currents to the various directive antennas, each one being located in such a position as to broadcast its directive or strongest signal toward the distant country with which it is designed to operate.

Programs to be broadcast over the short-wave station at Daventry, or at least the majority of them, originate in London; they reach the Daventry station via the control room at Broadcasting House. Programs can also be taken from other centers, such as Birmingham, Manchester, etc., by the usual telephone land-line pick-ups. The control rooms are acoustically treated and contain loud-speakers; headphones may also be used when desired. The powerful vacuum tubes used in the transmitter at Daventry are provided with a special water-cooling system. The frequency of each master oscillator tube is controlled by a quartz crystal, a separate crystal being provided for each wavelength used. Suitable frequency-doubling circuits are employed in order that crystals of fairly low frequency may be utilized on the waves below 17 meters in length. The crystal frequency is doubled three times, resulting in a total multiplication of eight times; thus the crystal used for a certain wavelength operates at ⅛th of the specified frequency. On wavelengths above 17 meters, but one or two doubling stages are employed. Each crystal is housed in an asbestos-insulated box, a suitable electric heater and thermostat control serving to maintain a constant temperature inside the box. Suitable switches are provided which enable the engineers in charge of the station to switch any one of the powerful short-wave transmitters on to any of the desired antennas.

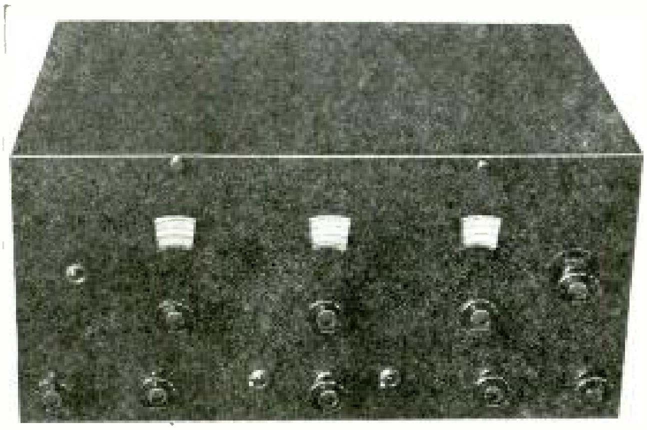
Paradoxically enough, the new Empire broadcasting station, which was opened last December, is less imposing, at first sight, than its neighbor, the now obsolete 5XX, with its two 500-ft. masts and large transmitting building. Yet, as a corporate whole, the short-

(Continued on page 485)

New Super-Het • Admiral BYRD Will Use • In the Antarctic

By McMURDO SILVER

The photo above shows McMurdo Silver and Admiral R. E. Byrd on the latter's visit to the Chicago laboratories of Mr. Silver, at the time the set here described was selected for the Antarctic expedition.



The new Silver "single-signal" superheterodyne that goes to the Antarctic with Admiral Byrd; the dials have three colored strips for individual station "logging."

● PROBABLY the first use of the quartz-crystal resonator for extreme selectivity in radio receiver design that came to popular knowledge was Dr. Robinson's Stenode Radiostat circuit. Unfortunately, this system contributed greatly to "apparent" selectivity (difficulty of tuning), but very little to "actual" selectivity (elimination of interference), except in almost direct proportion to loss of fidelity. Time seems to have proven that a crystal resonator has no place in a high-quality broadcast receiver.

Real Use For Crystal Resonator

But for C. W. code reception, it has a very definite place, particularly for the amateur bands, the width of which a good crystal resonator receiver (single-signal) will effectively double. But a crystal resonator cannot be added to any superheterodyne in a haphazard, "hit-or-miss" manner. There are plenty of tricks in getting it into a receiver design and making it work as it really will if the design be properly engineered. It is in no sense a subject for home building—nor for that matter is any superheterodyne today, because the proper testing of such a receiver requires laboratory equipment costing many times the price of the set, and economy does not result from saving a few dollars on parts and labor and spending a thousand or more on test equipment, which is even then difficult to operate.

Set Adapted to Phone Reception

The receiver here described and illustrated was selected by a well-known radio expert, acting as Admiral Byrd's radio advisor as the communication receiver for the Admiral's 1933-1934 Antarctic expedition. It and all other short wave and broadcast receivers for this expedition were designed and built by the writer. It is a strictly custom-built, single-signal superheterodyne, employing a properly designed quartz-crystal resonator, which effectively eliminates one audio image (one side of heterodyne signal) from every C. W. code signal, actually cutting in less than one-half the space in the frequency spectrum occupied by any C. W. code signal. It is also an excellent and advanced superheterodyne, which with the crystal switched out, is ideal for short wave *broadcast* or *phone* reception.

It covers a range of 200 to 10.1 meters (1500 to 30,000 kc.), can be used with regular or doublet antennas, has a C.W. beat oscillator, is entirely self-contained with no plug-in coils, A.C. operated, and has band spread tuning functioning anywhere in its range—on amateur, commercial or broadcast bands. 17½" long, 10½" deep and 8¾" high, it is self-contained in its own easily removable shielding case, and will fit a standard 19" relay rack if desired.

Its sensitivity is better than ½ microvolt absolute, its selectivity with crystal cut out absolute 10 kc. or one channel (22 kc. wide—10,000 times down) or absolute single-signal with crystal in series circuit, its fidelity flat to within 4 db. from 40 to 4000 cycles with crystal out, and its undistorted power output three watts (5% harmonic distortion).

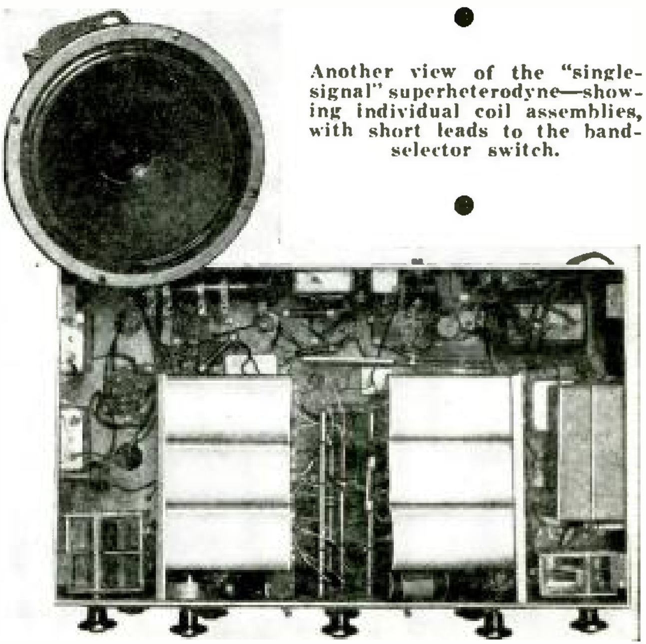
Electron-Coupled Oscillator Used

The circuit employs a '58 tuned r.f. stage (V1) on all four bands, and a 2A7 first detector and electron-coupled oscillator (V2). The r.f. and first detector circuits are tuned by the left hand six to one vernier dial, and the oscillator by the similar right hand dial. The center dial is the oscillator vernier, or *band-spread* tuning—the only control used in tuning over any short-wave band.

The new 2A7 tube is the first combination tube which actually does a better job than will separate tubes to perform the same functions. It is a remote cut-off (no cross-talk) screen-grid first detector, and an electron-coupled signal frequency oscillator. Its conversion gain and frequency stability are superior to separate tubes used to perform its two functions.

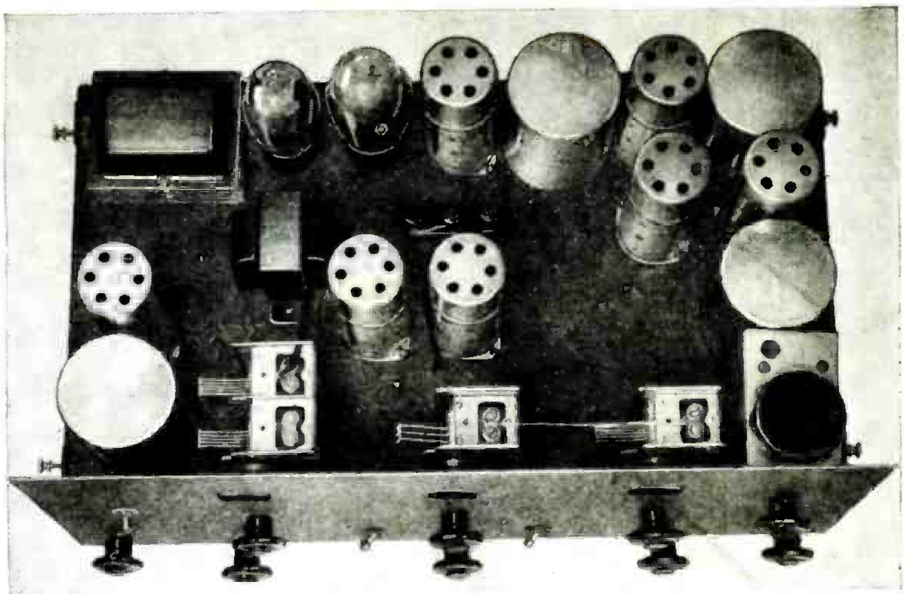
The tuned r.f. stage preceding it eliminates the image frequency or *repeat point* found on all short-wave receivers, starting with only a first detector tube, and also constitutes amplification which tends to minimize oscillator hiss found in sensitive superheterodynes not so equipped.

Separate coils for all of these circuits, in separate aluminum shields, are selected by a positive, long-lived, five-



Another view of the "single-signal" superheterodyne—showing individual coil assemblies, with short leads to the band-selector switch.

If you were Admiral Byrd, what sort of a short-wave receiver would you select to take to the Antarctic? That was the question that faced the radio experts who accompany Admiral Byrd and on the advice of a great eastern university, the receiver here described and illustrated was selected. This is indeed a very high tribute to the expert designing skill of McMurdo Silver, and we are pleased to present herewith a description of this super-fine short-wave receiver to our readers.



Top view of the superheterodyne to be used by Admiral Byrd's experts in the Antarctic. A band-selector switch is built into the set. The shield cover is removable by loosening eight thumb nuts.

gang, four-position band selector or wave-change switch mounted at the lower center of the panel.

Tuning Dials

The tuning dials deserve comment. They are six-to-one reduction ratio, and employ an automatic take-up gear drive free of all backlash or play, and have all the delightful smoothness of hand fitted and machined helical gears. They are a joy to operate, so smooth and easy are they to tune.

The first detector is followed by two stages of 465 kc. I.F. amplification (V3, V4). The I.F. transformers utilize Litz wound coils of excellent "Q", tuned by an entirely new type of mica and isolantite insulated compression trimmer (condenser) having all the desirable characteristics of permanency of setting of good air condensers, yet providing much better selectivity by virtue of the more favorable "LC" ratio possible in compression type condensers.

The crystal (XL) is placed in the I.F. amplifier input circuit, and is controlled by a switch having off (for broadcast) parallel (for intelligible phone) and series (for single signal code) positions. The selectivity it provides is variable, being controlled by the lower right knob (C5-C6) which actuates the air tuning condenser of the crystal input circuits. A 465 kc.

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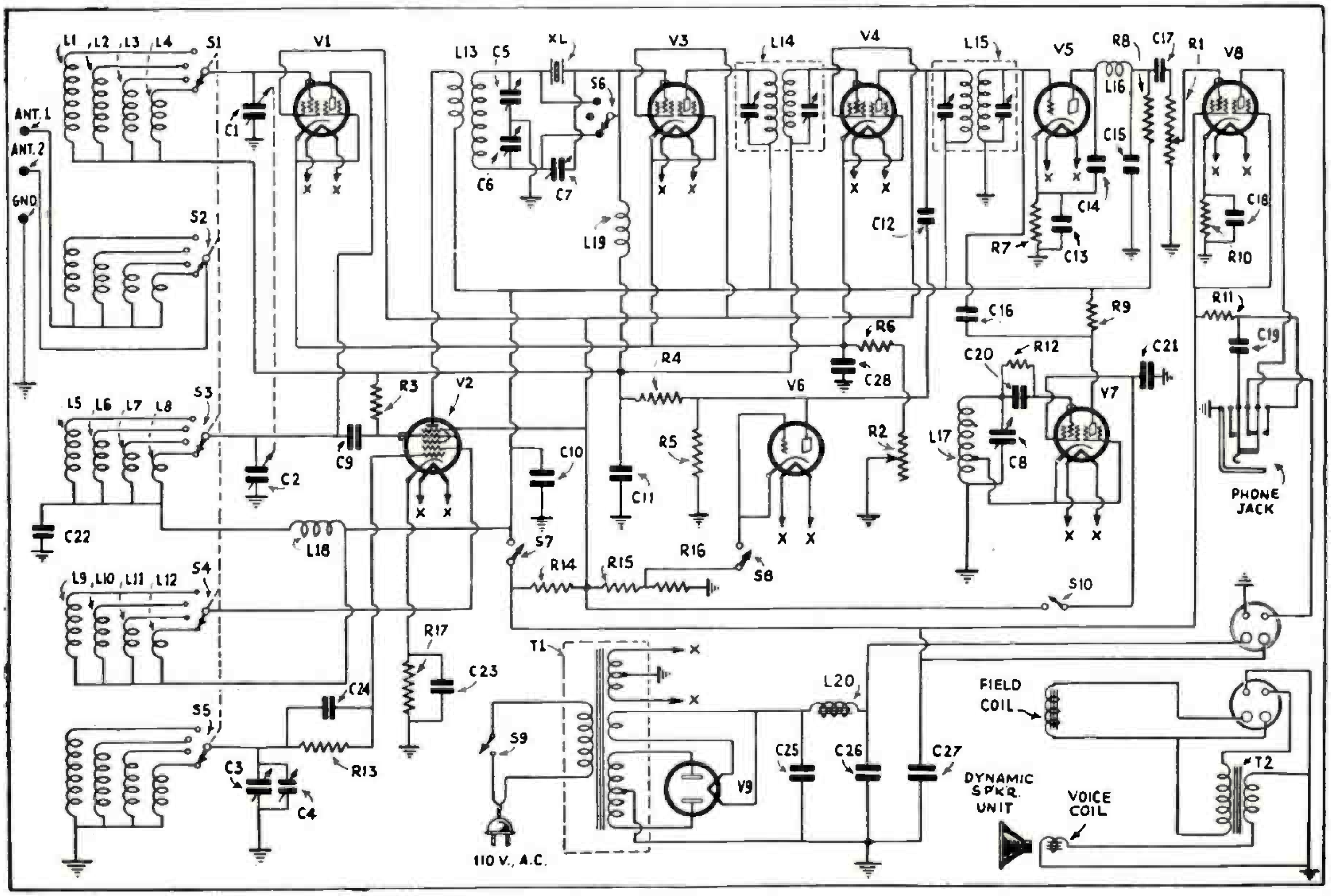
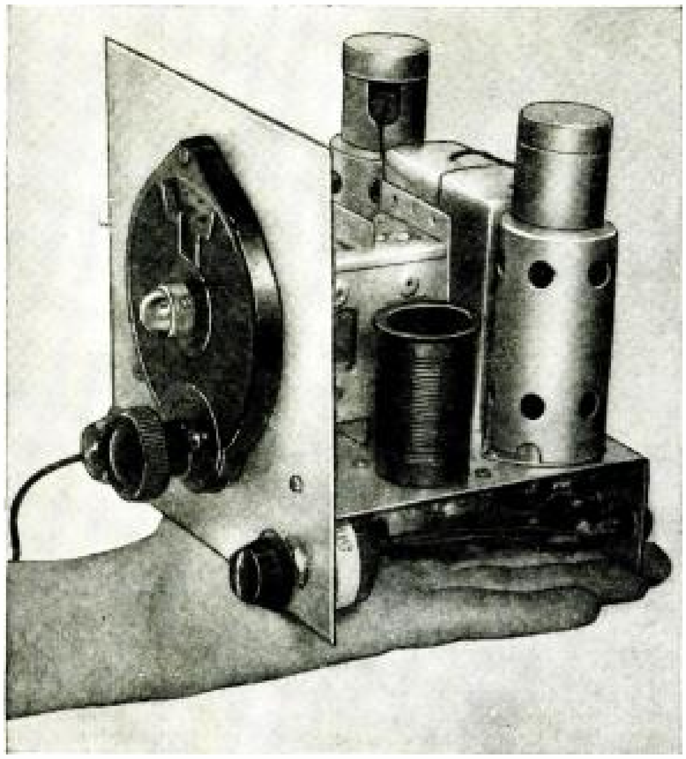


Diagram of Mr. Silver's latest set—the single-signal, crystal-filter, short-wave superheterodyne receiver.



The Victor 2-tube superhet short-wave receiver can be held in one hand.

The VICTOR 2-TUBE Superheterodyne Receiver

By LEONARD J. VICTOR, W2DHN and HAROLD MITCHELL

The world has been waiting for this set—a superheterodyne using but two tubes! This receiver utilizes the very latest type tubes and by clever design of the circuit, really remarkable results have been obtained. The selectivity is good and it will operate a loud speaker on a fairly strong signal—in fact European stations have been heard on the loud speaker with it.

● GETTING the most out of a radio, with the least possible number of tubes has always been the aim of the experimenter. Along with all the other circuits, the superheterodyne has come in for lots of scrutiny, to ascertain whether the number of tubes in it could be pared down without serious loss of efficiency. Until recently a superhet had to have at least four, or at best three tubes, which meant either there was no real intermediate gain or a poor oscillator circuit had to be used.

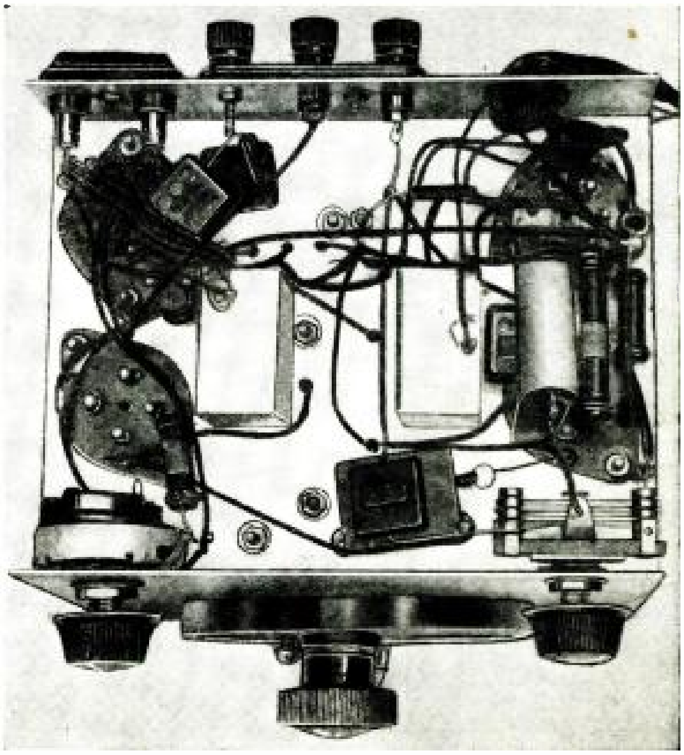
Recently, the advent of some of the new tubes has allowed the construction of a superheterodyne with as few as two tubes. The circuit herein described is not a tricky arrangement, but a straight-forward super circuit, working at high efficiency, capable of very fine results and *using 6 tuned circuits.*

New Tubes Used

Every standard super has four different departments, or stages, as they may be called. These are the first detector, oscillator, intermediate amplifier, and second detector. In the *Two Tube Super* each tube combines two of these functions. A 6A7, known as a *pentagrid converter*, is used as *combined detector and oscillator*. The detector circuit is of the screen-grid type. The local oscillator is a triode. The tube that is used as intermediate frequency amplifier and second detector is known as a *duplex pentode-triode* (6F7). The pentode section of the tube is used as an intermediate amplifier, and the remaining triode section is used as the second detector. These tubes having been designed to perform more than one function at one time; their efficiency is very high.

The Layout

Looking down on the set, the layout is as follows: In the upper left hand corner is the 6A7 detector-oscillator tube. Right in front of it is the oscillator coil. Alongside the 6A7 tube are the two 465 kilocycle intermediate transformers. In front of the two intermediates is the two-gang .00015 mf. variable condenser. In the upper right-hand corner the intermediate and second detector tube, 6F7, is located. In front of it is the detector coil. Although the entire set is mounted on a chassis only six and a half by five inches, there is no undue crowding or bad intercoupling effects. The panel is six and a half by six and a half. There are only three dials on it, a vernier and two small knobs in the lower right and left-hand corners. The lower left-hand dial is a little .00001 mf. (about) trimmer connected across the detector section of the big variable condenser. This condenser is set for maximum volume once for each set of coils, and is not used after that. This leaves only two dials to operate exactly as in a broadcast set. Just as with a regular set, the main dial is used for tuning and the lower right-hand knob is a volume control. Stations come in very sharply and a good high ratio tuning dial is practically a necessity. There is a surprisingly low background level and tuning through the European broadcast



Bottom view of the 2-tube superhet receiver.

band is exactly like operating a regular broadcast set.

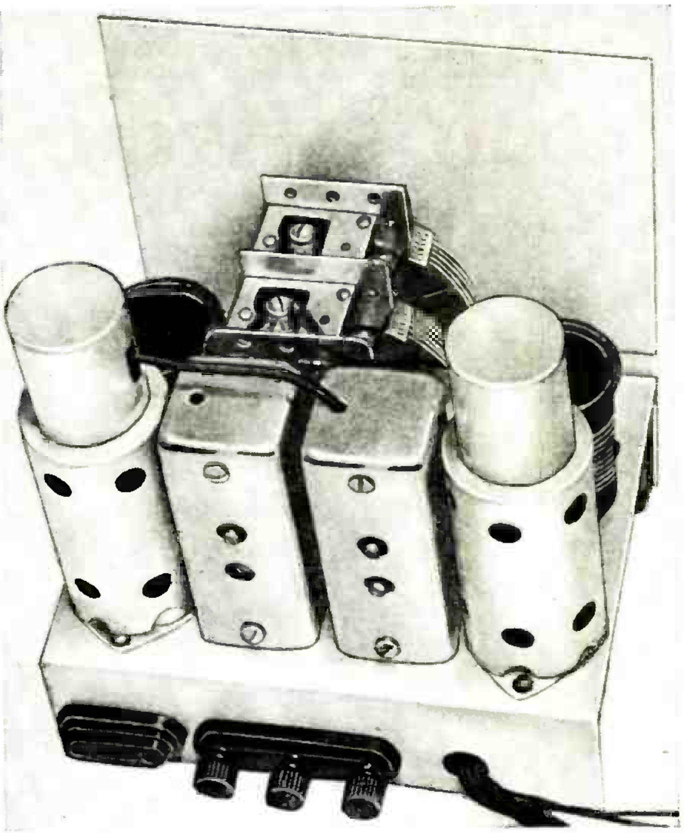
The under-the-panel view of the set shows quite an array of wires, but a little study of the wiring diagram and the pictorial diagram will quickly dissolve all doubts and show how simple and easy to build the set really is. On the back of the chassis is mounted a three binding post strip for *long aerial*, *short aerial*, and *ground*. Needless to say the entire chassis is grounded. Also on the back of the chassis there is a two plug arrangement to take the tip jacks of the earphones or loudspeaker. A hole is drilled in the back of the chassis to bring in the cable for power supply.

Parts Used

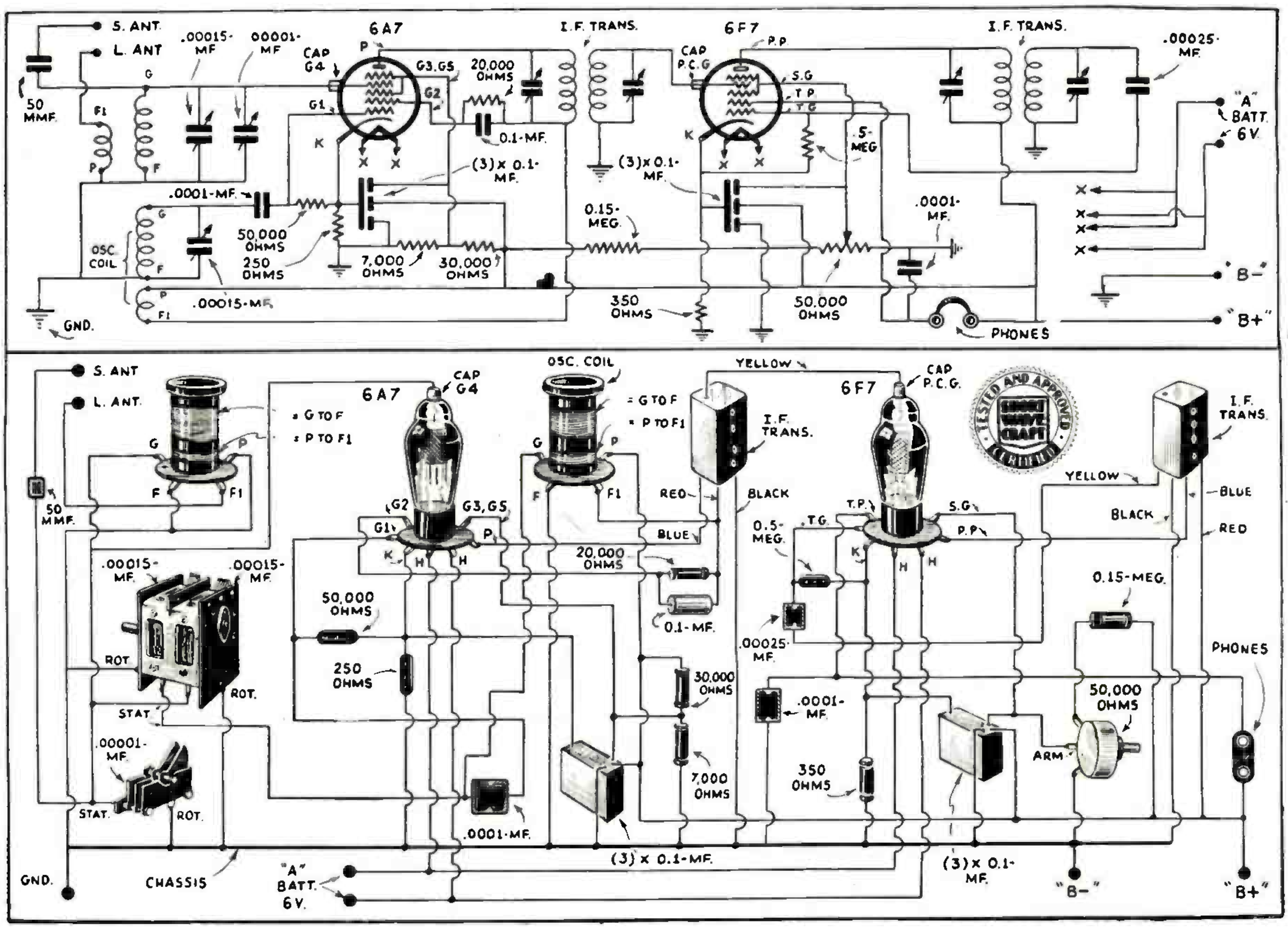
Standard equipment is used throughout the set, easily obtainable and of low cost. The intermediate transformers are of the type used in broadcast superhets, designed to peak at 465 kilocycles. The two sets of coils used in the detector are identically alike and are of the type used in regular regenerative short wave sets. These coils are sold by several manufacturers or can be made by looking up some back issues of *Short Wave Craft*. Any set that uses four prong coils, that is grid and tickler, will be all right to copy the dope from for coil winding.

As yet there is no two and one-half volt equivalent of the 6F7, although there is one of the 6A7, so it is necessary to run the filaments from a six volt source. This may be either a six volt storage battery or an A.C. stepdown transformer. A filament transformer can be made from an old toy or bell-ringing transformer by removing the secondary winding and winding on turns of number eighteen cotton covered wire. A fairly accurate A.C. voltmeter will tell you when six volts has been reached. The plate supply can be anything between 180 and 250 volts. The set works just a little better at 250, but not much will be lost by using 180 volts of "B" batteries. If an eliminator is used for power supply, or a power-pack is built up, be sure that it is very well filtered, as "hum" shows up quickly at high frequencies in a superhet.

(Continued on page 490)



Looking at the 2-tube superhet receiver from the rear; note the 2 I.F. transformers between the two tube shields.



Both schematic and picture wiring diagrams are shown above, which will enable those interested, even though quite uninitiated in the art of building radio sets, to easily construct this 2-tube superhet receiver.

An Efficient COIL SWITCH In New MIDWEST-16

Every short-wave "fan" today is interested in the latest improvements in "band-switching." The accompanying article describes the newest coil-switching arrangement in one of the leading "all-wave" receivers.

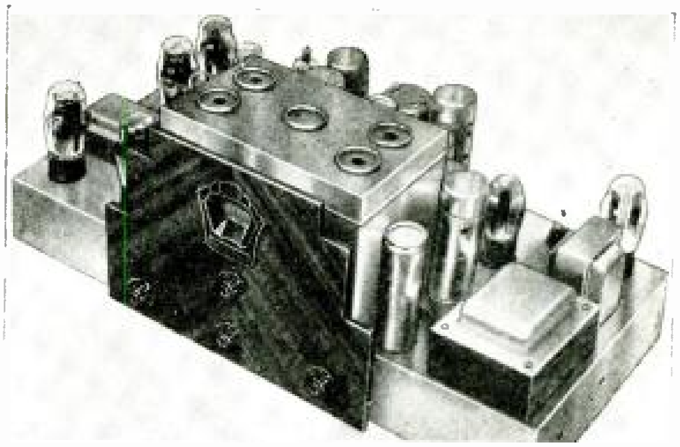


Fig. 1. General view of the Midwest 16-tube "All-Wave" receiver, the bands being changed by simply turning a calibrated switch knob.

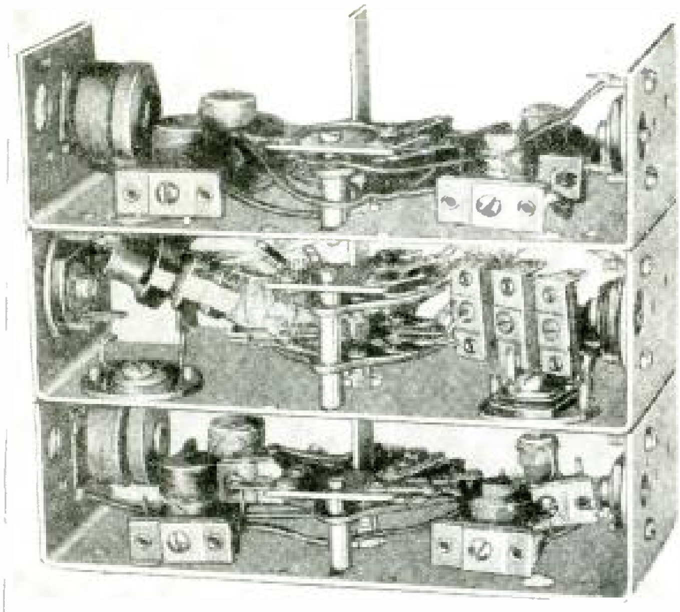


Fig. 4. Close-up view of the highly-perfected band-changing switch used on the Midwest 16-tube "All-Wave" receiver.

● THE latest Midwest sixteen tube, *all-wave* receiver has a novel coil switch for changing to any one of the five wave bands. This switch permits of much greater gain and selectivity without oscillation and also facilitates accurate factory testing and adjustment.

Heretofore, the switch has been a distinctly separate device electrically connected to the coils, condensers and tubes but mechanically separated. In some of the present day models of *all-wave* receivers, a shield plate has been added to the switch to stop r. f. oscillation. Frequently, this plate is used as a support for the switch, or, as a means of supporting some of the adjacent components.

This idea of combination tends to shorten leads and effects better shielding. It also groups related parts into a "sub-assembly" for fast production. The logical conclusion is to mount all coils and all possible related parts on the switch shield itself immediately adjacent to the switch terminals; the whole assembly may then be tested before placing in the set and only a few connections are required to put the whole receiver into operation.

This line of development is easily followed to its full requirements on simpler sets covering only a few bands with a two-gang condenser. However, a five-band set, using all three gangs of the variable condenser, requires 23 coils, 7 fixed condensers, 16 adjustable condensers for trimming and padding, and 6 resistors. The switch required to shift this apparatus is a four-gang, six-pole, five-throw switch, plus a five-position fan-type switch. The whole assembly is infinitely complicated and there are 154 terminals to be connected together—precisely and accurately, at such short wave lengths as nine meters.

This Gordian knot can be cut into several parts—if the switch itself can be divided. Every shielded plate can then carry its coils, etc., together with a part of the switch; then every plate may be separately assembled and tested before installation in the receiver. However, mechanism must be provided for synchronously operating every part of the switch from the control panel.

Details of New Coil Switch

When such a switch arrangement was first conceived, the commercial switches were studied with a view to using standard parts. The first difficulty encountered was that of withdrawing the shaft without having the entire assembly fall apart. However, a switch was found in which the individual gangs were self-contained so that the rotating portion did not depend for support upon the shaft itself. In figure 2 at "J," this switch section is shown and also a section with this rotator removed is shown at "K" and "M."

It will be noticed that the rotator portion of this switch is held in place by the two rear semi-circular pole-pieces (N) and that flanges (O) from these pole-pieces project through the bakelite supporting ring, and fold over to prevent the rotator from striking the contact fingers. It rotates very smoothly without chattering.

This rotating center carries two or more travelling contactors (L), one side of which is flattened to ride the rear semi-circular pole-pieces. The other end of this travelling contact is rounded off on the corners to slide freely from one finger to the next. The contact material itself is a very modern alloy having practically zero contact resistance when used with the silver- *(Continued on page 486)*

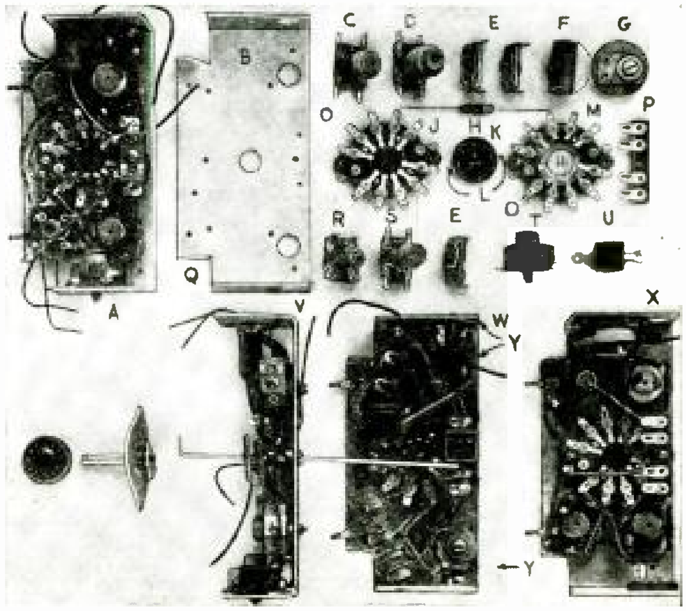
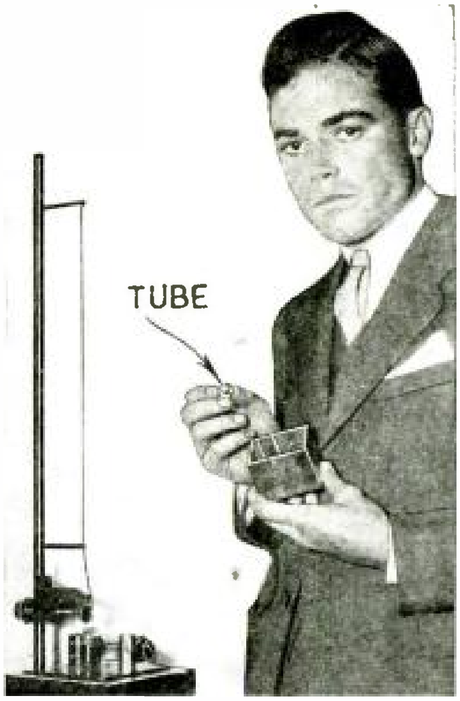


Fig. 2. The various component parts of the latest pattern Midwest coil-switch.

