THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

Edited by
HUGO GERNSBACK

OFFICIAL ORGAN OF SHORT WAVE LEAGUE

June
32

IN THIS ISSUE

NOW 25¢

BUILD THIS NEW
BRIEF CASE
SHORT WAVE RECEIVER

See Page 80

IN THIS ISSUE
$500.00
SHORT WAVE
PRIZE CONTEST

Rawls

TELEVISOR

Most efficient televisor produced for home use. Equipped with Duraluminum lens disc 16″ diameter. Each of its 60 lenses accurately adjusted focally to produce clear, definite images on screen. Disc driven by heavy duty Synchronous motor, with switch and framing device operated from front panel.

SHORT WAVE

The Rawls Short Wave Unit in connection with the broadcast receiver has been especially designed for long distance short wave reception from 15 to 200 meters, Super Heterodyne Circuit incorporating 9 tubes in the combination. The use of the new multi mu and pentode tubes give exceptional tone and power. To switch from one short wave band to another, it is unnecessary to change coils—just the click of the panel switch and the change is made automatically.

BROADCAST

A six-tube receiver, designed to give the ultimate in tone, selectivity and power. Uses the following tubes: two 235 Multi Mu, one 224A Detector, one 227 and one 247 Pentode output with 280 rectifier. The tone quality of the set is due to the accurate matching of all parts. Its eight-inch Dynamic speaker handles, without distortion, the tremendous output of the pentode tube. Designed especially for reception of the synchronized voice with television image.

TELEVISION

The television receiver is the most important receiver of the combination. Eight tubes T.R.F. circuit, using two 235 Multi Mu in RF circuit, one 224A Detector, one 224A, one 227 and two 245's in audio circuit, also with the 280 rectifier. Very careful attention has been given the audio amplifier and its frequency response is flat from 15 to 75,000 cycles, which is necessary to give clear, definite television images. Its two 245 tubes are so connected to supply the undistorted output and current necessary for proper operation of the Rawls crater point lamp.

To give the public the very latest in television our engineers have produced the "Ultimate in Television and Radio"—**Model TV85. . . .**

Pioneering in the television field they were quick to grasp the need of a set **capable of producing a picture large enough for a group to sit by and enjoy.**

No longer is it necessary to peep into a small aperture—one person at a time. The TV85 projects a picture on a screen in the panel of set. Invite your friends—**any number of people can enjoy the program.**

In addition it is now possible to get the added thrill of LISTENING TO AS WELL AS SEEING your favorite artist on the screen . . . and the TV85 is not only a television receiver . . . it is **also the latest in combination ALL WAVE RECEIVERS. . . .** Covering bands from 15 to 550 meters.

Housed in a beautiful console cabinet that will fit the appointments of the most pretentious home. . . . **TRULY the last yord in TELEVISION AND RADIO. . . .**

Think of the thrill of reaching out with just a turn of the dial to that **unknown, unexplored region of short waves** . . . just beyond the range of your present receiver. . . .

Distance means absolutely nothing . . . FOREIGN BROADCAST . . . an exciting chase through the underworld of a distant city hot on the trail of a murderer, thief, reported clearly by the police department. You don't have to strain to listen . . . **signals come in as loud and clear as your local broadcast.**

Listen to AMATEUR STATIONS all over the world.

Hear the progress in the field of Aviation. Planes are timed and reported exactly the same as on the most modern railroad . . . Dallas, Texas, reports No. 622 overdue . . . quickly the entire country is on the quévive searching for the missing plane.

If is positively thrilling . . . and don't forget all this time you are comfortably seated in your favorite chair surrounded by your family and friends . . . enjoyment for them all. . . .

Be up to date . . . order your Rawls TV85 today . . . costs no more than a good single purpose receiver, yet it provides thrills that **you've never experienced.**

List Price

295.00

Dealers' franchises will be valuable. Write us of your qualifications for exclusive contract. If there is no dealer in your community handling the complete Rawls television set, write us direct.

W. C. Rawls & Company SW
Bankers Trust Building
Norfolk, Virginia

Gentlemen: Please send me complete information about your dealer's franchise.

Name .....

Address .....

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

Yellow Base Tubes

RYB112A	Amplifier	$1.50	RYB232	2-Volt Screen Grid	2.30
RYB120	Amplifier	3.00	RYB233	2-Volt Pentode	2.75
RYB171A	Amplifier	.90	RYB235	2½-Volt Multi-Mu	1.60
RYB199	Detector Amplifier	2.75	RYB236	6.3-Volt Screen Grid	2.75
RYB199	Detector Amplifier	2.50	RYB237	6.3-V. Heater Amp. & Osc'r	1.75
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RYB230	2-Volt General Purpose	1.60	RYB551	2½-Volt Multi-Mu	1.60
RYB231	2-Volt Output	1.60		Rawls Teletron Crater Point	10.00

"Originators of Rawls Yellow Base Tubes"

W. C. RAWLS AND COMPANY

S.W. BANKERS TRUST BLDG. NORFOLK, VIRGINIA

My NEW Book is ready for You

IF you're in Radio now *spare time or full time* – it will show you how my *improved training* can help you make *still more money*

J. E. SMITH
President, National Radio Institute, the man who has directed the Home-Study Training of more men for the Radio Industry than any other man in America.

If you're not in Radio! this book will show you how you can get in quickly!

Radio's continued development and new uses in Radio principles will open hundreds of new, good jobs for the well trained man. Broadcasting Stations, Radio Dealers, Jobbers and Manufacturers, Shipping Companies, Aviation, Talking Movies, Research Laboratories, and many other sources of good jobs employ men well trained in Radio. Besides, there are almost unlimited opportunities for a profitable spare-time or full-time Radio business of your own. Many have jumped from $25, 35, and $40 a week to $50, $60, $75 and even $100 as a result of taking my Course. My book proves this.

I Will Train You Inexpensively At Home In Your Spare Time

Hold your job until you are ready for another. Give me part of your spare time. I will give you the training that has raised the salaries of hundreds of men. I send you home experimental outfits that show you how to do experiments, build testing equipment and make tests that make clear the basic principles of whatever branch of Radio you enter—and show you how to service practically every type of set made.

Many Have Made $200 to $1,000 In Spare Time While Learning

The day you enroll I will give you instructions, which you should master quickly, for doing 28 Radio jobs common in most every neighborhood. Nearly every one of the sixteen million Radio sets now in use need $2 to $10 servicing a year. Get some of this money for yourself. I will show you how to do it. I will give you the plans and ideas that have made $200 to $1,000 for many of my students while they are taking my course. Read their letters in my book.

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It tells you where the good Radio jobs are, what they pay, how you can fit yourself right at home in your spare time to get into Radio. It tells you about my iron-clad Money-Back Agreement and the many extra services and materials N. R. I. gives its students and graduates. It shows you what others who have taken my course have done —are making—what they think of it. There is no obligation. Send the coupon today.

I Help You Specialize Through My Five New Advanced Courses

My training not only gives you a thorough knowledge of Radio—all you need to get and hold a good job—but, in addition, you may take any one of my new advanced courses, without extra charge. They are:

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"Dear Mr. Smith: Before taking your course, I had worked at Radio for over 7 years But I realized I needed better training to succeed in the Radio game. Every part of the course has been very clear, teaching me what I could not have learned otherwise. In 9 months I made $3,500."—C. J. Stegner, 28 S. Sandusky St., Delaware, Ohio.

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"Dear Mr. Smith: I had been doing service work before taking your course. Now I am serving in the capacity of Field Engineer for the Central Public Address Systems, a position I feel I can serve well, due to your thorough training. Compensation is expected to run about $3,600 to $4,000 per year."—Paul E. Reiss, 3015 Regent Place, E. St. Louis, Ill.

Have YOU read my new book giving an outline of National Radio Institute's improved training in Radio? If you haven't, send for your copy today—it's free. No matter what kind of a job you may have in the Radio industry now, unless you are at or near the top, I believe my training can help you get ahead—make still more money—get a still better job. However, I'll let you decide that for yourself after you have read my book—just let me show you what I have to offer. Many others in Radio—amateurs, spare-time and full-time service men, Radio dealers, fans, custom set builders—have found the way to more profit and more money through this course. You will find letters from them in my book.

See What I Offer Men Who Are Now Or Who Want To Be Service Men

While my course trains you for all important branches of Radio—I am also giving extensive, thorough, and practical information on servicing almost every type of receiving set made. The experiments I show you how to perform with the Home Experimental Outfits I send you make learning at home easy, interesting, practical. This information is of special help—real money-making value—to those who are now service men or those who want to be service men. This part of my training, however, is only one of the 18 features that I am offering men and young men who want to get good jobs in the Radio industry—or who are in Radio and want to advance. Even though you may have received information on my course before, unless you have gotten my newly revised book as pictured above, write to me again—see how N. R. I. has grown and improved, too. Hundreds of men in Radio owe their success and larger income to it. Send the coupon today.

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Dear Mr. Smith: Send me your free book, "Rich Rewards in Radio." I want the facts on the opportunities in Radio and your revised and improved course. I understand this does not obligate me and that no agent will call.

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

Address.....

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

Vol. III **SHORT WAVE CRAFT** No. 2

HUGO GERNSBACK, Editor

H. WINFIELD SECOR, Managing Editor

CONTENTS

JUNE, 1932

In This Issue: Prominent Short Wave Authors

Brennan — Denton — Tanner — Nason — Günther — Cisin

FEATURES:

SHORT WAVES FOR THE BROADCAST LISTENER:

SHORT WAVE RECEIVERS:

SHORT WAVE TRANSMITTERS:

MISCELLANEOUS:

OUR COVER — A "brief-case" short wave receiver which has proved highly successful in the editors' tests is described fully on page..... 80

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They say you CAN'T, but I say you get Enjoyable Programs Every day of

E. H. SCOTT

Pioneer Designer of 'round the world broadcast receivers.

Seven years ago, newspaper and magazine editors gave columns and columns of space to the amazing performance of a theretofore unknown receiver. They heralded the advent of transoceanic reception, on the broadcast band (200-550 meters) as the greatest radio achievement of the age. They named the receiver "World Record Super," because it brought in 117 programs from 19 stations, ALL OVER 6000 miles away, and WITHIN THE SHORT SPACE OF 13 WEEKS.

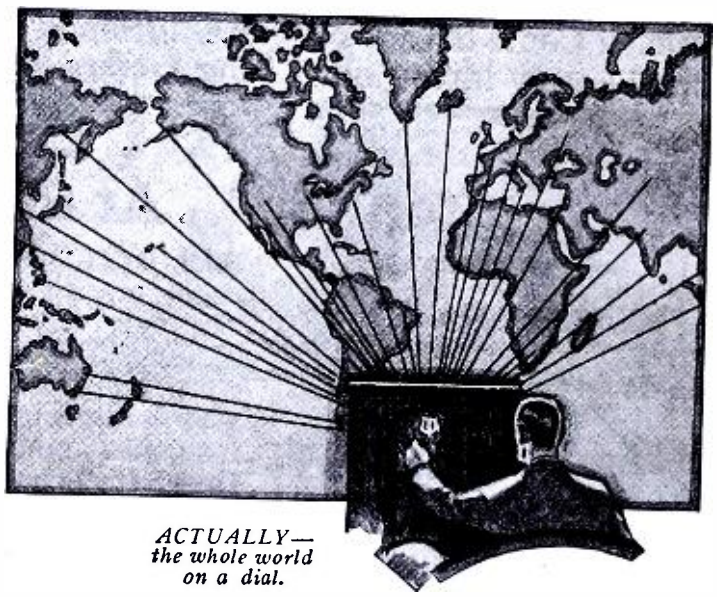
This receiver was the work of E. H. Scott, who believed that a radio set designed in accord with certain advanced ideas of his own, and engineered to micrometric precision, would do things no other receiver was ever able to do. These sets were built in the laboratory. Not even a screw was touched by an unscientific hand, and the radio industry was given a new target.

During the following years, E. H. Scott set still higher standards for radio's performance. Today, as the culmination of these efforts, he offers the Scott All-Wave, a hand-built instrument of scientific precision that is sold with a guarantee of regular, 'round the world reception, or YOUR money back.

MANY prominent radio engineers STILL contend that dependable daily reception of extremely distant foreign stations is impossible.

"It can't be done!" they shout. They insist that the distance is too great—that atmospheric conditions are too variable—that signal strength is insufficiently constant—that if foreign reception is to be obtained at all, an ideal location must be had—and, last, that there is no receiver generally available today that is sensitive enough to bring in foreign stations regularly.

Many of those making these statements are receiver manufacturers; men who have been forced to conclude that mass production methods cannot produce receivers capable of regular foreign reception. Seeming disbelief in the practicability of foreign reception is therefore the result of someone's failure. The only reason for *sincere* disbelief is ignorance of the facts.



ACTUALLY—the whole world on a dial.

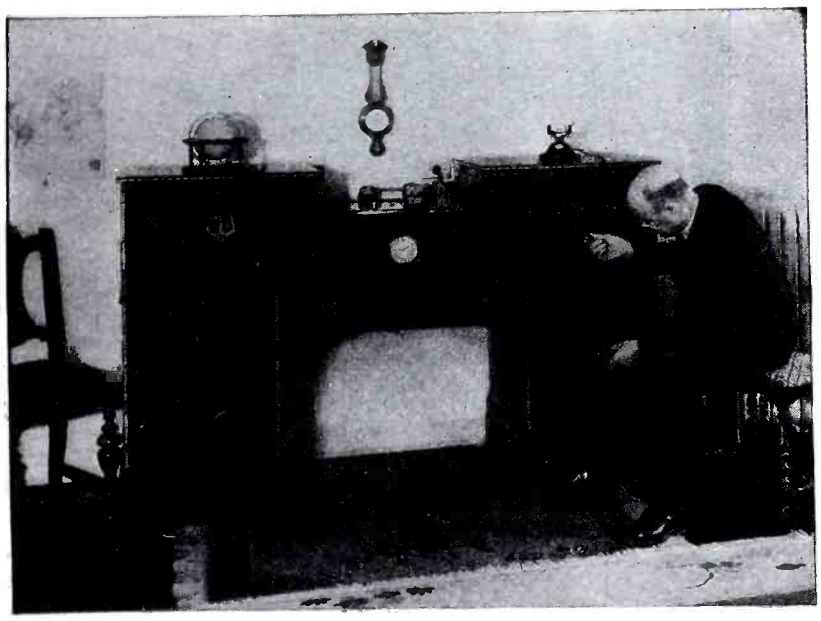
You are entitled to the truth. It is your privilege to know the FACTS, because the most interesting—the most enjoyable world of radio is to be found between 15 and 200 meters. Hence, I have written this answer to disbelievers and to the unadvised, and I am spending my own money to publish these four pages of FACTS.

You will find in them a full explanation of what foreign reception is; how regularly it comes in; what the programs are and how they sound. In addition—you'll find undeniable PROOF that the Scott All-Wave 15-550 meter Superheterodyne is certain to give you enjoyable round the world reception every day of every month of the year. Yes, EVERY day, even during the summer months! I say, "You CAN do it!" E. H. Scott

CAN

4 Pages of PROOF

from dozens of Foreign Stations Every month of the Year



Reception from VK3ME sent back to Melbourne, Australia, by telephone from Chicago by E. H. Scott.

The AUSTRALIAN TEST

first proved regular reception possible

For a considerable period, short wave broadcasts from England, France and Italy have been picked up by the broadcasting chains in this country, on highly developed laboratory-type short wave receivers and re-broadcasted on the 200-550 meter band to listeners in America. The fact that these broadcasts were always planned, weeks in advance, convinced us that their reception was contemplated with absolute certainty. Why, then, couldn't *all* foreign broadcasts be depended upon? To ascertain whether or not they could be, we selected the station farthest from Chicago that broadcasted regularly, and set out to see how many of its programs we could pick up with the Scott All-Wave.

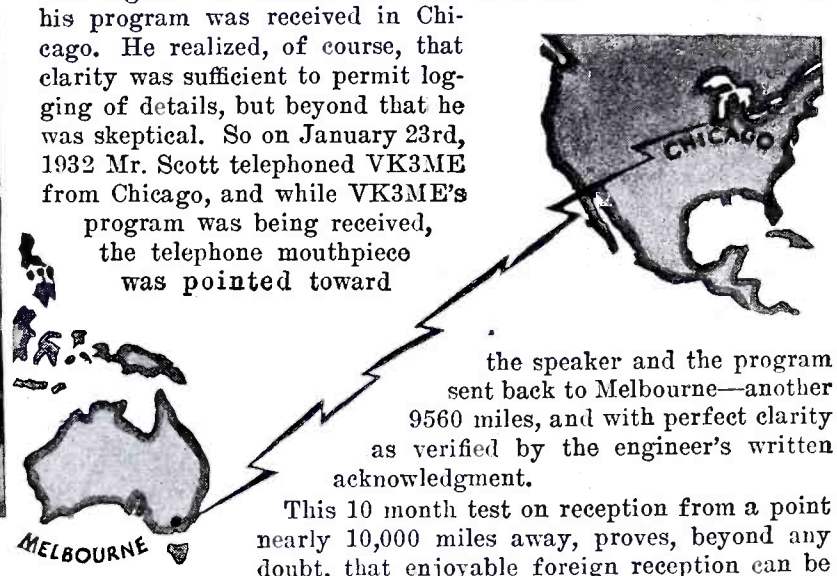
All Programs Recorded

VK3ME at Melbourne, Australia, is 9560 air miles from Chicago. This station broadcasts two times a week on a wave length of 31.55 meters. The reception test was begun June 6th, 1931. Ten months have elapsed, and *every* broadcast (excepting three) was received with sufficient loud speaker volume to be clearly heard and logged. The three programs were missed only because an illegal code transmission interfered.

Each broadcast from VK3ME has not only been clearly heard, and its reception verified by the station, but they have all been recorded just as they came from the amplifier of the Scott All-Wave on aluminum discs. These recordings are available to anyone who wishes to hear them.

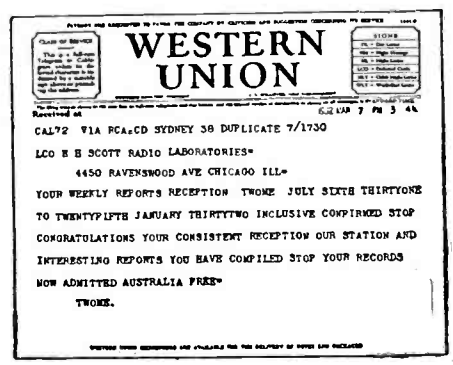
Program Returned to Australia by Phone

The engineer of VK3ME was curious to know with what quality his program was received in Chicago. He realized, of course, that clarity was sufficient to permit logging of details, but beyond that he was skeptical. So on January 23rd, 1932 Mr. Scott telephoned VK3ME from Chicago, and while VK3ME's program was being received, the telephone mouthpiece was pointed toward



the speaker and the program sent back to Melbourne—another 9560 miles, and with perfect clarity as verified by the engineer's written acknowledgment.

This 10 month test on reception from a point nearly 10,000 miles away, proves, beyond any doubt, that enjoyable foreign reception can be depended upon, IF the receiving equipment is competent. It PROVES that DISTANCE is *no* obstacle! And it PROVES that variable conditions of the atmosphere are not insurmountable obstacles! To further substantiate our contentions we began a test of VK2ME at Sydney. VK2ME's acknowledgment of this reception is reproduced below. Both of these tests PROVE that there IS a receiver having more than enough sensitivity to detect and reproduce the broadcast from foreign stations regularly and with adequate volume!



WESTERN UNION

CAL72 VIA PCA=CD SYDNEY 38 DUPLICATE 7/1730

LCO E H SCOTT RADIO LABORATORIES=

4450 RAVENSWOOD AVE CHICAGO ILL=

YOUR WEEKLY REPORTS RECEPTION TWONE JULY SIXTH THIRTYONE TO TWENTYFIFTH JANUARY THIRTYTWO INCLUSIVE CONFIRMED STOP CONGRATULATIONS YOUR CONSISTENT RECEPTION OUR STATION AND INTERESTING REPORTS YOU HAVE COMPILED STOP YOUR RECORDS NOW ADMITTED AUSTRALIA FREE=

TWONE.

Other Owners Do Even Better

This remarkable performance was not a stunt. It was not a freak happenstance occurring to one Scott All-Wave ideally located and installed. To the contrary, it appears as mediocre performance when compared to the 9,535 logs of foreign reception sent to us during January, February and March from Scott All-Wave owners located in all parts of the country! These logs, constituting further proof of the practicability of foreign reception, are discussed on the next two pages.

(*Turn the page, please*)

9535 Detailed Logs *by* SCOTT tell *What You hear*

and prove the absolute Dependability of the Scott All-Wave

See preceding pages

Clarity

THE detail contained in this log, submitted by Mr. Roye Bilheimer of Pennsylvania, demonstrates the clarity with which the Scott All-Wave brings in foreign stations 10,000 miles away. This log was made Feb. 28, 1932, and while only 30 minutes of it are shown here, the log, as submitted, covered the entire 2 consecutive hours of the broadcast.

6:00 a.m. E.S.T.—Chimes are heard striking the hour of 9:00 p.m., and you say, "Just 9:00 o'clock, Sunday evening." You go on to say, "VK2ME, 47 York Street, Sydney, Australia, would be pleased to receive reports from those overseas relating to the reception of these programs. Our next record is rather an interesting broadcast. I am going to play for you, a record recorded in Chicago. This record was picked up by Mr. Scott of Chicago, an ardent listener of VK2ME. It was then recorded on his home recording set, on aluminum discs, and then sent to VK2ME, and we will now play this record over for you, which will give you some idea of the reception in the United States, especially in Chicago. This is a musical selection by the Band of His Majesty's ———— Guards. Stand by a second, please."

6:05 a.m. E.S.T.—VK2ME, Sydney, Australia. The record you have been listening to was one made in Chicago by Mr. Scott, an ardent listener to VK2ME. The original recording was transmitted some time ago and Mr. Scott received that recording, and cut in the record on his home recording set, and forwarded this to VK2ME. That was the record which has just arrived in Sydney and we have just played it for you, to see how you will receive it. I shall now play for you the laugh of the "Kookaburra," that was also picked up in Chicago by the same gentleman.