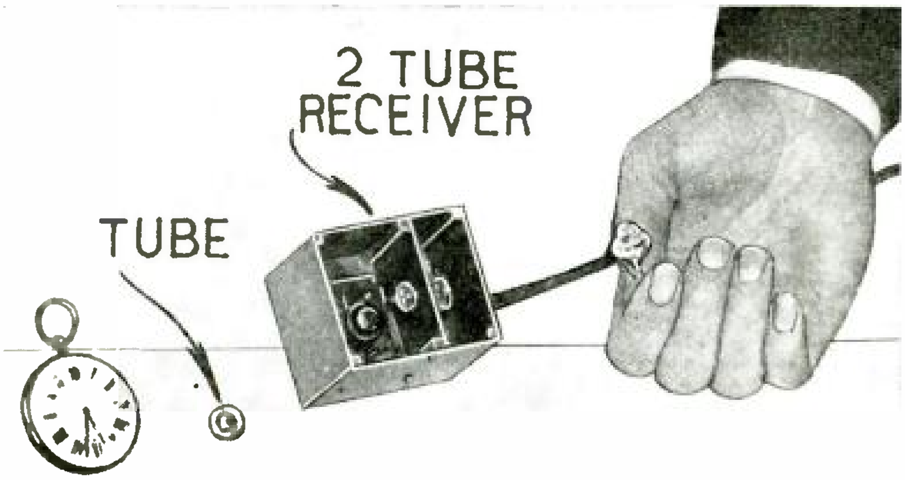
"SHOE-BUTTON" Tube Receiver the Tiniest!

A one-meter transmitter as well as two- and four-tube receivers, with tuned R. F. stages, using the new experimental "shoe-button" tubes were recently demonstrated.

● A REMARKABLY small transmitter and receiver were recently demonstrated at the Engineering Societies Building, in New York City, showing the possibilities of radio transmission and reception on wavelengths around one meter. They employ the new "experimental" type tubes recently developed in the R. C. A. Radiotron Company laboratories and commonly referred to as the "shoe-button" tube. This is a tiny tube measuring less than ¾ of an inch in diameter. It might be well to note at this point that these tubes are not available to the general public or experimenters; they are only in the laboratory stage. Two types of tubes were employed, namely, regular triode tube containing a heater, cathode, grid and plate. This tube corresponds to the familiar 27 type and also a screen-grid tube very much similar to the type 24, insofar as the number of elements and function of each element is connected. This tube is similar in size and shape to the triode, the only difference being the addition of a screen-grid. Standard circuits are employed with these tubes; the regular Hartley oscillator circuit was used for the transmitter, which was coupled to a half-wave, one-meter antenna as shown for transmission.



1-Meter Transmitter using new 'shoe button" vacuum tube as oscillator appears at the left; note tube between the fingers and tiny "2-tube" receiver" in left hand.



Compare the watch with the tiny new "shoe-button" vacuum tube and also with the "2-tube receiver" at the right.

The receiver using the screen-grid tubes, amazing as it may seem, had two stages of legitimately tuned radio-frequency, detector, and one stage of audio, each one of the tuned R. F. stages proved to have considerable gain, even comparable with the 24 at regular broadcast band frequencies.

The major part of the demonstration consisted of picking up a regular broadcast station on an orthodox broadcast receiver, the output of which modulated the one-meter transmitter. This in turn transmitted energy over a distance of 30 feet to the receiving antenna; the output of the one-meter receiver was amplified

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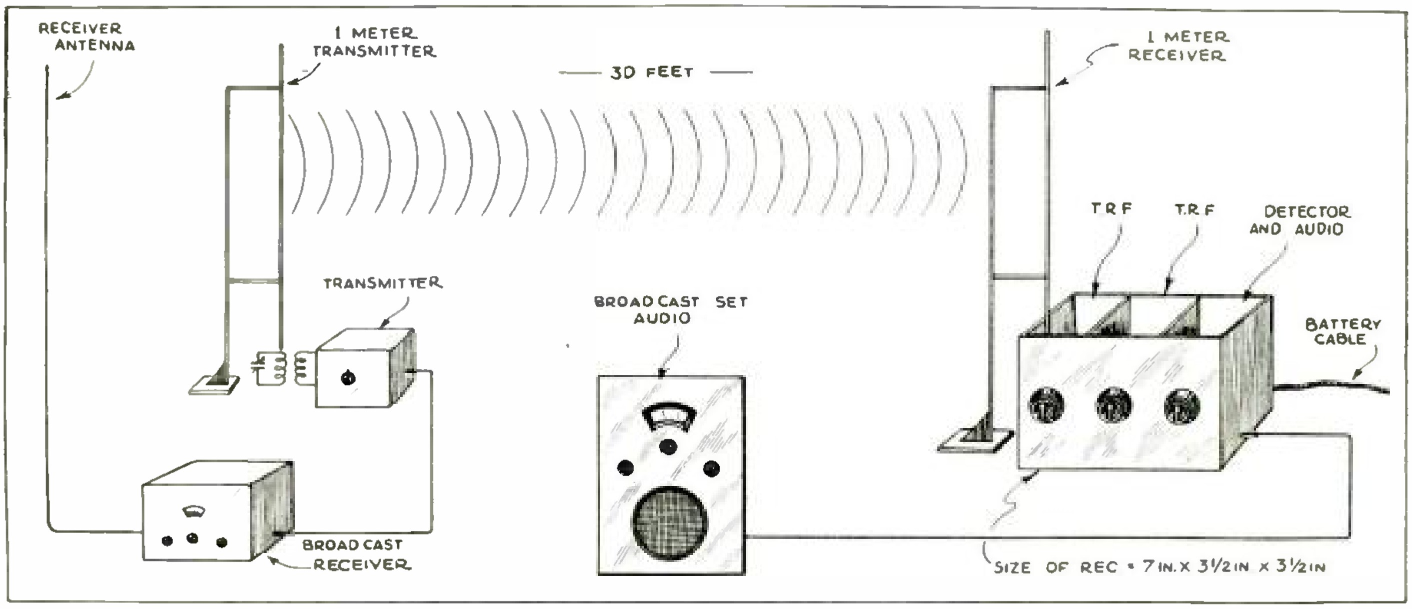
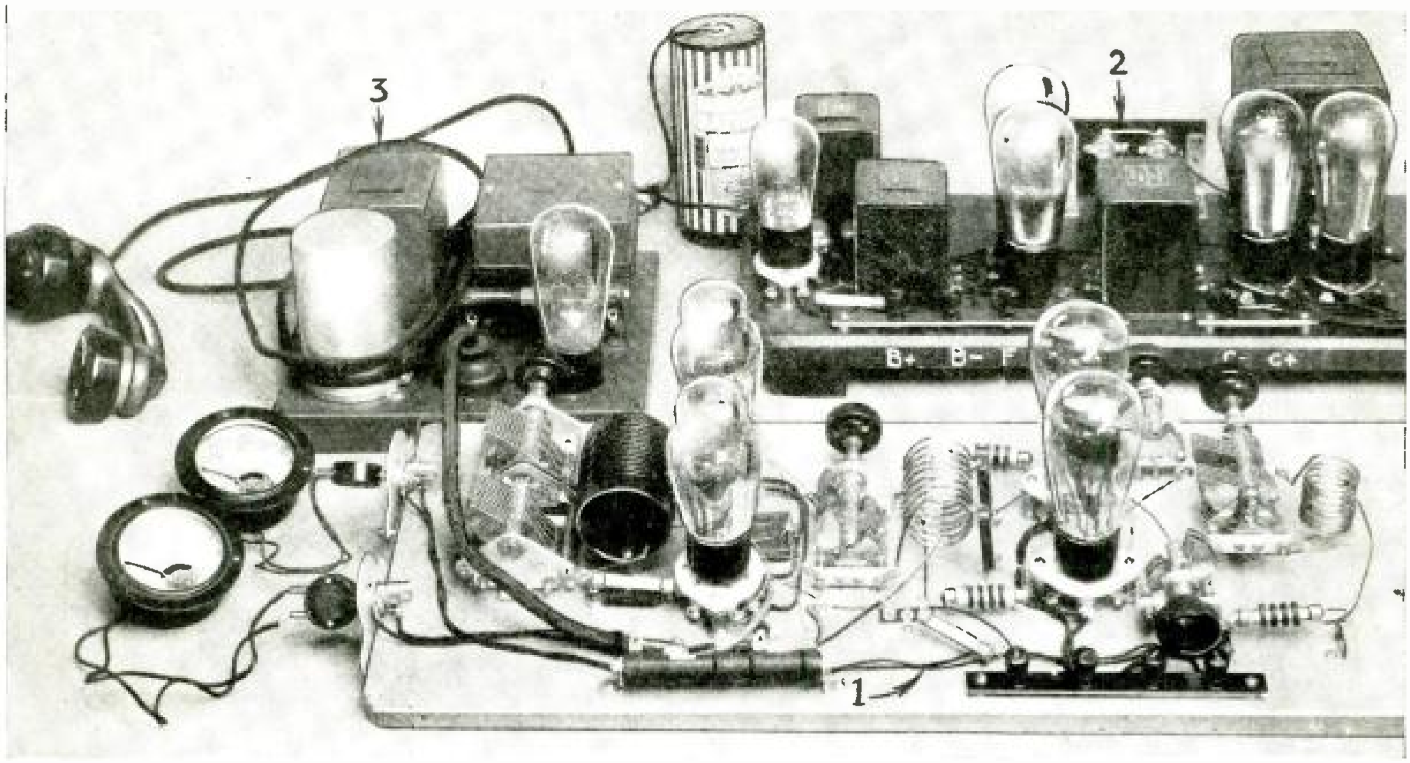


In a recent demonstration given by Mr. B. J. Thompson of the R.C.A. Radiotron Co., in the Engineering Societies Building, New York City, successful transmission and reception on waves approximately 1 meter long were carried out, using "shoe-button" tube sets, held comfortably in one hand.



In the photograph of the 10 meter transmitter above, the 30 meter oscillator portion of the circuit is shown to the extreme left. The left-hand tubes are the 59 master oscillators, while the tubes at the right are the 46 class "C" amplifiers. 1 is the oscillator section; 2 is the modulator, and 3 the power supply.

A Simple 10 Meter Phone TRANSMITTER

By CALVIN F. HADLOCK W1CTW-W1FFR

● FOR many years, the so-called "ten meter" band has been open for use by radio amateurs. The type of transmission permitted, however, has been limited to c.w. or telegraphy only. This band lies between 28,000 and 30,000 kilocycles.

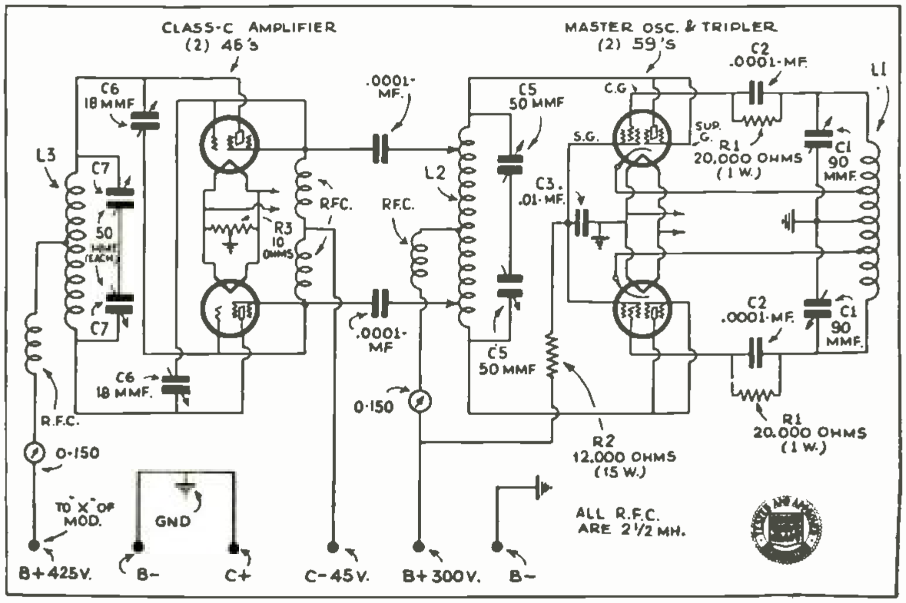
Recently, in response to the urgent request of many amateurs, a section of this band lying between 28,000 and 28,500 kilocycles has been opened for radiotelephony. It will be noted that this band is 500 kilocycles wide—five times as wide as the eighty meter phone band and one quarter as wide as the five meter band.

It has several advantages over the five meter band. First, the usual practice in five meter phone operation is to use a modulated oscillator for a transmitter and a super-regenerative receiver. These transmitters eat great chunks out of the 4000 kilocycles available and the receivers are extremely broad. With this apparatus in use, there are actually no more "channels" available than in the eighty meter phone band, where crystal-controlled transmitters and selective superheterodyne receivers are the usual practice.

Selective receivers, such as the National HFR superheterodyne or the National HFC converter, are available for five meter work but such receivers require special circuits and extreme care in construction. The use of these receivers requires fairly stable 5-meter MOPA's (master oscillator-power amplifier), which are not particularly easy to build and operate.

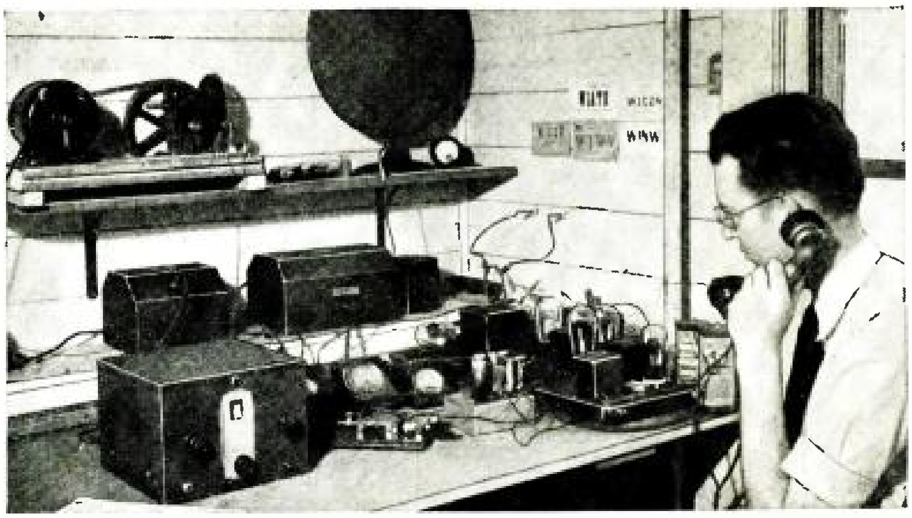
On the other hand, by using stable MOPA transmitters on ten meters and the same superheterodynes that we use on 80 meters, we have a band which is *practically* five times as wide as the eighty meter phone band, giving plenty of room to all who care to use it.

A stable MOPA for use on ten meters is easy to build and get into operation. One of these transmitters is to be described later in this article. Ordinary circuits can be used in building receivers for ten meters, this work providing but little more trouble than is encountered in building the same receiver for use on any of the lower frequency amateur bands. For example, the National FB-7, with type FBAA coils, works very well on ten meters.



In the diagram above the Master oscillator and tripler circuit is shown to the right and the hook-up of the class "C" amplifier at the left. (Fig. 1.)

As pointed out by Mr. Hadlock, the 10 meter phone signals will break through where signals of shorter wavelength will not carry. The interest in the 10 meter field is increasing by leaps and bounds and the article describing how to build a simple 10-meter phone transmitter comes at a very opportune time. Not only is this 10 meter transmitter of excellent design but the cost of building it is not prohibitive and it may be built on a "bread-board" layout. This 10 meter transmitter has been in use at W1FFR for several months and a number of well-known stations have been "worked." Good quality and "strong steady signals" were reported in all cases.



A corner of the author's short-wave station, showing the 10 meter phone transmitter in actual use, together with the receiving equipment used at W1FFR.

This receiver has been used at several stations to receive signals transmitted by the apparatus to be described, with very good results.

10 Meter "Sigs" Crash Through!

The ten meter phone band will probably be most useful if employed in the same manner as the five meter band; that is, for "local" work. It is, however, much superior to five meters in this respect, as it "fills in" much better. In one instance, when testing with Dick Briggs, W1BVL-W1ZZAW, of Dorchester (Mass.), I received his ten meter signals about R7, *while it was impossible to hear his five meter signals at all from the same location!* In addition, there is always the possibility of having "DX company" at any time from stations 1,000 miles away or even from foreign stations. It will be remembered that several years ago much inter-continent work was accomplished on the ten meter band.

I hope that by this time the reader will have been "sold" on ten meters and ready to ask *"How can I build a ten meter transmitter?"* In answer to that question, I am going to describe a layout which works surprisingly well for the amount of apparatus required to build it. In designing this transmitter, the objective was to build an outfit that is cheap and easy to construct, as well as effective in operation. It is not claimed that the transmitter is the best that could be made, but it will be entirely adequate for years to come for use on this new band.

It has only two stages and uses only four cheap receiving tubes, yet it gives about a thirty-five watt carrier and is stable enough to "walk" through a selective superheterodyne without distortion due to frequency modulation.

Bread-board Layout Used

For the sake of convenience, a "bread-board" layout has been used. This board measures 24"x 9" and there is plenty of room to spare. The circuit diagram is shown in Fig. 1. Push-pull circuits have been used throughout. Single-ended amplifiers were tried at first but it was found difficult to prevent feed-back. even though the stage had been perfectly neutralized, due to the fact that the filament leads act as a coupling impedance between the grid circuit and the plate circuit of an amplifier stage. The only solution was to go to push-pull, as in this case the filaments become dead.

The exciter stage uses two type 59 tubes as a push-pull electron-coupled oscillator and tripler unit. The cathodes, control grids, and accelerator (or screen) grids, are connected up to form a push-pull oscillator working on thirty meters. By using this particular circuit it will be noted that the accelerator grids are both grounded through the condenser C_3, thus acting as a screen between the oscillator and plate circuit and giving true electron-coupled action through the tubes.

Advantage is taken of the fact that when working in push-pull, the odd harmonics do not cancel. Thus the plates of the 59's are connected in push-pull and tuned to ten meters, thereby tripling the oscillator frequency in the plate circuit. This system gives good isolation between the *frequency-generating portion* of the transmitter and the *modulated stage*, thus reducing frequency modulation to a minimum. Ample excitation is obtained to excite the final stage easily. It will be noted that the *suppressor grid* has been connected to the *plate*, thereby making it a part of the plate. In most circuits I have seen it has been connected to the accelerator grid. It made

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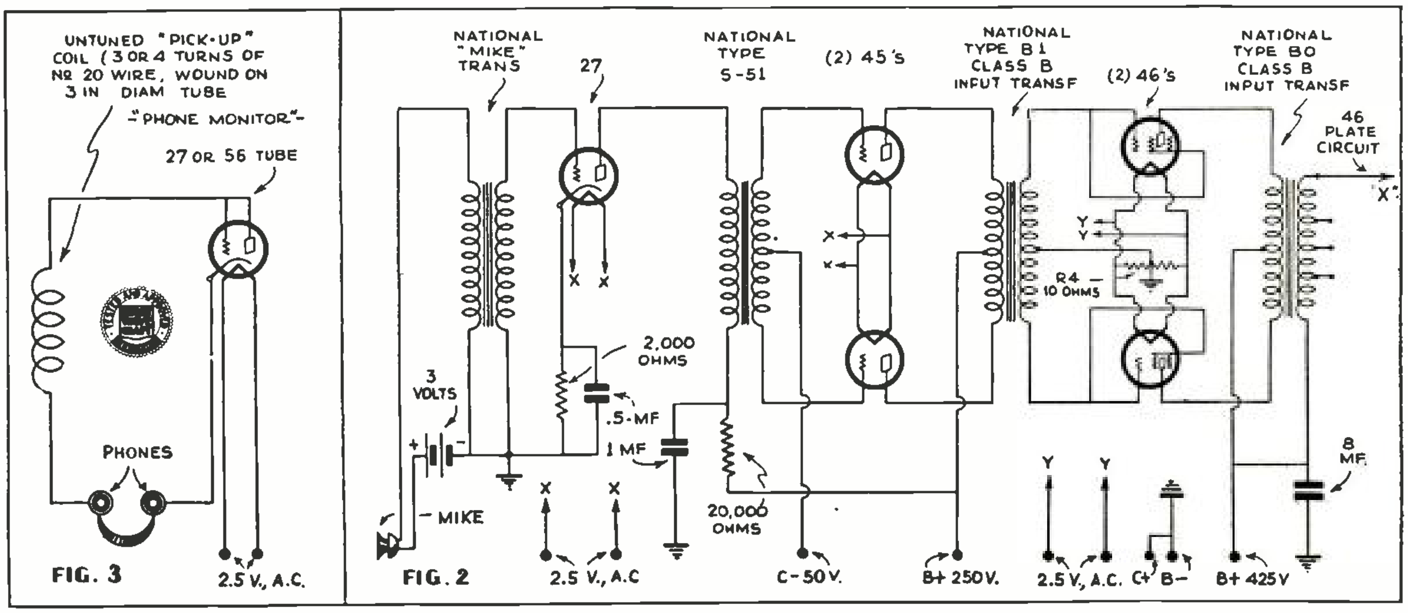


The diagram above shows the simple circuit for the voice amplifier, constituting the modulator unit.

The MITCHELL 7-TUBE S-W Super-het

By HAROLD MITCHELL

$20.00 Prize Winner for September

After the average short-wave "fan" has tried his hand with a one, two, or three tube S-W receiver, he invariably starts looking about for a somewhat more ambitious receiver—one that possesses sufficient amplifying power and selectivity to ensure the reception of "foreign" stations on the loud speaker, with some real volume! Such a receiver is the 7-Tube Superheterodyne here described. This "super" employs carefully selected tubes and it produced very fine results when tested in our laboratory. Most important today—the cost is nominal.

● THIS IS NOT a Ham receiver, but one that will appeal to every short wave "fan", who wants to roll in the "foreign" stations with ease and volume. There are no fancy trimmings or features, just an honest-to-goodness short-wave super-het. Much has been written about Ham receivers and "fancy" short wave sets for Hams, and by Hams, but what about the fellow that is after the *short wave broadcast* stations and particularly the *foreign* stations? Let us admit once and for all that the Ham receiver is not always adaptable to the requirements of the short-wave enthusiast, and since most of the fellows that are writing this stuff are Hams, there is usually that tendency to concentrate their efforts on the Ham bands.

No Trick Circuits

Thousands of trick circuits have been devised and articles written about them, and about ninety per cent of them are the "bunk." You fellows that have built some of these sets will surely agree to this, so with this in mind, together with the fact that the short wave "fan" deserves a break, the author has spent many weary hours over these trick circuits and special short wave sets with fancy features, and in most cases the result was not worth the effort or additional expense.

While we are on the subject of "fancy frills," we might mention that most of these trick circuits will run you into complications which may be beyond your comprehension, and since we are not all engineers, we usually have a pretty tough time getting these trick circuits to work—if at all.

This super-het is not the cheapest that can be built—neither is it the most expensive; however, after you look over the details you will find that we are not giving you anything but plain, honest, everyday information, and if you will forget about the nifty tricks in some other fellow's set, you can build yourself a very fine short wave super that WILL give you excellent results.

Selection of Parts

In building this all purpose short wave superheterodyne, the writer recommends that you use good parts, not necessarily the best that money can buy, and certainly not *junk*. For example, by referring to figure one, you will note that two radio frequency chokes are used. One is an 80 millihenry choke; this choke does not necessarily have to be shielded, any good 80 millihenry choke can be used satisfactorily. The other radio frequency choke is a 10 millihenry choke; this too, need not be shielded, however, in this case any old choke *won't do*. Be sure that it is a 10 millihenry choke.

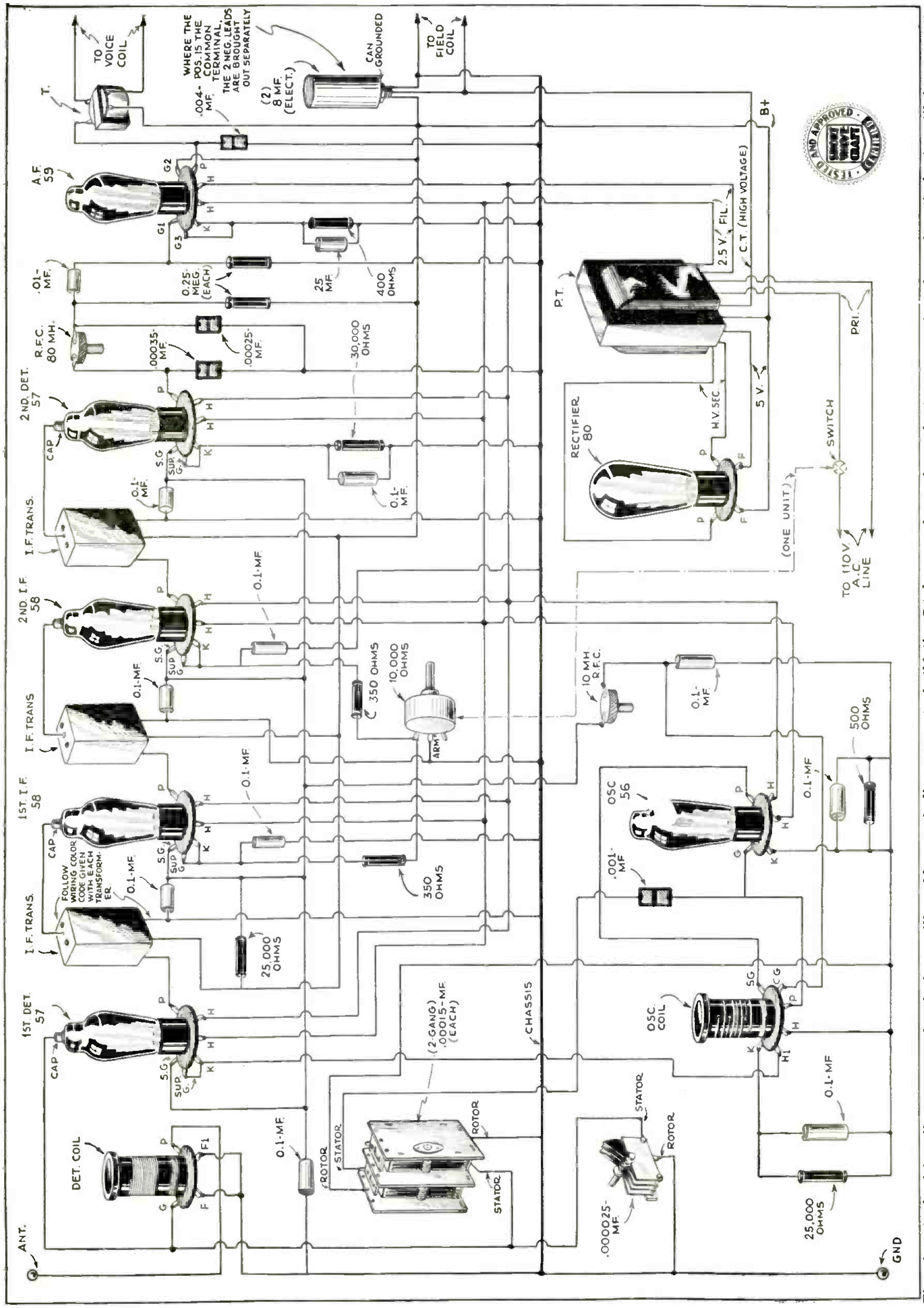
The sockets for the tubes and plug-in coils need not be isolantite, however, should you care to use isolantite, so much the better, yet a good grade of bakelite base-mount socket will not only give a good appearance but will serve the purpose well.

Selection of Circuit and Tubes

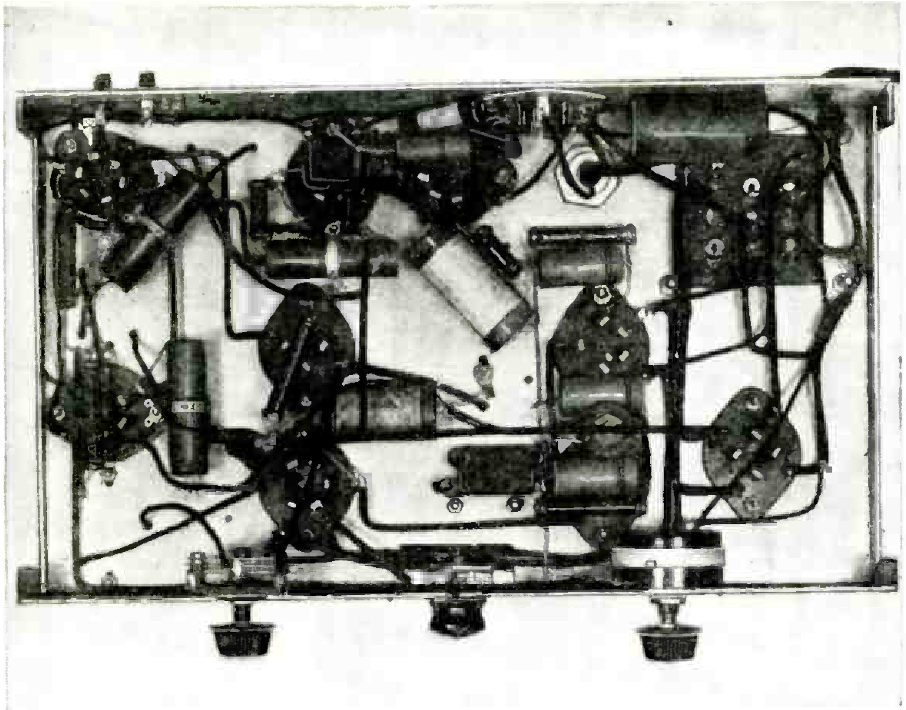
The reason that the superheterodyne circuit was used is that while many short wave fans may prefer to begin with a one-tuber or a Tuned-Radio-Frequency receiver, they ultimately wind up with a "Super".

In the wiring diagram you will find nothing new — everything has been tried and used before. The new tubes have been used in this superheterodyne, not on-

Low-Cost 7 Tube Super-het That Packs a Real Wallop!



The picturized wiring diagram reproduced above will enable practically anyone to build the 7-tube superheterodyne short-wave receiver here described. As will be seen, the general line-up of this superhet is quite orthodox, but the very latest ideas have been exercised in the selection of the tubes and the various components of the set. No fooling—this set is a real "go-getter"!



Above—bottom view of 7-tube short-wave superhet receiver.

ly to keep up with the times, but because they are efficient and give excellent results. The tubes are arranged as follows: a '57 first detector, a '56 oscillator, two intermediate frequency stages using '58 type tubes, a '57 second detector, and a '59 output tube as the audio amplifier.

Description of Circuit

In describing the circuit let us begin with the high frequency section. As mentioned before, many and varied circuits have been tried, and in order to keep the cost and construction down to the beginner's level the circuit shown in figure one was selected. Many beginners and short wave fans regard the superheterodyne with awe, and are not over-anxious to try and build one, especially the beginner; however this super is comparatively simple and if a little care is exercised you will be able to build yourself a very fine short-wave "super".

In using single control in a "superhet", it is necessary to get the two circuits to "track"; therefore, *a padding condenser* has been connected in series with the oscillator tuning condenser. The capacity of this padding condenser is .001 microfarad, and it is highly important that this condenser be connected as shown in figure one.

Both of the main tuning condensers are .00015 mf. and are ganged together. A 25 *micromicrofarad* (.000025) compensating condenser is connected in parallel with the detector tuning condenser. This condenser aids considerably in "clarifying" weak stations, and allows for changes in the antenna circuit.

The *intermediate frequency* transformers are 465 kc., and should be of fairly good quality. The National type with air-dielectric condensers is recommended for stability.

The volume control is a 10,000 ohm variable resistor, and is a wire-wound unit, this has been found to be very effective. The volume control is connected in series with the two 350 ohm bias resistors of the '58 I.F. amplifiers (Cathode) and ground. The two 350 ohm cathode bias resistors are bypassed at each tube with a .1 mf. condenser.

A 30,000 ohm bleeder resistor is connected between the screen circuits and ground and should be placed in the circuit at the second detector, as is shown in figure one.

The output of the second detector goes to an 80 millihenry choke, and is by-passed at the plate side with a .00035 mf. condenser and at the other side with a .00025 mf. condenser. The other side of each condenser is tied together and goes directly to the cathode of the '57 second detector. The "B" supply for the second detector is fed through a 250,000 ohm resistor. The coupling condenser to the '59 tube is .01 mf. (400 volt).

Due to the high plate impedance of the '59 type tube, it is imperative that your output or speaker transformer is made to operate from a single '59 tube. An output or speaker transformer for any other type tube will not do, and unless this item is given careful consideration, poor volume and quality will result.

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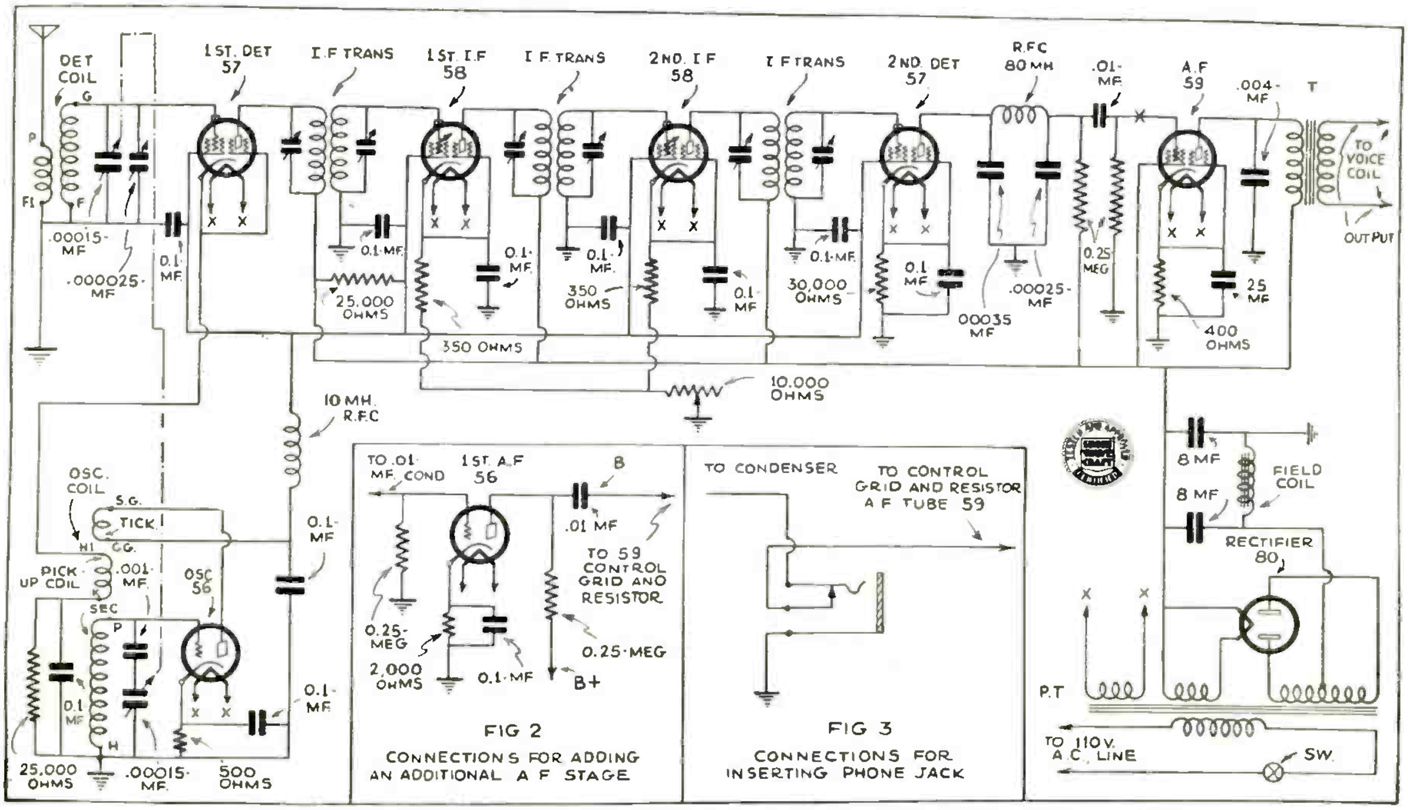

Here we have the schematic wiring diagram for the 7-tube superhet short-wave receiver.

Practical Measurement of Ultra-Short Waves

By C. C. WHITEHEAD

A Review of Practical Methods of Measuring Wavelengths Below 5 Meters

● ONE of the beauties of ultra-short-wave research is the facility and accuracy with which wavelength measurements may be made, with the aid of quite simple and comparatively inexpensive apparatus. The methods of measurement fall into four types:—(1) The Harmonic Method. (2) The Rod (linear resonator) Method. (3) The Lecher Wire Method. (4) The Absorption Wavemeter.

The Harmonic Method

Where an accurate short-wave wavemeter of the heterodyne type is available, the harmonic method, well known in connection with the measurement of longer wavelengths, may be employed.

The oscillating wavemeter covers a waveband embracing wavelengths from two to four times the length of the wave to be measured. The wavemeter is loosely coupled to the source of the shorter waves and the points on the wavemeter scale at which heterodyning occurs are noted. In regard to the application of this method to ultra-short waves, it is necessary to mention that—firstly, stable and accurate wavemeters are not generally available covering wavelength ranges extending below 10 meters. Consequently, it may be said that the use of this method is not conveniently practicable for shorter wavelengths than this.

The Rod Method

It has long been known that when a long thin conductor, such as a wire or long thin rod, is suitably coupled to a source of high frequency, the wavelength of which is equal to, or a sub-multiple of (approx.) twice the conductor length, standing waves of current and potential are set up along that conductor.

The most familiar application of this principle (to the amateur) is the half-wave dipole (Hertzian) aerial, commonly used in short-wave communication. It will be seen that by having a current meter situated at the center of the conductor (Fig. 1a) we can determine the point of resonance by observing the point at which the reading on A is maximum. Therefore our wavemeter might conveniently consist of the same material and length, arranged to slide inside t, t. This variable length Hertz resonator can now be adjusted so that its natural frequency coincides with that of the source of oscillations.

A simpler arrangement and a more accurate one is, however, available. We can measure the wavelength, not by observing the current induced in the rod from the source, but by observing the reaction of the rod at resonance, upon the source. This scheme is applied as shown in Fig. 2. The length of the rod is adjusted until the minimum reading shows on the grid current meter M. Since for this method the rod needs no current indicator it may now consist (Fig. 1b) of two portions only, each of a length of 125 cm. (49 inches approx.) one arranged to slide within the other. With a rod of these dimensions wavelength-ranges of 5 to 2.5 meters (fundamental), 2.5 to 1.25 meters (2nd harmonic) etc., may be measured.

This method may be finally dismissed by saying that it is very simple and useful where accuracy is not essential.

Lecher Wire Methods

Use is made of a pair of parallel wire conductors of length (l) relatively great, and distance apart (d) small, compared with the wavelengths to be measured. These wires are then excited in opposite phase from the source to be measured. This is usually carried out by connecting one end of the system to a tuned circuit as shown in Fig. 3. This will be recognized as a normal *Lecher Wire* system.

When the system is tuned to the frequency of the source, there are two possible modes of distribution of the standing current and voltage waves, according to whether we use the "open end" or "closed end" connection. Either method may be used, the only difference being in the tuning of the coupling circuit required to obtain resonance. A number of points at which the system is in resonance can usually be found over the range covered by the condenser scale. It is immaterial which of these points is employed.

In the closed end connection, the free end of the system is bridged by a conductor of negligible impedance (thick copper wire). It will be noted that for the system to be in resonance, a voltage anti-node must always occur at an open end and a current anti-node at a closed end.

Consequently, if a bridging wire is placed across the wires at any point other than at a current anti-node (which corresponds to a potential node, since the current and voltage are 90 degrees out of phase) such as points b-c, b'-c', Fig. 3, the system will be thrown out of resonance. It will be seen from Fig. 3, that as the length of the system is greater than a wavelength, there are several positions at which the bridge could be placed without disturbing the tuning of the sys-

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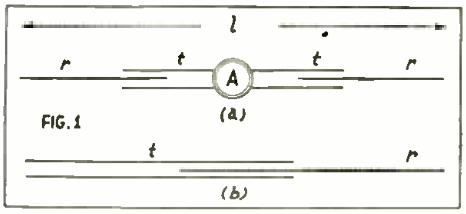


Fig. 1—Simple resonator made of sliding rods and tube.

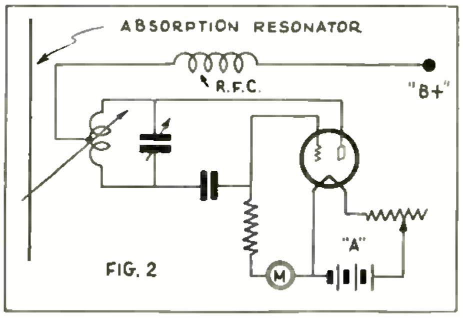


Fig. 2—Principle of the absorption method of measuring waves, reaction being noted on meter M.

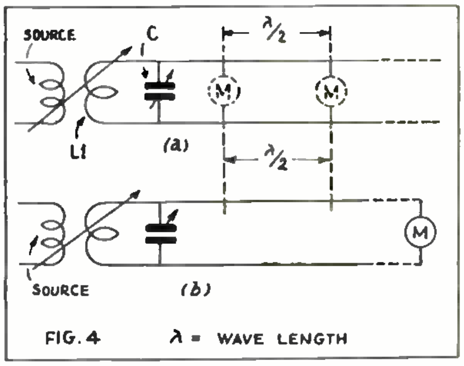


Fig. 4—Two methods of using a thermal ammeter as a "bridge."

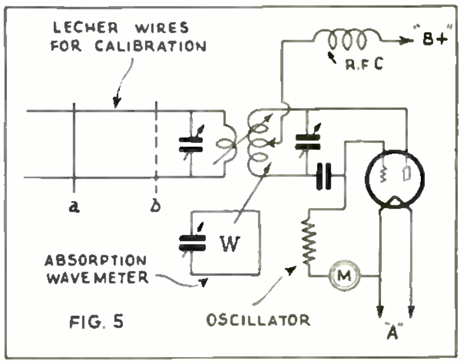


Fig. 5—One method of using the absorption type wavemeter.

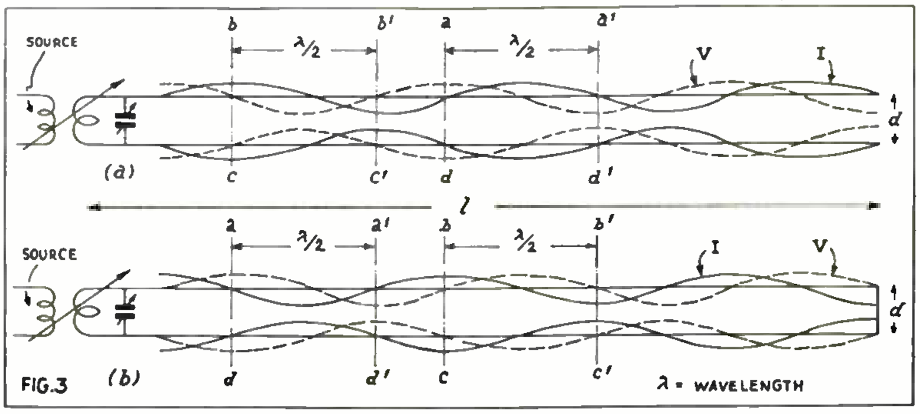
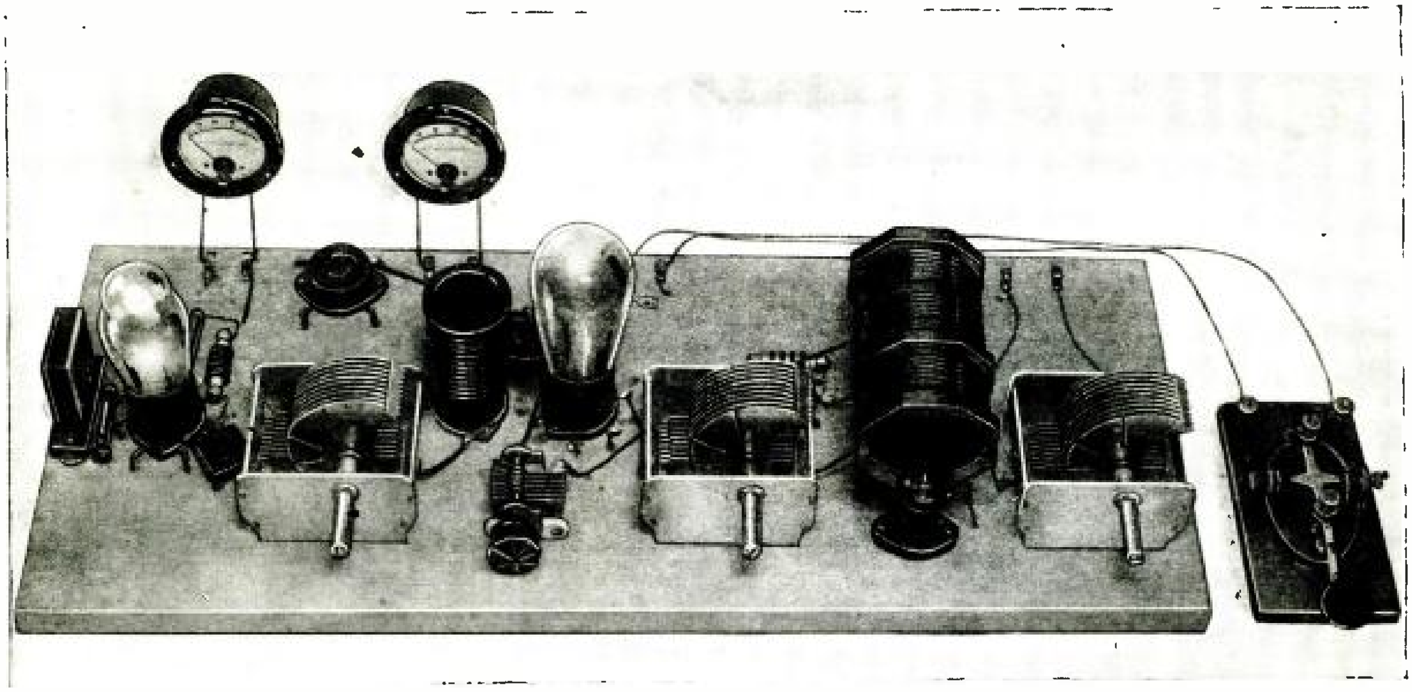


Fig. 3—Lecher wires—current and voltage distribution in (a) open end, and (b) closed end systems.



The latest type crystal-controlled transmitter here described by Mr. Victor. It uses a 2A5 tube as the oscillator and a 46 tube as the amplifier.

Amateur Transmitters

How to Build, Install, and Operate Them

In this fourth article in the "Beginners' Transmitter" series, Mr. Victor explains how to improve the Transmitter previously described, so as to comply with the latest Federal Regulations.

By LEONARD VICTOR
W2DHN, W2DPT

● OCTOBER first there came into official being a new and more stringent set of regulations in regard to the Radio Amateur. Plainly stated these "regs" require that every amateur station have at least a "D.C." note. Likewise *frequency stability* or the *steadiness of the note* emitted by the station must be of a high order. This goes especially for phone stations in which there is a great possibility of spurious side-bands and other unwanted interference-producing notes. To back up the new regulations Uncle Sam, through the *Federal Radio Commission*, has installed ten monitoring stations, with the latest type receivers, scattered throughout the country.

These stations will be "on the air" day and night, listening in on all the amateur bands. They will check on all stations, and woe to the fellow that is caught operating out of the band. Likewise they will check on the note and stability of stations that are in the band. In other words, real enforcement will be practised from now on, and it will be the better part of wisdom to have a "rig" that complies fully with the new standards.

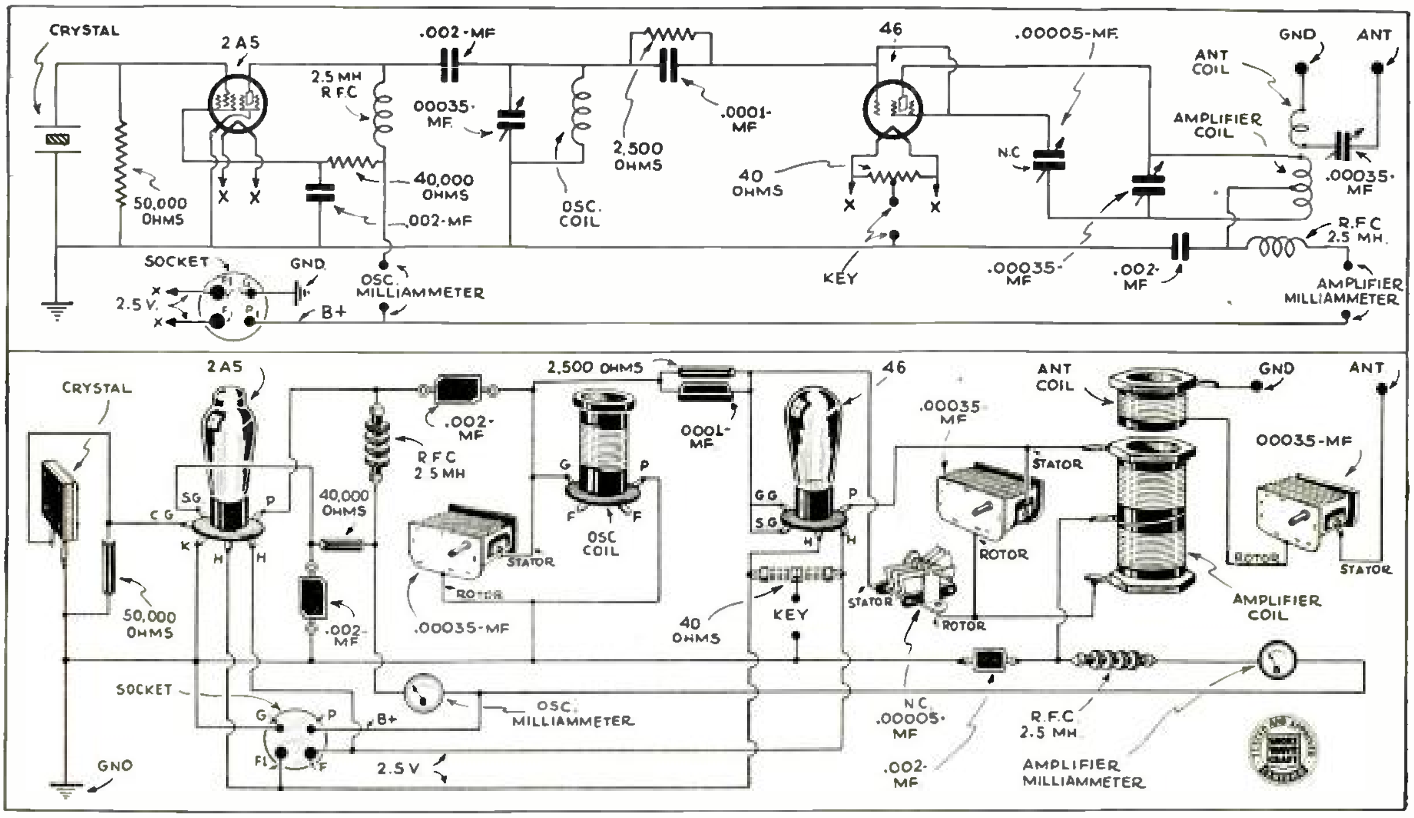
Even a self-excited oscillator is still O.K. provided pure D.C. power supply is used, and the frequency is carefully checked, but the safest thing to do is to get some other type of control that guarantees absolute stability and assures that the frequency is well within the band. *Crystal-control* is the answer to this problem. Provided a good quartz crystal is used, the transmitter will operate only on the frequency of the crystal, and thus forever eliminate all worry about being out of the band. Also with "xtal" it is much easier to get a pure note, even though little filter is used in the power supply and the rig is maladjusted. Try getting a good steady note with something "haywire" in a self-excited xmittr. 'Nuff sed!

Until quite recently crystal-control was both a very costly and inefficient system. With the advent of the pentode type tubes, the efficiency of "xtal" control went up, so that now it is possible to get as much from a "rock" as from a "self-excited" stage at the same voltage. Recently there has been a great drop in the price of oscillating quartz plates. It is now possible to purchase a good xtal that will last forever, for around two bucks or a little less. A caution might be given in regard to the purchasing of a xtal. Be sure that it comes from a reputable dealer and is backed up by a guarantee. Too many fellows are flooding the market with cheap low-output crystals. It is now possible to get good stability and frequency insurance at a low price. A crystal oscillator can be "keyed" just the same as self-excited ones, and usually better results and greater "DX" will be obtained.

The transmitter pictured and described in this article is just a representative example of how simple crystal-control is to build and use. The "rig" was built up out of parts from the *Beginners' Transmitter* described in the past three issues. Those who built the other job can modernize it by merely changing the oscillator tube and replacing the untuned grid circuit with a crystal.

Technical Description

The transmitter proper uses two tubes, a 2A5 tube as the oscillator and a type 46 tube as the amplifier. The 2A5 is one of the newer type tubes recently released. It is a pentode similar to the 47 tube but with an indirectly heated cathode. The efficiency with this tube is very high and voltages as high as 400 or even 450 can be used without straining the crystal. The 46 is used as an amplifier because it has several very good features. Firstly it



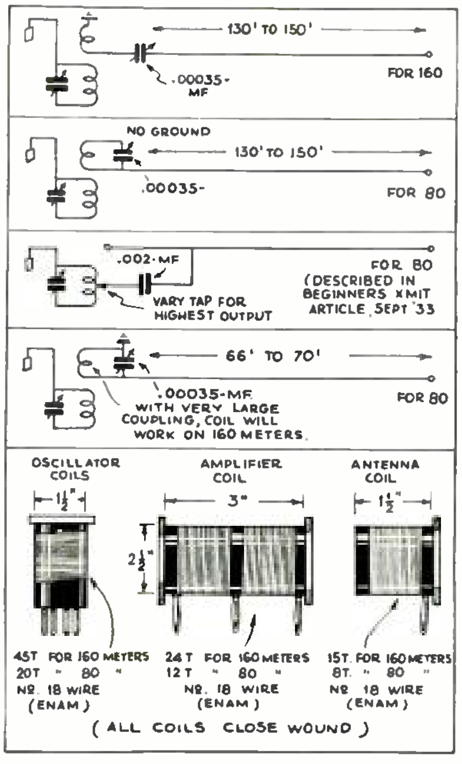
Both schematic and picture diagrams are given above, showing how to build the crystal-controlled transmitter here described at length by Mr. Victor.

requires very little excitation to produce high output, as it is a high mu tube. Likewise it needs no battery bias, which is a great saving, and eliminates one of the nuisances around an amateur station. The 46 is an excellent *doubler* tube, that is a tube to double the frequency of the xtal for operation on the higher bands, if it is ever desired.

Power inputs to a 46 can be as high as 30 or even 35 watts, especially when there is no worry about frequency stability, which is taken care of in this set-up by the xtal. This rig is designed for the 80 and 160 meter bands, which are the best bands for the fellow just getting up code speed, or wishing to do "message handling." The 160 meter code band extends from 1715 kilocycles to 1825 kc. Those that want to work both 80 and 160 meters without using more than one xtal should get one rated between 1755 and 1825 kc. Using a 160 meter xtal the 46 amplifier tube would be working as a doubler on 80 meters.

The Layout

The transmitter is mounted on a varnished board two foot by nine inches. The layout of the parts is exactly like the wiring diagram. From left to right the parts are: crystal holder, 2A5 tube, oscillator tank condenser, oscillator coil, 46 tube, amplifier tank condenser, amplifier and antenna coils, and antenna condenser. Behind the 2A5 tube are mounted the 40,000 ohm voltage dropping resistor, the oscillator R.F. choke, and the voltage dropping resistor by-pass condenser. In back of the oscillator coil is the excitation coupling condenser, and bias resistor for the 46. Plug-in jacks are used for the amplifier because they make a very neat arrangement and facilitate changing bands quickly. Behind the amplifier tank condenser is mounted the R.F. choke and by-pass condenser for that circuit. Along the back edge of the set the parts are as follows, reading from left to right: two binding posts for oscillator milliammeter, four-prong plug for power-supply cable, two binding posts for amplifier milliammeter and the two binding posts for *aerial* and *ground*. Filament, plate and ground leads are run under the board to give a neat appearance.



Various methods of coupling the transmitter, together with coil data, are given above.

Parts

Receiving type parts are used throughout this transmitter, but care should be taken that they are of the best construction available. Make sure the variable condensers have good spacing and that all the fixed condensers are of the mica type, rated at least 400 volts. The R.F. chokes play a very important part in this set and should be of a type designed for transmitting use, although some short-wave receiving chokes work very well. The milliammeters need only be the cheap, "less-than-a-dollar" type. Both are 0-100 M.A. scale instruments. All the resistors are one-watt carbons, but be sure they are R.M.A. standard, as large quantities of poor resistors have recently been "dumped" on the market.

The Power Supply

Any power supply up to 450 volts, capable of delivering 125 mills (M.A.) will do. Even as low voltage as that delivered by a "B" eliminator will give surprisingly good results. The supply shown is the same one used on the Beginners' Transmitter, consisting of a 400 volt transformer, a 5Z3 rectifier, and a "brute-force" filter of 4 mf., a 30 henry 150 mill choke, and another 4 mf. section. The condenser is rated at 500 working volts. A 20,000 ohm, 25 watt resistor is used as a bleeder.

Tuning Up

Before doing anything else, check all the wiring. Mistakes happen, even in the best of families. Next connect up the power supply and transmitter. Connect the oscillator milliammeter, which will put current on the tube. The tube will draw between 40 and 80 mills. Tune the oscillator condenser until there is a sharp dip in the oscillator current. This shows the crystal

(Continued on page 495)

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.

RCA Victor Introduces "All-Wave" Sets

Console model (left) of the new R.C.A. Victor 8-tube "All-Wave" superheterodyne receiver, with continuous range from 16 to 555 meters. (Refer to No. 129.)

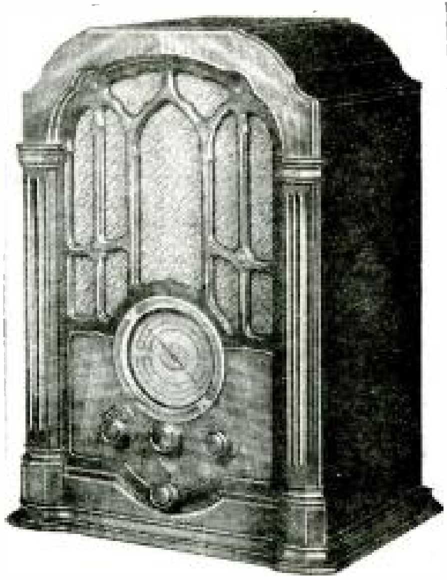


Table model (right) of the new R.C.A. Victor "All-Wave" set, using an 8-tube superhet chassis with wave range from 16 to 555 meters. (No. 129.)

● A BRAND new 8-tube "all-wave" superheterodyne has just been brought out by the R.C.A. Victor Company. The accompanying photos show two of the "all-wave" models, the console and a table style set. These sets have a continuous wavelength range from 16 to 555 meters. A special 4-position frequency switch controls four separate wave bands: (a) 540 to 1500 kc; (b) 1500 to 3900 kc; (c) 3900 to 10,000 kc; (d) 8,000 to 18,740 kc. The new set has greatly improved signal-to-noise ratio resulting in marked clarity and a minimum of background noise. It has high audio gain on signals of low percentage modulation. Three sets of interchangeable coils provided for each band, assuring maximum performance of each complete circuit. Technically, this instrument is a complete and distinct radio receiver in each position of the switch. It uses Class "B" audio amplification with output of 5.5 to 7.0 watts. Has full-vision airplane dial with double-ended pointer for convenience in tuning. Dial is calibrated in kilocycles and megacycles. Fine, split-hair tuning made possible by 50 to 1 ratio vernier control. Has automatic volume control; tone control continuously variable; full size 10" dynamic speaker. Tube complement: three RCA-58, one -2A7, one -2B7, one -56, one -53 one -80. Three of these tubes are used for double functions, providing performance which would ordinarily require ten or more tubes.

Another table model, Style 121, comprises a low-cost six-tube Superheterodyne receiver operating on two bands, from 540 kc to 1500 kc (covering the domestic broadcast bands), and from 5400 kc to 15,500 kc (which includes the 49, 31, 25 and 19 meter short wave bands). A push-pull frequency switch shifts the radio frequency circuits from the standard broadcast bands to the short wave broadcast bands. A radio frequency stage provides a low "noise-to-signal" ratio. A special coil system makes this instrument a complete and distinct radio receiver in both range positions. It has a full-vision airplane dial with a double-ended pointer for ease in tuning, the bottom end for the domestic bands and the upper end for the short wave range. An ingenious double vernier tuning control in two sections is used to tune either band. This set has continuous variable tone control; automatic volume control; a 6-inch full dynamic speaker; output of 2.0 to 3.5 watts. Tubes: two RCA-58, one -2A7, one -2B7, one -2A5, one -80.

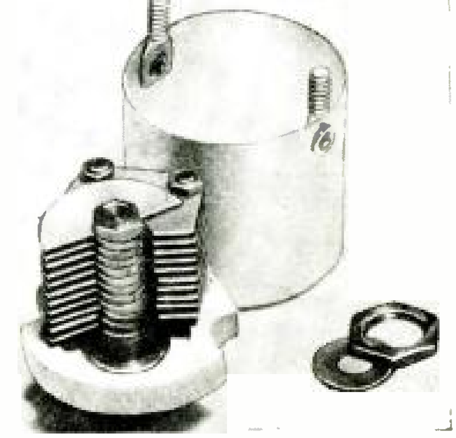
These very latest *all-wave* receivers are fitted in the newest style, finely finished hardwood cabinets, and they represent the very latest engineering developments.

New Stand-off Insulator and Padding Condenser

● THE new National *stand-off* insulator, as will be seen from the accompanying illustration at the left, has a unique mounting arrangement. The three metal feet permit fastening down to any kind of a base material, without possibility of cracking or otherwise damaging the ceramic. The new size is also particularly well suited for mounting low-power transmitter inductances, raising transmitting condensers off base panels, and the one hundred and one other uses that will readily suggest themselves to the average radio amateur and experimenter. These new stand-off insulators are made of isolantite, the new ceramic, which has the lowest loss where ultra short waves are concerned, and in 5 and 10 meter work especially, it is highly important to conserve every bit of energy possible.

A very useful new type stand-off insulator made of isolantite. (No. 130)

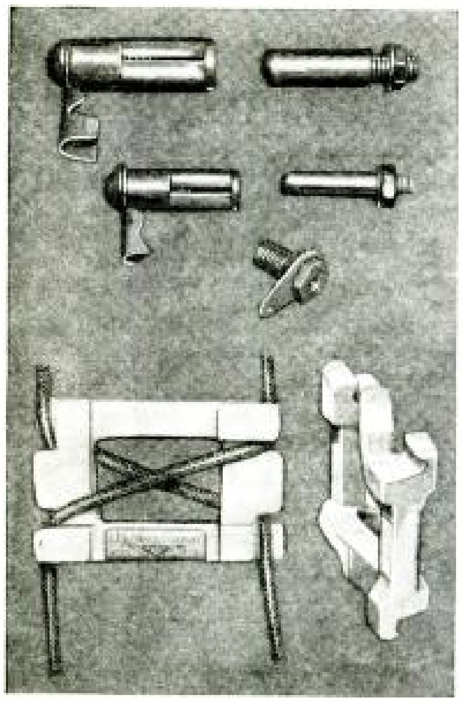
An air-dielectric padding condenser is one of the latest products of the High Frequency Development Laboratories of the National Company. It has a maximum capacity of 100 mmf. and yet requires essentially no more mounting space than the old fashioned mica type. This new condenser gives complete freedom from capacity change or *creepage* with variations in temperature, humidity and vibration. The plates are of non-resonant aluminum and the entire assembly is mounted on an isolantite base, and enclosed in a drawn aluminum dust shield.



New dustproof padding condenser. (No. 130.)

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

New SW Jacks and Transposition Insulators



● AN enterprising radio specialty manufacturer has recently placed on the market several sizes of plugs and jacks which are ideally adapted for use with transmitting inductances and similar coils. These jacks have powerful sleeve-type springs, which ensure a very firm contact and at the same time permit the operator to instantly remove a transmitting coil and replace it with another. Substantial soldering lugs are provided on the jacks.

Left: New Johnson transmitting coil jacks and transposition insulators. (No. 131.)

The same company furnishes a new design of transposition insulator, and also a line of stand-off and "feeder" insulators. This type of insulator is much in demand today, as all of the better short-wave receiver installations are being provided with a transposition feeder system connecting the antenna proper and the receiving set. This new insulator is designed so that the wires slip under the projecting prongs at each corner in a fraction of a second and the center of the insulator is left open so as to minimize surface losses.

5000 Ohm Phones

New featherweight headphones wound to 5000 ohms resistance, providing extreme sensitivity to very weak signals. (No. 132.)

● THE well-known Trimm line of featherweight headphones has recently had a new addition to the family, an extremely lightweight pair of phones wound to have a resistance of 5000 ohms (4,800 to be exact) which makes them extremely sensitive to very weak signals. Actual tests by the editors show that when fairly weak signals were just about audible in an ordinary pair of 2000 ohm phones, the signals were surprisingly clear when a pair of these new phones were plugged into the receiver.

The Adams--4 S-W Converter

● THIS S-W converter unit picked up Europe and Australia the first time it was used. The beginner in the field of short waves will without doubt find a great deal of interest in this new converter unit which is connected to the regular broadcast receivers; utilizing the high amplification and fine quality of the latter. While many other converter units have been designed before, the writer has never tried one that produced such remarkable results as this one.

On the *first* evening after the set was completed, the following stations were heard on the loudspeaker. Some of them faded as you might expect, but all came in with sufficient volume to fill a large room. All of these stations were logged between 8:00 and 10:30 p. m. Eastern Daylight Saving time; at a point just outside of New York City.

VE9JR—25.6 meters—Winnepeg, Manitoba
FYA—25.8 meters—Pontoise, France
31.5 meters—Daventry, England
DJC—49.8 meters—Berlin, Germany
W3XAU—49.5 meters—Philadelphia, Pa.
W8XK—25.2 meters—Pittsburgh, Pa.

But this is not all—much to the astonishment of the author, VK3ME in Melbourne, Australia, was received at 6:30 a. m. the next morning. While the fading on this station was rather bad, and the static was unusually strong, the station announcement came in clear and distinct.

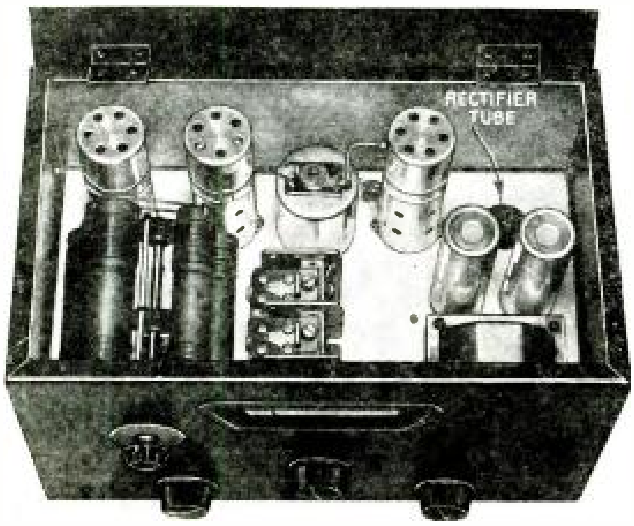
This is a remarkable record for any set, especially when it is remembered that the converter was new and had not been fully tried out.

The Converter

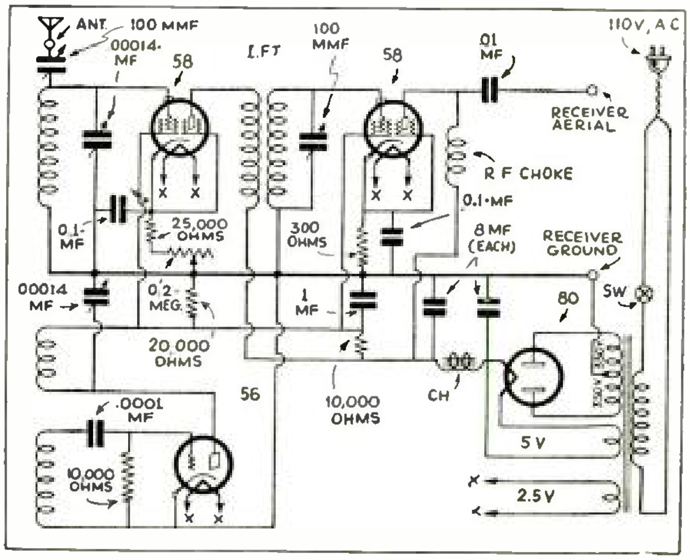
So much for the results obtained with the unit. The circuit as you can readily see consists of a 58 type tube used as a frequency changer, a type 56 tube as a local oscillator and another 58 as the first intermediate frequency tube. The unit supplies its own power, so a power transformer and a type 80 tube are included for this purpose.