6:06½ am. E.S.T.—Laugh of the "Kookaburra." Now you say, "That was the laugh of the 'Kookaburra,' reproduced in Chicago again after receiving the original recording from VK2ME. We should be glad to receive reports from other listeners as to how they receive these recordings." A talk of the day is entitled "Australia Commences the Travel Idea," prepared by Charles Holmes, Director of the Australian National Travelers' Association. Now you continue with the talk:

"Set in the sunshine of southern seas, Australia is the world's littlest continent. Australia is a continent that is different from other lands in its appearance, its geographic formation, and its strange animals, as well as its age-old peoples. Then, too, the remainder of the native race that originally inhabited Australia are a stone-age people, but now I wish you could see them in the Government Reservations, and in the far-back places of the continent, where many still lead their primitive lives.

6:12 a.m. E.S.T. — They were entertained by Australian aborigines who are located in a settlement there. They were amused to see them throw their boomerangs, that strange wooden weapon which, when thrown by a person, returns to the thrower, and the visitors had an amusing time practicing among themselves. Rudolph Friml gazed at a group of black fellows who were playing a tune with the leaf of the eucalyptus tree, "Rose Marie," from the famous play he had written.

6:14 a.m. E.S.T.—You are now speaking of native bears, and say: "Here the visitors saw the quaint and lovable little bears. 'Living toys,' one visitor called them. One gentleman wanted to buy them outright, so enthused was he by these little native animals. Some of the ladies brought honey and candy, and were greatly disappointed when their gifts were refused by the bears. They prefer to get their own sweets from the eucalyptus tree.

"Australia welcomes the visitor. We want the world to know us better, and we, ourselves, seek a greater knowledge of people of other lands. In these days, travel is more than a great pleasure maker—it is a great peace maker, and that is what the world today is most in need of. This concludes my short talk, entitled 'Australia Commences the Travel Idea,' prepared by Charles Holmes, Director of the Australian National Travelers' Association."

6:15 a.m. E.S.T.—The Band of His Majesty's Air Force will play "Washington Braves," arranged by Victor Herbert.

6:18 a.m. E.S.T.—VK2ME, Sydney, Australia. You now give the time as 18 minutes past 9:00 Sunday evening. Contralto solo, "God Shall Wipe Away All Tears," by Sullivan.

6:22½ a.m. E.S.T.—VK2ME, Sydney, Australia. An organ solo, "Just Imagine," by Leslie James.
This is coming through with fine volume and clarity, although the weather here is very bad. It is very foggy and rainy.

6:25 a.m. E.S.T.—VK2ME, Sydney, Australia. The time is 26 minutes past 9:00 Sunday evening. You now announce the next selection, a waltz.

6:30½ a.m. E.S.T.—VK2ME, Sydney, Australia. The band of His Majesty's Guards directed by R. G. Evans, playing "Intermezzo," by Reeves

9,535 Detailed logs of foreign programs have been sent to us since January 1st, 1932. All of these logs are complete—proving that the reception was not only *heard*, but that the *clarity* was *perfect*. Two of these logs are reproduced (in part only, for lack of space) on these pages. Think of it! 9,535 logs from 186 stations in 40 different foreign countries! It is difficult to understand, how anyone after reading these logs, could believe that dependable, day in, day out foreign reception is anything but a complete, and thoroughly satisfactory actuality.

What Countries Will You Hear?

Any Wednesday, Saturday or Sunday morning you can tune in the Australian stations and listen to a three hour program, in English, of course. Then if you wish something with a decidedly foreign flavor, you can dial Saigon, Indo-China, and listen to the weirdest, Eastern music you have ever heard.

Right after breakfast, most any morning, you can tune in the Radio Colonial at Paris, France—or Chelmsford, England, from which station comes an English version of the World's latest news.

From 11:30 A. M. until 5 P. M. you have your choice of musical programs, talks, plays, etc. from Italy, France, Germany or England. In the late afternoon, the offerings from Portugal will be found very entertaining.

In the evening you may have your choice of a dozen or more different stations including Colombia and Ecuador in South America. Then, too, there is Spain, and Cuba.

Is this all?—Indeed not!—These are just a few of the many foreign stations that will be found on the dial of the Scott All-Wave. A complete list showing the exact time to tune dozens of foreign stations, is furnished with the receiver.

What Will You Hear?

From a large number of these foreign stations you'll hear news in English, and you'll delight in the variety of aspect the different countries give to an item of international interest.

You'll hear music from everywhere. Weird chants from Indo-China, and in contrast, a tango from the Argentine. From Rome you'll hear the real Grand Opera—you'll hear the voice of the Pope, the Vatican Choir and solo voices mellowed in Italian sunshine. From Germany you'll hear political speeches, music and news. From France, Spain and Portugal you'll hear a wonderful musical program that will thrill you hour after hour. From England you'll hear plays—drama—comedy and musicales; delightful presentations, refreshingly different from those to which you are accustomed. You'll never tire of foreign reception, because it never loses its novelty.

Will the Reception Be Clear?

Foreign stations are tuned easily and smoothly with a Scott All-Wave. As the dial is turned to the correct spot, the station comes on, in most cases, with the same naturalness, clarity, and roundness of tone that characterizes *domestic* reception.

# of Foreign Reception Owners and *How You hear it*

Usually, you can have more volume than you wish, which means simply that the sensitivity may be lowered beneath the noise level, thereby permitting the program to come through with truly enjoyable bell-like clarity. There's no doubt about it. Dependable foreign reception is here; yours to thrill to; yours to enjoy as you have never enjoyed radio before.

Read These Logs*

The log reproduced at the right represents one day that E. B. Roberts of Massachusetts spent with his Scott All-Wave. During the day he journeyed from France to England, to Italy, back to France and in the evening to South America. The other log is that sent in by Mr. Roye Bilheimer of Pennsylvania who made a point of logging every word put on the air by VK2ME, Sydney, Australia, February 28, 1932. If you have any doubt concerning the authenticity of these two logs or the others sent to us, see the auditors' report herewith. Read these logs—then consider that 9,533 more detailed logs bear witness to the new world of radio pleasure opened to YOU by the Scott All-Wave 15-550 meter Superheterodyne.

THE SCOTT WELLINGTON

Typical of the many excellent models of Scott Consoles, the Wellington is a beautiful example of deluxe cabinet artistry. Fashioned from burl walnut and finished to go with the finest furniture. The center drawer contains the optional phonograph equipment, which, when wanted, is supplied with an automatic ten record changer.

Prove to yourself the practicability of Short Wave foreign reception

These four pages have told the story of short wave foreign reception in no uncertain terms. They have PROVED that clear, enjoyable reception of foreign stations can be enjoyed by anyone irrespective of the state or country in which he lives. And we want to prove to you, right in your own home—that YOU can tune 'round the world whenever you choose and enjoy every program you hear. To do that, we'll build a Scott All-Wave 15-550 meter superheterodyne to your order; we'll test it on reception from London, Sydney or Rome—and give you the exact dial readings. If you don't get enjoyable foreign reception from these stations—if the receiver does not eclipse every statement made for it, you may return it and your money will be refunded. The coupon below will bring full particulars of this offer—also the technical details of the Scott All-Wave. Clip the coupon—mail it now.

The E. H. SCOTT RADIO LABORATORIES, INC.

4450 Ravenswood Ave., Dept. SW 62 Chicago, Ill.

The E. H. Scott Radio Laboratories, Inc.,
4450 Ravenswood Ave., Dept. SWC 62
Chicago, Ill.

Send me full particulars of the Scott All-Wave Superheterodyne.

Name .....

Street .....

Town..... State.....

***AUDITORS' REPORT**

We hereby certify that we have examined and counted 9,535 logs of programs reported by purchasers of Scott All-Wave Receivers from 186 stations, foreign to the country in which received, during the months of January, February, March, 1932.

CHESNUTT, MURPHY, POOLE & Co.
Certified Public Accountants

News and Music From Four Foreign Countries Received in One Day

THESE logs, made March 7, 1932, and submitted by E. B. Roberts of Massachusetts, indicate the variety of foreign programs that may be heard with a Scott All-Wave. For lack of space, only a portion of each log appears here.

NEWS FROM FRANCE
STATION RADIO COLONIAL—PONTOISE

8:44½ a.m. E.S.T.—"This is Radio Colonial from Paris calling. Wavelength 19.68 meters."
News in English from the Continental Daily Mail, Great Britain—The financial recovery of Great Britain has aroused the interest of the world.

8:45 a.m. E.S.T.—Chimes.
From N. Y., Sunday—The U. S. view is that the world economic crisis is behind. Sterling reflected by rising to a new high.
From Geneva, Sunday—Small nations are not willing that the League's authority be flaunted even if the larger nations are.
From N. Y., Sunday—Bulletin on the death of Bandmaster Sousa.

8:51½ a.m. E.S.T.—From Berlin, Sunday—Speeches regarding the election next Sunday. Will Hindenburg or Hitler be elected only question.

8:55 a.m. E.S.T.—From N. Y., Sunday—The Lindberghs have turned to the underworld for help as the authorities seem helpless.

NEWS AND MUSIC FROM ENGLAND
STATION G5SW—CHELMSFORD

1:15 p.m. E.S.T.—Chimes.
1:15½ p.m. E.S.T.—This is the British Broadcasting Corp. calling short wave listeners of the British Empire through G5SW. G5SW broadcasts on a wave of 17,550 kilocycles or 25.53 meters.
1:16 p.m. E.S.T.—Programs to be radiated today.
1:17 p.m. E.S.T.—Programs to be radiated tomorrow, March the 8th.
1:18 p.m. E.S.T.—News Bulletins for the Middle Zone. World copyrighted.
Briand died today. An ardent advocate of peace.
Bulletin regarding the Indian Budget.
Far East Bulletin—Dr. Yen announced that China is ready to enter negotiations to restore peace. The Japanese have no intention of advancing further.
Bulletin regarding the kidnaping of the Lindbergh baby—no news as yet.

NEWS AND MUSIC FROM ITALY—STATION 12RO
ROME

2:49 p.m. E.S.T.—Telling in Italian of the results of the six-day bicycle race in Madison Square Garden, which was won by the team of McNamara-Peden.
2:52 p.m. E.S.T.—Now talking about Primo Carnera and Young Stribling.
2:54 p.m. E.S.T.—"Raddio Roma-Napoli."
News bulletins from the U. S. A., Shanghai and Tokio.
News regarding the Lindbergh baby.
2:59 p.m. E.S.T.—Announcement.
3:01½ p.m. E.S.T.—Announcement. Gave names of Italian cities. Music by orchestra between announcements.
3:02 p.m. E.S.T.—Orchestra selection.

MORE MUSIC FROM FRANCE
STATION RADIO COLONIAL—PONTOISE

3:57 p.m. E.S.T.—"The Marseillaise."
3:59 p.m. E.S.T.—"Hilo, Hilo, Ici. Paree. Station Radio Colonial."
4:00 p.m. E.S.T.—Piano and violin selection.
4:06 p.m. E.S.T.—Announcement.
4:08 p.m. E.S.T.—Instrumental selection.
4:15 p.m. E.S.T.—Announcement.
4:16 p.m. E.S.T.—Cello solo.
4:21 p.m. E.S.T.—Announcement.

MUSIC FROM SOUTH AMERICA—STATION HKF
BOGOTA, COLOMBIA

8:25 p.m. E.S.T.—Vocal solo. Man singing native selection.
8:28 p.m. E.S.T.—Announcement.
Baritone solo, with choruses singing.
8:33 p.m. E.S.T.—Announcement.
Vocal duet.
8:46 p.m. E.S.T.—Announcement.
8:47 p.m. E.S.T.—Native instrumental selection.
8:50 p.m. E.S.T.—Announcement.
8:53 p.m. E.S.T.—Dance music. Waltz.
8:57 p.m. E.S.T.—Announcement.
Baritone solo.
9:02 p.m. E.S.T.—Announcement.
9:03 p.m. E.S.T.—Native dance selection.
9:06 p.m. E.S.T.—Announcement.
9:00 p.m. E.S.T.—Station announcement. "HKF, in Bogota, Colombia, South America."
9:10 p.m. E.S.T.—Instrumental selection.
Volume very good. Some fading.

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RADIO PUBLICATIONS - - -

245-S GREENWICH STREET NEW YORK, N. Y.

SHORT WAVE CRAFT

JUNE, 1932 VOL. III, No. 2

H. GERNSBACK, *Editor*

H. WINFIELD SECOR, *Managing Editor*

A Career in Short Waves

By HUGO GERNSBACK

NOT infrequently we receive letters from either irate or puzzled parents who object to the short wave activities of their sons, and who at other times wish to know whether it is worth while for young men to spend their time in short wave experimental work.

Since short waves have taken the country by storm, and since actually hundreds of thousands of new recruits have been added to the already lengthy list, it is understandable why parents should be puzzled.

200,000 Amateurs and Experimenters

At the present time, it is safe to state that there are some 200,000 amateurs and experimenters devoted to *short waves* in this country. The list of licensed radio amateurs, according to the latest census, is over 29,000. The difference is made up of fans and experimenters who are not licensed for transmission, but who may be properly termed as *receiving amateurs*, *fans* and *experimenters*. This is a conservative estimate and was obtained from a number of independent sources. The list is growing rapidly.

Radio Amateurs' Role in Business

When radio was young, and when, as a matter of fact, it was still called *wireless*, the list of amateurs in those days was rather small, but even then we received the same sort of letters from parents, and even from the amateurs themselves, wanting to know what good the pursuit of *amateur radio* was. We need only to point to the present gigantic radio industry, and the answer will be found there. It is safe to say that there is not a radio business nor a radio manufacturing establishment today, which in one way or another, does not have in its makeup a considerable number of *ex-radio amateurs*. As a matter of fact, the heads of a number of radio manufacturing establishments are ex-amateurs themselves. A great many of their employees are ex-amateurs, and in very many instances all the technical *key positions* are held by ex-amateurs.

Short Waves the Coming Field

Make no mistake, *short waves* are the coming field of radio. The radio industry, already one of the largest of all businesses in this country, is rapidly expanding due principally to the instrumentality of short waves, and those young men who get in on the "ground floor" by virtue of having acquired an adequate education on the subject, are now preparing themselves for engineering and business careers, when their *hobbies* will be turned into money-producing activities. Thousands of radio amateurs, fans and experimenters who are today making small investments in short wave apparatus, are unconsciously paving their way towards success later on, because after all there is nothing that counts as much as *practical experience*, particularly in such a technical field as short waves. Practical experience, in the writer's opinion, is a paramount necessity, and of course let me add that this experience is not 100 per cent practical, because no experimenter worth his salt tackles short waves from the practical end only. He reads every scrap of theory on short waves that he can lay his hands on, which gives him a really amazing education in the theoretical side of the subject as well. And, of course, all this experience will prove very valuable later on.

Today's Experimenters Tomorrow's Business Men

The young short wave fan and experimenter of today may be in business tomorrow for himself, as a manufacturer, or he may secure worth while employment with a large organization where his talents can be made mutually valuable.

And, incidentally, it will be found that there is not the overcrowding in this particular profession that we have to contend with in others, principally because the art is still young and because there is a lively demand for good men who "know their stuff" in short waves.

Even at the present time, there is a brisk demand by manufacturers for short wave experts for their laboratories, because right now every radio set manufacturer is already in the short wave line, a thing that the industry itself would not have believed possible even a year ago. Practically every radio manufacturer, without exception, is making short wave converters and adapters, and many are already contemplating the building of ultra-short wave sets for five meters and below, due to the brisk demand for such sets. Of course, television, which is only another branch of short waves, makes use of short wave sets, and this new industry is and will be in the market for good short wave talent.

Short Waves to Cure Our Ills

The medical fraternity has shown great interest in short waves for therapeutical work, and an entirely new field is being opened up to short waves in this particular branch of the art, and here, too, those experimenters who have followed this latest branch of radio will be in demand.

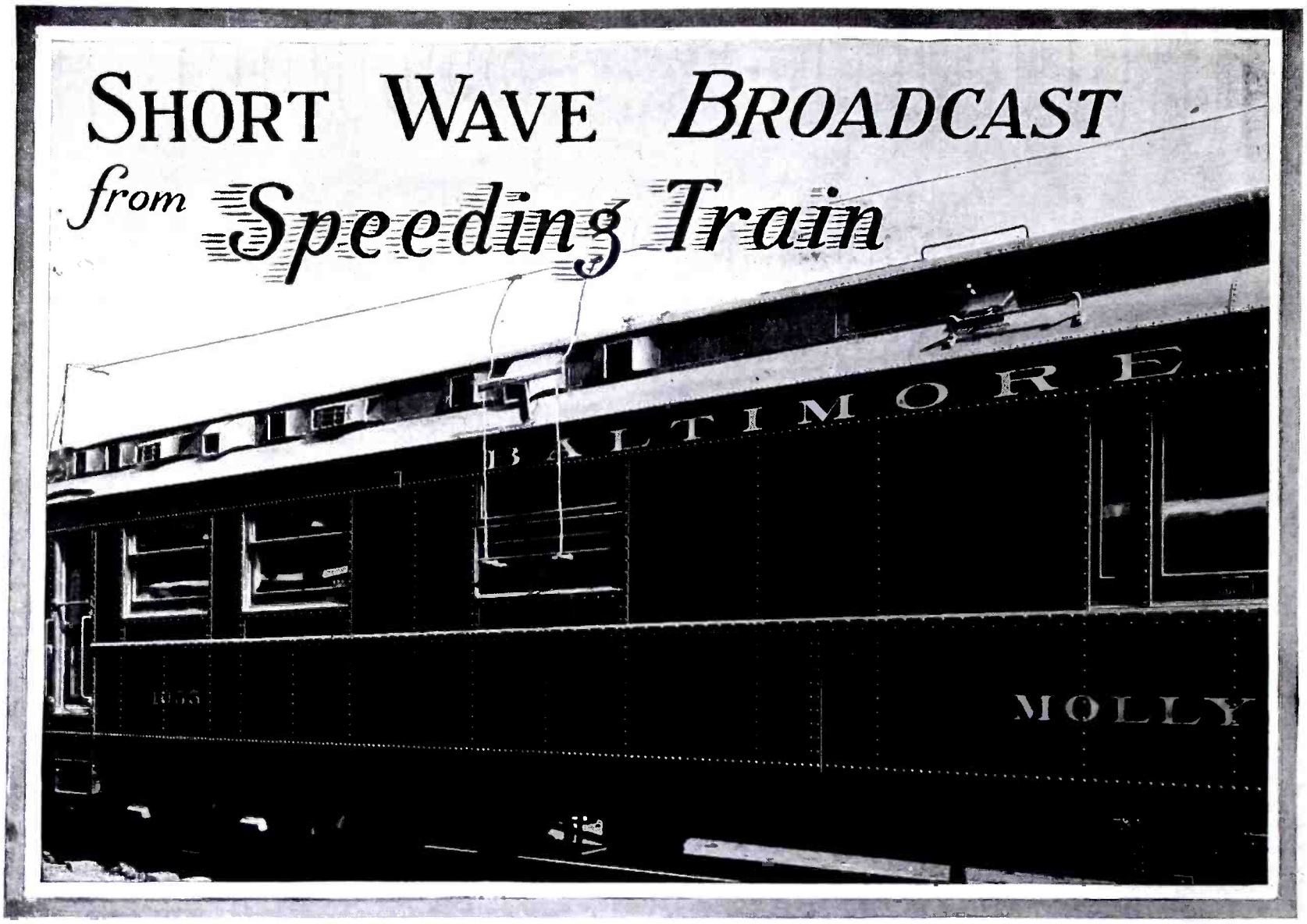
Of course, we can't all be big set manufacturers, nor can everyone become the chief radio engineer of a big plant. Some of us must rest content with smaller incomes, and for those there is the great and rapidly growing field of *servicing* radio sets.

To be sure, up to the present time, there has not been much occasion to service short wave sets, because there were too few of them, and those that owned such receivers most likely were experts or near-experts in short waves themselves; but during the coming year, there will be on the market not less than a *million short wave sets* which may be *adapters, converters or straight* short wave sets bought by the public. Sooner or later these sets will have to be serviced. Now it is a fact that the average service man has his hands full with the straight broadcast set, in which he has become expert. During 1933 and thereafter, there will be a lively demand for *short wave* service men, and many short wave fans and experimenters will no doubt find that they can make a nice living indeed from servicing the short wave sets.

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

THE NEXT ISSUE COMES OUT JUNE 15th

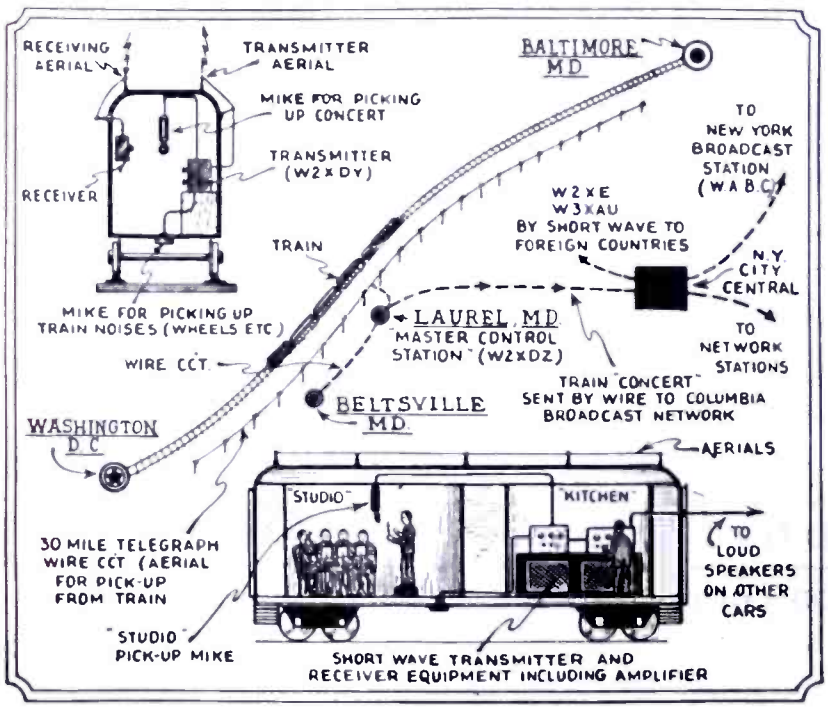
SHORT WAVE *BROADCAST from Speeding Train*



ENGINEERS of the Columbia Broadcasting System were faced with an interesting group of problems when they decided to undertake the first broadcast of a complete program of entertainment from a Baltimore & Ohio railroad train running at a speed of more than a mile a minute between Washington, D. C., and New York City. The prime requisite of the broadcast was, of course, to find a mobile studio capable of accommodating Jack Denny's twelve-piece orchestra, Belle Baker, and the other talent of the regular Ever-Ready Radio Gaieties, the program chosen for this unique experiment.