The receiver is available either completely assembled, for those who do not wish to construct it, and in kit form with all the parts, including a drilled chassis and cabinet, for those enthusiasts who enjoy rolling their own. The values of all the parts are shown on the diagram, and the positions of the parts can be readily seen from the photographs. The unusual points in the design of the converter are the use of an intermediate frequency amplifier in the converter unit—and the use of a tuned-plate oscillator. The first of these assures the user of having plenty of amplification, as well as adding a tuned circuit to the complete receiver-converter arrangement. The second, provides a stable oscillator system which is essential in a successful short-wave superheterodyne. In addition to this, the tuned-plate oscillator tunes less sharply than the common tuned-grid oscillator found in most superhetero-

(Continued on page 499)

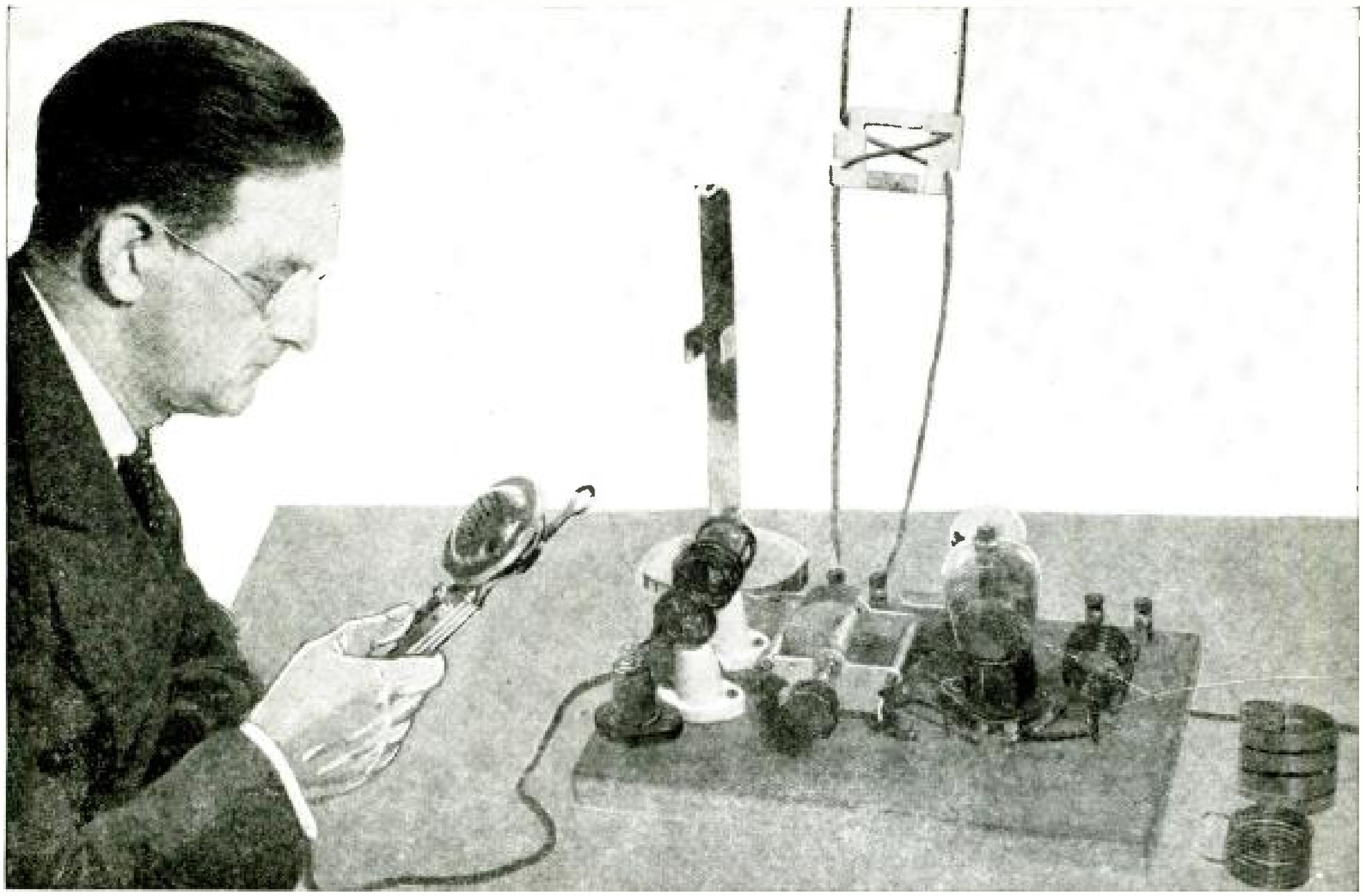


The Adams short-wave converter, which uses four tubes including rectifier; it permits reception of foreign stations on your "broadcast" receiver.



Wiring diagram for the Adams 4-tube short-wave converter, one tube being a rectifier. Turning a switch changes the wave hands to which it responds. (No. 133.)

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



The 5-meter "pigmy" phone transmitter in actual operation, a transposition feeder connecting with the Hertzian doublet antenna. This set uses but one tube and it "talked" over 15 miles in actual tests made by the author.

A 5 Meter Phone . . . "PIGMY" Transmitter

By GEORGE W. SHUART, W2AMN

● LOW-POWER transmitters seem to be the rage lately, especially for use on the ultra high frequencies. With the advent of the 53 tube which is of the class "B" twin variety, low-power transmitters can be reduced to almost a skeleton and still be made to perform very efficiently on either "CW" or phone.

The '53 operates very nicely as a push-pull oscillator at frequencies as high as 60,000 kc. (5 meters) and has a fair power output when operated with around 300 volts on the plates. In operating condition the '53 acts somewhat differently from other tubes used in push-pull arrangement. And this difference is—the plate current drops to a lower value when *excitation* or *feed-back* is reduced, and increases when excitation or feed-back is increased. Also the plate current is lowered when the plate circuit is loaded by the antenna. The above actions are due to the fact that the tube is designed to have a very high amplification factor, requiring no "C" bias of any kind. In other words this tube will act very much the same as a low "mu" tube having external bias batteries connected in place of the usual grid-leak resistance.

The '53 also has a 2 volt battery type "brother" which has exactly the same features except that it only requires 2 volts D.C. on the filament and 135 volts on the plates. This tube is known as type 19.

The transmitter shown in the photograph can be constructed using either the '53 or the 19. The 19 of course will have considerably less power output than the '53 on account of its lower plate voltage rating.

How Voice Modulation Is Applied

The outstanding feature of this little transmitter is the method by which voice modulation is applied. Around 70 or 80 per cent modulation can be obtained by inserting an ordinary 200-ohm, single-button microphone in series with the *grid return* lead. This is made possible by the relatively large amount of D. C. grid current drawn by this type tube. It is impossible to use the customary microphone transformer in this position, because the resistance of the transformer secondary would reduce the plate current to a value where there would be no chance of obtaining enough output to make the set worth while for transmitting.

With 300 volts on the plate, the plate current is around 100 milliamperes when the grid and plate circuits are tuned to resonance. For maximum output, however, the plate circuit is not tuned to the point where the plate current is the highest.

Adjusting for Maximum Output

Maximum output is obtained when the plate circuit is detuned considerably toward the high frequency side of this peak. This reduces the plate current to above 70 milliamperes, but this is still too high for continuous operation and will result in ruination of the tube. Therefore, we must provide more resistance in the grid circuit than the 200 ohms provided by the microphone. This is done by putting a resistor of about 1000 ohms in series with the "Mike," this resistance depends upon the plate voltage. With lower voltages (around 200) no resistor will be required, however it should be large enough to limit the plate current to 60 milliamperes. This value will be still further reduced when the antenna is coupled to the transmitter; a drop of around 10 or 12 milliamperes indicates a reasonable amount of coupling. Efforts to obtain more coupling will result in decreased output and may stop the tube from oscillating.

Returning to the bias resistor mentioned above, it will appear, by consulting the diagram that there will be needed a suitable audio frequency by-pass condenser across this resistor; a value of about .5 mf. will be satisfactory. Don't connect this condenser from one side of the resistor to B negative, unless the resistor is on the negative side of the "Mike," or there will be no modulation.

The diagram shows a small fixed condenser connected across the "Mike;" this is used only to make sure that there will be no radio frequency current in the microphone or microphone cord, because if there were, handling the microphone would cause changes in the frequency of the transmitter and result in instable operation or serious frequency modulation. It might be well to state at this point that, under the new regulations, **this type of phone transmitter can only be operated in the 5 and 10 meter amateur bands; (and by a licensed amateur operator).**

Coils and Tuning Condenser

The diagrams clearly show the sizes and construction of the various coils for the five and ten meter bands. The main tuning condenser can be anything from a 50 to 100 mmf. The one shown in the photograph is a 100 mmf. single stator type. However, it is preferable that this unit be of the *split-stator* type in order that the rotor section can be connected to the "B" minus. This will eliminate the troublesome *body capacity* effect encountered in tuning when a single section is used. A bakelite wafer socket is shown, but it is advisable to use an isolantite socket because of its far better insulating qualities at these tremendously high frequencies.

In tuning up this transmitter, **do not tune for any particular plate current peak or dip;** use a flashlight bulb connected to a single turn loop, and couple this "pickup" loop to the plate tank coil and adjust the plate tuning condenser until the light glows the brightest. Then check the frequency; if the frequency has to be changed, adjust the grid coil accordingly and retune the plate condenser as before. If the plate current is too high adjust it to the value mentioned in the first part of this article by changing the value of the grid resistor.

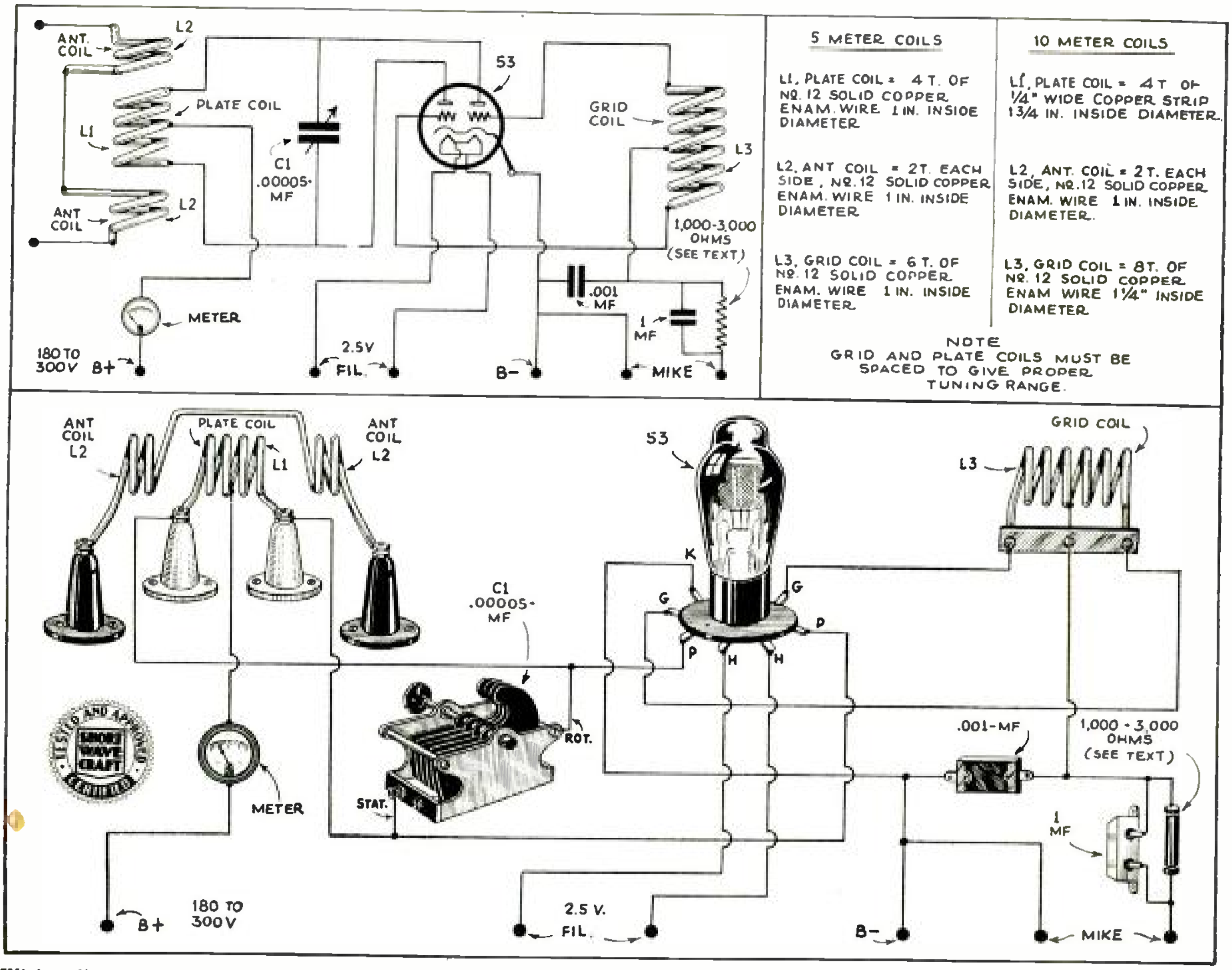
With the above method of tuning it was possible to get this little transmitter to perform as well as the "orthodox" five-meter transmitter, using regular plate modulation with a total of five tubes, including the rectifier, while this one has really only two.

Simplicity is probably the most important item in a short-wave transmitter—even more important than cost in most cases. The more complications the higher the losses usually; Mr. Shuart here provides the answer to every Ham's dream—a simple 5-meter "Pigmy" Transmitter using but one 53 tube!

Actual Test

On the five-meter band the author was able to communicate with W2DFU located in Suffern, N. Y., a distance of about 15 miles from the transmitting location. The report was "QSA 5 R 7" on the loud speaker! The quality was reported as comparable with any five-meter station received at W2DFU, which isn't so bad when one considers the speech equipment used on this outfit—or rather should we say *the lack*

(Continued on page 488)



Wiring diagrams, both schematic and physical, showing how to connect up the extremely simple 5-meter "pigmy" Transmitter are given above, together with the coil data.

SHORT WAVES and

ANOTHER DANDY TRANSMITTING OUTFIT

Here's a whale of a transmitter; it's owned and operated by W5AUA, Stocker Sturgeon, Stigler, Oklahoma. We hope to receive many more photos of amateur transmitting and receiving stations.

Editor, SHORT WAVE CRAFT:

In answer to your request for station photos, here's mine.

I now have my first-class radiotelephone broadcast license. I am also a "talkie" moving-picture operator. I am figuring on entering some engineering school soon but cannot do so at the present time, due to lack of finances. This same transmitter is still in use at W5AUA and going strong, as it has been for nearly a year.

STOCKER STURGEON,
W5AUA.
Stigler, Okla.

(Some outfit, W5AUA, and Stigler should be proud of this dandy short-wave station and its owner and operator. Congratulations on your attainment of a first-class radio-telephone broadcast license. We hope you will be able to realize your ambitions to enter an engineering school at an early date.—Editor.)

SHORT WAVE SCOUTS

Trophy Cup Contest

● A handsome silver trophy, standing 22½ inches high, was illustrated and described on page 393 of the November issue, together with the various conditions and rules for entering our new SHORT WAVE SCOUT contest. The first contest closed November 1. One of these handsome silver trophies, designed for us by a leading New York silversmith, will be awarded each month and the winner will be announced in the following issue of SHORT WAVE CRAFT, the winner's name to be hand engraved on the silver trophy. 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 phone stations! Address all entries to SHORT WAVE SCOUT AWARD, 98 Park Place, New York City.

OUR A.C. 2-TUBE DOERLE WINS!

Editor, SHORT WAVE CRAFT:

I have built the Doerle 2-Tube A. C. set described by George W. Shuart and it is the "sweetest" little set I have ever heard! With the results I have obtained so far there is nothing that set can't get! I want to add another audio stage to it using a 47 tube. I strongly recommend this set to anyone.

EDWARD McGRATH,
424 E. 139 St.,
Bronx, N. Y.

(We are glad to hear that you had such fine results with the "A. C. 2-Tube Doerle" receiver described by Mr. Shuart. You will find numerous circuits published in past issues wherein the connections were given for a 47 tube, and which you can easily adapt for use with the "2-tube A. C. Doerle."—Editor.)

HE LIKES OUR FICTION!

Editor, SHORT WAVE CRAFT:

Well, here's where I "kick in" with a snapshot of my station and the "OM" himself—that is, what you can see of him.

My rig is, of course, the famous "haywire" brand consisting of a 47 crystal oscillator, 46 doubler and a 210 final stage, with 65 watts input. The receiver is another home made product; I call it the "Blurpodyne." It is a 58 R.F. 24 detector, 27 audio, and 47 audio.

I've been buying SHORT WAVE CRAFT for a year now steady, and I think it's a pretty fine magazine or I wouldn't buy it —Hi! I personally think the short-wave stories are the "Berries" and would like to see one in each issue.

HANK EVANS. W6HBG,
137 Palm Court,
Santa Maria, Calif.

(Glad to hear that you like our "short-wave fiction" and that you think our stories are the "berries," Hank. We have been seriously thinking of running a short-wave story in each issue but so far we have been scattering them, so as to have one appear in about every other issue and while we have had many thousands of letters commending us on the short-wave stories that we have published, we are not quite convinced that all of you boys would like to see a story in every issue. However, you can rest assured that as soon as we feel certain that the majority of our readers want short-wave fiction monthly, we will give it to them, as SHORT WAVE CRAFT is "your" magazine, and not the editor's.—Editor.)

Hank Evans tuning in a "DX" call at his transmitting and receiving station, W6HBG.

LONG RAVES . . . OUR READERS' FORUM

HATS OFF AGAIN TO THE "DOERLE"!

Editor, SHORT WAVE CRAFT:

I bought my first issue of SHORT WAVE CRAFT quite a while ago, a way back in January, 1932, to be exact. What a break for me, because that issue contained the world famous "Doerle" receiver. Anyhow I constructed it, after reading of the wonderful results obtained by others—and it worked right off the bat!

The first station received was W1XAZ and since I made it all kinds of stations have been "logged." Here are some of them: KKZ, KWU, KEZ, VE9GW, W9XF, W8XK, W1XAZ, W1XAL, VE9JR, WOO, WMI, WMA, WEF, W3XAU, W2XE, GBU, GSH, GSB, EAQ, W4XB, XPE, HKC, PSH, PCV, and others too numerous to mention. I have pulled in "hams" from Canada, Mexico, Venezuela and nearly every state in the Union. Also, I have received about 300 stations in the broadcast band! Quite a few were "logged" late at night or early in the morning. That Doerle set is sure a winner on the short waves and broadcast! I have been using 201A's in it and would not exchange it for a "full-fledged" *all-wave* superhet. My aerial at the present time is a single wire running north and south 175 feet long and the lead-in is on the northern end.

GERALD E. NEARHOOD,
Cedar Rapids, Nebraska.

(Hot stuff, Gerald, and we are tickled pink that you found the "Doerle" receiver such a great "DX" getter. You have rolled up a mighty fine "log" and it is apparent also that you have learned the trick of how to tune in the distant stations. You are to be complimented, especially in view of the fact that you have also heard about 300 broadcast stations with your "Doerle" receiver; your log is all the more intriguing in view of the fact that you have been using "nothing stronger" than 01A's. —Editor.)

IT'S THE BERRIES!

Editor, SHORT WAVE CRAFT:

Just a line to let you know how much I enjoy and appreciate your SHORT WAVE CRAFT.

It's the Berries! Nuff sed!

A. SMITH.

P. S. Your fiction stories are OK.

(We are glad to hear from another booster for our "short-wave fiction," and if we receive many more recommendations as strong as yours, A. S., we will surely "hop to it" and give you a story a month.—Editor.)

AN "A1" LISTENING POST

Editor, SHORT WAVE CRAFT:

I have been reading every issue of your excellent magazine, SHORT WAVE CRAFT from cover to cover since the May, 1932 issue and it receives my vote as the best S.W. "mag" in the market.

In answer to your request for S.W. listening stations, I am enclosing two photos of my "rig" (myself included) and here is the "dope."

In the center of the table is the receiver which I constructed; a 3-tube regenerative set using '01-A tubes and which, after some experimenting, developed into an excellent "DX" receiver. On the receiver is the SHORT WAVE LEAGUE globe and behind it on the wall the "world map."

The speaker is on the extreme right with the letter "M" on the grille. In front of this are the five coils covering 19 to 215 meters (also constructed at home). On the left and right of the receiver are the two "mags" which I consider indispensable to the "Ham," Listener, or Experimenter.

I am a "listener" now, but soon expect

MR. DOERLE WINS AGAIN!

Fernand Maybarduk of Brooklyn, New York, has a dandy station and he has accumulated "some" log of distant stations in all parts of the world; he did it with his "Doerle" circuit.

MR. DOERLE WINS AGAIN!

Editor, SHORT WAVE CRAFT:

I have put off writing this letter so many times that at last I feel it is my duty to take my hat off to SHORT WAVE CRAFT and Walter Doerle.

Mr. Doerle certainly has two fine circuits there. After building both his two- and three-tube receivers, I find they more than live up to your claims. Yessir, they "percolate"!

The following is my "log". Every station listed has been written to and none is listed that could not be verified.

GSA—England
GSB—England
GSD—England
GSE—England
GSF—England
GSG—England
DJA—Germany
DJB—Germany
DJC—Germany
DJD—Germany
HJ1ABB—Colombia
HJ3ABD—Colombia
HJ3ABF—Colombia
HJ4ABE—Colombia
HJP—Colombia
YV1BC—Venezuela
YV3BC—Venezuela
YVQ—Venezuela
HCJB—Ecuador
Prado—Ecuador
XETE—Mexico
Rabat—Morocco
VK2ME—Australia
VK3ME—Australia
I2RO—Rome, Italy
EAQ—Madrid, Spain
XIG—Mexico
VE9GW—Bowmanville, Canada
VE9DR—Montreal, Canada
VE9JR—Winnipeg, Canada
VE9DE—Sault Ste. Marie
VE3AQ—Woodstock, Ontario
VE3H—Toronto, Ontario
VE2DX—Montreal, Canada
TI4NRH—Costa Rica
K4SA—Porto Rico
HBL—Switzerland
HBP—Switzerland
GBZW—S. S. Berengaria
Pontoise, France
W1XAU—Boston, Mass.
W1XAZ—Boston, Mass.

(Continued on page 504)

to be a full-fledged "ham", as I have built the *Beginner's Transmitter* described by Leonard Victor on page 270 of the September issue of SHORT WAVE CRAFT.

I would be glad to correspond with either amateur operators or listeners and will answer all letters.

WILLIAM B. BYRD,
Millerton, N. Y.

(Fine business, William, and we hope to receive many more photos of such excellent short-wave "listening posts." In these days when 6000 to 12,000 mile "DX" reception is a common occurrence you are wise indeed to have a globe in your station. We wish you every success with the "Beginners Transmitter" described in the September and October issues by Mr. Leonard Victor. You should be able to reach out in fine shape with this well-designed transmitter. —Editor.)

William B. Byrd of Millerton, N. Y., has had very fine receiving results with his 3-tube regenerative set.

WORLD-WIDE SHORT-

Ultra-Short Waves in the Air

(From Wireless World, London, England.)

● THE wavelengths below 10 meters are becoming increasingly interesting to short-wave enthusiasts abroad, as we have pointed out a number of times in this department.

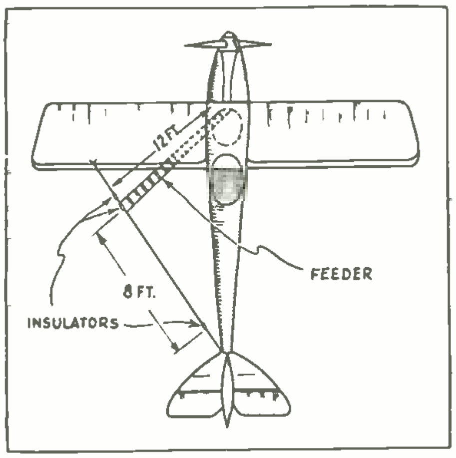
A recent issue of *Wireless World* described a transmitting unit which was used in tests on a wavelength of about 5 meters, for phone and C.W., the entire transmitter being contained in a small plane.

On Saturday evening, July 8th, a short test flight was made around Croydon, during which signals from the plane were received at great strength on the ground, but with a good deal of interference from the engine and rush of air in the slipstream from the propeller. This was later reduced by correct shielding of the transmitter, engine and all supply leads.

The modulating unit on the plane transmitter consisted of a standard solid back microphone coupled through a suitable transformer to a Marconi LP2 tube, driving through a Class "B" transformer, two Mazda PD220 tubes in parallel.

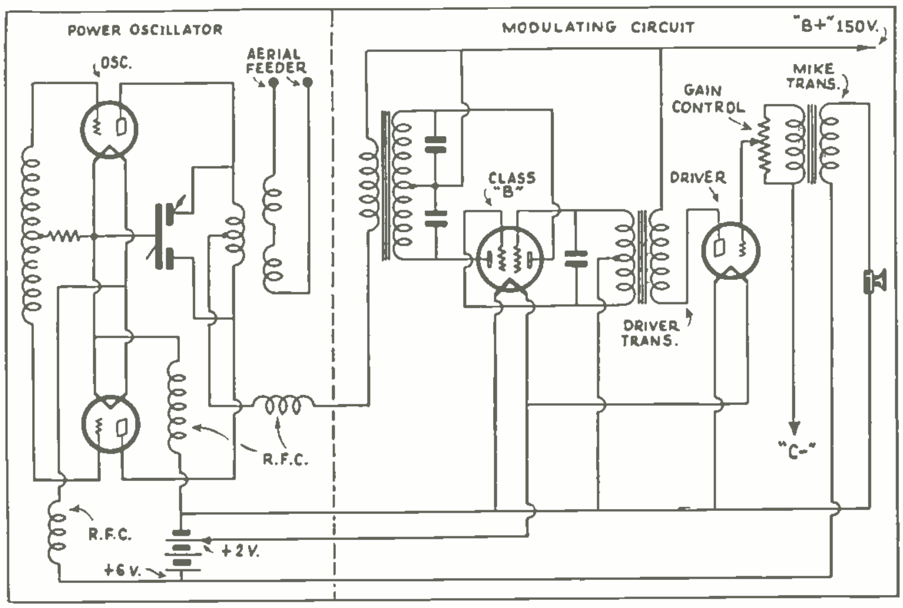
The oscillators drew a current of 50 ma. at 150 volts and a special output transformer for the Class "B" stage was built to conform with the above-mentioned characteristics. The oscillator tubes were some of the old Ediswan type PV625A which have been found to be ideal low-power oscillators.

The oscillator unit is normally quite separate from the modulator and can be mounted, if desired, in the middle of the antenna system and fed with current through a three-way cable. The antenna of G6SM's plane transmitter consisted of a half-wave radiating portion fed through a three-quarter wave double-feeder wire, mounted as shown in the illustration.



Feeder system and antenna used on the plane.

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



Circuit diagram of complete 5-meter phone and C.W. transmitter used on airplane.

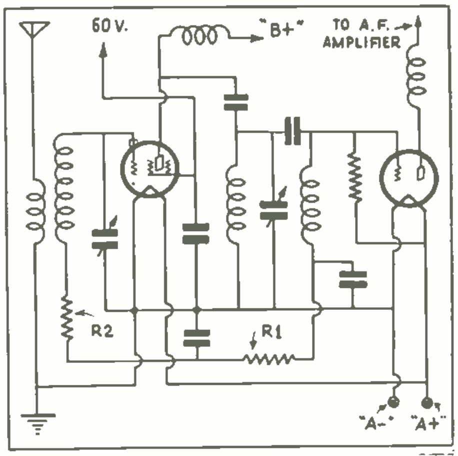
The circuit diagram of the complete transmitter is shown, also. The push-pull oscillator is on the left, while the Class "B" modulator is at the right. It will be noted that the tubes mentioned above are not available in U.S., but other types may be substituted.

A.V.C. for Short Waves

(From Amateur Wireless, London, England.)

● SEVERAL writers in English radio magazines have been advocating the use of Automatic Volume Control methods for short-wave receivers, and while the full benefits of A.V.C. cannot be realized with the average short-wave set, still the detector cannot be overloaded by strong local stations, when it is used.

While no values are available for the circuit shown, as it was presented as an experimental circuit diagram, still the general idea of the system will be readily apparent to the experimenter, who can substitute available parts to try it out. *(A.V.C. is not recommended for "C.W." code reception.—Editor.)*



Automatic volume control circuit.

Notes on Ultra-Short Wave Radiation

(From La Radio per Tutti, Milan, Italy.)

● IN a résumé on the most popular types of oscillators for ultra-short wave communication, *La Radio per Tutti*, an Italian radio magazine, points out several circuits which are interesting and have features that are novel to the American reader.

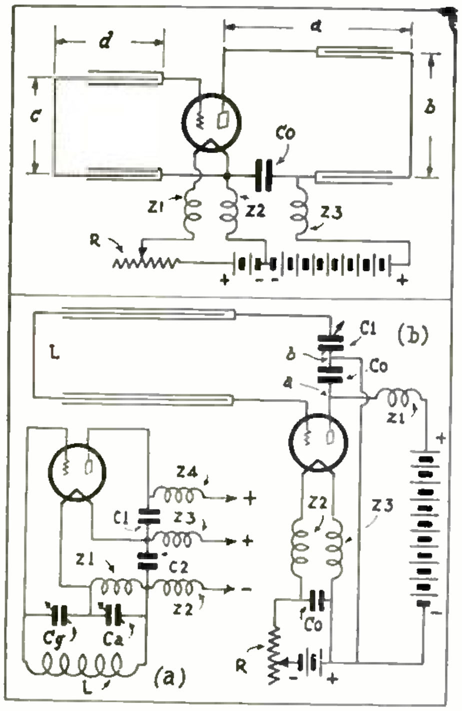
Van der Pool Circuit—This circuit is of the tuned-plate type, derived from an ordinary feed-back circuit in which reactive coupling between grid and plate circuits is obtained by means of the inter-electrode capacity of the tubes.

With ordinary tubes having a high degree of vacuum, waves of 3.65 meters were obtained with a good transmitting efficiency at 3.75 meters.

The oscillating circuits consisted of rectangles of wire which could be lengthened by telescoping (approximately 15 inches in length). By lengthening or shortening these rectangles, the wavelength may be varied; in fact, it regulates the two oscillating circuits which possess no other capacity but that mentioned and the inter-electrode capacity of the tube. The blocking condenser Co has a rating of 300 mmf.

Southworth Circuit—This circuit may be classified as a tuned-grid arrangement as compared to the tuned-plate arrangement of the Van der Pool circuit. This consists of the well-known circuit shown at A in the illustration, which permits reducing the wavelength to 10 meters, the capacity of Ca and the internal capacity of the triode

WAVE REVIEW . . Edited by C. W. PALMER



Ultra short-wave circuits from the Italian excerpt—"La Radio per Tutti."

producing a variable oscillating circuit instead of the fixed circuit as shown.

The variable oscillating circuit consists of a rectangle which can be lengthened by telescoping the brass tubes. In one of the sides of this rectangle is inserted a tube having the grid connected directly to one terminal of the inductance and the anode (plate) to another terminal across two condensers placed in series, one fixed and the other variable. See "B."

The wavelength depends mainly on the size of the circuit. In order to obtain minimum wavelengths ranging from 1 to 10 meters, the sides of the inductance were approximately 6 and 4 in. respectively with the internal capacity of the tube approximately 5 mmf. The blocking condenser Co had a capacity of 150 mmf.

Class "B" Adaptions

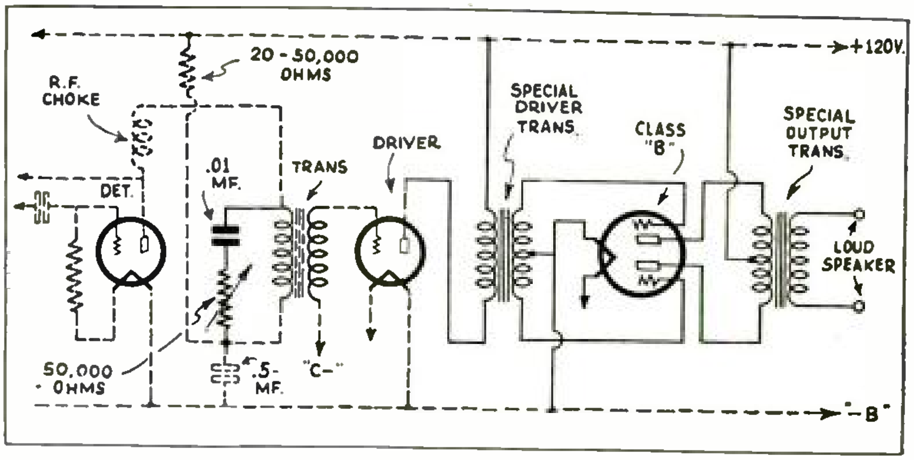


Diagram showing how old style amplifier circuits can be converted into Class "B" system.

● A RECENT issue of *Wireless World*, London, England, gives some pointers on converting existing sets to use class "B" power amplification.

When dealing with such sets, especially if they use a small power tube, the most convenient plan will be to convert this output tube into a *driver*. Following this general plan, the extra parts needed will be the special driver transformer, the class "B" tube, and a transformer designed for the class "B" tube to match the speaker.

In order to prevent undue emphasis of high notes, a tone control must be used. This can take the form of the conventional series resistance and condenser across the input of the power transformer, but perhaps might better be inserted before the driver stage, as shown in the illustration.

With regard to the driver transformer, it is a matter of importance that its ratio should be suitable for operating with the type of driver tube actually employed.

A 15 Watt Crystal Transmitter

(From Radio-Ref, Paris, France)

● *RADIO-REF* describes a very interesting amateur transmitting station for radio telegraphy and telephony, constructed by M. Grossin, F8RJ. The amplifier is at the left part of the diagram. V2, a crystal controlled tube is mounted in the usual manner. Resistor R6 regulates the voltage on the plate of this tube and it will be noted that the initial source of plate supply is 600 volts.

Tube V2 controls the output of V1, the screen-grid tube. The screen grid of V1 is connected through resistors R2 and R3, connected in parallel to the "B" supply voltage.

The modulating unit is situated on the right hand side of the diagram. It consists of an ordinary Class "A" amplifier. The control tube V4 is a screen-grid tube giving a high voltage amplification. The grid bias of V4 is supplied by rheostat R11. The plate voltage of V4 is furnished by the normal voltage passing through R7. The screen-grid of this tube is connected through potentiometer R8 and R9, tapping H.T. (plate supply).

Tube V3 is a modulating tube, the grid of which is controlled by V4, through condenser C8. M2 measures the current through the plate circuit of V3.

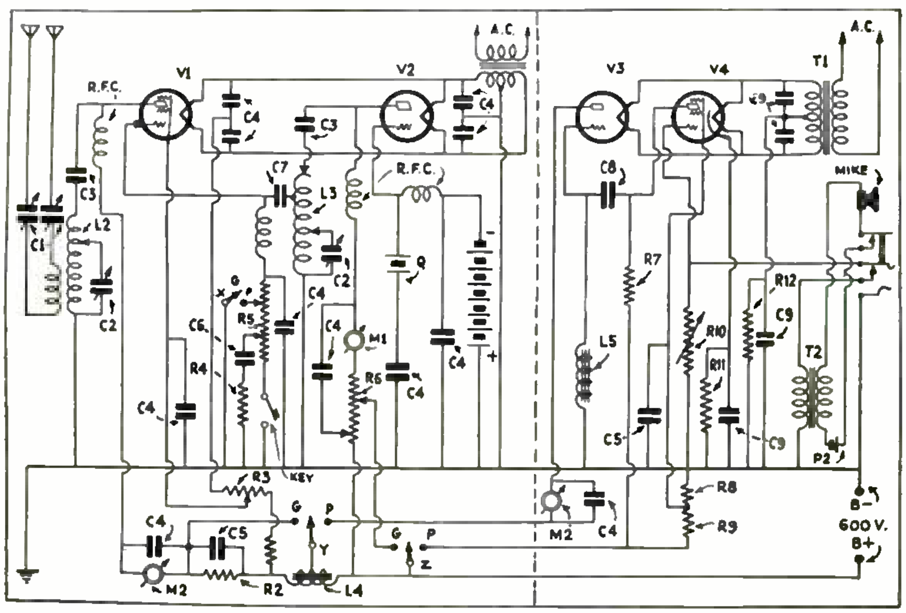
Operation: The oscillating circuits L2C2 and L3C2 are equipped with coils for 40 or 80 meters, corresponding to the band selected. It will be noticed that the wavelength at the quartz crystal and the final stage is the same. The tuning condenser of the crystal stage, C2 is operated to the minimum deviation of M1, so that C2 of the amplifier stage is tuned to resonance.

It is interesting to "hams" in U. S. to note what is being done in other countries in the line of new developments in transmitters. It will be noticed that this transmitter corresponds closely to some used in this country.

As the diagram shows the set is A.C. operated and a doublet antenna is employed, tuned by the two condensers C1. The microphone is labeled MIKE. T1 is the usual heater transformer; T2 is the microphone transformer.

Music from Transmitting Aerials

● VERY few readers will have stood near a transmitting aerial and heard music or speech coming from the aerial, without the use of a wireless receiver. Instances of such direct radiation of sound, however, are by no means uncommon, and most radio engineers have, at one time or another, experienced this apparent phenomenon. The explanation is simple, however, says *World-Radio*, London. If an arc or electrical discharge occurs across an insulator, for example, the surrounding air will be heated; the amount of heating will depend on the strength of the current, and will therefore vary with the modulation of the carrier wave. Sound waves will be set up in the air by the expansion and contraction produced by the variations in heat, and the electric arc thus acts as a loudspeaker.



A 15 watt crystal-controlled transmitter.

SHORT WAVE LEAGUE

HONORARY MEMBERS

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

No "Code Test" Says He!

Editor, SHORT WAVE CRAFT:

Just why some of the amateurs should make all the shouting over the "code-less" license proposition on 5 meters, is not quite clear to me.

Some wit once remarked the following: "It is said in the Bible that the meek shall inherit the earth. No wonder. for in the condition it is now, no one else would have it."

I think the same could be applied to the 5-meter band! However, with some constructive experimenting by the technically-minded, rather than CW-stricken amateurs, the 5 meter band may amount to something more than a place to burn out old 201A's! JOHN A. KIRK, W3CRB,
80 meter "CW" station.
Woodlawn, Md.

A Good Argument for "No Code" Exam

Editor, SHORT WAVE CRAFT:

To the larger percentage of "dyed-in-the-wool" amateurs I must seem just another bum too lazy to "pound brass," because of the fact that I uphold the platform of the SHORT WAVE LEAGUE, particularly the abolishment of the code test for operators of phone transmitters below six meters. To my thinking, the above hot-headed amateurs are so conceited and selfish because of the fact that they think they should have been given advantage of "no code" test below six meters at the time they began the game.

If considerable sane thought is given to the ultra short wave "no code" question, any thought that enters our mind which opposes the change can be disregarded. because there is a sensible answer to counteract it. For instance, practically all who oppose the "no code" test regulation uphold their belief upon the fact that the band would soon be "cluttered" up to such an extent that the signals would be indistinguishable. This would be true in regards to the other amateur bands, but when the 5-meter ultra short wave band is considered, we must remember that the signal cannot carry such a great distance. thus confining the transmitter to a small area.

I hope that the Federal Radio Commission will soon take some action regarding the "no code" test question in favor to the platform of the SHORT WAVE LEAGUE.
MILTON A. FELDNER,
1624 Spain St..
New Orleans, La.

Learning the Code Easy!

Editor, SHORT WAVE CRAFT:

For the past few months I have been reading of the arguments of our so-called future "hams" in regards to abolishing the code examination on five meters.

I never knew that radio had such "jelly fish" characters. These nit-wits want to get everything from radio, but not give anything in return. We all owe it to the rest of the "ham world" to be able to understand their language. There are about 40,000 licensed hams. All had to pass their code test. Are any of these fellows more brilliant than our complaining brothers? These fellows worked hard for their "tickets" and derive pleasure from holding them. What fun would they have if they got their tickets for nothing. which is all it is if nothing is required of them which demands a little intelligence. The written exam is not hard for anyone.

As yet I am not a licensed ham, but I do know the code enough for a ticket, and the code was not hard. Learning it killed the monotony of my everyday life. My YL (young lady) certainly is proud of my being able to read code. I happened to pass a ham's house. I gave him a CQ on my auto horn. A second later another CQ came, this one for me! A ham was following in his car. Needless to say a pleasant QSO followed, no doubt fellow motorist thinking we were crazy. Was my YL pleased? Oh Boy, Oh Boy! She is now learning it too, so that if I ever encounter any YLs on the road she will know what I am talking about, hi, hi!

In regards to the phone bunk. A good CW Xmtr is essential for phone operation. This holds true whether it is five or eighty meters. Who wants to go on the air with a 1920 phone transmitter in the year 1933? No self-respecting ham would.

So, fellows, learn your code, and get some fun out of life. This is good training for future jobs, especially if they are disagreeable. Learning the code gives you a great superior feeling over your more dumb friends. What is more, you will have your neighbors guessing what is going on, which is darn good psychology nowadays. Well, 73 to all, and remember, *learn the code!*
Don Meissner,
Haledon, New Jersey.

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.

1 Year Probation Scheme

Editor, SHORT WAVE CRAFT:

For some time a great deal of space has been given over to the arguments for and against the code exam in order to obtain a Ham "ticket," in the League's publication, SHORT WAVE CRAFT. At present most of the arguments seem to be in favor of the negative.

Most of the fellows who are in favor of the abolition of the exam do a lot of talking and that is about all. They do not even state their ideas on the subject.

For myself, being on the affirmative side, I do seriously consider some radical changes necessary in the method of obtaining an operator's license, in order to keep in accord with the times. To the man interested purely in phone operation the code test may be placed in the same class of assets as boxing gloves to a man with the itch.

What the League really needs to do is work together and form a plan sensible enough for the FRC to consider. While my ideas on the subject are probably "not so hot" here they are:—

1. No examination of any sort. (Below six meters.)
2. A one year probationary period during which time the "Would-be-Ham" must prove his ability to operate a transmitter.
3. Members of the League who are known by that body to be reliable (preferably licensed Hams) are appointed under the supervision of the FRC to act as "traffic cops" for this band. Several Reps. are selected from each district and report to the Inspector of that particular district.
4. During the one year's probation if the "Would-be-Ham" proves capable of operating a transmitter skillfully and efficiently. and without causing interference the local League Representative may send him a temporary or permanent QRT or QRV.
5. After one year's successful operation of a transmitter the "Would-be-Ham" is made a member of the "Gang" and given a six meter phone ticket.
6. At any time after he has received his license, if the "Would-be-Ham" (now a full fledged member of the Frat), causes interference or commits other misdemeanors he may be sent a temporary QRT or QRV by the local League Rep., such as the Rep. may see fit, or his license may even be revoked by the District Inspector.

As I said before this is not as good as it might be, but possibly it may serve as a starter for really worth-while ideas.

Clifford O. Field,
Fair Haven, N. Y.

SHORT WAVE STATIONS OF THE WORLD

SECTION ONE

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

The November, 1933, issue (copies mailed for 25c) contained a very fine list of police, airport and television stations, which was marked "Section Two." This will reappear in the January issue with the latest corrections and additions. Section One (this month's list) will be published again in the February issue, also with last minute changes. **Note: Stations marked with a star (★) are the most active and easily heard stations and transmit at fairly regular times.**

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

Around-the-Clock Listening Guide

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

From daybreak to mid-afternoon, and particularly during bright daylight, listen between 13 and 22 meters (21540 to 13000 kc.).

To the east of the listener, from about noon to 10:00 p. m., the 20-35 meter will be found very productive. To the west of the listener this same band is best from about midnight until shortly after daybreak. After dark, results above 35 meters are usually much better than during daylight. These general rules hold good whether you live in the United States or in China.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

18970 GAQ
-C- 15.81 meters
RUGBY, ENGLAND

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

18680 GAX
-X- 16.06 meters
RUGBY, ENGLAND

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

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

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

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

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

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

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

18040 GAB
-C- 16.63 meters
RUGBY, ENGLAND

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

17780 kc. W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
Bound Brook, N. J.
12:30-6:30 p. m., exc. Sat. and Sun. Relays WJZ

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

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

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

17300 kc. W8XL
-X- 17.34 meters
DAYTON, OHIO

17300 kc. W6XAJ
-X- 17.34 meters
OAKLAND, CALIF.

17300 kc. W9XL
-X- 17.34 meters
ANOKA, MINN.

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

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

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

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

16270 kc. WOG
-C- 18.44 meters
LAWRENCEVILLE, N. J.

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

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

15490 kc. J1AA
-X- 19.36 meters
Mornings
JAPAN

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

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

15270 kc. ★W2XE
-B- 19.65 meters
COLUMBIA BROAD. SYS.
Wayne, N. J.
10 a. m.-Noon

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

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

15200 kc. ★DJB
-B- 19.73 meters
ZEESEN, GERMANY
7:55 a. m.-4:30 p. m.

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

15120 kc. ★HVJ
-B- 19.83 meters
VATICAN CITY
Rome, Italy
Daily 5:00 to 5:15 a. m.

15120 kc. J1AA
-C- 19.83 meters
TOKIO, JAPAN
Irregular, early morning.

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

(Time Given is Eastern Standard Time)

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

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

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

14440 kc. GBW
-C- 20.78 meters
Rugby, England

14440 kc.
-C- 20.78 meters
RUGBY, ENGLAND

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

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

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

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

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

12850 kc. W2XCU
-X- 23.35 meters
AMPERE, N. J.

12850 kc. W9XL
-X- 23.35 meters
ANOKA, MINN.,

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

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

12820 kc. ★CNR
-B, C- 23.38 meters
DIRECTOR GENERAL
Telegraph and Telephone
Stations, Rabat, Morocco
7:30 a. m., Sunday

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

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

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

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

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

11880 kc. ★FYA
-B- 25.25 meters
"RADIO COLONIAL"
Pontoise, Paris
11:15 a. m.-1:15 p. m.

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

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

11830 kc. ★W2XE
-B- 25.36 meters
COLUMBIA BROADCASTING
SYS., Wayne, N. J.
2:00-4:00 p. m. Relays WABC

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

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

11760 kc. ★DJD
-B- 25.50 meters
ZEESEN, GERMANY
10 a. m. to 6:15 p. m.

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

11730 kc. PHI
-B- 25.57 meters
HUIZEN, HOLLAND

11720 kc. ★VE9JR
-B- 25.6 meters
WINNIPEG, CANADA

11705 kc. ★FYA
-B- 25.6 meters
"RADIO COLONIAL"
Pontoise (Paris)
3-5 p. m.; 6-11 p. m.
Daily

11695 kc. ★YVQ
-C- 25.65 meters
MARACAY, VENEZUELA
(Also broadcasts occasionally)

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

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

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

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

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

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

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

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

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

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

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

10000 kc. ★EAQ
-B- 30 meters
TRANSRADIO ESPANOLA
Alcala 43-Madrid, Spain
(P. O. Box 951)
5:30-7:00 p. m. daily

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

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

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

9870 kc. J1AA
-X- 30.4 meters
TOKIO, JAPAN
4-7 a. m., irregularly

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

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

9675 kc TI4NRH
-B- 31 meters
HEREDIA, COSTA RICA,
10-11 p. m.

9640 kc. HSP2
-B- 31.10 meters
BROADCASTING SERVICE
Post and Telegraph Department
Bangkok, Siam
9-11 a. m., daily

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

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

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

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

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

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

9580 kc. ★HBL
-B- 31.32 meters
League of Nations
GENEVA, SWITZERLAND
5:30-6:15 p. m., Saturdays

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

9560 kc. ★DJA
-B- 31.38 meters
REICHSPOSTZENTRALAMT
11-15 Schoenberge Strasse
(Berlin)
4:30-9:15 p. m., Germany

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
Schenectady, N. Y.
Relays WGY programs
6:45 p. m.-1 a. m.

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

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

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

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

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

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

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

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

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

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

8650 kc. W2XCU
-X- 34.68 meters
AMPERE, N. J.

8650 kc. W8XAG
-X- 34.68 meters
DAYTON, OHIO

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

8450 kc. PRAG
-C- 35.50 meters
PORTO ALEGRE, BRAZIL
8:30-9:00 a. m.

8036 kc. CNR
-B- 37.33 meters
RABAT, MOROCCO
Sunday, 3-4 p. m.

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

7880 kc. J1AA
-C- 38.07 meters
TOKIO, JAPAN

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

7799 kc. ★HBP
-B- 30.47 meters
LEAGUE OF NATIONS,
GENEVA, SWITZERLAND
5:30-6-15 p. m., Saturday

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

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

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

7150 kc. HJ4ABB
-B- 41.6 meters
MANIZALES, COLOMBIA
Sat., 11 p. m.-Midnight

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

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

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

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

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

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

6660 kc. F8KR
-B- 45 meters
CONSTANTINE, ALGERIA

6610 kc. REN
-B- 45.38 meters
MOSCOW, U. S. S. R.
5-6 p. m., Tues., Thurs., Sat.

6425 kc. W9XL
-X- 46.70 meters
ANOKA, MINN.

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

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

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

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

6270 kc. HKC
-B- 47.81 meters
BOGOTA, COLOMBIA
8:30-11:30 p. m.

6243 kc. HKD
-B- 48.05 meters
BARRANQUILLA, COLOMBIA

6250 kc. ★CN8MC
-B- 48 meters
CASABLANCA, MOROCCO
Monday, 3:00-4:00 p. m.
Tuesday, 7:00, 8:00 a. m. and
3:00-4:00 p. m.

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

6147 kc. ★VE9CL
-B- 48.8 meters
WINNIPEG, CANADA
7:00-9:30 p. m.

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

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

6122 kc. ZTJ
-B- 49 meters
JOHANNESBURG, SOUTH AFRICA
11:45 p. m.-12:30 a. m., ex. Sat.; 4-7 a. m., 9 a. m.-3:30 p. m., ex. Sun; 9 a. m.-4:45 p. m., Sat. only; 8-10.30 a. m., 12:30-3 p. m., Sun.

6120 kc. ★W2XE
-B- 49.02 meters
COLUMBIA BROADCASTING SYS.
Wayne, N. J., 6:00-11:00 p. m.

6120 kc. ★YV1BC
-B- 49.02 meters
CARACAS, VENEZUELA
10:30 a. m.-1 p. m.; 5:15-10:00 p. m., nightly

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

6110 kc. VUC
-B- 49.1 meters
CALCUTTA, INDIA
9:30 a. m.-12 noon, except Fri. and Sat.

6100 kc. ★W3XAL
-B- 49.15 meters
NATIONAL BROADCASTING CO.
Bound Brook, N. J.
Relays WJZ programs
Saturday, 3:30 p. m.-12 midnight

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

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

6090 kc. ★VE9GW
-B- 49.22 meters
BOWMANVILLE, ONTARIO, CANADA
Mon., Tues., 7-11 a. m., Thurs., Fri., 3-7 p. m.; Sat., 3-11 p. m.; Sun., 11 a. m.-8 p. m.

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

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

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

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

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

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

6060 kc. VQ7LO
-B- 49.50 meters
IMPERIAL AND INTERNATIONAL COMMUNICATIONS, Ltd.
Nairobi, Kenya, Africa
11 a. m.-2 p. m.

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

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

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

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

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

6020 kc. DJC
-B- 49.83 meters
ZEESEN, GERMANY
7:00-9:15 p. m.

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

6005 kc. VE9CU
-B- CALGARY, CANADA
Irregular

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

6000 kc. ★RW59
B 50 meters
RADIO MOSCOW, U. S. S. R.
2:00-5:00 p. m. daily

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

5900 kc. HJ4ABE
-B- 50.80 meters
MEDELLIN, COLOMBIA
Mon., 7-11 p. m.; Tues., Thurs., Sat., 6:15-8:00 p. m.; Wed. and Fri., 7:30-10:30 p. m.

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

5835 kc. HJ1ABB
-B- 51.40 meters
BARRANQUILLA, COLOMBIA
Daily, 8-10 p. m.; Thurs., 8-10:30 p. m.

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

5690 kc. FIQA
-B- 50.1 meters
ADMINISTRATION DES P. T. T.
Tananarive, Madagascar
Tues., Wed., Thurs., Fri., 9:30-11:30 a. m. Sat. and Sun., 1-3 p. m.

5550 kc. W8XJ
-X- 54.02 meters
COLUMBUS, OHIO

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

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

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

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

4795 kc. W9XAM
-X- 62.56 meters
ELGIN, ILL.
(Time signals.)

4795 kc. W3XZ
-X- 62.56 meters
WASHINGTON, D. C.

4795 kc. VE9BY
-X- 62.56 meters
LONDON, ONTARIO, CANADA

4752 kc. WOO
-C- 63.10 meters
OCEAN GATE, N. J.

4753 kc. WOY
-C- 63.1 meters
LAWRENCEVILLE, N. J.

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

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

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

4273 kc. WOY
-C- 70.22 meters
LAWRENCEVILLE, N. J.

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

3256 kc. W9XL
-X- 92.50 meters
CHICAGO, ILL.

3076 kc. W9XL
-X- 97.53 meters
CHICAGO, ILL.

2342 kc. W7XAW
-X- 128.09 meters
FISHER'S BLEND, INC., Fourth Ave. and University St.
Seattle, Washington

1560 kc. W1XAU
-X- 199.35 meters
BOSTON, MASS.

A Word of Explanation About S. W. Schedules

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

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

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

When To Listen In

By M. HARVEY GERNSBACK

● W2XE at Wayne, N. J., now operates as follows daily: 11 a.m.-1 p.m. on 15270 kc., 3-5 p.m. on 11830 kc., 6-11 p.m. on 6120 kc. They relay the programs of WABC of the C.B.S. in New York.

* * *

W3XAL at Bound Brook, N.J., now operates on 17780 kc. daily except Saturday from 2-8 p.m. and on Saturday on 6100 kc. from 4 p.m.-1 a.m. (Sunday).

W3XL also at Bound Brook has no regular schedule but operates irregularly on 6425 kc. on Friday from 4 p.m.-1 a.m. (Saturday). All 3 relay WJZ of the N.B.C. in N.Y.City.

* * *

During November VK2ME, at Sydney, Australia, will operate each Sunday on 9590 kc. as follows: 1-3 a.m., 4:30-8:30 a.m., 9-11 a.m. During December from 1-3 a.m., 5-9 a.m. and 9-11 a.m.

OXY at Skamlebak, Denmark, relays the Copenhagen station daily on 6075 kc. from 1 p.m. till anywhere from 5-8 p.m., depending on the closing hour of the Copenhagen station. OXY has a power of 500 watts.

* * *

YV3BC at Caracas, Venezuela, now operates as follows: daily on 6134 kc. from 10:30 a.m.-1:30 p.m. and 4:30-9:30 p.m. On Sundays 8:30 a.m.-noon, 3-6 p.m. and 7:30-9:30 p.m. They also operate on 9510 kc. daily from 9:30-10 p.m. and on Sundays from 9:30-10:30 p.m.

* * *

HI1A, "La Voz del Yaque," at Santiago de Los Cabelleros, Dominican Republic, C. A. operates on 6272 kc. daily from 8-8:30 a.m., 12:30-1:30 p.m. and 8-9 p.m., with 7½ watts power.

From Europe there come reports of a new Russian broadcasting station at Moscow, operating in the vicinity of 25 met. (meters). The call of the station is RFN. It operates on 12020 kc. or 24.96 met. According to the Berne Frequency list of stations it is a commercial telephone station engaged in telephone service. However it apparently is being used for broadcasting service. It relays one of the large Moscow stations. Its exact schedule (if any) is unknown but it seems to be on the air around 4-6 p.m. Reports of reception will be welcome together with further information.

* * *

From Wm. S. Vincent, a seaman of Suffolk, Va., comes the information that VUC at Calcutta, India, broadcasts in English on about 48 met. (actually 6109 kc.) as

(Continued on page 492)

SHORT WAVE QUESTION BOX

IMPROVING THE "DOERLE"

John J. Riley, Philadelphia, Pa.

(Q) Will you please give me your opinion as to whether or not it is advisable to add another stage of audio amplification to the "3-tube Doerle Electrified?" (Described in the August issue.)

(A) Very good results can be had by adding another stage of audio to the 3-Tube Doerle. This should give very fine speaker volume.

(Q) Can the two tuning condensers be ganged?

(A) There is no reason why the two condensers cannot be ganged. If they were it would be necessary to use a small tuning condenser as a trimmer in parallel with the tuning condenser of the R. F. stage, for best results.

ADDING R.F. STAGE

W. F. Bertram, San Francisco, Calif.

(Q) I have been an ardent reader of your magazine for the past three years, and find it very interesting. I wish to avail myself of the opportunity of taking advantage of your offer in the *Short Wave Question Box*, by asking the following question: I have constructed a two-tube Doerle from your magazine, and wish to add a stage of R.F. or T.R.F., whichever is preferable, also a stage of audio, which will give loud-speaker results on this set. I would also like your recommendations concerning a short-wave set which is adaptable to short-wave broadcast only.

(A) We are very pleased to learn that you are constructing the 2-tube "Doerle" receiver. We suggest that you consult the August, 1933, issue of SHORT WAVE CRAFT in which you will find the 3-tube Doerle receiver using a stage of tuned R.F. ahead of the detector. The same method employed in the 3-tube set can be used in adding a stage of T.R.F. to your present receiver. For very high audio output we suggest that you add a 2A5 pentode, making four tubes in all. The pentode, of course, will have to be coupled to the speaker through a suitable output transformer.

ADDING "AUDIO" STAGE

Edward McGrath, Bronx, N. Y.

(Q) I have built the *A. C. Doerle* in the July issue of SHORT WAVE CRAFT and could not praise it enough. It sure is some "sweet" little set. I have pulled in London, Germany, and others, and have not gone hunting yet. I would like to add another stage of audio using a 47, and use an R.C.A. magnetic speaker.

(A) We were very pleased to hear that you have had such very fine results with

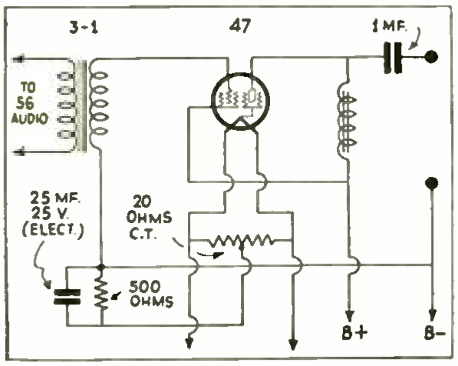


Diagram of a 47 audio amplifier to be added to the Doerle A.C. receiver.

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

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

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

the *2-Tube Doerle Receiver*. Your idea of adding a pentode to the present line-up should work out very nicely and very good results can be expected. Your R.C.A. speaker will work O.K. with the 47 output tube providing you have some sort of coupling unit. We would suggest that you use an output choke and condenser arrangement. The diagram is shown elsewhere on this page.

DUNSMORE CIRCUIT

J. Lemeister, Harvey, N. Dak.

(Q) I would like to have information regarding the construction of the coils used in the "Dunsmore Consuello Falcon," described on page 215 of the August issue of SHORT WAVE CRAFT.

(A) Regarding the Dunsmore Consuello Falcon receiver, the main point that is brought out in this set is the form of the hook-up or connections. The regular coil and condenser data given for other sets may be used with it, without in any way detracting from the efficiency and results which Mr. Dunsmore obtained.

PUSH-PULL TRANSMITTER

R. Gargatagli, Casalmaggiore, Cremona, Italy.

(Q) Please publish circuits of push-pull, or other transmitters using the two-wire feeder system.

(A) We suggest that you consult the September and following issues of SHORT WAVE CRAFT magazine for transmitting circuits and information. We are running a series of articles on transmitters for the beginner and we feel sure that you will find all the information you need contained in these various articles. For names, calls and addresses of various *amateur* stations we suggest that you consult the *Radio Amateur Call Book Magazine;* address and publisher's name furnished upon receipt of stamped and addressed envelope.

"STEAM NOISE" AND CAUSE

S. Saniuk, Danbury, Conn.

(Q) I have just built a 3-tube set and when I turn up the regeneration control it delivers a very loud noise similar to escaping steam. At this point the volume is pretty good but the noise makes it unpleasant to listen to any station.

(A) From what you state we believe you have too great a number of tickler turns and you are getting a super-regenerative effect in your receiver, which may account for the very loud noise which you refer to as "sounding like steam escaping." We suggest that you remove tickler turns until the detector tube just oscillates. This should eliminate the trouble you have had.

MODULATED OSCILLATORS

Sam Oxman, Bronx, New York.

(Q) I would like to have a hook-up for a 247 pentode used to modulate a Hartley oscillator employing a 245 tube.

(A) Modulated oscillators are no longer permitted by the Federal Radio Commission. We suggest that you discard your idea and consult recent issues of SHORT WAVE CRAFT magazine in which were described different types of short-wave transmitters which will come within the government regulations.

VOLTAGES FOR DOERLE RECEIVERS

J. Feintuch, Brooklyn, N. Y.

(Q) I have a "B" eliminator adjusted for use with the Atwater-Kent 20 Broadcast receiver. I wish to use this eliminator with the 3-tube Doerle battery set. I need 135, 90, 67, and 45 volts. Can you give me the arrangement for getting these voltages?

(A) The voltages used on the Atwater Kent No. 20 are 45, 67, 90, and 135. Your eliminator being adjusted to these voltages should prove to be very satisfactory when used in conjunction with the Doerle receiver.

MR. LACEY'S TRANSMITTER

W. E. Bremer, Jr., Houston, Texas.

(Q) What is the value of the tank condensers used in the article by Robert Lacey, "A 30 Watt Transmitter Made From a Receiver," which appeared in the August 1932 issue of SHORT WAVE CRAFT?

(A) The capacity of the plate tuning condenser used in Mr. Lacey's 30 watt transmitter is .0005 mf.

160 METER TRANSMITTER COIL

Gerald Brown, Jersey City, N. J.

(Q) Please give me the coil dimensions for the 160 meter amateur band on the "Flea Power Transmitter" described in March 1933 issue of SHORT WAVE CRAFT.

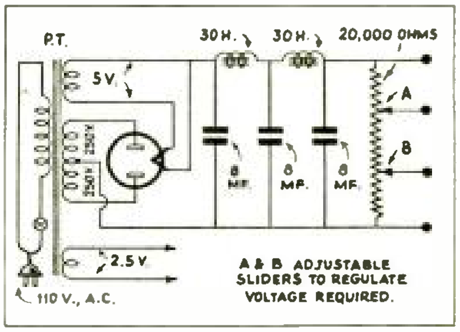
(A) The size of the coil for the 160 meter band for the "Flea Power Transmitter" described in the March issue of SHORT WAVE CRAFT is 25 turns of No. 14 enameled wire, wound on a 2¾ inch bakelite tube with turns spaced the diameter of the wire. It will be necessary to tune this coil with a .0005 mf. condenser.

RECEIVER POWER SUPPLY

Seymour Greenburg, Bronx, N. Y.

(Q) Will you please publish a diagram of a power-pack using a 280 or similar tube which would deliver power to any receiving set with two or more tubes?

(A) The power-supply unit shown in diagram on this page can be used to operate almost any type short-wave receiver requiring the voltages specified.



Power supply using 280 rectifier tube, to be used with S-W receiver.

Daventry, England S-W Hub of the Empire

(Continued from page 457)

wave station is every whit as perfect in design as those other models of symmetry, the B.B.C. regional stations.

The vistor's glance at once picks out the trim little transmitter building forming the hub of the Empire broadcasting service, from which there radiates the network of feeder lines leading to the scattered "arrays," five in number, which cover the whole Empire.

A tour of the station naturally begins at the transmitter building. This consists of three distinct portions; a central block containing the transmitting hall, control rooms and offices, and two wings, one of which houses the motor-generators, switchboards and sub-station equipment, and the other the valve water-cooling plant, boiler room and stores.

In the Transmitter Hall

The two transmitters face each other from opposite sides of the main hall, as seen in the inset picture. Along the south end of the hall is the power switchboard. The two control desks in the centre complete the visible equipment and the whole bears a striking resemblance to a miniature regional station. An extraordinary spick and span effect is given by the duraluminum cubicles, of which there are four for each transmitter. The front panels are of polished black slate screened at the back from the transmitter components, by duraluminum sheets.

To ensure the highest possible degree of frequency stability, each master oscillator tube is controlled by a quartz crystal, separate crystals being employed for each wavelength used. It is impracticable to grind crystals to such a size that they will oscillate at the very high frequencies employed by the transmitter, and for this reason the crystals used have a much lower natural frequency; the required frequency is obtained by means of a series of frequency-doubling stages.

The Empire station uses the well-tried system of modulation at low power. The output of the first transmitter unit is therefore a completely modulated carrier wave, suitable for transmission, but of insufficient power. Stage by stage the power is amplified on the push-pull principle, the first amplifier employing two 2 k.w. tubes, the second two 10 k.w. tubes, and the final amplifier four 15 k.w. tubes. All these tubes are water-cooled. The output of the last stage is taken to a special aerial charging panel mounted above each transmitter which carries the terminals of the various aerial feeder lines.

The modulation of the two transmitters is adjusted to peak at 90 per cent., which the B.B.C. engineers consider as providing the maximum practicable efficiency consistent with a satisfactory linearity of response.

Power is supplied to the station from the power station at Northampton, twelve miles away. There is a sub-station on the Daventry site, fed from an 11,000 volt 50 cycle three-phase power line, and this is connected to the station mains by a 300 K.V.A. transformer.

Apart from the high tension D.C. supply to the first and the main power amplifier, which comes from a six-phase rectifier with a D.C. output of 10,000 volts 6 amperes, all the power supplies for the transmitters are provided by the motor-generators in the transmitting building. There are twelve of these machines, which are divided into three groups, two of which are used at one time, the third acting as standby plant.

Efficient Coil Switch in Midwest-16

(Continued from page 462)

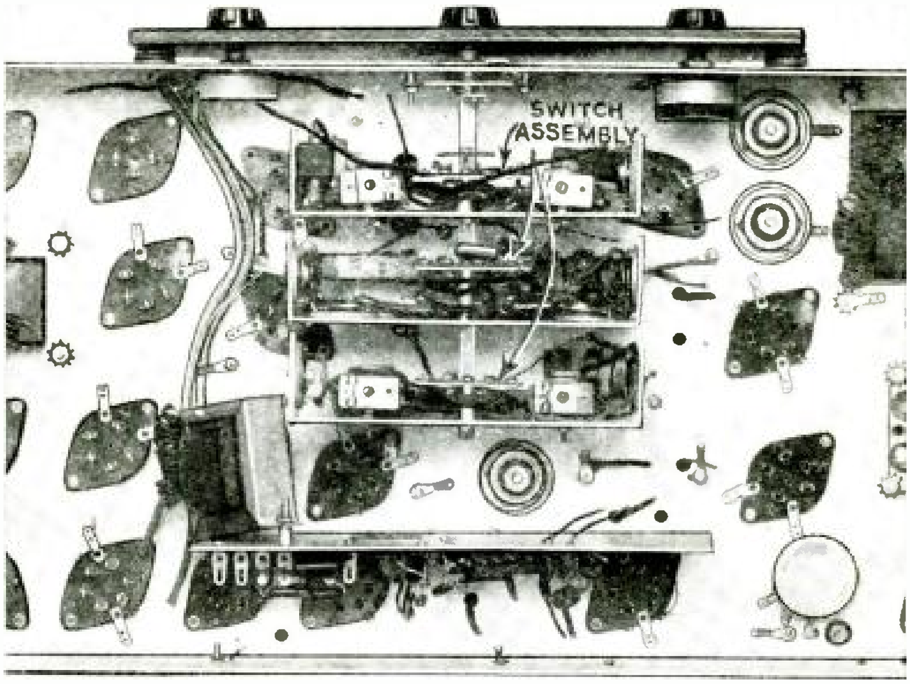


Fig. 3. Bottom View of Midwest 16 Tube "All-Wave" Receiver, showing coil change switch.

plated pole-pieces, and silver-plated contact fingers. The bakelite supporting ring may be very satisfactorily mounted to the shield plate by means of screws and tubular spacers.

This supporting shield plate "B" is the result of many experimental models. Over three hundred sets were built with hand-made plates before dies were designed. Difficulties encountered during this hand-made production were gradually eliminated, and finally "one-shot" dies were made for high speed production. The finished die-made plate is shown in the upper part of the picture, and some of the handmade plates are shown in the lower part of the picture. It will be noticed that there are apparently some holes that are not used in every plate.

The cut-away portion, at the left side of the plate, (Q) is necessary in order that the plate may not touch the radio frequency sockets over which it extends as a shield. A portion of this cut-away is turned back as a foot to hold the plate upright. The plate is secured to the bottom of the rear chassis by means of flattened screws. Fig. 4 shows a close-up view of the entire assembly.

Improved Coil Design

The first designs of this plate were enormously large, inasmuch as they contained coils several times as large as those now used. The final design of these coils is the result of extensive research and engineering endeavor in an attempt to decrease the size of the coils and, if possible, to raise the efficiency. In this work, several facts were developed leading toward increases in efficiency. It appears that there is an optimum diameter for every value of inductance, assuming a constant size of wire and type of winding. In our tests, we have assumed 10 strands of No. 41 enamel wire grouped into a Litzendrat silk covered cable, and a "lateral" type of winding. This optimum size for the American broadcast band (D) appears to be one-half of one inch. Therefore, in this particular band, an actual increase in efficiency was attained. In the band covering from 1500 k.c. to 4100 k.c. (C), the efficiency appears to be practically the same on a ½" diameter as on a 7/16" diameter. In the European band (T), ranging from 150 to 375 kc, the efficiency is slightly lower on a ½" dowel than it would be on a ⅝" dowel, but size does not permit the use of this large dowel. The results obtained in an air test do not indicate that it will be necessary to make any changes.

In studying the M band (S), which ranges from 4,100 kc to 11.7 megacycles, the optimum size of wire for ½" dowel was found to be No. 31 wire, close-wound, and exceedingly great efficiency is obtained with this coil. This efficiency is far in excess to any previous coil developed, and an air test shows this to be a fact.

In studying the efficiency of the "H" band (R), which ranges from 11,700 kc to 33 megacycles, it was found that the efficiency of the coil itself was of very little importance on account of the very necessary losses in the bakelite tube base, the bakelite sockets and the bakelite supports in the variable condenser and in the switch. These tests were therefore confined to practical air tests and the coil constants were varied until best results were achieved. A coil diameter of 5/16 (R) was found to be a great improvement over the larger coils due to a great increase in coupling.

Trimming Condensers Mounted on Coil Terminals

The necessary trimming condenser (E and G), padding condensers (Y), by-pass condenser (F), and isolating resistors (H) were easily mounted in the small space allotted. The trimming condensers are mounted directly on their own coil terminals. A great increase in efficiency at the high frequency end of every band is obtained by such short connections.

These compact assemblies thus give much greater efficiency and also permit the use of the entire gain available. The sensitivity is not limited by any oscillation difficulties. No feed-back energy can penetrate to the small coils and switches so well shielded by these plates.