Technical Problems of Train Broadcast

After a preliminary survey of the Baltimore & Ohio road had been made by both Columbia engineers and railroad experts, and the stretch between Washington and New York selected, it was necessary to find the railroad car best suited for transformation into a temporary broadcasting studio. A regular Colonial type dining car of the Baltimore & Ohio, the latest model in diners, was decided upon. The car, air-cooled, equipped with ball bearings, rubber shock absorbers, and permanently sealed windows, was completely stripped and treated acoustically with velour drapes to reduce reverberation. The control, amplifying, and short wave transmitting equipment was located in the kitchen compartment of the car. Power supply was obtained from dry cell type batteries carried in a combination battery and cable box.



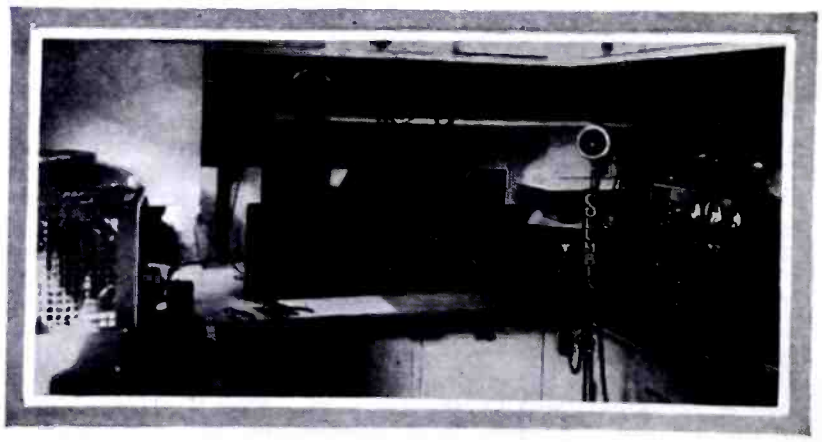
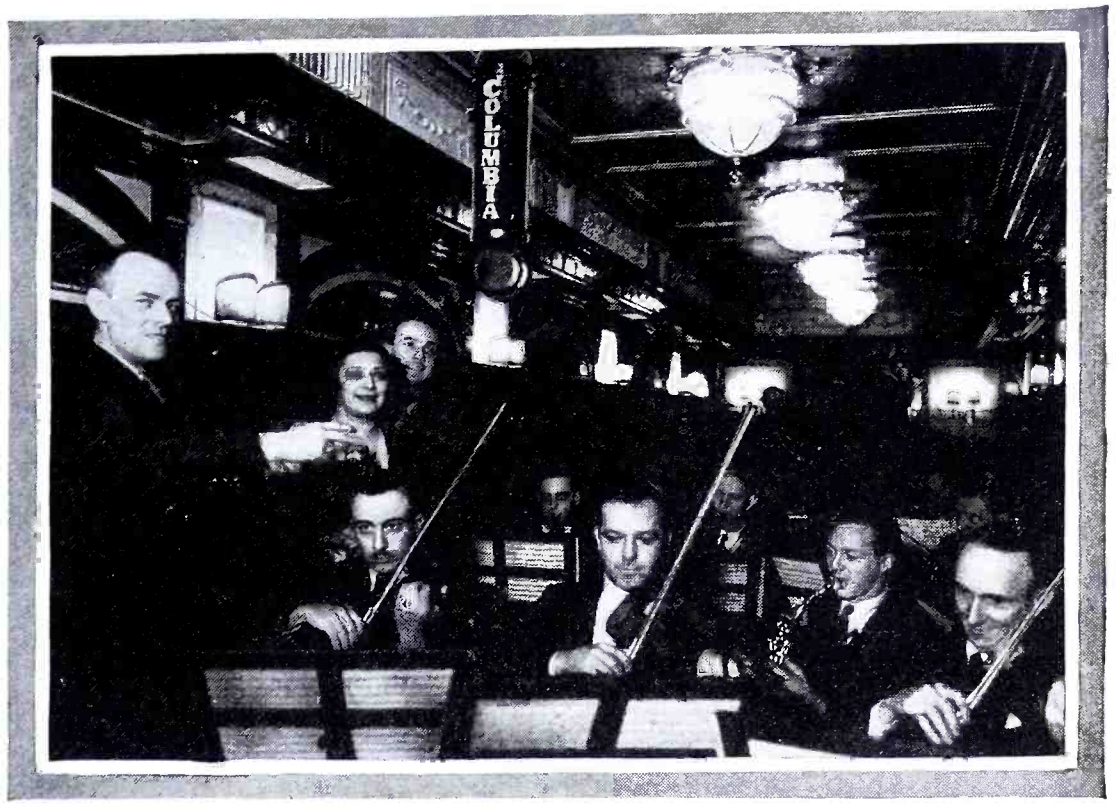


Photo above shows one corner of the short wave transmitting and receiving room which was installed in the kitchen of the Baltimore & Ohio dining car. Diagram at left shows route followed by the speeding train and location of studio and short wave apparatus on car.

Transmitter and Receiver on Train

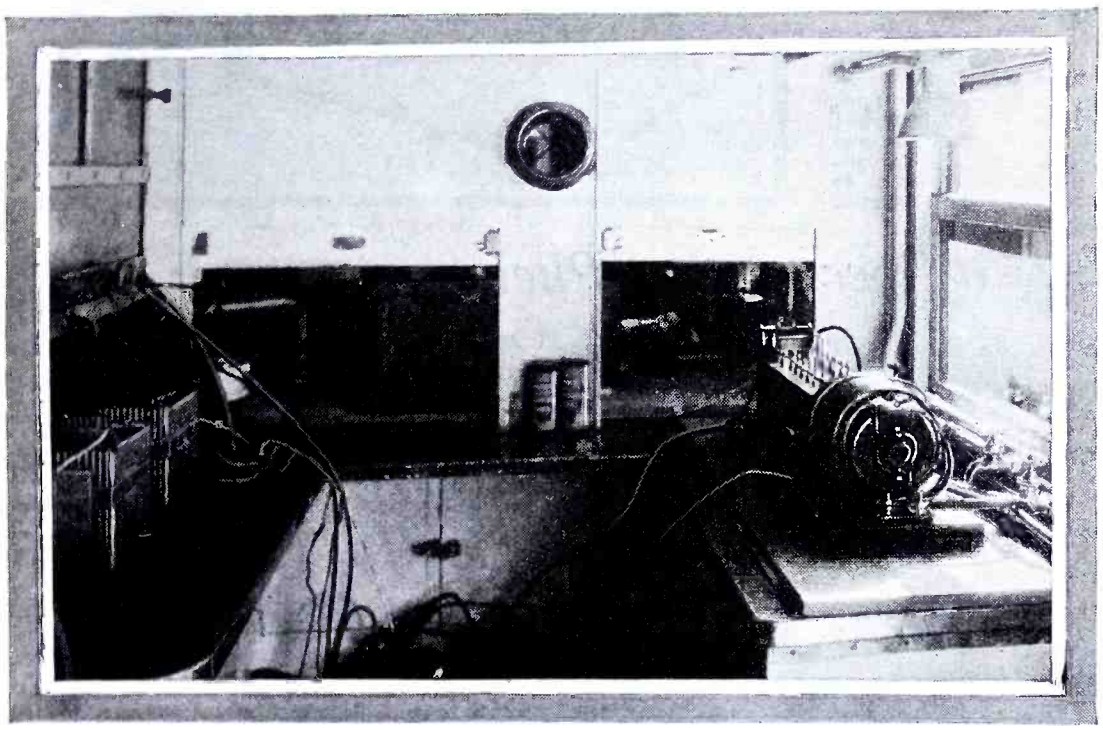
Two separate antennas were mounted on the roof of the car, projecting at a maximum distance from it, consistent with restrictions imposed by bridge and tunnel clearances—one for *transmitting* the program to the two pick-up points located along the route of travel, and one for *reception* of instructions from the

Recently a very novel radio program was broadcast over the Columbia network from a train speeding along at seventy miles an hour between Washington, D. C., and New York City. The characteristic sounds of spinning wheels and the locomotive's whistle were heard on loud-speakers of listeners across the continent. A special broadcast studio was installed in the dining car and the program was sent by "short waves" from the train to the pick-up stations.



Above—Jack Denny and his orchestra in the improvised studio aboard the B. & O. Railroad train, broadcasting the "Ever-Ready Gaieties" program which was heard by broadcast listeners all over the country on Sunday evening, March 27, over WABC and the nation-wide Columbia network.

master control station at Laurel. Thus both a short wave transmitter and short wave receivers were carried on the train. The transmitter, temporary broadcast station W2XDY, operating on a wave length of 1,542 kilocycles, was a direct crystal controlled model employing high percentage modulation and operating on 50 watts of power. A special antenna tuning unit equipped with a monitoring rectifier and a dummy antenna were included as an integral part of the transmitter. The receivers were equipped with suitable "wave-traps" to insure proper reception of instructions and cues.



Above—Another view of the short wave apparatus, showing batteries and motor-generator used as part of the power supply.

At Right—Short wave "pick-up" station installed in railroad station; Edwin K. Cohan, C. B. S. director of technical operations, at left, and A. B. Chamberlain, chief engineer of C. B. S., at the controls in station at Laurel, Md.

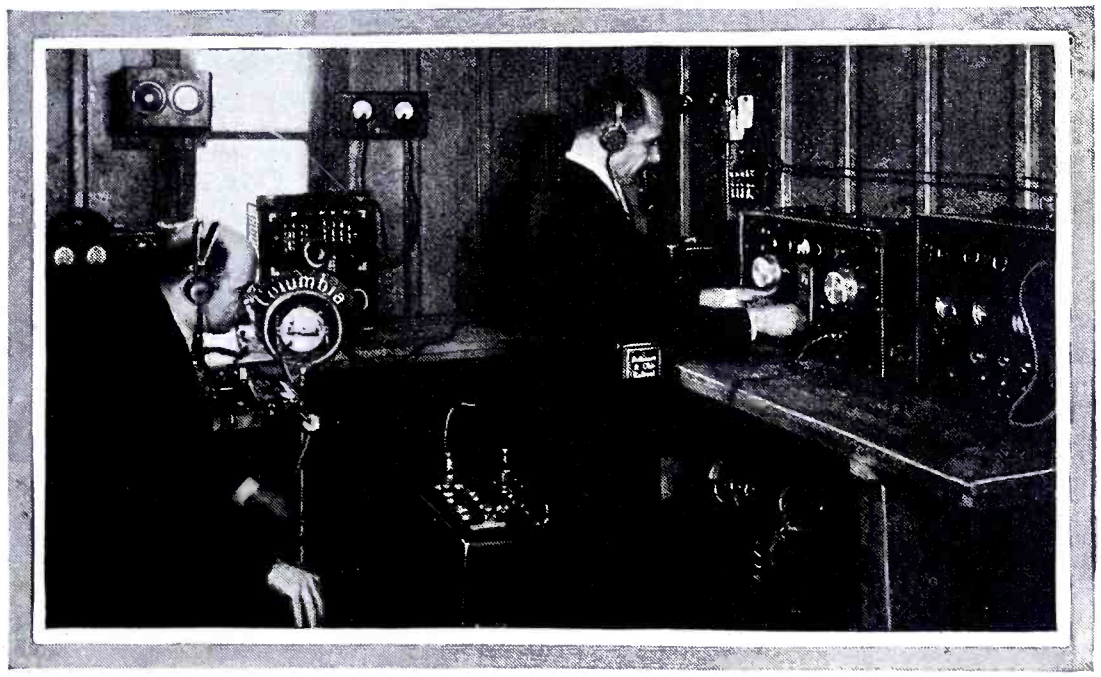
Preliminary tests had indicated the desirability of two separate pick-up points to receive the program by short wave direct from the speeding train. One station was located at Beltsville, Md., approximately ten miles out of Washington; the other at Laurel, Md., close to twenty miles out of Baltimore. The master control station was constructed at Laurel, and the Beltsville pick-up was fed by special circuits to Laurel, whence the program was transmitted over the nation-wide Columbia network, and also to foreign countries over Columbia's regular short wave stations, W2XE and W3XAU.

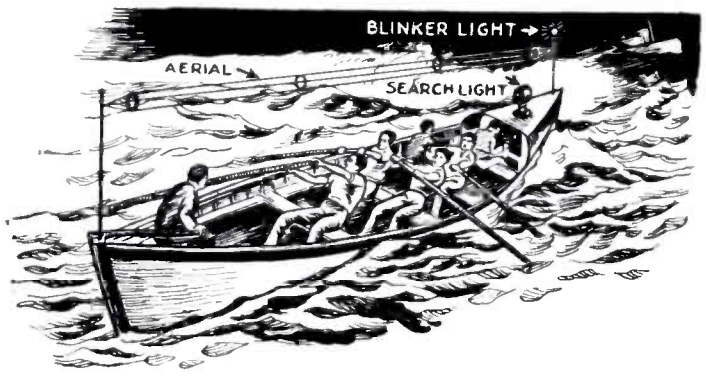
In order to complete the two-way communication between the moving train and the temporary master control station, the special short wave transmitting station, W2XDZ, was installed at Laurel. From here the instructions and cues necessary for the program were transmitted to the receiving sets aboard the train.

30-Mile Circuit Used as Aerial

One of the unusual features of the broadcast was the 30-mile long copper telegraph wire which was used as an

(*Continued on page* 106)

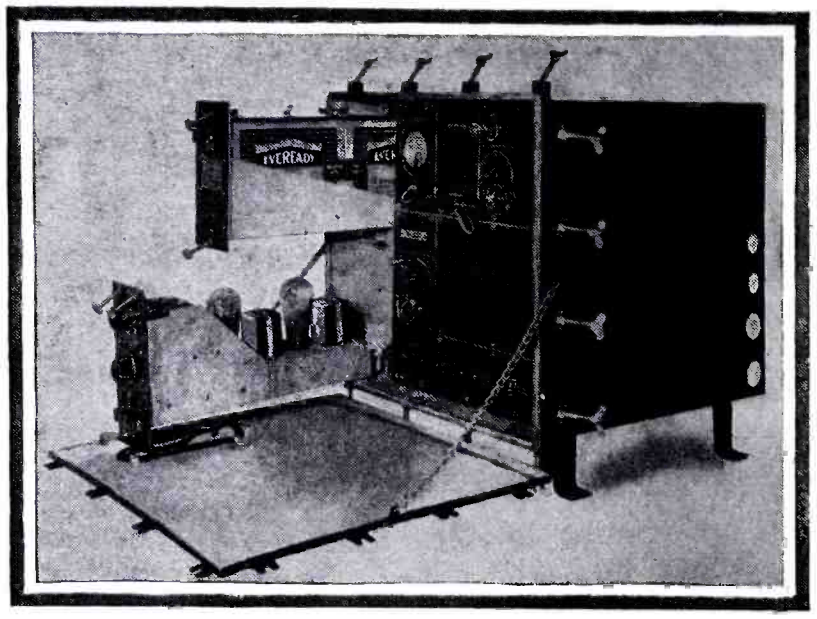




The life-boats of our modern steamships will be fitted with short wave radio transmitters, a blinker light and also a searchlight.

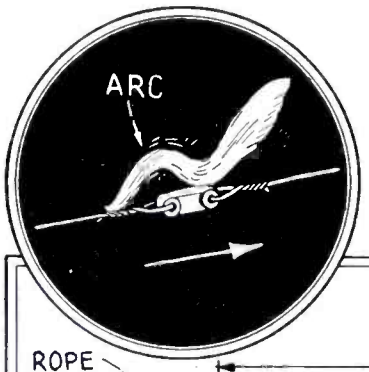
SHORT WAVE LIFE-BOAT Emergency Transmitters

IN the last twenty years, during which time radio has been available for saving life at sea, practically no use has been made of portable transmitters which could have been easily installed on the life-boats carried by our modern leviathans. The accompanying illustration at the right shows the latest Radiomarine "Life-boat" transmitter, of the portable type, which has been especially designed to operate on dry batteries. It has a range of from 50 to 100 miles. The transmitter is mounted in a water-tight metal case, the front panel of which can be lowered by loosening the wing-nuts shown. The control dials for tuning and adjusting the transmitter are all greatly simplified and made very rugged to stand the hard use to which they may be subjected. In many cases lives have been undoubtedly sacrified due to the fact that stranded life-boats carrying survivors have been lost, so far as rescuing ships were concerned.



Right—Appearance of the newest short wave transmitter of compact type, operated on dry batteries; has water-tight case designed especially for installation in life-boats as carried on our ocean liners.

"Musical Arc" a Spectacular Phenomenon

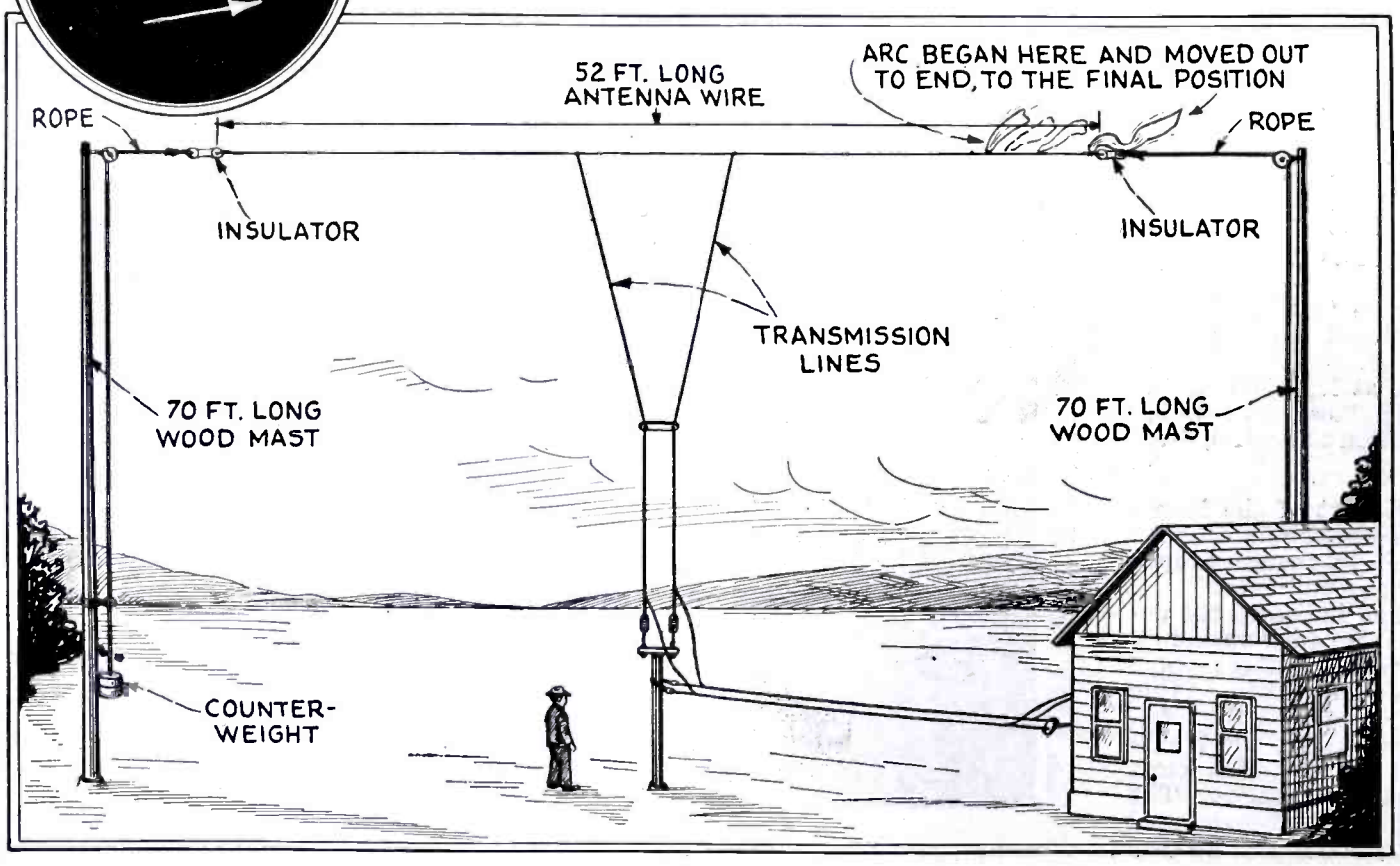


A "musical arc"—one of the most unusual effects ever witnessed at a short wave transmitting station and which took place at Schenectady, due to the conditions mentioned in the accompanying article.

MUSICAL thunder, accompanied by a vivid electrical display, has been encountered by radio engineers of the General Electric Company in their investigations near Schenectady, of high-powered, *short--wave* broadcasting.

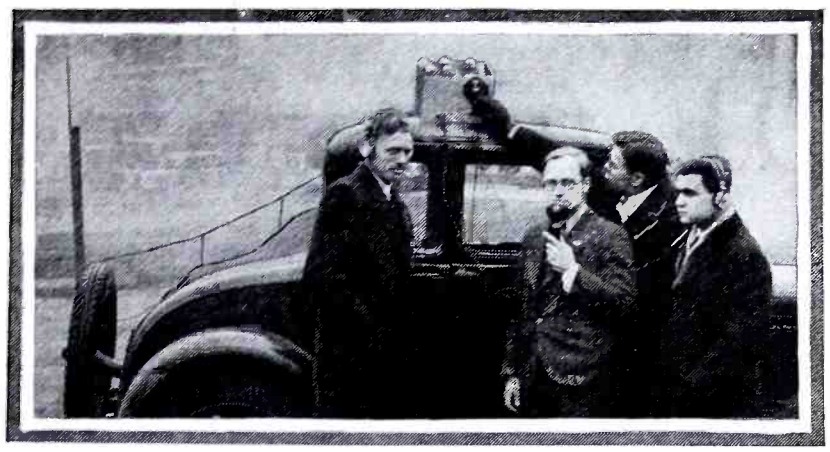
In these miniature thunder-storms, which occur during any kind of weather, daylight or darkness, clear or overcast skies, the thunder is converted into music, which corresponds to the input at the radio microphone.

WGY engineers have solved the problem of handling 200 kilowatts of power modulated, on *long* waves, but new difficulties are presented in the use of powers above 15 kilowatts on the *short waves*. In using powers up to 15 kilowatts in the antenna no unusual phenomenon has been observed, but when it was first attempted to increase the power to 35 kilowatts in the antenna, vivid coronas flashed, wavering like ghostly spectres in mid-air. This corona demonstration didn't appear as long as the carrier alone was on, but as soon as the engineers attempted to modulate, the arc was struck in the surrounding air. *This arc generally started about three or four feet from the antenna and shot upward four feet in the air.* Since the power supplying the arc was modulated with music, the arc alternately collapsed and built up in size corresponding to the



(*Cont'd on page* 110)

SHORT WAVE SNAPSHOTS



Ultra short wave tests being made with automobile set.