It will be noted by referring to figure 3 that the R.F. (radio frequency) sockets are partially covered by the switch assembly. This is in order that the leads may be as short as possible and also to

(Continued on page 488)

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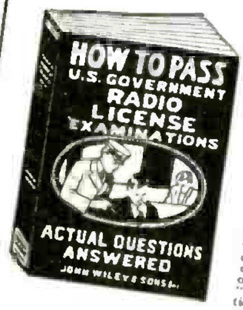

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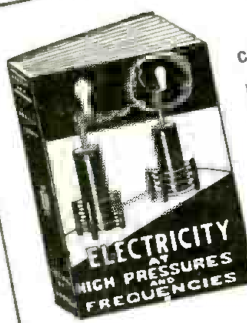

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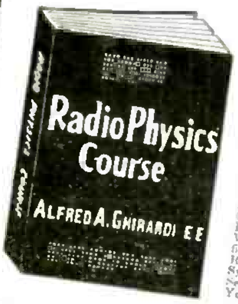

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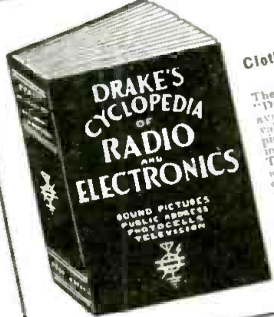

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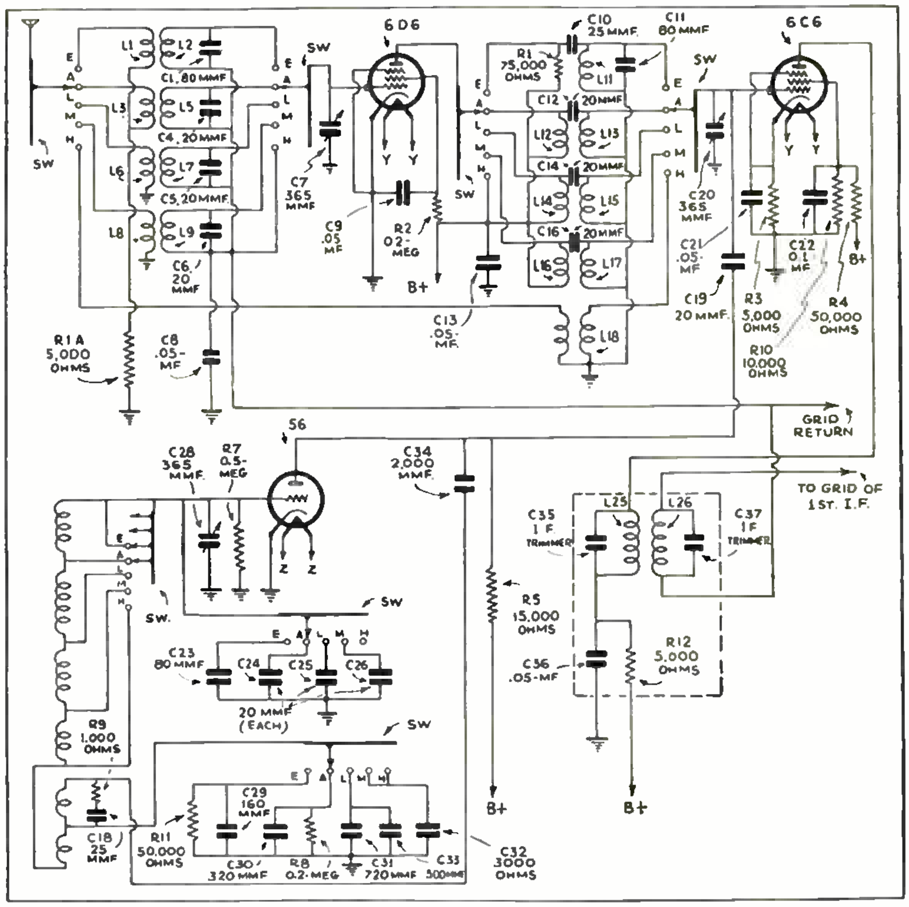
Efficient Coil Switch in Midwest-16

(Continued from page 486)



Midwest-16—How coils are connected to "band-changing" switch.

provide shielding for the "hot" prongs and leads. Further shielding to prevent radiation from the third I.F. (intermediate frequency) and detector is provided by placing these stages behind a shield plate, upon which is mounted all "hot" audio generation resistors and automatic volume control generators.

It is a novel feature of this assembly that all adjustments of the oscillator and R.F. coils are completed before the plates are assembled into the completed radio. Thirty tests and adjustments are made to limit the frequency range. Fifteen tests are made for efficiency, and thirty for sensitivity before passing a matched set of plates.

From every standpoint this switch assembly has proven efficient, economical and trustworthy.

"Shoe-Button" Tube Receiver

(Continued from page 468)

by a standard audio frequency amplifier and reproduced through a regular dynamic speaker. The accompanying sketches clearly indicate the relative sizes and placement of the various parts used in the demonstration. The entire 4-tube, 1-meter receiver was small enough to be easily held in one's hand, the over-all length being approximately seven inches. This receiver was a hand-constructed unit and one of the most compact sets of its class and to all appearance there seemed to be room to incorporate one or two more tubes. This demonstration surely proved that if enough experimenters devote some of their time to the development of the *ultra short waves* and its required apparatus, it will only be a very short time before regular communication is being carried on at these ultra high frequencies.

5-Meter "Pigmy" Transmitter

(Continued from page 475)

of it! The antenna system used was all but the best for this type of work. It consisted of a single 8 foot rod with four foot feeders which is O.K. but it was lying on the floor of an attic not over 20 feet above the earth. So with a good antenna system this set should get out as well as any of the more elaborate types using approximately the same power.

Now let's go back to the type 19 mentioned in the first part of this paper. It can be seen at a glance that this tube should be the ideal thing for portable work when used in the arrangement here brought forth as the "Pigmy." Using the new light-weight "A" and "B" batteries, it should be possible to construct a very compact one-tube portable transmitter that will do the same work that many another set would when using about three times the number of parts and weighing at least twice as much, not to mention the considerably larger physical size. So go to it lads, and let's see just what can be done with these new tubes, along the line of portable sets working on the ultra high frequencies.

List of Parts

1—Variable condenser 50 or 100 mmf. Cardwell "Featherweight."
4—Standoff insulators, Johnson (Fleron; National).
1—'53 tube—(Arco, Gold Seal, Van Dyke).
1—Grid resistor (see text)
1—By-pass condenser, .5 mf. used only when grid resistor is used. Flechtheim.
1—Bypass condenser, .001 mf. For microphone (see text) Flechtheim.
6—Binding posts
1—Base-board (wood) 6x10 inches.
1—Microphone and stand. Universal.

Practical Measurement of Ultra-Short Waves

(Continued from page 469)

tem. These positions, it will be noted, *are half a wavelength apart.*

Consider now the voltage and current distribution a little more closely. At points such as a-d, a¹-d¹, the voltage is a maximum and the current zero, so that the effective impedance between the wires is infinite; so that to indicate voltage maxima along the wires they would have to be bridged by a voltmeter of infinite impedance (practically, a neon tube or other high resistance indicator may be used).

Now at points such as b-c, b¹-c¹, current is a maximum and voltage is zero, so that to indicate the current maxima along the wires, they would have to be bridged by an ammeter of zero impedance (practically, a thermal ammeter, milliammeter or microammeter, of as low resistance as possible may be used).

A more convenient and accurate method, however, is to connect the instrument at the end of the system, remote from the coupling coil (Fig. 4-B). The system is tuned to give a maximum reading in M. To carry out the measurements, the wires are then bridged by a plain wire or strip and the distance apart at which either maximum or minimum readings on M are obtained are noted. With reference to Fig. 4 for the measurements of wavelengths between 1 and 5 meters, the following dimensions will be found suitable: Wires of No. 16 or 18 B. & S. bare copper, at least 5 meters long (16.5 feet long). Distance apart about 1½ to 2 inches, strictly parallel and stretched taut. Coupling circuit—L1, 1 or 2 turns of heavy wire about 2 inches in diameter. C 25 to 50 micro-microfarads.

The Absorption Wavemeter

There is no difficulty in constructing wavemeters of the absorption type for the measurement of wavelengths down to about 1 meter. They have the advantage of providing the most handy method of measuring these short waves, but their calibration is somewhat tedious, as it has to be carried out "step by step" with the use of an auxiliary oscillator and Lecher Wire system.

The wavemeter normally consists of a small variable condenser of maximum capacity about 25 micromicrofarads, and a small coil of heavy wire. Perhaps the best form of the coil is the single-turn square, since it allows easy calculation of inductance and from its arrangement, of the probably inherent inductance of the condenser with which it is associated. The condenser would normally be connected in the center of one of the sides of the square (as shown in Fig. 5). For the coils the following dimensions are given with the approximate wavelength ranges covered:—

Single turn squares formed of No. 8 B. & S. gauge copper wire or ⅛ inch copper tube. Tuning capacity range 5 mmf. to 25 mmf.

Side of Square	Wavelength Range Approx.
10 cms. (4 in.)	5.37 to 3.10 meters
7 cms. (2.8 in.)	4.22 to 2.45 meters
5 cms. (2 in.)	3.38 to 1.95 meters
4 cms. (1.6 in.)	2.88 to 1.67 meters
3 cms. (1.2 in.)	2.49 to 1.44 meters

These figures allow for an inherent circuit capacity of 5 mmf. but not for the inherent inductance of the condenser. These values will be found to be fairly accurate for the sizes above 5 cm. but will not generally be very reliable for smaller sizes. In the case of the 3 cm. coil, this will ordinarily consist of an open-sided square, since the distance between the condenser terminals will usually be about 3 cm.—*From World Radio, London, Eng.*

The Victor 2-Tube Superheterodyne

(Continued from page 461)

Hints on Operating 2-Tube Superhet

Adjustment and operation of this set is very simple and requires very little experience. If the wiring diagram and the following directions are followed very carefully, no trouble should be found in getting the set to "percolate."

Check all wiring leads before applying any voltage to the set. Make certain that no error has been made in the connections and that all wires are soldered on firmly. Then connect up the filament and plate supply and connect a pair of phones to the "output" terminals. It will be best to make all adjustments with earphones. Connect the aerial and ground and plug in the 160 meter coils. The transformers are usually "peaked" at the factory so that it is fairly certain that some stations will be heard while tuning over the dial. If no station is heard, some device that produces interference, such as a buzzer or a fan, can be used to adjust the intermediate transformers. Leave the first I.F. condenser alone but adjust the other three for maximum volume. When this point has been reached put in some higher frequency coil and tune in a station. Of course at this point the noise-producing source, if one is used, should be shut off. When a station is located tune the I.F. trimmers until highest efficiency, or the loudest signal is heard. The condenser in the plate circuit of the first I.F. transformer should not be touched unless the frequency of the I.F. is to be changed to try and find a spot with higher gain.

Once the I.F. transformers are lined up, there is nothing to do but go to it and see how many continents can be heard. With a good location (and not a worse one could be picked than Mr. Mitchell's home in the city), a high aerial, or, if wanted, a doublet, there is no limit to what can be heard on this set. Tune very slowly because, as previously mentioned, the set is very sharp and you may pass right by a station without noticing it.

Results

"How does it work?" will be the inevitable question. A little synopsis of what was heard during a week's test will adequately answer that. On 160 meters, amateurs were heard as far west as Chicago. Also one Pacific Coast police radio station was logged. On 80 meters, phone stations all over U. S. and Canada were heard. Down on the 49 meter broadcast band, England, France, Italy, Germany and Sweden were heard.

The 30 meter band produced practically the same results, but with the addition of Rio de Janeiro. On good afternoons it was possible to get room-filling volume on the loudspeaker from all the European "locals." Needless to say "ham" stations were heard in abundance on all bands. For phone work this set is infinitely better than any regenerative job, and with the addition of a *beat oscillator* for code work, it will make a perfect set for the fellow who wishes a good receiver for his station, yet does not want to spend a young fortune or work a couple of weeks getting a "blooper" going.

All this reception was done with a 25 foot aerial between a second story window and a garage. We wanted to see what this set would do under the worst of conditions. To our immense satisfaction, it came through in grand style, with surprisingly low background noise, and plenty of sock. Those that have or intend putting up doublet aerials will probably get much better results. Remember that no matter how good a set is, it will only work as well as its aerial. Get the "skyhook" up as high as possible! If there is some particular station or direction in which best results are wished, point the free end of the aerial towards it. Likewise, a point that most of the fellows forget, a *good ground* is almost as important as the aerial. Sandpaper a clean place on a cold water pipe and affix a firm, solid ground clamp on it. Then run a heavy lead to the set and to the power supply, if one is used instead of batteries. If any hum is encountered, a center tapped resistor of 50 ohms, across the tube filaments, with the midpoint grounded, will usually clear it up. If the hum still persists, try a .006 mf. mica condenser connected between one side of the filament and ground. In our tests with both A.C. and D.C., however, we encountered no trouble from this source whatsoever.

Next month we hope to describe an audio amplifier, a beat oscillator for code reception, also a power supply for this set. Happy "DX" hunting, and let's hear how this job works.

Parts For 2-Tube Superhet

- Two sets of standard S-W receiving coils Na-ald (or equivalent).
- 1—2-gang .00015 mf. variable condenser National (Hammarlund).
- 1—.000015 mf. variable condenser (Trimmer), National (Hammarlund).
- 1—.00075 mf. fixed mica condenser.
- 2—.0001 mf. fixed mica condensers.
- 1—.00025 mf. fixed mica condenser.
- 1—.1 bypass condenser (Flechtheim).
- 2—3x0.1 mf. bypass condensers (Flechtheim).
- 2—465 kc. intermediate transformers, Gen-Win (Acratest, National, Hammarlund).
- 1—50,000 ohm, 1 watt resistor, Lynch (International).
- 1—250 ohm, 1 watt resistor, Lynch (International).
- 1—7,000 ohm, 1 watt resistor, Lynch (International).
- 1—30,000 ohm, 1 watt resistor, Lynch (International).
- 1—150,000 ohm, 1 watt resistor, Lynch (International).
- 1—350 ohm, 1 watt resistor, Lynch (International).
- 1—500,000 ohm, 1 watt resistor, Lynch (International).
- 1—20,000 ohm, 1 watt resistor, Lynch (International).
- 1—50,000 variable potentiometer, wire-wound. Acratest.
- 1—2A7 wafer socket. Eby, Na-ald.
- 1—6F7 wafer socket. Eby, Na-ald.
- 2—4 prong wafer sockets. Eby, Na-ald.
- 1—antenna ground strip. Eby.
- 1—phone output plug. Eby.
- 1—4 wire battery cable.

Na-ald Plug-in Coil Data

Meters Wave-length	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch	19 T. No. 30 En. Close wound (CW)	1/8"
80-40	23 T. No. 28 En. Wound 16 T. per inch	11 T. No. 30 En. C. W.	1/8"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	1/8"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	1/8"

Coil form—2 1/8" long by 1 1/4" dia. 4-pin base.

CORRECTION

On page 432 of the November, 1933 issue in the schematic wiring diagram the type 45 transmitter in the "Ham and Yeggs" solution, the grid and plate connections are reversed. The plate should be shown in the position now occupied by the grid and vice versa.

MORE DOPE on "5 and 10" Meter Sets in the NEXT ISSUE!

A Simple 10-Meter Phone Transmitter

(Continued from page 465)

very little difference in this case but slightly lower tube capacity results if connected as shown and the output does seem to be a little greater.

The final amplifier is not much different from most other final amplifiers. Two type 46's are used in push-pull with the grids connected together as in the usual Class B connection. L_2 and L_3 should be mounted with their axes at right angles to each other, to prevent coupling between them.

It has been brought to my attention by Mr. Bacon, W1BZR, that much better results are obtained on very short wavelengths, if the coupling condensers C_4 are connected about half way between the end and middle of the coil L_2, instead of at the ends as is usually done. A big improvement in operation is obtained by doing this very simple stunt.

Referring to the photograph of the transmitter, the 30 meter oscillator portion of the circuit is shown to the extreme left. The left-hand tubes are the type 59 master oscillators, while the tubes at the right are the type 46 Class C amplifiers. The tuned circuit in the middle is the ten meter plate tank of the master oscillator, while the tuned circuit at the right is the tank circuit of the Class C amplifier. The neutralizing condensers are mounted one on each side of the 46 tubes. *No antenna coupling apparatus is shown in the photo.* It will be noted that the 30 meter tuned circuit is wound rigidly on bakelite and securely fastened down to prevent vibration from producing an unsteady carrier. The other two tuned circuits are No. 12 solid wire wound "on air" as vibration of these coils will not produce an unsteady carrier.

With 300 volts the total plate current of the 59's should be about 90 milliamperes. The accelerator grid voltage should be between 150 and 200 volts. The output of the oscillator can be changed by changing this voltage, but it should not be made too high as the tubes will heat and *frequency drift* will occur.

The Matter of Bias

When first put into operation, grid leaks bias was used on the 46's instead of battery bias. A 5,000 ohm resistor was used in place of the C battery and it worked very well except that the plate current of the 46's would drift upward if the transmitter was run for several minutes, due probably to heating of the grid leak. A good way to check the excitation is to put a 5,000 ohm resistor in place of the battery and put a high resistance voltmeter across it. With the 46's loaded up to draw 100 to 120 milliamperes plate current at 400 to 425 volts, the voltmeter should read at least 45 volts. A slightly higher reading is not undesirable. Of course, if the plate voltage and load is removed this bias will increase, hence it should be measured under actual operating conditions. Grid leak bias is practical for 46 tubes because if you should forget to turn on the excitation stage before applying plate voltage to the 46's, the tubes will only draw about 15 milliamperes instead of "blowing up!" Without load on the amplifier, the plate current should read a minimum of around 20 to 30 milliamperes, when C_7 is tuned to resonance. When this circuit is *detuned*, the plate current should shoot up to over 150 milliamperes.

It is recommended that a Zeppelin type feeder system be used to couple this transmitter to the antenna although other types of antenna feeder systems can be used if handled carefully.

How to Neutralize

Neutralization is accomplished in the same manner as usual. Plate voltage is removed from the 46 tubes. Excitation is placed on the tubes, C_5 being tuned for minimum plate current. A flashlight, or preferably a thermo-galvanometer, is coupled closely to L_3 and C_7 is rotated until an indication is obtained. The neutralizing condensers C_6 are rotated together until the lamp goes out or no reading is obtained on the meter. The whole process is then repeated several times until the amplifier is fully neutralized. *The setting of the neutralizing condensers is critical and the whole process must be done very carefully.*

Modulation

The Class C amplifier may be modulated by any modulator system that delivers from 20 to 25 watts of audio power. In this case, modulation was obtained by using a pair of 46's in Class B running off the same power supply as the Class C amplifier. A circuit diagram of the modulator unit is given in Fig. 2. The complete modulator and speech amplifier equipment is shown in the photograph.

Another simple method of modulation is to use a pair of 250's with 600 volts on the plates, dropping the voltage to 400 volts by a dropping resistor which is by-passed by 2 mfd. or more.

One of the most important characteristics of any transmitter is "frequency-modulation." This characteristic of any phone transmitter is the change in the frequency of the carrier as the plate voltage of the Class C or modulated amplifier is varied by modulation from a minimum to a maximum.

Frequency Modulation

A rough measurement of the *frequency modulation* of this transmitter was made in the following manner: The transmitter was put into operation under normal operating conditions with the normal plate voltage on the Class C amplifier. The carrier was tuned in on a National FB-7 and the beat note was set on zero beat. The plate voltage was then removed or changed to zero volts as would be done on a negative modulation peak provided 100% modulation was being obtained. The change in pitch of the beat note was observed indicating the change in frequency on a negative modulation peak. The beat note would be changed in the opposite direction an equal amount by a positive modulation loop, which would double the normal plate voltage on the tubes. Therefore the change in frequency produced by reducing the plate voltage from normal to zero as indicated by the beat note in the receiver is doubled to give the actual frequency modulation. In this case, it was about 1.5 kilocycles. On ten meters this amount of frequency modulation should be no cause for worry.

A very simple but effective *monitor* for checking the quality of a phone transmitter has been described to me by Mr. Leonard, W1AUJ. It consists of a 27 or 56 tube connected up as a *diode rectifier*. The circuit diagram is shown in Fig. 3. The heaters are connected to a 2.5 volt supply, either A.C. or D.C. It is convenient to make these leads several feet long, so that the monitor can be moved around. The grid and plate are tied (connected) together and a pair of phones and a pick-up coil are connected between them and the cathode. This pick-up coil is untuned and can be three or four turns of wire two or three inches in diameter. This coil is coupled near the plate coil of the 46's and the exact character of the modulation can thus be checked.

This transmitter has been in use at W1FFR for nearly three months. The stations worked so far are W1BZR, W1CCX, W1BVL, W1DXD and W1KH. Good quality and strong, steady signals were reported in all cases.

It is hoped that many amateurs all over the country will awaken to the possibilities in our new ten meter phone band and will make full use of this new field for some "real thrills" and pleasure.

List of Parts for 10 Meter Transmitter

L1—12 to 14 turns on a 2" dia. form—No. 14 enamel wire spaced by its own diameter
L2 and L3—9 turns of No. 12 or No. 14 wire, self-supporting, with the turns spaced about ¼ inch. (dia. form 1½)
C1—National SE-90 (90 mmf. per section)
C2—.0001 mf. mica condenser
C3—.01 mf. mica condenser.
C4—.0001 mf. mica condenser
C5—National STD-50 condenser (50 mmf. per section)
C6—National STN-18 condenser (18 mmf. per section)
C7—National STD-50 condenser (50 mmf. per section)
R1—20,000 ohm, 1 watt resistor, Lynch
R2—12,000 ohm, 15 watt resistor, Lynch
RFC—National Type No. 100 R.F. Chokes. (2½ mh. each)
2—Center-tap resistors; 10 ohms each.
1—National microphone modulation transformer.
1—National type S-51 transformer.
1—National type BI, Class B, input transformer.
1—National type BO, Class B, input transformer.

When to Listen In

(Continued from page 488)

follows: Daily 10:21 a.m.-11:36 a.m., Sundays 12:21 a.m.-2:36 a.m. and at other times in other languages. The power is 300 watts. The address of the station is: Indian State Broadcasting Service, Calcutta Station, 1, Garstin Place, Calcutta, India.

* * *

EAQ at Madrid, Spain, on 10000 kc. now operates daily from 5:30-7:30 p.m. and in addition from 1-3 p.m. on Saturdays. This station is one of the best heard in the eastern U. S.

* * *

A letter from Amando Cespedes Marin, director of station TI4NRH at Heredia, Costa Rica, states that they transmit on 9680 kc. daily from 10-11 p.m. and also at 6 p.m. on Sunday.

* * *

HVJ at the Vatican City, Italy, has been heard sending test program recently from 10-10:30 a.m. on 15120 kc.

* * *

CT1AA at Lisbon, Portugal, is now back on 9600 kc. broadcasting Tuesday and Friday from 4:30-6 p. m.

* * *

In addition to the English broadcasts from RV59 at Moscow, on 6000 kc. mentioned last month in this column, they broadcast in various other languages daily from 2-6 p.m.

* * *

The British Stations at Daventry, England, now transmit as follows: Transmission 1 GSD, GSF 2:30-4:30 a.m.; Transmission 2 either GSG or GSF and also GSE 7-8:45 a.m. daily and 7:30-8:45 a.m. on Sundays; Transmission 3, GSF, GSE 9-11 a.m., GSE, GSB 11 a.m.-1 p.m.; Transmission 4, GSD, GSB 1:15-5:45 p.m.; Transmission 5, GSB and GSD or GSA 6-8 p.m.

* * *

PHI at Huizen, Holland, now broadcasts on 11730 kc. from 8:30-10:30 a.m. daily except Tuesday and Wednesday.

* * *

VE9GW at Bowmanville, Ont., Can., now operates on 6090 kc. Monday, through Thursday 3 p.m.-midnight, Friday and Saturday 8 a.m.-12 midnight, Sunday 12 noon-9 p.m.

* * *

It is reported that VQ7LO at Nairobi, Kenya, Africa, now operates Monday-Friday from 11 a.m.-2 p.m., Saturday 11 a.m.-3 p.m., Sunday 10:50 a.m.-2 p.m. and in addition on Tuesday from 3-4 p.m. and Thursday from 8-9 a.m. From other sources come reports that it operates daily from 11 a.m.-3 p.m. only. The transmitter operates on 6060 kc. Has anybody any information?

8 Meter Police Radio

(Continued from page 456)

mately 8½ meters. It was found that the active range could be fairly well controlled by changing the amount of power or watts used in the transmitter. The receivers on the cars are of a new simplified super-regenerative type using 4 tubes, and they include automatic volume control. One of the clever tricks resulting from the use of these new style police car receivers is that if the carrier wave fails, a hum is heard on the loud speaker in the police car, owing to the action of the automatic volume control in the receiving set. Thus the officers in the car are apprised of the fact at once that the transmitting station is "off the air." If this should happen at a regularly scheduled time period, one of the first assumptions would be that the receiver on the car was out of order and one of the officers would then procede to telephone headquarters from the nearest possible point.

In the Newark test the 8½ meter transmitter was located on the 36th story of a building located in the center of the city, the transmitter panel shown in the photo being located about 6 feet from a window. Feeder wires were carried out through the window and were suspended out over the cornice, up to a flag pole on the roof. The antenna used was a Hertzian doublet.

Police officials from all over Essex County, New Jersey, witnessed the demonstration tests given by Messrs. Godley and La Port and they were very enthusiastic over the remarkable showing made by these ultra short waves. It is interesting to note in passing that in the photo shown herewith Mr. Godley is seen in the act of giving actual police test messages over the 8½ meter transmitter, and he is not merely "acting" for the benefit of the camera man.

The Mitchell 7-Tube Super-het

(Continued from page 468)

The complete circuit is shown in figure one and you will note that there is no driver or first audio stage. This was not found necessary, as the original receiver brought in all of the major "foreign" short-wave stations with enough volume to be heard all over the house. However, in the event that you want to include a first audio stage in the circuit, the wiring diagram for this unit is shown in figure two and should be connected into the circuit at X in figure one.

Perhaps you may want to include a phone jack in your super, in this case the connections are shown in figure three, and can be connected into the circuit at X in figure one, or at B in figure two.

There is no filter choke used, as this function is performed by the speaker field, which can be from 1800 to 2500 ohms.

The power transformer is a 650 volt unit delivering 100 milliamperes. It also has a five volt winding for the rectifier, and a 2.5 volt winding for the other tubes.

Operating the Set

The adjustment and operation of the "All Purpose" Super is simple and requires hardly any experience. If you will follow these instructions you should have little or no difficulty in getting the set to operate perfectly right away.

Naturally, you should check all of the wiring and connections before you apply any of the voltages. Be particularly careful that all of the connections have been soldered correctly and that you have no "rosin joints." Then apply the filament voltage leaving the '80 rectifier out of its socket. After you are sure that the filament circuits are correct, insert the '80 tube in its socket and connect a pair of earphones to the output terminals, and then apply all of the voltages. Make all of the adjustments with phones.

Adjust the plate condenser of the first

intermediate transformer to about one-half of its capacity. Use an oscillator in making these adjustments. In the event that you have no oscillator, use some electrical appliance using a motor or a common door buzzer. Place this device very close to the set. You are now ready to proceed and adjust the other intermediate frequency transformers. The I.F. tuning condensers should be adjusted for maximum volume; in other words, rotate these condensers by means of a screw driver or neutralizing wrench to the left or right until the signal or noise in the phones comes to its loudest point.

When this has been done, tune the oscillator condenser until a hissing or rushing sound is heard. This will indicate to you that the oscillator is in tune with the intermediate frequency stages. You then disconnect the noise generating device. You are now ready to tune in a short wave station. When this has been done, adjust the I.F. trimming condensers again for best results. It should be noted that during this procedure, the plate condenser of the first I.F. transformer should NOT be changed or adjusted, therefore your adjustments should be made with the remaining five I.F. condensers.

Those of you that are "old timers" can pass this along, but you fellows that are just "breaking into the game" should read this three or four times and remember that the secret to a successful job is SHORT LEADS, complete shielding, and a clean wiring job. Take your time and do a neat job, not only will it look good but it will work well. Make your leads as short as possible and make them clean and ship-shape. Don't have HOT grid leads running all over the chassis. Be proud of your set, and remember that the more time and care that you put into the set the more fun and pleasure you will get out of it.

Alden 4-Pin Plug-In Coil Data

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

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

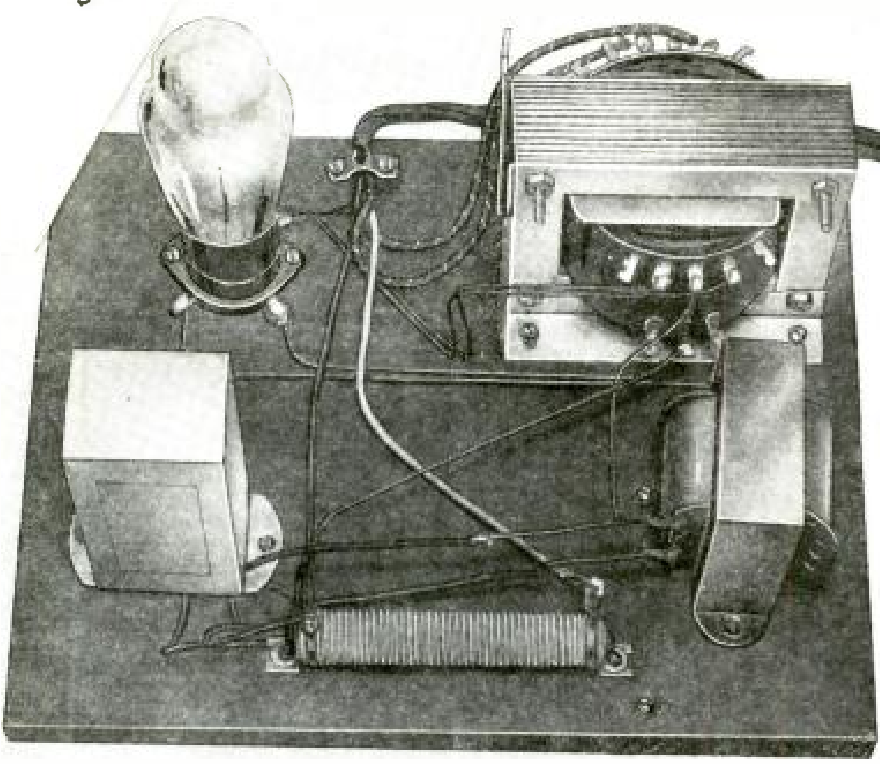
List of Parts

1—Chassis and Panel
1—Set Na-ald 2 winding, 4 pin S-W plug-in coils.
1—Set special 3 winding, 6 pin S-W plug-in coils.
5—Tube Shields, National (Hammarlund).
3—465 Kc. I.F. Transformers, National; (Gen.-Win; Hammarlund.)
1—2 gang .00015 variable condenser, National.

(Continued on page 498)

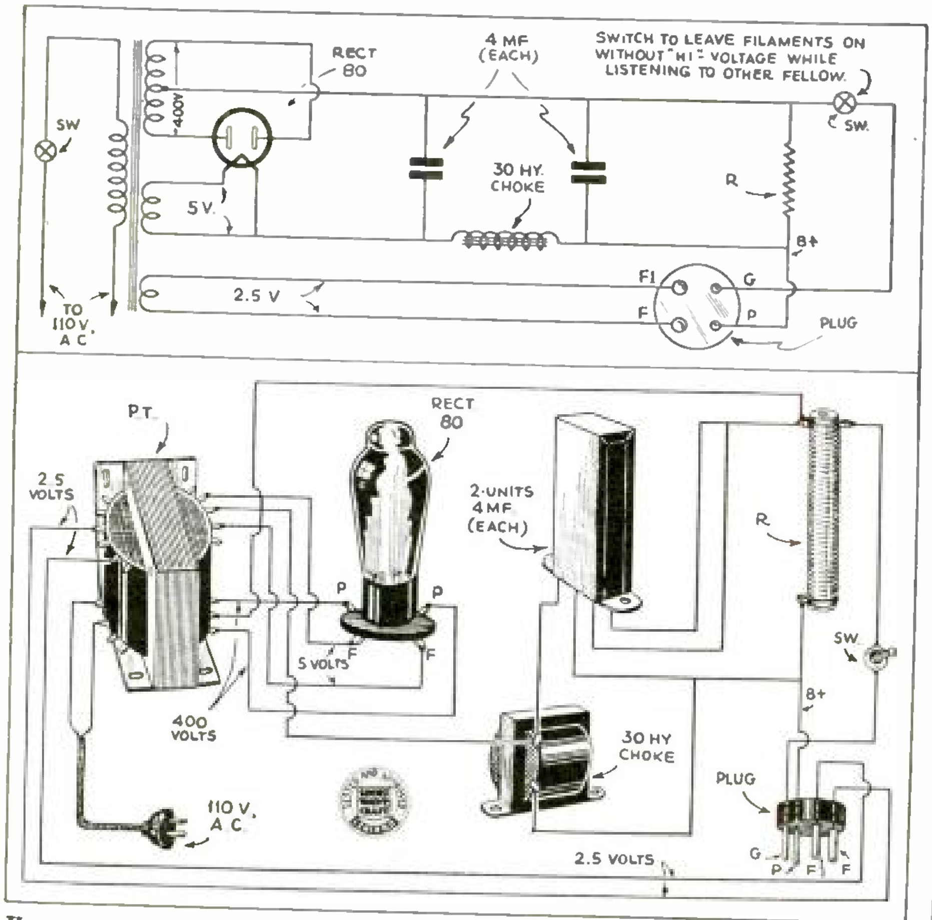
SHORT Amateur Transmitters

(Continued from page 471)



Appearance of the power-pack used with the Amateur Transmitter described this month by Mr. Victor.

is oscillating. The tube should draw only 20 to 25 mills, if a good crystal is in the holder. Now place the amplifier tube in its socket, but do not apply current. Remove the antenna coupling coil. Now tune the amplifier tank until there is a rise in oscillator current. Then adjust the little neutralizing condenser until the amplifier condenser can be moved all over its range, without causing a rise in the crystal cur-



Here are the simple wiring diagrams showing how to connect the essential parts used in building the power-supply unit for the Amateur Transmitter.

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OFFER NO. 2	Short Wave Craft $2.50; Radio-Craft 2.50	$5.00	$3.75
OFFER NO. 3	Short Wave Craft $2.50; Radio News 2.50	$5.00	$3.75
OFFER NO. 4	Short Wave Craft $2.50; Everyday Science and Mechanics 2.50	$5.00	$3.75
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OFFER NO. 12	Short Wave Craft $2.50; Pathfinder 1.00	$3.50	$3.00
OFFER NO. 13	Short Wave Craft $2.50; American Boy 2.00	$4.50	$3.50
OFFER NO. 14	Short Wave Craft $2.50; Motion Picture 1.50	$4.00	$3.25
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OFFER NO. 17	Short Wave Craft $2.50; Silver Screen 1.00	$3.50	$3.00
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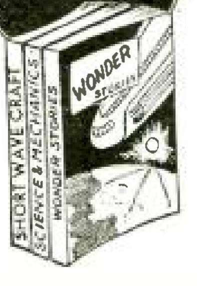
OFFER NO. 19	Short Wave Craft $2.50; Review of Reviews 3.00	$5.50	$4.25
OFFER NO. 20	Short Wave Craft $2.50; Nature 3.00	$5.50	$4.25
OFFER NO. 21	Short Wave Craft $2.50; Scribner's 4.00	$6.50	$5.25
OFFER NO. 22	Short Wave Craft $2.50; Physical Culture 2.50	$4.00	$3.25
OFFER NO. 23	Short Wave Craft $2.50; Boys' Life 1.00	$3.50	$3.00
OFFER NO. 24	Short Wave Craft $2.50; Pictorial Review 1.00	$3.50	$3.00
OFFER NO. 25	Short Wave Craft $2.50; Wonder Stories 2.50	$5.00	$3.75

Makes an Ideal Gift for Anyone



Perhaps there is some friend out of town, or right near you, to whom you wish to carry your remembrance throughout the year. Then here is a good idea. Send him his favorite magazine, or one you know he will thoroughly enjoy. (You can even send a magazine subscription to your best lady friend.) A subscription to a magazine is always appreciated, and certainly brings remembrances. A courtesy card advising your friend of the kind donor will be sent to him or her bearing your name. Send one or more popular magazines to your many friends or relatives.

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Christian Herald	College Humor
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Please send the .... to
(Name of magazine)

Name ....

Address ....

City .... State ....
Mention that it is sent by

....
(Print your name clearly)

Amateur Transmitters

(Continued from page 495)

rent. Now apply voltage to the amplifier, and a spot will be found where a flashlight bulb connected to a loop of wire and held near the amplifier tank coil, will light brightly. The amplifier should now be drawing about 20 mills. (M.A.) Connect the aerial and load it up by varying the coupling adjustment and the antenna series condenser until the set draws about 70 mills. Never draw more than that! For operating on either 80 or 160 meters the procedure is identical. If it is desired to use a 160 meter xtal on eighty meters, tune the oscillator on 160 meters and follow the procedure previously outlined with the exception of the fact that the amplifier coil is wound for 80 meters. It may be that it will not be necessary to neutralize when *doubling*, but a little experimental work with the transmitter going will show what gives best results. Remember that 15 minutes with the monitor will tell you a lot more than several hours asking questions over the air. The antenna used is the same as that described last month, a piece of wire 130 feet long, including lead-in, and a good *ground* connection. As always I will be glad to answer questions, provided a stamped, self-addressed envelope is enclosed. Cheerio, and hope you have plenty of good QSO's.