Ultra Short Waves Transmitted from Car Set

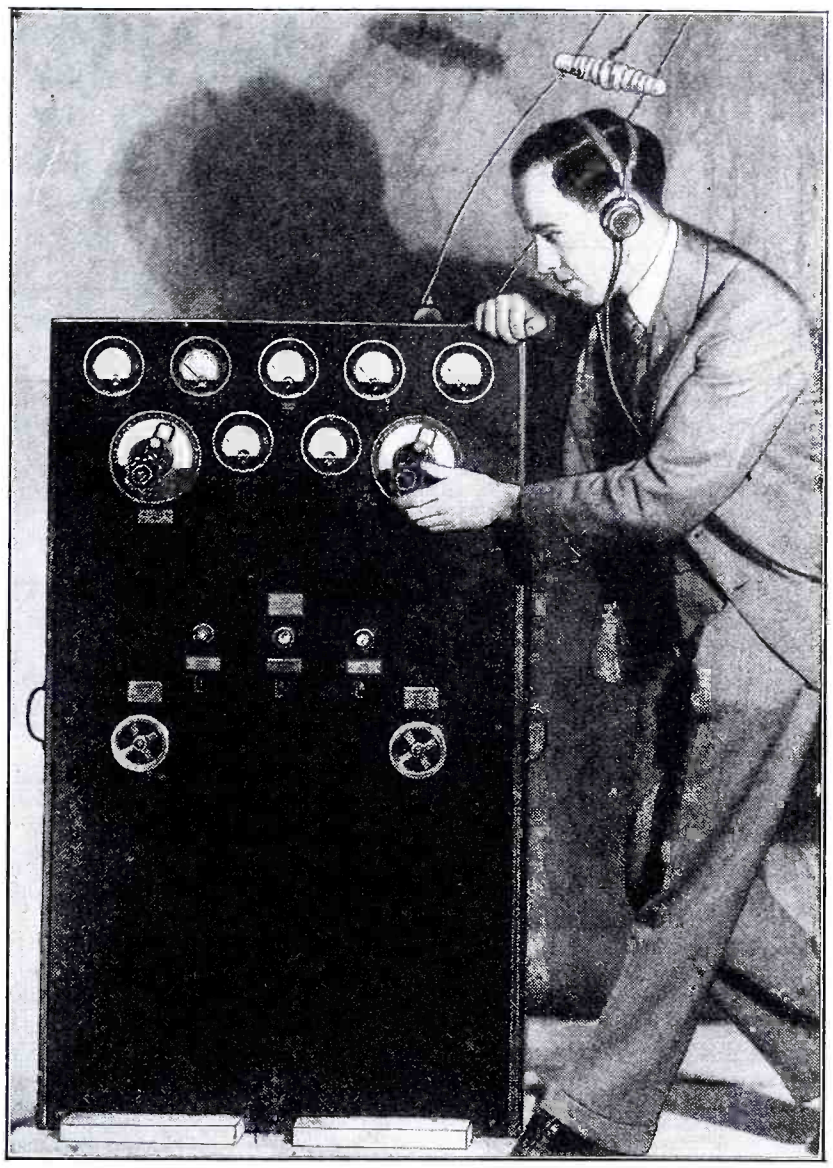
THE photo above shows a portable ultra short wave transmitter and receiver, mounted on an automobile; this set was used in making field tests by Hollis Baird of the Short Wave & Television Corporation of Boston, who are interested in the application of ultra short waves, in the region of five to ten meters, for the transmission of television and voice signals. The small antenna used with this ultra short wave receiver can be seen mounted on the spare tire at the rear of the car, with the feeder system leading up to the set which is mounted on the roof.

Short Wave Transmitter at the New RCA Building

THE photograph at the right shows the special short wave transmitter installed in the tower of the new "R. C. A." fifty-story building in New York City. This transmitter is used with an antenna which is concealed behind the stone balustrade at the top of the golden-tinted crown of the tower. By using this tower transmitter the National Broadcasting Company and R.C.A.-Victor engineers have been able to determine the effects of the massive steel buildings of Manhattan, upon the propagation of short waves.

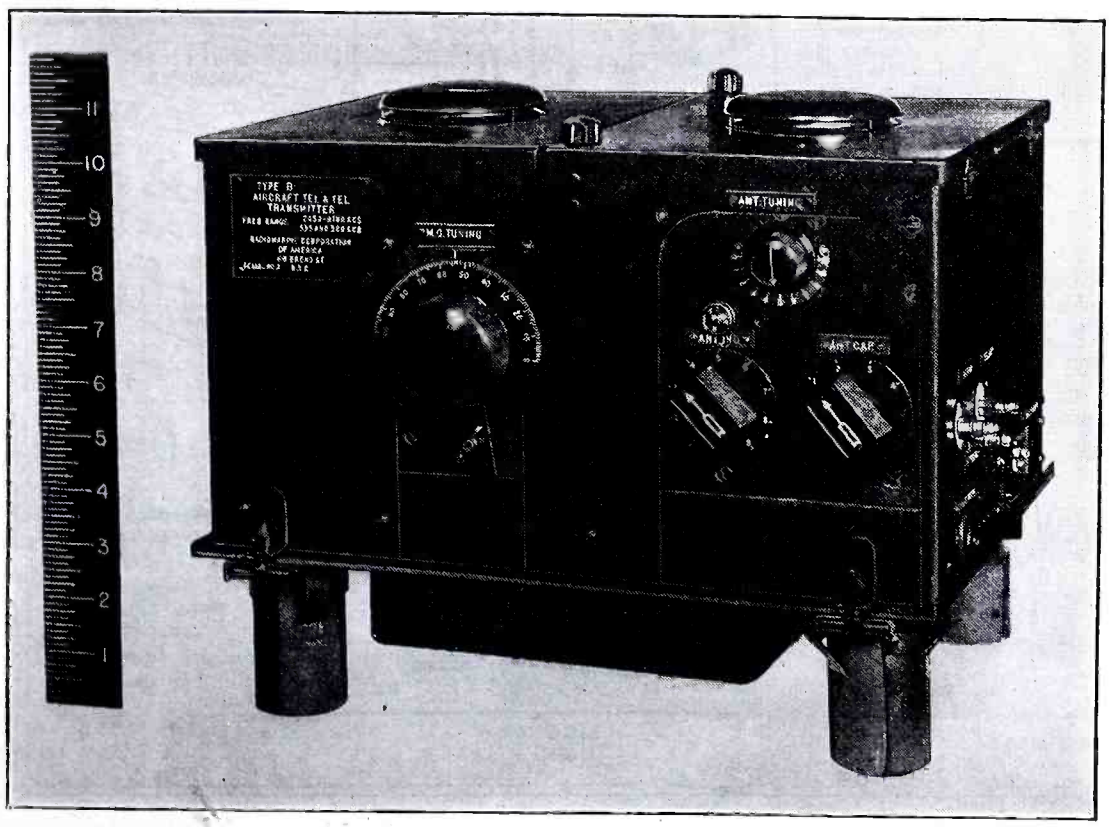
Aircraft Transmitter Eleven Inches High

THE photo below shows a remarkably compact short wave transmitter designed especially for use on Aircraft. The Radiomarine Corporation developed this transmitter, which has been successfully tested in U. S. Army air maneuvers. The transmitter, together with companion receiver, will provide two-way phone or code transmission and reception, as well as beacon and weather service, and weighs but 53 lbs., including power supplies for both transmitter and receiver.

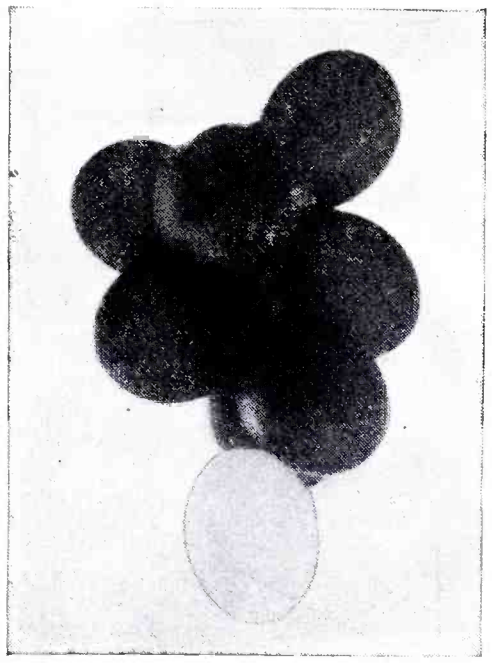


Short wave transmitter atop the R.C.A. building in N. Y. City.

A Bunch of Grapes or Short Waves ??



Aircraft short wave transmitter, 11 in. high and weighing but 53 lbs., with receiver and power supply.



We give you three guesses! What is it? Well, we may as well tell you, it is not a bunch of grapes—and it does have some connection with short waves. Well, here goes and, believe it or not, Ripley, it is a bunch of small balloons supporting an antenna from an N.B.C. transmitter mounted on a truck.

A STENODE *for* SHORT WAVES

By JOHN B. BRENNAN, JR.
Formerly Engineer with Stenode Corporation of America

In spite of recent changes in amateur transmitting regulations, QRM or "interference" is still a serious problem. Application of Stenode principles provides one means for overcoming it. Here are the constructional details for making a "Stenodapter" for short-wave reception.

THE proverbial *grain of salt* must needs be taken in exceedingly large doses, if one is to believe implicitly the astounding descriptions of performance of the products of some few manufacturers of short-wave apparatus, whose claim to fame and reputation have been gained, not so much by excellence in performance of their products, as by the superlatives employed in their advertising.

It is only necessary to sit down before a short-wave receiver for a few minutes and twiddle the dial, to realize that we are still face to face with a problem of interference and heterodyning which is all but discouraging. Particularly in the "80-meter" phone band has the congestion been felt and recent revisions of amateur transmitting rules has only partly alleviated the "Q R M" (interference) problem. Heretofore the so-called eighty-meter phone band covered a mere 50 kilocycles. The new regulations double this width and shift the operation to the upper end of that band. Before, the band covered from 3500 to 3550 kilocycles . . . now it covers from 3900 to 4000 kilocycles.

As a further step in the weeding out process in the eighty-meter band the new regulations also stipulate that operation in this band be confined exclusively to those amateur operators who (a) have had at least twelve months' operating experience under any class of commercial operators' license, excepting radiotelephone operators' license, (b) those amateurs who have had a year's operating experience, and who now hold an unlimited amateur radiotelephony license, (c) those amateurs who, having had the year's experience, satisfactorily pass a government examination for unlimited phone operation.

While it is realized that these new regulations and their requirements have had a beneficial effect in limiting phone operation only to those amateurs who, by virtue of their experience and training, know how to handle a phone station, it has also been realized that some advancement in the radio art was necessary to provide the needed solution.