Parts List

1 Crystal (Harrison Radio)
1 Crystal Holder.
1 Crystal Mounting.
3 .00035 m.f. variable condensers; Harrison Radio Co., (National Hammarlund; Cardwell)
1 .00005 m.f. variable condenser; Harrison Radio Co. (National Hammarlund; Cardwell)
3 .002 mica condensers; Harrison Radio Co.
1 .0001 mica condenser; Harrison Radio Co.
1 50,000 ohm one watt resistor; Harrison Radio Co. (Lynch)
1 40,000 ohm one watt resistor; Harrison Radio Co. (Lynch)
1 20,000 ohm 25 watt resistor; Harrison Radio Co. (Lynch)
1 25,000 ohm one watt resistor; Harrison Radio Co. (Lynch)
1 40 ohm C.T. resistor; Harrison Radio Co.
2 125 M.H. R.F. chokes; Harrison Radio Co.
1 Eby 6 prong socket; Harrison Radio Co.
2 Eby 5 prong sockets; Harrison Radio Co.
2 Eby 4 prong sockets; Harrison Radio Co.
1 Power Transformer, Acratest
1 Dual 4 mf. Condenser, Acratest
1 150 M.A. 30 henry choke, Acratest
4 stand-off plug-in insulators, Harrison Radio Co. (Johnson, Fleron, National.)
Fahnestock clips; hardware, wire, coil forms, etc.

The Mitchell 7-Tube Super-het

(Continued from page 494)

1—.000025 midget variable condenser. National.
1—.001 mf. padding condenser. Hammarlund.
1—.00035 mf. mica condenser.
1—.00025 mf. mica condenser.
1—.01 mf. 400 v. coupling condenser.
10—.1 mf. bypass condensers. Flechtheim.
1—25 mf. 50 volt Electrolytic condenser. R. T. Co.
2—8 mf. Electrolytic condensers. R. T. Co.
1—10 millihenry R.F. choke, (Hammarlund)*.
1—80 millihenry R.F. choke, National (Hammarlund)*.
1—High ratio tuning dial.
1—5 prong socket Eby (Na-ald).
3—4 prong socket Eby (Na-ald).
5—6 prong socket Eby (Na-ald).
1—7 prong socket Eby (Na-ald).
1—10,000 ohm potentiometer—Acratest.
2—350 ohm 1 watt resistors, Lynch (International).
1—400 ohm 5 watt resistor, Lynch (International).
1—500 ohm 1 watt resistor, Lynch (International).
2—25,000 ohm 1 watt resistors, Lynch (International).
2—30,000 ohm 1 watt resistors, Lynch (International).
2—250,000 ohm ½ watt resistors, Lynch (International).
1—Antenna-Ground terminal strip.
1—A.C. line switch.
1—650 volt C. T. power transformer, Radio Trading Co.
1—Dynamic speaker and plug, with output transformer for '59 tube, R. T. Co.
1—A.C. line cord and plug.
Necessary knobs, wire, hardware, etc.

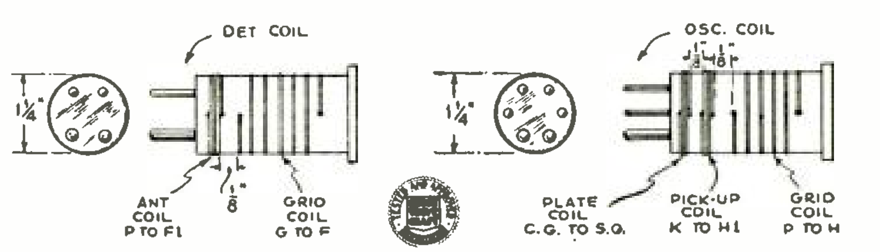
Tubes

1—'56 type tube, Gold Seal, Arco, Van Dyke.
2—'57 type tubes, Gold Seal, Arco, Van Dyke.
2—'58 type tubes, Gold Seal, Arco, Van Dyke.
1—'59 type tube, Gold Seal, Arco, Van Dyke.
1—'80 type tube, Gold Seal, Arco, Van Dyke.

*Choose the nearest standard size.—Editor.

— COIL DATA —

RANGE METERS	DET. COIL ANT	DET. COIL SEC	WIRE USED	OSC COIL PLATE	OSC COIL GRID	OSC COIL PICK-UP
10 - 20	4 TURNS CLOSE WOUND	4 TURNS SPACED 3/16"	ALL GRID COIL = Nº 24 D.S.C ANT., PLATE AND PICK-UP COILS = Nº 30 D.S.C	4 TURNS CLOSE WOUND	4 TURNS SPACED 3/16"	2 TURNS CLOSE WOUND
20 - 40	7 TURNS CLOSE WOUND	11 TURNS SPACED 1/8"		7 TURNS CLOSE WOUND	11 TURNS SPACED 1/8"	2 TURNS CLOSE WOUND
40 - 80	7 TURNS CLOSE WOUND	23 TURNS SPACED 1/16"		7 TURNS CLOSE WOUND	23 TURNS SPACED 1/16"	3 TURNS CLOSE WOUND
80 - 200	16 TURNS CLOSE WOUND	50 TURNS SPACED 1/32"		16 TURNS CLOSE WOUND	50 TURNS SPACED 1/32"	4 TURNS CLOSE WOUND



Coil Data for Mitchell 7-Tube Super-het.

The Adams-4 S-W Converter

(Continued from page 473)

dynes. This simplifies the task of tuning and also makes the adjustment of the "ganged" tuning condensers less complicated.

Assembling the Converter

Those who prefer to make the converter will find their work quite simple. First, mount all the parts on the metal chassis in the positions shown in the photographs. This will be found very easy, as the mounting holes are already drilled. It will be noted that many of the parts, such as some of the fixed condensers and resistors, are connected to the metal chassis. These may be mounted so that the grounded terminal touches the chassis and a drop of solder applied to assure a good contact. When the parts are all in place, the unit may be wired. This is done by soldering insulated wires to each of the parts as shown in the diagram.

After the converter has been wired, it is ready for adjustment. This consists of turning the coil switch to the 80-200 meter scale; connecting the converter to the broadcast receiver and tuning the latter to about 200 or 225 meters; turning the equalizing condenser on the top of the intermediate frequency coil to a point at almost maximum—and then tuning in a station. After a station has been picked up, re-tune the equalizer on the I.F. coil for maximum volume, and then adjust the trimmers on the two tuning condensers to the best point. Finally, turn the equalizing condenser in the aerial lead (the one on the back of the converter) to the point where the volume is best. During all these adjustments, the converter and the broadcast set are turned on, of course.

To connect the converter to the broadcast set, it is only necessary to disconnect the aerial from the latter and connect it to the aerial binding post on the converter. Then connect two wires from the Converter Unit to the receiver aerial and ground binding posts. (The two binding posts on the converter for this purpose are marked "Receiver Aerial" and "Receiver Ground" on the diagram.)—*Emanuel Mittleman.*

The List of Parts

The following parts are used in the construction of the converter:

1—Powertone metal chassis and cabinet
1—Slow-Motion Dial
1—Powertest 2 gang special S.W. condenser
2—Powertest 6 prong sockets
1—Powertest 5 prong socket
1—Powertest 4 prong Socket
3—Powertest Tube Shields
1—Powertest Special Power Transformer
2—Powertest 8 mf. Dry Electrolytic Condensers
2—Powertest 100 mmf. Equalizing Condensers
1—Powertest .00014 mf. Variable Condenser
1—Powertest Special I.F. Coil (Shielded)
1—Powertest 200,000 ohm Volume Control and switch
1—Powertest 1. mf. Condenser
2—Powertest .1 mf. Condensers
1—Powertest .01 mf. Condenser
1—B. B. L. Special S.W. Coil Unit (With Switch)*
3—Binding Posts, Eby
1—Powertest Special Filter Choke
1—A.C. Cable & Plug
4—Knobs
2—Screen-Grid Clips, National
1—Powertest 2500 ohm resistor (1 Watt)
1—Powertest 2500 ohm resistor (1 Watt)
2—Powertest 10000 ohm resistor (2 Watt)
1—Powertest 300 ohm resistor (5 Watt)
1—Powertest Special R.F. Choke
1—Type 56 Tube, Arco, Gold Seal, Van Dyke
2—Type 58 Tubes, Arco, Gold Seal, Van Dyke
1—Type 80 Tube, Arco, Gold Seal, Van Dyke

*This coil data can be found in the 25c treatise "Short Wave Coil Book," page 13.

BOOK REVIEW

THE INDUCTANCE AUTHORITY, by Edward M. Shiepe, B. S., M. E. E. Size 9¾"x12½". 52 pages, including formulas, diagrams and a wealth of carefully calculated graphic charts, which will enable the short-wave student to determine the inductance in microhenries of practically any conceivable size of coil, wound with wire from No. 11 enamel up to No. 32 enamel. Published by Herman Bernard. Price $2.00.

The author has performed a prodigious amount of mathematical calculation in working out these extremely valuable graphic curves, which should find a place on the book-shelf of every short-wave student. A special large chart measuring 16"x23" accompanies each book, this chart having been carefully calculated by the author so that it provides straight line graphs showing the relations of various values of inductance, capacity, and frequency. This chart covers the values from .1 microhenry to 100 millihenries; 1mmf. to 0.1 mf. and frequencies from 5 to 50,000 kc. Unlike many previous attempts to provide this extremely important information in graphic form, the author has taken all of the various factors into consideration, such as the capacity between wires, effect of resistance on frequency, current-sheet effect, the shape factor for various coils, which depends on the ratio of the diameter to the axial length, and most important of all—the calculation of the inductance of coils with spaced windings.

R 9 SIGS! ANGLE RADIATION, by Arthur L. Munzig, W6BY, published by the author. Size 5½"x8". 46 pages, illustrated. Stiff paper covers. Price $1.00.

This valuable book covers the special subject of how to radiate stronger signals with certain new types of antennas—those producing angle radiation. Among some of the subjects illustrated and described are wave propagation, ground wave and sky wave; the Kennelly-Heaviside Layer; Refraction; Angle of Radiation; Critical Vertical Angle; Penetration of the Kennelly-Heaviside Layer; Shielding Effects of Fog; Wave and current distribution in antennas; Feeder connections; Slanting antennas; Bent Hertz and Metal ball aerials.

A later section in the book deals with the characteristics of harmonic antennas; directional characteristics, effect on angle, second harmonic antennas; fourth harmonic antennas, all the way up to the tenth harmonic antennas. Another section deals with two-wire R.F. lines, single-wire feeders and the new three-wire feeder systems. A valuable book which should be read by every short-wave fan who is attempting or is thinking of building a really efficient short-wave transmitter.

New Super-het for Admiral Byrd

(Continued from page 459)

crystal and plug-in air-gap holder are used.

Second Detector and Beat Oscillator

The second detector is a '56 triode (V5), to the plate circuit of which is coupled the '58 electron-coupled beat oscillator (V7) for C.W. code reception or location of weak phone or broadcast stations. This oscillator is turned on or off by the upper left toggle switch (S10), and its audio beat note is controlled by the vernier condenser actuated by the lower left knob (C8).

Tube V6 is a '56 diode A.V.C. tube, giving the full benefits of automatic volume control for phone or broadcast reception. It can be cut out when desired for code reception by the lower right toggle switch (S8). The lower left center knob is the audio volume level control (R1) and "on"—"off" switch (S9), while the lower right center knob is the sensitivity, or manual volume control (R2). The lower left toggle switch (S7) cuts off B supply to prevent blocking, when the receiver is used close to a powerful transmitter.

Audio Amplifier

The audio amplifier consists of a single '59 3-watt pentode (V8), resistance coupled to a second or audio detector, and having an output jack on the rear of the receiver chassis for head phones or magnetic speaker, and a four-pin plug for the eight-inch Jensen speaker furnished. Use of head phones cuts out the dynamic speaker.

The power supply is conventional, using an '80 rectifier (V9) in a condenser input filter system employing two filter chokes—one in the chassis and the second, the five watt speaker field. Semi-self-healing dry-electrolytic filter condensers used.

Throughout the design of the receiver, electrical symmetry has been rigidly held to in the placement of all parts, so that each circuit progresses through the shortest possible leads on into the next circuit. The result is absolute stability and the entire absence of regeneration, resulting in a most favorable signal to noise ratio.

As for results, foreign amateurs and broadcast stations at excessive loud speaker volume are "duck soup" to the 5A single signal receiver, while selectivity can be made anything from 50 cycles and less to 10,000 cycle band width by means of the crystal switch and selectivity control.

Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 21, 1912.

Of SHORT WAVE CRAFT, published monthly at Mount Morris, Ill., for October 1, 1933.

State of New York }
County of New York } ss.

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Hugo Gernsback, who, having been duly sworn according to law, deposes and says that he is the editor of the SHORT WAVE CRAFT, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Popular Book Corp., 98 Park Place, New York, N. Y.

Editor, Hugo Gernsback, 98 Park Place, New York, N. Y.

Managing Editor, H. Winfield Secor, 98 Park Place, New York, N. Y.

Business Managers, None.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Popular Book Corp., 98 Park Place, New York, N. Y.
D. Gernsback, 98 Park Place, New York, N. Y.
H. Winfield Secor, 98 Park Place, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

H. GERNSBACK,
Editor.

Sworn to and subscribed before me this 2 day of October, 1933.

(SEAL) MAURICE COYNE,
Notary Public.

(My commission expires March 30, 1934.)

Indexing S-W Stations

VK3ME MELBOURNE, AUSTRALIA	No. 13
31.40 METERS DIST. 9960 MILES	
ADDRESS: G.P.O. BOX 1272L MELBOURNE AUSTRALIA	
SCHEDULE: WEDNESDAY 5 TO 6:30 A.M. SATURDAY 5 TO 7:00 A.M.	
REMARKS: Begins to fade after 6.00, but quite reliable after that time.	

SUNDAY TIME ON THE AIR	
AM	STATIONS
1	VK2ME
2	VK2ME
3	
4	
5	HVJ, VK2ME
6	VK2ME
7	PONTOISE (19), RABAT (23) VK2ME
8	PONTOISE (19), RABAT (23) VK2ME
9	PONTOISE (25.2)
10	PONTOISE (25.2), DJB, CT3AQ.
11	PONTOISE (25.2), DJB, 2RO, CT3AQ
NOON	PONTOISE (25.2), DJB, VK2ME 2RO.
1	PONTOISE (25.2), DJB, VK2ME
2	G2NM, OXY.
3	PONTOISE (25.6) G2NM, RABAT(32), 2RO, OXY.
4	LSY (14) PONTOISE (25.6) RABAT (32), 2RO, DJA, OXY.
5	PONTOISE (25.6), 2RO, DJA, OXY.
6	DJA, OXY, PRDA.
7	PRDA, EAQ.
8	LSX, EAQ, PRDA.
9	
10	
11	
MIDNIGHT	
CORRECTED TO	JUL 1 1932

Top—Good style for station "Index" cards; Below—Handy "Time-on-the-Air" chart.

● Here are two "kinks" which have greatly increased my pleasure in short-wave reception.

The card title "VK3ME" is a sample of the one I make for every station listed. Of course, it's a bit of a trouble making them out, but when they're done they're well worth any effort expended. The distance is not filled in except in the cases when I have the station. The addresses are put in when available. The schedule is taken from SHORT WAVE CRAFT. Every month when I read through the different magazines and find some comment on how a station is being received, I put that under the "remarks" heading. In that way I am able to collect data and information from many sources and have it where I can find it when I want it. The cards are filed by call letter for each country and the countries filed alphabetically.

The card titled "Time on the air" systematizes reception work. I have a similar card for each day of the week. When the new SHORT WAVE CRAFT comes out each month, I go through the station list and see that each station is down for the proper time. Station underlined are not on for the full hour (i. e.—Pontoise on 25.2 meters signs off at 10:30 A.M.). When a station operates on more than one wave length, I put the first two figures of the wave in question in parentheses behind the call as may be seen from the sample. All seven cards are kept together in a pack and the proper one on top. Commercial stations which come in well are put in in red ink. By use of this card system, I can tell what station to look for at any time of the day. Some short wave enthusiasts know the schedules of the various stations, but for those who can't put all their time on it, this system has its advantages.—Carleton Lord.

The World at your Finger tips

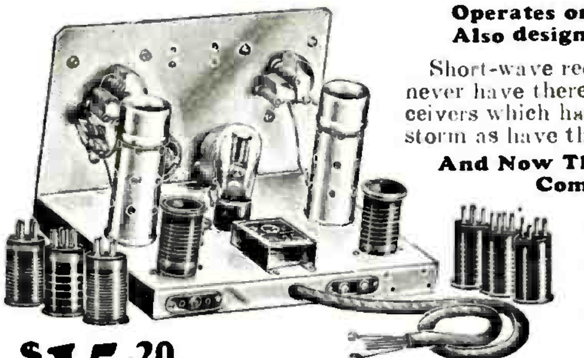
WITH ANY ONE OF THESE

ELECTRIFIED DOERLE 2 and 3 Tube Receivers

Operates on either AC or Battery. Also designed for 2-volt operation

Short-wave receivers have come and gone, but never have there been produced short-wave receivers which have taken the entire country by storm as have the famous Doerle Receivers.

And Now These Doerle Sets Have Been Completely Electrified



$15.20

3-Tube Doerle Signal Gripper
Rear view of A.C. Model—2-volt model does not have tube shields.

Mr. Doerle described his first receiver, the now famous 2 TUBE 12,500 MILE RECEIVER in the Dec.-Jan. issue of *Short Wave Craft*, and his 3 TUBE SIGNAL GRIPPER in the Nov. 1932 issue.

If you are a reader of this magazine, you have undoubtedly been surprised at the great number of fan letters published in *Short Wave Craft*, praising these receivers to the skies—and for good reasons! We have sold many hundreds of these sets, and they are still going strong.

They are low-priced, yet pull in short-wave stations from all over the world REGULARLY, in practically ANY LOCATION.

These two receivers EMPLOY THE 2-VOLT, LOW-CURRENT CONSUMPTION TUBES, and are, therefore, most popular with people living in *rural* districts where electric service is scarce.

For the thousands of fans however, who *enjoy* the benefits of electric service, we have developed the *2 and 3 Tube A. C. Doerle sets*. These sets, employing the latest type triple-grid tubes, are naturally more selective and infinitely more sensitive than the original Doerle receivers.

Furthermore, *not only can they be used on alternating current, but with batteries as well*. The 2-tube 12,500 Mile Electrified Doerle Receiver employs a type 57 triple-grid detector tube, which is resistance-coupled to the type 56 output tube. For operation on batteries the 57 is replaced with a 77-tube and the 56 with a 37. This set actually *works a loudspeaker* on all local and many distant stations. The 3 Tube Electrified Doerle Signal Gripper employs a 58 triple grid tube as a radio-frequency amplifier, followed by a type 57 detector, and finally, a 56 output tube. For battery operation the Type 78, 77 and 37 tubes are used. This receiver, in its sensitivity and DX ability, *equals* many expensive 5 and 6 tube short-wave sets.

Improved Circuit and Design

Despite the remarkable performance of the Doerle receivers, our technical staff felt that they could obtain better results by making slight modifications of the circuit. This is especially true of the 3 Tube Signal Gripper, both the new A. C. and 2-volt models. In the 2-volt model, the first type 30 R. F. tube was replaced by a type 34, which is a special-purpose screen-grid R. F. amplifier. In the A. C. model, a type 58 triple-grid, high-gain R. F. tube is employed. Furthermore, in this latter model the Antenna trimmer condenser has been eliminated through the use of inductive coupling. The detector plug-in coils are of the six-prong type, each having three separate windings. This means that the R. F. Stage is inductively coupled to the detector. *With these various changes, we have not increased the price of these receivers.*

By special arrangements with the publishers of *Short Wave Craft*, we have been given the *exclusive right to manufacture and sell* the Official Doerle Receivers, both the earlier 2-volt and the latest A. C. models—so that now, all short-wave enthusiasts who have ever wished to own any of these fine sets can buy them without the slightest doubt in their mind but what they *will perform 100%*. This means that all the usual "bugs" have been ironed out by us in such a way that in practically every location, anywhere, they will "do their stuff."

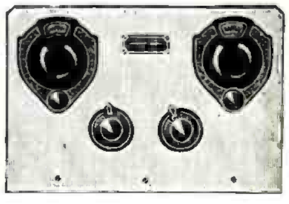
Only First-Class Parts Are Used

It may be possible to buy the parts or complete sets at a lower price—we admit this at once—but without concern. For we have used only the best parts available in the construction of our sets. We have done away with all usual "losses" which are incidental to the use of poor components. In these receivers, only the best tuning condensers, and that means Hammarlund are used! These sets could be produced for considerably less if we used cheaper condensers. We refrained from doing so, however, because then we COULD NOT GUARANTEE RESULTS! And this goes for everything else in these sets. . . .

If you are skeptical of the results obtainable with these receivers, read the letters from our many short-wave fans and friends printed in the adjoining column.

Our Own Tests

Every one of these Doerle receivers, without exception, is tested in our laboratory *under actual operating conditions*. We refrain from giving you the astonishing list of stations which we, ourselves have logged during the course of our tests. We would much rather have you and our many other short-wave friends talk about the results. *Each receiver is accompanied by schematic diagram and wiring blueprint, as well as a pamphlet of detailed instructions.*



FRONT VIEW showing general appearance of Doerle receivers.

These fans tell you how our sets actually perform—

THE OSCILLODYNE
HOW IT WORKS

I have constructed the OSCILLODYNE RECEIVER and boy! how it works!

The first day without any trouble I received Spain, England, France, and other foreign countries. Amateurs! why I never knew there were that many until now. With the one tube Oscillodyne, I bring in more stations on one plug-in coil than with a set of coils on different short-wave sets.

IF ANY ONE IS TRYING HIS LUCK ON SHORT-WAVE SETS, IT WILL BE WORTH WHILE TO CONSTRUCT THE ONE TUBE OSCILLODYNE.

PAUL KORNEKE, JR., N. S. Pittsburgh, Pa.

A PEACH

The Oscillodyne receiver, believe me is a "peach." I get short-wave stations from Germany, France, Spain and Italy—not to mention the American stations, including amateurs all over the United States.

I heartily recommend this set to any Short-Wave fan.

HENRY TOWNSEND, Ramsey, N. J.

THE DOERLE RECEIVERS
SOME LIST!

Have just completed your Doerle two-tuber. I received the following on the loudspeaker: XDA, LQA, GMB, VE9DR, VE9GW, KKQ, W1XAZ, W2XAF, W3XAL, W3XAU, W8XK, W8XAL, W9XF, W9XAA, Bermuda, Honolulu, Budapest, Hungary, and "hams" in 38 states.

MAURICE KRAAY, R. F. D. 1, Hammond, Ind.

THIS IS GOING SOME!

Today is my third day for working the Doerle set, and to date I have received over fifty stations. Some of the more distant ones I shall list. From my home in Maplewood, N. J., I received the following: WVR, Atlanta, Ga.; WGK, Ohio: W9BHM, Ft. Wayne, Ind.; W9AYS, Elgin, Ill.; W8ERK, Girard, Ohio: and best of all, XDA, Mexico; PZA, Surinam, South America: TIR, Cartago, Costa Rica; G2WM, Leicester, England. I have also received stations WDC and PJQ, which I have not found listed in the call book.

JACK PRIOR, 9 Mosswood Terrace, Maplewood, N. J.

A DOERLE ENTHUSIAST

I have just completed my two-tube Doerle, and it surely is a great receiver! It works fine on all the wavebands. Nobody could wish for any better job than this one. I can get W8XK and W9XAA to work on the loudspeaker at night, and the code stations come in with a wallop behind them.

Samuel E. Smith, Lock Box 241, Grayling, Mich.

FRANCE, SPAIN, ETC., ON LOUDSPEAKER

I hooked up my two tube Doerle Kit and I received France, Rome, Spain, Germany and England on the loudspeaker as well as over 100 amateur phone stations.

I am very pleased with the receiver and would not part with it for anything. I have listened to many factory built short-wave receivers, but believe me, my DOERLE is the set for me.

ARTHUR W. SMITH, Springfield, Mass.

REGULAR FOREIGN RECEPTION

A few days ago, I purchased one of your TWO TUBE DOERLE WORLD WIDE SHORT WAVE RECEIVERS. I just want to tell you that this set does all you claim. In the short time I have had the set, I have brought in stations in England, Germany, France and South America. Daventry, England, and Nauen, Germany can be picked up daily with very strong volume. THE DOERLE IS A FINE SET.

ARTHUR C. GLUCK, Brooklyn, N. Y.

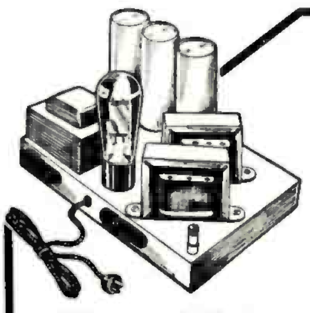
THRILLED BY DOERLE PERFORMANCE

I am very much pleased with the DOERLE S.-W. radio I received; the local amateur stations come in loud and clear. The first foreign station I received was DJA, Zeessen, Germany. I certainly received this station with a thrill. Yours for success.

RANDOLPH GRAY, Quincy, Mass.

We Actually Guarantee Results on These Sets

These Are Fool-Proof Short Wave Sets—Sets Which Work At Your Command. No Longer Is It Necessary To Be Sceptical About Short Waves.



This is a special Short-Wave Hum-Free A. C. Power Pack.

Special Doerle Designed Power Pack

Everyone knows that an A. C. short-wave set is no better than the power pack which supplies its power! A power supply for short-wave use must be constructed with extreme care. It must be absolutely free from hum or other disturbances caused by insufficient filtering, poor wiring, or faulty equipment.

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

The power pack supplies 250 volts at 50 mils for the plates of the tubes, 22½ volts for the screens, and 2½ volts at 5 amperes, for the filaments. Those various voltages are obtained from convenient binding posts on the side of the pack. Furthermore, provisions are made for energizing the field of a dynamic speaker. Any speaker having a field resistance of from 1500 to 2500 ohms may be thus energized. All the component parts of this pack are built into a sturdy, metal base which is black, crackle finished. The power transformer and one of the chokes are the only units which are mounted on top of the chassis. The pack employs a type 280 full-wave rectifier which is inserted in a socket on top of the base. A convenient on-off switch is mounted on the side. The pack is sold complete with four feet of connecting cord, terminating in a special Belden soft rubber plug. Measures 7½" long x 4" wide x 4¾" high overall. *Sold complete with 280 tube.* Ship. wt. 10 lbs.

No. 2149 Short-Wave Power Pack, including 280 tube
YOUR PRICE **$7.25**

FREE CATALOG

116 page Radio and Short Wave Treatise. 100 hook-ups, 1,000 illustrations. Enclose 4c for postage. Treatise sent by return mail.

Radio Trading Company

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, acts 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:

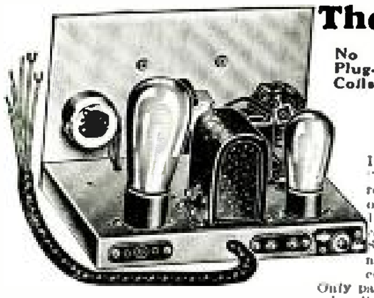
No. 2146. Official One-Tube Wonder Set, completely wired and tested as per above specifications. YOUR PRICE.......... **$7.20**

No. 2147. Official One-Tube Wonder Set, but not wired, with blueprint connections and instructions for operation, complete shipping weight 3 lbs. YOUR PRICE.......... **$6.35**

No. 2148. COMPLETE ACCESSORIES, including the following: one 6 month guaranteed Neontron No. 237 tube; one set No. 1678 Brandes matched headphones; four No. 6 Standard dry cells; two standard 45-volt "B" batteries, complete shipping weight 22 lbs. YOUR PRICE.......... **$5.50**

The Beginner's Ideal Set

The Oscillodyne 2-Tube Loudspeaker Set



This illustrates the rear of the set

No Plug-in Coils

This receiver is one of the most powerful 2-tube sets built, and when we say "powerful," we *mean* powerful! It employs the same **Oscillodyne** circuit as the receiver listed above, but differs from that set mainly in that a tapped inductance coil covering the entire short-wave range is employed rather than a set of short-wave plug-in coils. Furthermore, a powerful stage of audio frequency amplification has been added so that **a loudspeaker can be used** on practically all stations.

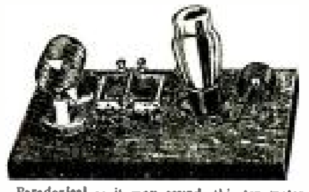
The use of a tapped inductance coil does away with the necessity for using plug-in coils. It is only with a set of the **Oscillodyne** type that a tapped inductance can be used as the "losses" introduced do not seriously interfere with the operation of the set. In other receivers, these very same "losses" may spell the difference between success or failure of operation. Under actual test, we have picked up signals half way 'round the world—12,500 miles—on the loudspeaker. Station **VK3ME, Melbourne, Australia**, was intercepted and reproduced on the loudspeaker without interruption and with excellent fidelity. Station **EAQ, Madrid, Spain**, and many other foreign stations were received regularly, night after night. There is no question but what this set will work in all parts of the country, under all conditions.

Only parts of the highest quality, such as Hammarlund condensers, Yaxley switches, Kurz Kasch vernier dials, etc., have been used. These parts are mounted on a sturdy cadmium-plated metal chassis which measures 9 in. long x 6¼ in. wide x 6 in. high.

No. 2197. 2-Tube Oscillodyne Loudspeaker Set, Completely wired and tested. Shipping wt., 9 lbs.
YOUR PRICE.......... **$11.85**

No. 2199. Complete accessories for this receiver, including 1—type 56 tube, 1—type 47, 1—special short-wave hum-free AC power pack, No. 2149; 1—type 280 rectifier tube for the power pack; 1—B. B. L. magnetic loudspeaker. Ship. wt., 14 lbs.
YOUR PRICE.......... **$11.50**

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.

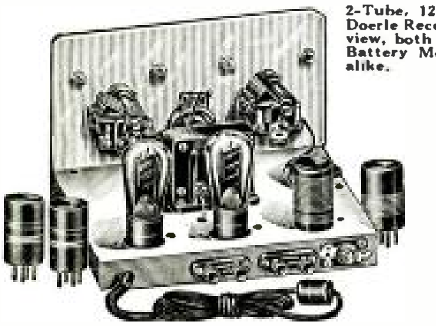
It is the advent of the new type 53 tube, which makes this feat possible. The tube is actually "TWO" tubes, in one glass envelope.

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 fixed-tuned grid tuned plate type and utilizes a solenoid of solid copper ribbon as the plate coil. All component parts are of the highest possible quality, since R.F. losses in ultra short wave work are fatal.

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 it's neat bread-board measures 11" long x 6¾" wide x 8" high overall. Furnished complete with a set of 10 meter coils. Shipping weight, 6 pounds.

No. 10-M Versatile 10 Meter Transmitter Less Tube. Your Price.... $4.50



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.......... **$10.45**

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.......... **$10.25**

No. 2176 Complete set of tubes for above: either one—57 and one—56 for A. C. operation, or one—77 and one—37 for battery operation.
YOUR PRICE.......... **$1.90**

No. 2177 Electrified 3 Tube Doerle Signal Gripper, completely wired and tested; less tubes. Measures 10½" long x 7" high x 8 1-8" wide. Ship. wt., 7 lbs.
YOUR PRICE.......... **$15.20**

No. 2178. Electrified 3 Tube Doerle Signal Gripper in kit form, including blueprints and instructions; less tubes. Shipping wt., 7 lbs.
YOUR PRICE.......... **$13.75**

No. 2179. Complete set of tubes: either one—58 one—57 and one—56 for A. C. operation or one—78 one 77.— and one—37 for battery operation.
YOUR PRICE.......... **$2.80**

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.......... **$9.90**

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.......... **$8.70**

No. 2142. COMPLETE ACCESSORIES, including 2 No. 230 tubes; one set of Brandes Headphones; 2 No. 6 dry cells; 2 standard 45-volt "B" batteries complete. Ship. wt. 22 lbs.
YOUR PRICE.......... **$5.50**

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

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

No. 2145. COMPLETE ACCESSORIES, including 2 No. 230 tubes; and one type 34, one set of Brandes 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.......... **$11.25**

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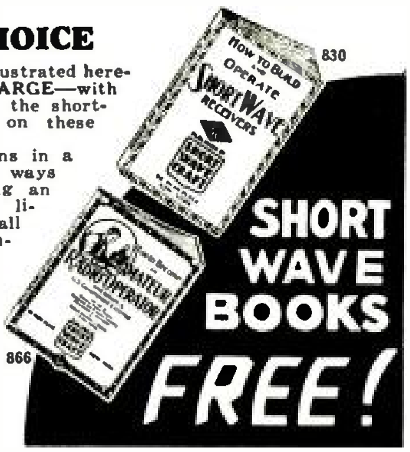
of either one of books illustrated herewith—FREE OF CHARGE—with the purchase of any of the short-wave receivers listed on these pages.

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.



Short Waves and Long Raves

(*Continued from page 477*)

W2XAF—Schenectady, N. Y.
W2XE—New York City
W3XAL—Bound Brook, N. J.
W3XL—Bound Brook, N. J.
W8XAL—Cincinnati, Ohio
W8XK—Pittsburgh, Pa.
W9XAA—Chicago, Ill.
W9XF—Chicago, Ill.
W9XQ—Chicago, Ill.
WOO—Deal Beach, N. J.
WOU—Green Harbor, Mass.

The above reception is far beyond my expectations. Have heard hundreds of "hams", (in almost all districts) police and aircraft stations. For smooth tuning and results, it beats anything I have ever heard. I cannot say too much for S.W.C., *the answer to a set-builder's prayer!*

FERNAND MAYBARDUK,
236 E. 28th Street,
Brooklyn, N. Y.

(Some "log," Fernand, and it speaks volumes for the Doerle receivers. Your letter is about the 16,000th one, so it seems, praising the well-known Doerle circuit. While the original copy of this magazine containing the description of the 2-tube Doerle receiver is no longer in stock a full description with drawings and photos appears in the book, TEN MOST POPULAR SHORT WAVE RECEIVERS.*—Editor.)*

SAYS WE'RE WORTH "MILLION BUCKS" TO HIM!

Editor, SHORT WAVE CRAFT:

Several weeks ago after receiving verification from short wave station XETE, I sent to SHORT WAVE CRAFT information regarding XETE as to their hours of broadcast and frequency used. I in turn wrote XETE thanking them for their fine card of verification. Also told of taking the liberty of sending to SHORT WAVE CRAFT information regarding their station so that readers and SHORT WAVE LEAGUE members could know of and appreciate their fine station and programs.

Today I received another card from XETE: "Many thanks, Mr. Peil for your interest in XETE and for the very nice and kind letters. We are at your service." Signed R. S. Bravo, Engineer in charge. Just a few words on the back of a QSL card, yet they mean so much. That touch of personal contact that makes up for many weary hours of listening and for those unanswered reports and letters. It gives one faith in these stations of today, for without them and the "amateurs," what would short-wave radio be—nothing but "commercial" and about as interesting as an old shoe.

Guess I'll oil up this old pen of mine and send in a few more reports.

It's a "grand and glorious" feeling, getting these stations and cards, and it's a great game, this radio! I wouldn't trade all the "fun" of it or all the good I get out of SHORT WAVE CRAFT for a million bucks—and that's straight! Incidentally, fellows, if you ever hear ole XETE at Mexico City, owned by the Edison Telephone Co., their P. O. Box is 1396, drop them a line and there is a reward of a "keen" QSL card at least.

EDWARD PEIL, Jr.
Hollywood, Calif.

(Merci beaucoup, Edward, for the information regarding XETE, and we are sure that other short-wave readers will be interested in your letter concerning data on XETE. All readers interested in listening to XETE will find them listed in our directory of short-wave stations in the October issue of SHORT WAVE CRAFT, *and again in the December issue.—Editor.)*

2-TUBE "DOERLE" ROLLS 'EM IN!

Editor, SHORT WAVE CRAFT:

I have built a 2-tube "Doerle" short-wave receiver and it is a wonder! I have been using it for about two weeks and have "logged" the following stations: W2XAF, YV1BC, EAQ, FYA, DJA, W3XAL, W8XK, GSD, YV3BC, WEF and a lot of code and phone stations. It works without any noise at all, all the stations come in as clear as a bell on the phones, though I am using a "B" eliminator. It is really a pleasure to use your circuits for their clearness and simplicity. They are all a hit!

RAFAEL PEREZ,
Munoz Rivera, No. 41,
Rio Piedras, P. R.

(Yes, the "Doerle 2-Tuber" seems to have made many thousands of friends, Rafael, and we are glad that you have it working without any noticeable noise, especially in the tropical climate in which you live. Thanks for your recommendation of our circuit diagrams; we are constantly endeavoring, to the best of our ability, to make them clear and simple. We shall be pleased to hear from you again some time and would appreciate learning how you received the DX short-wave stations throughout the year in your location.—Editor.)

"GLOBE TROTTER" NAILS THE "DX" STATIONS!

Editor, SHORT WAVE CRAFT:

I am a reader of SHORT WAVE CRAFT. It is the best magazine out. I would like to put in a word for the 2-tube "Globe Trotter" that was described in the 1932 November issue. The result was a "knock-out!" I have received EAQ, Spain, I2RO, Rome, FYA, Paris, VIT, Bermuda, LSN, Buenos Aires, LSR, South America, VE9JR, Winnipeg, Canada, G5SW, England, JIAA, Japan, and over a hundred amateurs, phones, all received on a RCA-100-A loud speaker!

JOHN KERTASZ,
16 Paradiso St.,
S. Norwalk, Conn.

(F. B. (fine business) John, using only 2 battery tubes in the "Globe-Trotter" hook-up—and all received on a loud speaker at that! While the reception of such distant stations as those in Europe and Japan on a loud speaker, using only 2 small battery tubes, is done fairly regularly by those who have had a little experience in short-wave reception, still it is not the "easiest" thing in the world and we doff our hats to you. Ordinarily speaking, if we had to produce results like those you describe, we would certainly wish to have a little more power, at least for "loud-speaker" results. —Editor.)

W2AMN'S SETS A HIT!

Editor, SHORT WAVE CRAFT:

It is with much pleasure that I write and tell you of the remarkable results I have gotten from the 2-tube "Band-Spread" receiver designed by G. W. Shuart, W2AMN, which I made up from his article in your valuable magazine of a few months ago. I must say that it is a wonderful little outfit and really does more than the writer claims for it!

I use this receiver on 80 meter band mostly and, Man! how it does bring 'em in—and not a bit broad! I have no difficulty in hearing 6's and 7's during early A. M. on 80 and 40 and 20 meters work out equally as well.

On 20 meter coil I heard British stations, and Germany, Italy and many others. I hear them consistently, I mean, and interference from static is very low, in fact, it is the finest little "all-around" outfit I could wish for. This receiver tunes so nearly equal to a superhet, that it is "F.

B." Also is economical on current, using but 2 tubes.

Mr. Shuart's article in July issue of SHORT WAVE CRAFT, the 2-tube converter is most interesting and I hope to build one of these converters soon.

Your magazine is one of the most interesting S.W. magazines I have ever read and I wouldn't be without it and always look forward with much pleasant anticipation to the 5th of the month when it is issued.

Give us plenty of "W2AMN" articles. They are the best and most interesting of all.

EVERETT H. GRAY,
Sloatsburg, N. Y.

(Great work, Everett, and the 2-tube "Band-Spread" Receiver described in our February issue, seems to have made a big hit, especially with the short-wave "hams," for the excellent reason that it enables the operator to spread out the stations on the "ham" bands. Mr. Shuart's sets are always designed with the idea in mind that they should appeal to the short-wave "ham" as well as the general "fan," the latter presumably being mostly interested in hearing "foreign" short-wave broadcast stations, such as EAQ, et al.

TOO MUCH "RE-HASH" OF OLD CIRCUITS!

Editor, SHORT WAVE CRAFT:

Present day radio is running on the discoveries that were made and the momentum that was gained during those pioneering days when Hugo Gernsback was publishing the *Electrical Experimenter.* (It's about run down, now.)

You know this to be an absolute fact, although you may not like to admit it.

When the present crop of radio-experimenters, and self-styled "Radio Engineers" acquire enough intelligence to break away from the constant "hashing and re-hashing" of old-time dust covered circuits, and break into original thought; then, and then only, will "epoch-making" discoveries be made.

Of course I realize that you have to "feed pap" to your contributors, as it is a good business policy. But the fact remains that practically everyone of the loudly-heralded "marvelous discoveries" that have been announced lately, can be traced back to its origination many years ago.

Of course the "Radio Engineers" are left out of this, as they invariably crib their ideas from the amateur-experimenters, and also they have an inexhaustable supply of material to revamp, in the back copies.

I suppose that "business policy" will preclude the publishing of this letter, but it might be beneficial in shaking some amateur loose from the cobwebs of the past.

For instance, these mysterious oscillations that are coming in from space—Hiram P. Maxim claims that probably 25 years more of experiment will enable the radio-engineers to separate them. Ha! Ha! 25 years is too short a time for the R.E.'s. They will need that many centuries, unless the amateurs help them.

It would be like old-times, to see this in print, and then hear the readers "Rave."

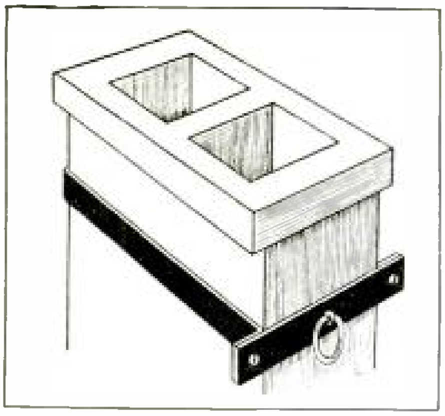
LESLIE HULET,
406 West 46th St.,
N. Y. City, N. Y.

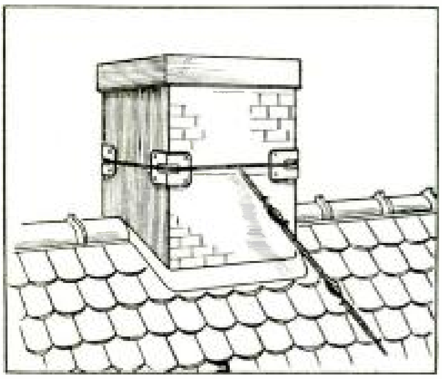
(Yep! There's a heap of truth in what you say, Leslie. We're waiting, patiently waiting, for that genius (he's probably rattling a key on some attic transmitter) who will show us a really "new" short-wave circuit! Dollars to doughnuts it'll be some amateur who'll discover that new circuit! So-o-o Amateurs, get the old "think tank" busy—maybe there's an idea there that you overlooked. (By the way, as you are an old time radio man, why don't YOU work up something new?) Who said every S-W circuit had to have a tickler? Why must every super-regenerative circuit have a peanut whistle or a steaming noise as a "back-ground" for the signals? These and dozens of other problems await the onslaught of keen minds. Let's Go!—Editor.)

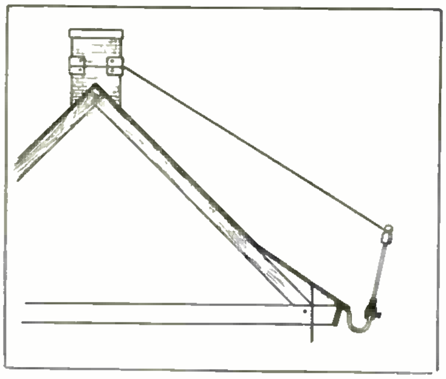
LEAGUE MEMBERS

Turn to Page 451 and read the special offer. Take advantage of this today.

Chimneys as Aerial Supports







Upper Left—Iron clamp aerial support for chimney. Lower Left—Substitute for iron clamp made from wire. Above—How aerial wire is supported above roof between chimney and gutter insulator.

● THE accompanying diagrams illustrate three ways of anchoring an aerial support to a building chimney. In the one case, a band of iron or other metal is bent by means of a hammer and anvil or with the aid of a vise, so as to encircle the chimney, a flat iron bar being secured across the two ends of a U-shaped member by means of bolts as indicated. A strong iron ring is held by means of a bolt in the flat bar of the chimney clamp.

The second illustration shows a simple method which provides a substitute for the scheme just discussed; here an iron wire or other cable is passed around the chimney, with suitable metal or other plates placed at the four corners as illustrated, the cable then being twisted tightly as the picture shows. Suitable insulators are attached to the wire or cable left projecting from the band or clamp which encircles the chimney.

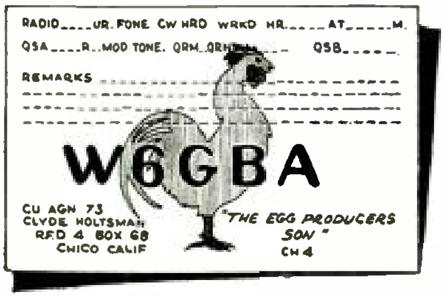
The third picture shows a side view of an antenna supported from a chimney in the fashion already described, the lower end of the antenna being secured to an insulator having a short metal arm which clamps to the rain gutter or other part of the roof. The lead-in wire is secured to the antenna or in fact, may be an extension of it, and is arranged in the usual manner, taking pains to keep the lead-in wire proper away from the building at least ten inches by means of stand-off insulators.

Home-Made QSL Cards

● IT is the wish of many hams to make their own QSL cards. They may want a special kind of letters or design on the card, all of these things are possible, if the method I use is followed. The cards can be made in any quantity and in black, brown or in several colors. The method is as follows and is very simple.

Colorless gelatine is bought from a Drug Store, enough for a surface 6 in. by 4 in. can be purchased for a few cents. The gelatine is dissolved in double its amount of hot water, until a tough, viscous mass is obtained. Pour this mass of gelatine into a shallow box or tray which can be made of tin or cardboard. The box need not be more than a half inch deep. The gelatine will need a little time to harden so we can prepare the print while it is cooling and hardening.

The ink, with which all of the drawing and writing on the QSL cards must be done with is sold at book stores under the trade name of hectograph ink and is very cheap. A small bottle of ink will make several different forms of QSL cards.



The writing and design is first made with this ink on a smooth sheet of paper and allowed to dry; the sheet is carefully laid on the gelatine surface, and is left there for about a minute. When the sheet is lifted you will see the writing and drawing lying on the smooth gelatine surface, showing dully.

The printing is done as follows, the gelatine surface is inked by means of a little rubber roller and the ink used is known as lithographic ink and may be obtained from a printer.

The dull inked surface on the gelatine takes on the ink; while the other parts repel it and does not take on any color. When the lithographic ink is rolled in, you can see the design of the card well defined but reversed.

In the printing use a smooth finished card for the best results, the 1c postcards that can be bought at the post office will work nice. Lay the card on the gelatine surface and press it on well and after a few seconds time take it off. On it you will find a well defined design of your QSL with all of the lettering very distinct.

Before the second and each successive print you must roll the gelatine with the inked roller.

If you want to make a card in two or three colors you will have to have a different tray for each form or design and color. Print first one color and then the next, giving the cards time to dry between each printing.

The sheets of gelatine can be melted and used over again. A good Ham with an eye for business could make a nice cartoon on cards and sell them to other amateur operators.—Clyde Holtsman, W6GBA.

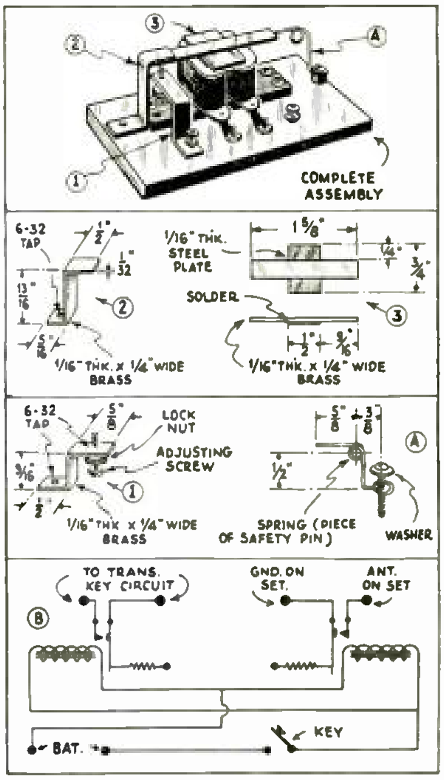
Easily Constructed "Break-in" Relays

● THE relay shown in the sketch was constructed from parts found in the work-shop "junk pile" and its cost is practically nil. This relay is a sensitive device and can be operated on run-down "B" batteries for several months. The three major parts used in its construction are one good-sized "safety-pin," one set of magnet-coils removed from discarded loud-speaker, and a length of brass strip.

The drawings clearly show the formation of each part in their mounting. The particular magnet used in this relay was taken from an old R.C.A. "horn" type speaker and has a resistance of 2,000 ohms. The entire relay is mounted on a piece of 3/16" bakelite measuring 2" by 3". A good-sized "safety-pin" being obtained, remove the point from one side and the clasp from the other, leaving about ¾ of an inch of the clasp bar remaining, and about one inch of the other side, that is, the side having the point. Form an eyelet in this side and bend at right angles to the main bar. Now bend the entire pin in the shape of drawing A. The next operation is to cut a piece of iron about 1/16" thick. ¾" long, by ½" wide and solder this as shown in Fig. 3 to a piece of brass strip 1¾" long, 3/16" wide and 1/16" thick. Now solder the pin formed as in Fig. A to the assembly shown in Fig. 3. This is known as the *armature* of the relay. Fig. 1 shows the lower contact bracket with adjustable screw and Fig. 2 is the *backstop* for the armature. Assemble these to conform with the drawing and we have a complete relay which is very small in physical size and very accurate in operation. Incidentally this relay will follow an automatic "bug" key at full speed.

Fig. B shows connections for a "break-in" system. When the key is closed one relay closes, putting the transmitter "on," the other relay short-circuits the receiving antenna and ground, thus eliminating some of the racket from the transmitter, which usually exists in the receiver when the antenna is not grounded and the transmitter in operation.

These same connections are used when the transmitter is going to be used at some point remote from the receiver, which is practical when one wishes to keep the operating room in complete order and overcome the complexities of running *feeder systems* from antennas which are located in a position where it would be impossible to have an operating table.



Simply constructed "break-in" relay for use in "Ham" station.

Short Wave Reception in England

BY "MEGACYCLE"

● RECEPTIVE conditions on the wave-band 12-100 metres must necessarily differ considerably in America from those obtaining at any given time in England. This fact is known to English short-wave broadcast listeners by the reports appearing in American journals and which find circulation in England. American listeners do not have the same opportunity for comparing their results with the results obtained outside the North American continent. It is therefore confidently anticipated that this log of short-wave broadcasting reception compiled in London for the period August 13th-September 3rd will be of assistance to you, as an American listener. To derive full benefit from these reports—which will be continued as a regular feature if sufficient interest* is shown—it is essential that a really detailed log book be kept regularly, showing all short-wave telephony heard. When it is remembered that these notes must of necessity be prepared some considerable time before you actually read them, to ensure publication, the keeping of an efficient log is seen to be of paramount importance because you may have to refer back to reception which took place two or even three months previously.

Before giving the actual reception record it is important to note that, in general, little mention will be made of U.S.A. short wave broadcasting which are of minor interest to you as DX fans, but attention will be mainly confined to recording of reception from stations situated outside the North American continent. In this way you will be in a position to judge, just what stations are definitely in regular operation and which up to date you have failed to log. Consequently a regular "watch" can be kept which may ultimately be rewarded

*If you want more of these articles just write a post card and say "Want more," and address it to Editor "Megacycle," % SHORT WAVE CRAFT, 98 Park Place, N. Y. City.

by a new low-power European or Asiatic transmitter being "caught" for your log book. This briefly is the primary object of these notes.

* * *

Speaking generally the 25 metre band has been the most productive of programmes having real entertainment value for the period under review August 13th-September 3rd. The 31 metre band has been variable but at times really phenomenal signal strengths have been obtained from stations which normally produce quite moderate signal levels. The 19 and 16 metre bands have been on the whole very poor, whilst the 13 metre band, with the exception of a number of South American telephony stations, has been devoid of interest.

* * *

The star performer for the period has been the Zeesen transmission DJD on 25.51 metres which could be relied upon to operate a moving coil speaker practically every evening from 17.00 to 24.00 GMT.† On Saturday, August 19, at 21.00 GMT, DJD was relaying a particularly beautiful musical concert inspired by the Bayreuth Musical Festival. The Zeesen transmitters evidently looked upon this programme as something special because the 31 m. transmitter DJA and the 16 metre transmitter DJE were received at the same time and with equal strengths, a rather remarkable occurrence.

* * *

The Rome transmitter on 25.4 metres has similarly been very reliable every evening but is occasionally marred by a rather bad modulation hum. The French Colonial transmitter FYA on 25.63 is of such a variable nature, although only a few hundred miles distant, that beam transmission or variation of power is strongly suspected. On August 15, 16 and 17, FYA was badly jammed by a commercial code transmitter PJZ (Curacao) on 25.6 metres. Any listener who has a note of this interference in his log and cannot read code is now satisfied.

* * *

The Pittsburgh transmission on 25.27 metres W8XK has been the star of U.S. reception but no trace of W1XAL (25.45) or W2XE (25.36) has been heard lately.

* * *

The British Empire transmitters on the 25 metre band are received nightly but as the signal is apparently a combination of ground and sky wave intelligibility is nil due to high speed "fluttering."

* * *

On the 19 metre band the Vatican City transmitter HVJ is received very consistently on the 10.00-10.15 GMT transmission daily. Besides this transmitter DJB Zeesen is the only other European 19 metre transmission of any value at this time of year and as a matter of fact Europe is very poor in transmitters in this particular channel.

* * *

It is worthy of note that W2XAD is received very irregularly just now and often fades out completely in a few minutes and is never heard again until the next evening. One is inclined to attribute these "fade-outs" to breakdowns so suddenly do they occur. On Sunday, August 13, JNJ (21.69) and WJX (20.44) were received at R 9 both on code whilst no trace whatsoever of W2XAD was to be had—not even the carrier.

* * *

On the 48-50 metre band really enjoyable reception has been obtained nightly from OXY (49.4), Denmark, although at times a most objectionable heterodyne is present throughout the evening on the transmission. This is due to an experimental transmission from Vienna UOR2, also 49.4 metres, which operates irregularly with a power of 20 watts. The programmes from OXY are of course the regular Kalundborg transmissions on 1153.8 metres being relayed. On Thursday, August 24, it is seen from the log book that signal strength was R9 so that mention should be made that

†G. M. T. means Greenwich Mean Time, which is 5 hours ahead of Eastern Standard Time. In example when it is 7 p.m. in New York City, it is 12 p.m. midnight in London.

evening in some American "log" books. Moscow Trade Unions station is of course well known to U.S. listeners on his 50.0 metre band continues to give excellent entertainment on his regular Monday, Thursday and Saturday schedules at 21.00 GMT.‡ Incidentally a new Moscow transmitter on the 25 metre band has made his appearance during August but is not listed. A careful watch should be kept between 21.00 to 24.00 GMT nightly.

* * *

VQ7LO Nairobi on 49.5 metre is a surprisingly difficult transmission to catch in England due probably to the low power of 500 watts used. This station was logged for the first time by the author on August 24th at 19.00 GMT and was held for five minutes. The return to winter conditions should see a little more regular logging of this transmitter. ZTJ Johannesburg on 49 metres has not yet been logged in the course of three years regular listening.

* * *

Casablanca (North Africa) CN8MC continues regularly on his Monday and Tuesday schedules 20.00-21.00 GMT but is ruined by being badly "over-modulated." A code transmission jamming him has not yet been identified. Barcelona EAJ25 on 50 metres is heard well most Saturday evenings 20.00-21.00 GNT. but is badly heterodyned by an unknown transmission probably Bucharest also on 50 metres and with an input of 300 watts not yet logged by the author but listed.

* * *

The South American transmissions enjoyed last winter on the 50 metre band are conspicuous by their absence just now and only once on the evening of August 25 was YV1BC 49.08 metres received.

Similarly FIQA Madagascar (52.7) ZGE (Malay States) 48.9 m. have yet to be logged by the author.

Incidentally Khabarovsk RV15 on 70.2 metres is very rarely heard if at all in England although in Central Europe it is believed reception is fair. It might be worth while Pacific Coast listeners keeping a watch on this wave length.

* * *

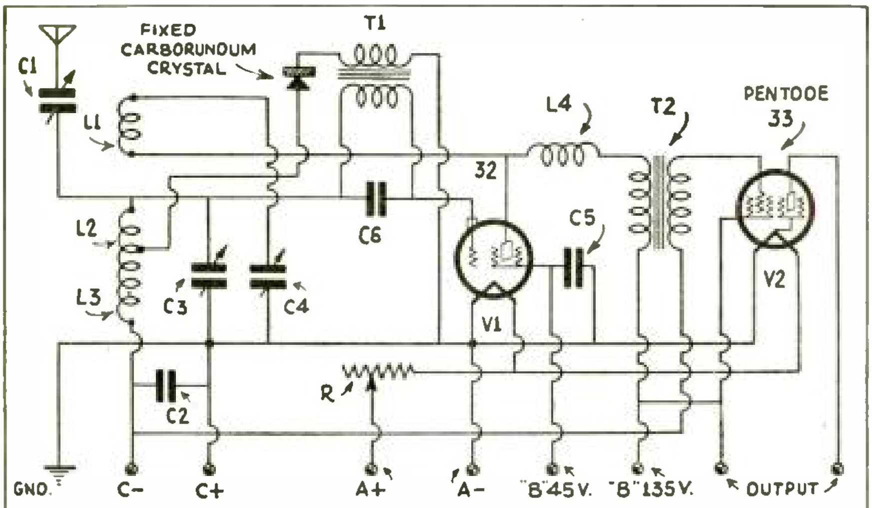
Rabat (North Africa) on 37.33 metres is received during the summer at great strength on the Sunday schedule 19.00-21.00 GMT, but the transmission on 23.29 metres at 12.30 GMT-16.00 GMT on Sundays is generally spoilt by excessive fading. VK2ME Sydney was heard weakly for the first time for two years on August 20 at 06.00 GMT but soon faded out again. EAQ Madrid on 30 metres has been easily the star performer on this band during August and particular mention must be made of his signal strength on Tuesday, August 15, although curiously enough CT1AA was unobtainable at that time.

* * *

The "Empress of Britain" GMBJ on 17.81 metres was heard on August 14 at 22.05 GMT apparently in two way conversation with Montreal. No indication was obtained of her position at the time. Incidentally IAC Contrano, Italy, on 16.8 metres has also been heard late at nights 23.00 GMT calling the "S. S. REX" and badly interfering with W3XAL Bound Brook on 16.87 metres which is received here irregularly but best of all towards midnight. Code transmissions from the numerous South American stations between 13 and 16 metres are sometimes quite phenomenal as regards signal strength late at night around 23.00 GMT. This is of course contrary to the generally accepted theory for that waveband. The Pittsburgh transmission on 13.93 metres has been heard in the afternoons in England during August, but so far the author has failed to log the transmission. The British Empire transmitter on 13 metres is not yet operative so it is useless for American listeners to keep a watch at the moment on this wave.

‡In Continental Europe a 24 hour clock dial is used, where 12 p.m. midnight is 24 o'clock; 12 M. (noon) is 12 o'clock; 8 p.m. is 20 o'clock and 11:59 p.m. is 23 hrs. 59 mins., and it is commonly written in radio matters without punctuation between the hours and minutes with a cipher (zero) in the first position indicating the hour, where necessary, as when writing 54 minutes past 1 which is written 0154. Following this style the 23 hrs. and 59 minutes quoted above is written 2359 o'clock, etc.

A Crystal-Pentode Combination



C1 .00003-MF.
C2 .1-MF.
C3 .00014-MF.
C4 .00025-MF.
C5 .1-MF.
C6 .0001-MF.

T1 3:1 A.F. TRANSFORMER.
T2 1:1 A.F. TRANSFORMER.
L1 REGENERATION COIL.
L2, L3 } GRID COIL; L2 IS ALWAYS 1 TURN FROM GRID TERMINAL OF COIL.
L4 85 MILLIHENRY R.F. CHOKE.
R 1-10 OHM RHEOSTAT

A novel receiving circuit utilizing crystal detector; the 32 tube acts as R.F. and A.F. amplifier.

● MOST short-wave fans know about the "crystal-clear" reproduction of the crystal detectors, but because of the impossibility of obtaining regeneration, which in the fan's lingo means poor sensitivity, many a fan has been willing to sacrifice that crystal's tonal beauty to a poorer but more efficient and more sensitive detector—the regenerative vacuum tube detector.

In the accompanying diagram, however, is shown a circuit for using two 2-volt tubes in a "crystal-pentode" combination short-wave receiver, that enables the builder to obtain the advantages of the crystal's pure reproduction, plus the removal of its greatest defect—its inability to regenerate and plus sensitvity to the brim.

As shown in the diagram, the '32 tube performs a triple function. First, it acts as an R. F. amplifier; then it brings about regeneration and its last function is as an A. F. amplifier. Its output is fed to a '33 pentode and of course the output of this tube is enough to drive your magnetic speaker, on a program from VK2ME, sufficiently loud to wake-up the family.

Remember that the '32 tube acts both as an R. F. and as an A. F. amplifier; correct grid biasing should therefore be used.

The plug-in coils are wound on 5-prong tube bases. 5-prong commercial coil forms may also be used. The tickler coil takes two prongs, while the beginning and the end of the grid coil take another two. The remaining prong takes the 1-turn grid tap for the fixed crystal carborundum detector. These coils are all wound in the same direction. Use coil data from past issues or from manufacturer's data sheets for winding tube base or commercial coil forms, to suit the capacity of your particular tuning condenser. Herminio Alvarez, Sta. Rita Hall, Manila, P. I.

$20.00 Prize Monthly For Best Set

● THE editors offer a $20.00 monthly prize for the best short-wave receiver submitted. If your set does not receive the monthly prize you still have a chance to win cash money, as the editors will be glad to pay space rates for any articles accepted and published in SHORT WAVE CRAFT.

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

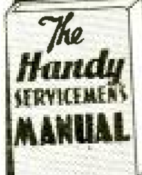
Sets must be sent PREPAID and should be CAREFULLY PACKED in a WOODEN box!

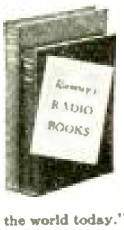
The closing date for each contest is sixty days preceding date of issue (December 1 for the February issue, etc.)

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

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

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





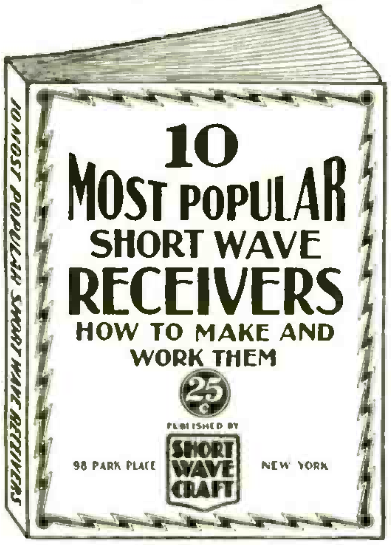
The 4 ESSENTIAL SHORT WAVE BOOKS

'ROUND THE WORLD FANS USE THESE GREAT SHORT WAVE BOOKS

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

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

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



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

CONTENTS

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

2-R.F. Pentode SW Receiver having two stages of Tuned Radio Frequency, by Clifford E. Denton and H. W. Secor.

My de Luxe S-W Receiver, by Edward G. Ingram.

The Binneweg 2-Tube 12,000 Mile DX Receiver, by A. Binneweg, Jr.

Build a Short Wave Receiver in your "Brief-Case," by Hugo Gernsback and Clifford E. Denton.

The Denton 2-Tube All-Wave Receiver, by Clifford E. Denton.

The Denton "Stand-By," by Clifford E. Denton.

The "Stand-By" Electrified.

The Short-Wave MEGADYNE, by Hugo Gernsback.

A COAT-POCKET Short Wave Receiver, by Hugo Gernsback and Clifford E. Denton.

Boy, Do They Roll In on this One Tuber! By C. E. Denton.

The S-W PENTODE-4, by H. G. Cisin, M. E.

Louis Martin's Idea of A GOOD S-W RECEIVER, by Louis Martin.

40 PAGES
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IMPORTANT

THERE IS NO DUPLICATION BETWEEN THIS BOOK AND OUR OTHER VOLUME—"HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS." ALL THE MATERIAL PUBLISHED IN THE NEW BOOK HAS NEVER APPEARED IN ANY BOOK BEFORE.

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The Short Wave Beginner's Book

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

The book is profusely illustrated with all sorts of photos, explanations and everything worthwhile knowing about short waves—the book is not "technical." It has no mathematics, no "high-faluting" language and no technical jargon. You are shown how to interpret a diagram and a few simple sets are also given to show you how to go about it in making them.

It abounds with many illustrations, photographs, simple charts hookups, etc., all in simple language It also gives you a tremendous amount of very important information which you usually do not find in other books, such as time conversion tables, all about aerials, noise elimination, how to get verification cards from foreign stations, all about radio tubes, data on coil winding and dozens of other subjects.

Partial List of Contents

Getting Started in Short Waves—the fundamentals of electricity. Symbols, the Short Hand of Radio—how to read schematic diagrams. Short Wave Coils—various types and kinks in making them.

Short Wave Aerials—the points that determine a good aerial from an inefficient one.

The Transposed Lead-in for reducing Man Made Static.

The Beginner's Short-Wave Receiver—a simple one tube set that anyone can build.

The Beginner's Set Gets an Amplifier—how the volume may be increased by adding an amplifier.

How to Tune the Short-Wave Set—telling the important points to get good results.

Regeneration Control in Short Wave Receivers.

Audio Amplifiers for S. W. Receivers.

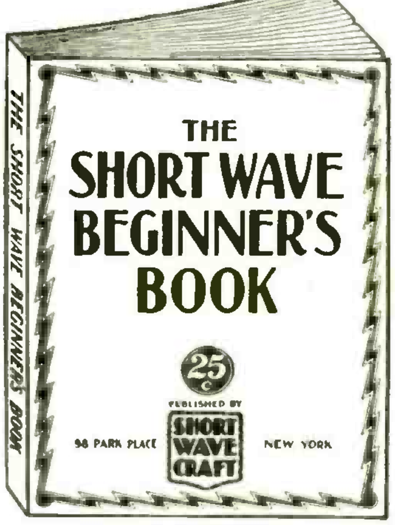
How to Couple the Speaker to the set.

Learning the Code—for greater enjoyment with the S-W set.

Wave length to Kilocycle Chart.

Wire Chart—to assist in the construction of coils.

Kinks in the construction of S-W Receivers.



40 PAGES
OVER 75 ILLUSTRATIONS

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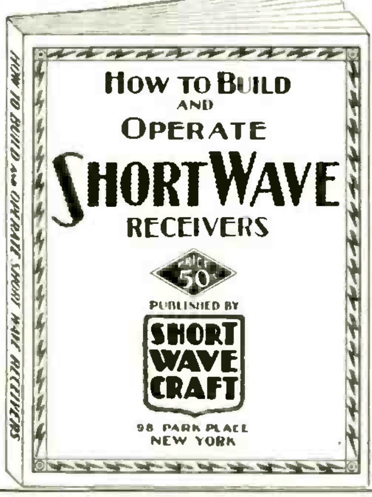
How to Build and Operate Short Wave Receivers

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

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

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

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



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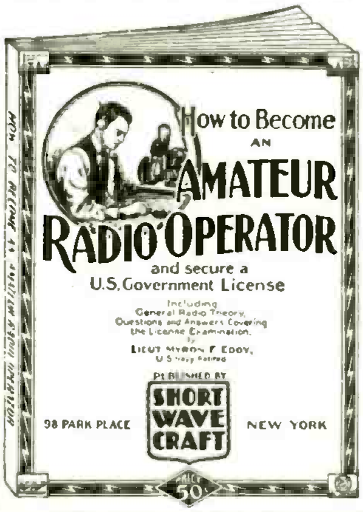
How to Become an Amateur Radio Operator



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

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

Partial List of Contents

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

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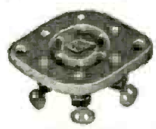

These new NATIONAL Isolantite sockets, designed specifically for short-wave service, will reduce losses at this point to a minimum. Made with convenient prong-guiding channel, and in 4, 5, 6 and 7-prong styles.

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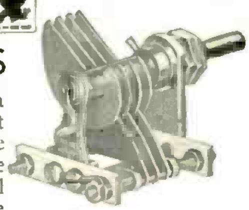
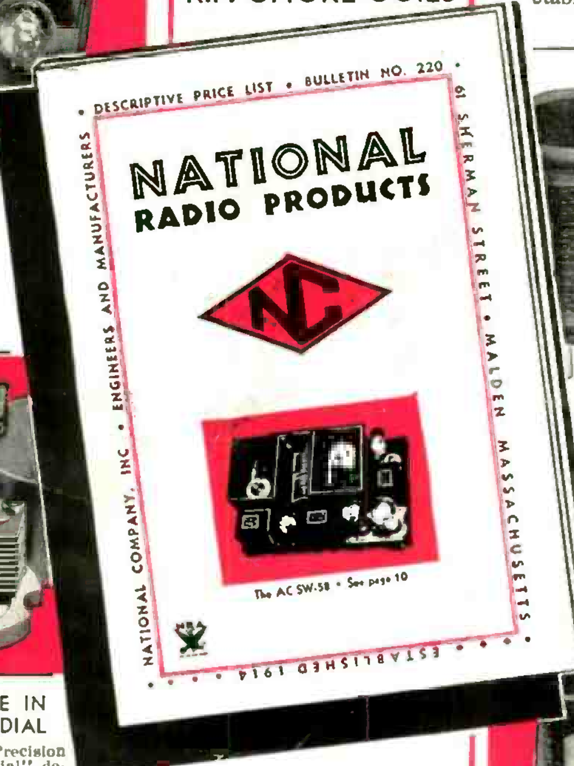


National Co. makes a full line of 52 different models of short-wave and ultra-short-wave variable condensers. All midgets have Isolantite Stator insulation, no shorted-turns, constant impedance rotor-connections to eliminate crackle and noise, mechanical rigidity and electrical stability. Fully listed in Catalog No. 220.



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When you see and operate the FB-7 you will understand why this seven-tube short-wave superheterodyne receiver has become so popular not only with the experienced amateurs, for whom it was designed—but with short-wave broadcast listeners everywhere. Two stages of high-gain I.F. amplification (six tuned circuits) give very high sensitivity and selectivity. Class A Pentode audio output assures ample volume and quality. Full range 9 to 200 meters. Our catalog gives all the features—many of them exclusive—of this outstanding receiver.

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And completing the NATIONAL line of High Performance R.F. Chokes, the type R-100 is particularly effective for short wave receivers.

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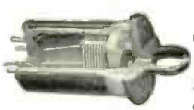

Bring your short-wave receiver up to date with coils wound on NATIONAL Regular and Band-Spread Coil-Forms with grounded and shielded cast-metal handles, and built-in-air-dielectric padding condensers:—as used in FB-7 and FB-X Receivers. These forms are made to fit the NATIONAL special 6-prong front-of-panel coil-socket with aluminum shield and external terminal strip.

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