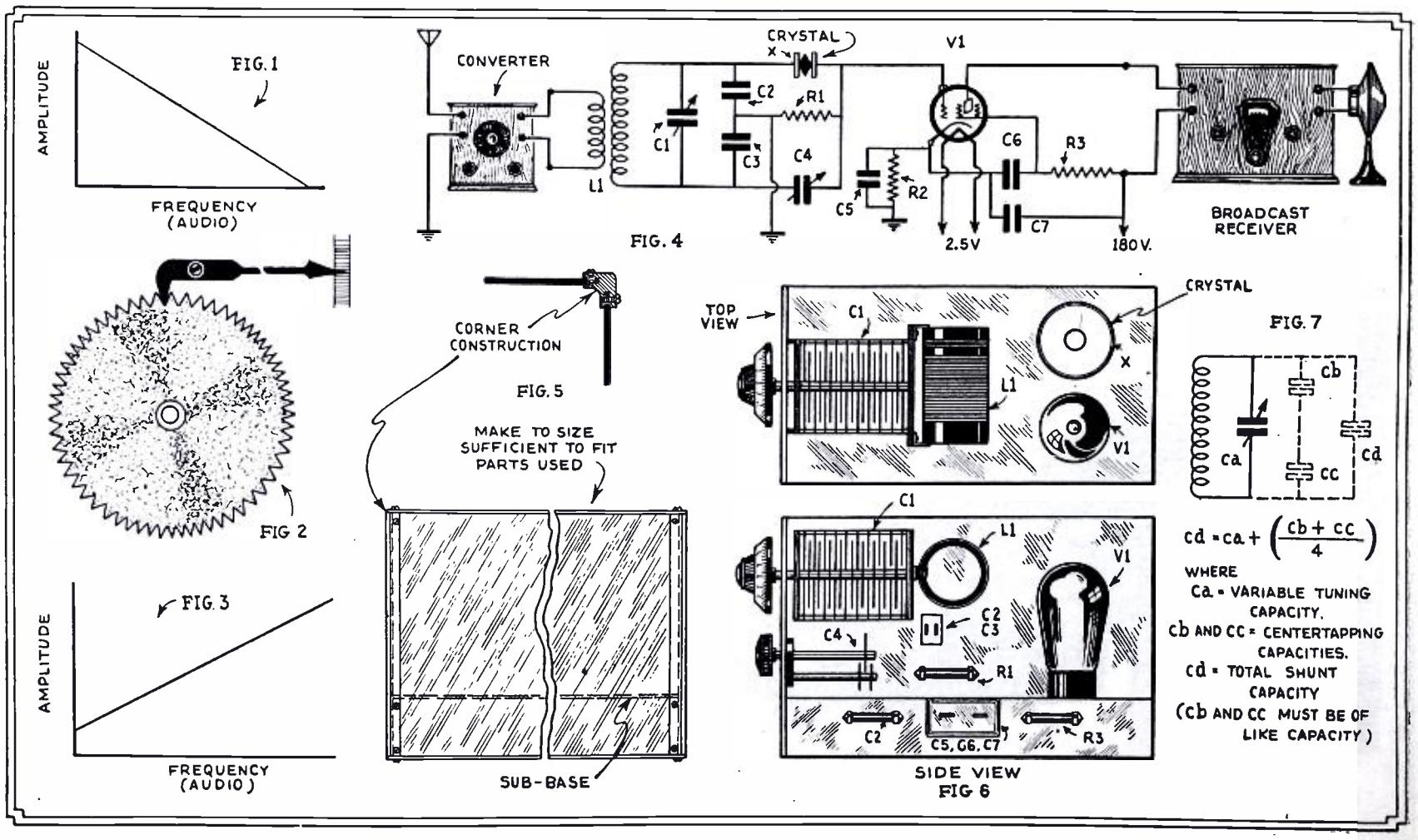
The application of the Stenode principle of radio reception, the invention of Dr. James Robinson of England, goes a long way towards providing a satisfactory answer to this very pressing problem. Past issues of *Radio-Craft* have dealt with this principle in complete detail. Only a brief resumé of these principles will be included in a later portion of this paper.

The Extent of the Interference Problem

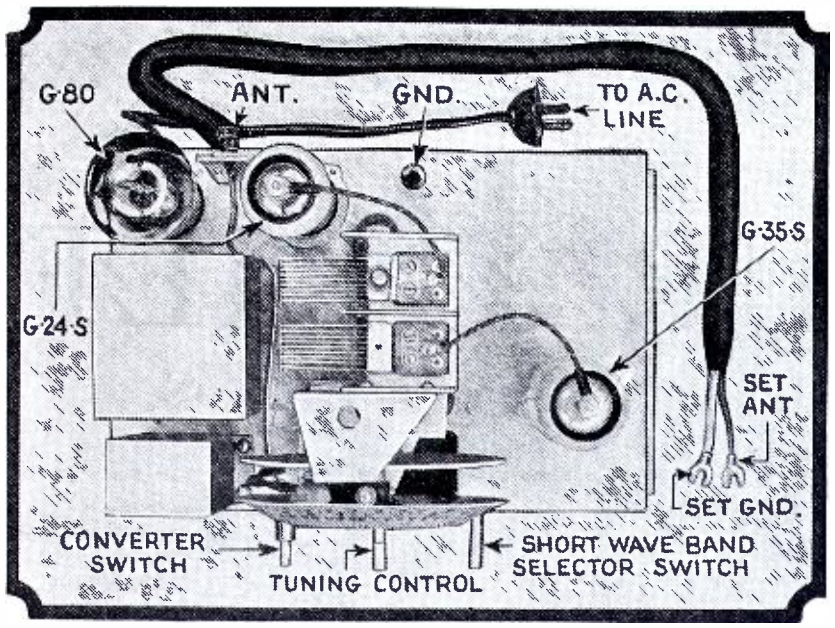
Even though the new regulations offer a partial remedy to the Q R M problem it is felt in some quarters that just as severe a condition will prevail as before, only now in the 160-meter band, by virtue of the fact that those amateurs who could not qualify for phone operation in the 80-meter band must necessarily shift to the 160-meter band, just as soon as they can revamp their transmitters.

Picture, then, sitting down before a short-wave receiver and tuning in a conglomeration of whistles, squeals, howls, cross-talk and whatnot. Indeed a condition which would try the patience of a saint.

(*Continued on page* 118)



The various diagrams above show the action of and also a practical wiring diagram for hooking up a Stenode bridge circuit between a short wave converter and a broadcast receiver, for the purpose of improving the selectivity.



Top view of the Majestic Short Wave Converter.

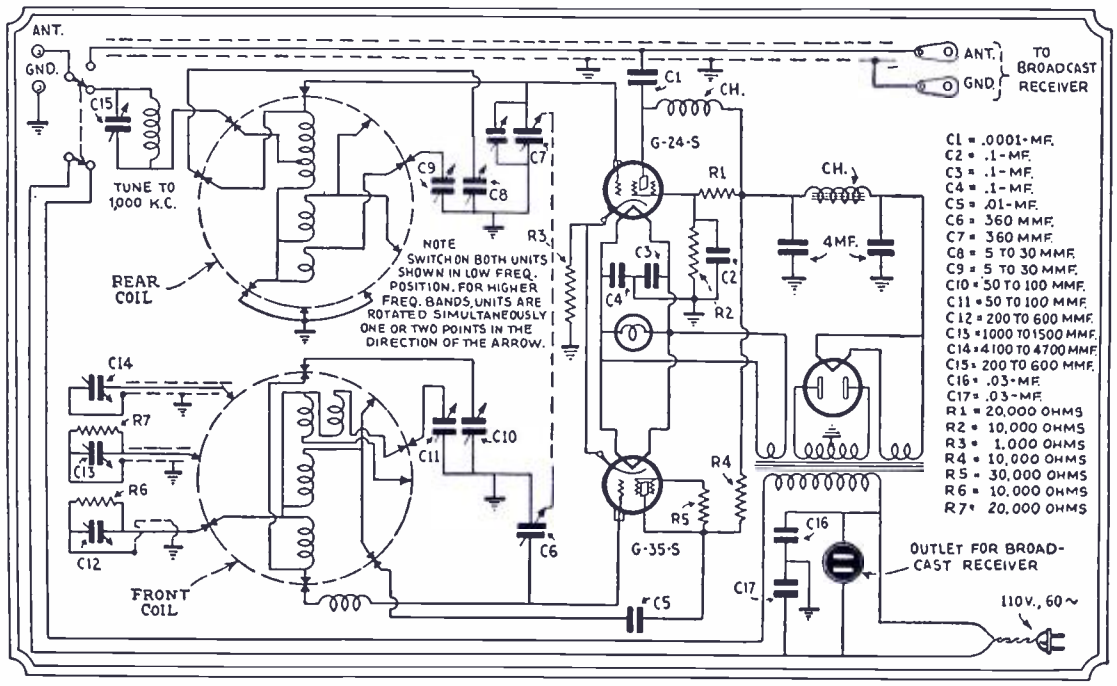
The MAJESTIC *Short Wave* Converter

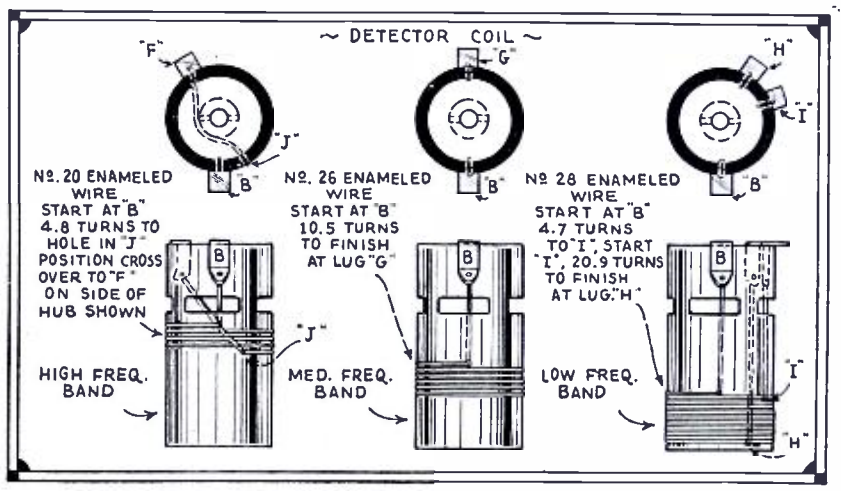
Brings in short wave stations on your regular broadcast receiver.

THE short wave converter here illustrated has been developed by the engineers behind the well-known Majestic line of broadcast receivers. When this converter is connected to a broadcast receiver, the tuning dial of which is set to 1,000 K.C. or 300 meters, then your broadcast receiver R.F. stages serve as the intermediate frequency stages of a super-heterodyne for short wave reception.

You may not realize it at first but if you couple such a converter as this to a ten-tube broadcast receiver, you have eleven "working" tubes in your short wave combination receiver, two of the tubes being rectifiers, of course. The value of such a combination, which results in a short wave super-heterodyne receiver, is just beginning to make itself known to broadcast listeners and short wave fans as well, and the tremendous amplifying power of the combination of S.W. converter and B.C. receiver brings in far-distant stations on the loud speaker, which would be almost or quite impossible with any ordinary short wave receiver using but a few tubes..

The coil winding data and condenser as well as resistor values are given in the diagrams. With regard to the inductance shunted across the condenser C15, this combination may be a regular broadcast unit, which can be picked up in most any radio store. If C15 has a capacity of .00035 mf., then the coil may comprise about 81 turns of No. 30 enameled wire, close wound, on a ⅞-inch diameter tube. The R.F. choke ch may be about .5 millihenry. The iron core choke ch, connected between the two 4-mf. condensers in the plate filter, may be of the size usually employed in "B" eliminators, or about 32 henries. In the schematic diagram the rotation of the "rear" coil is counter-clockwise and clockwise for the front coil.





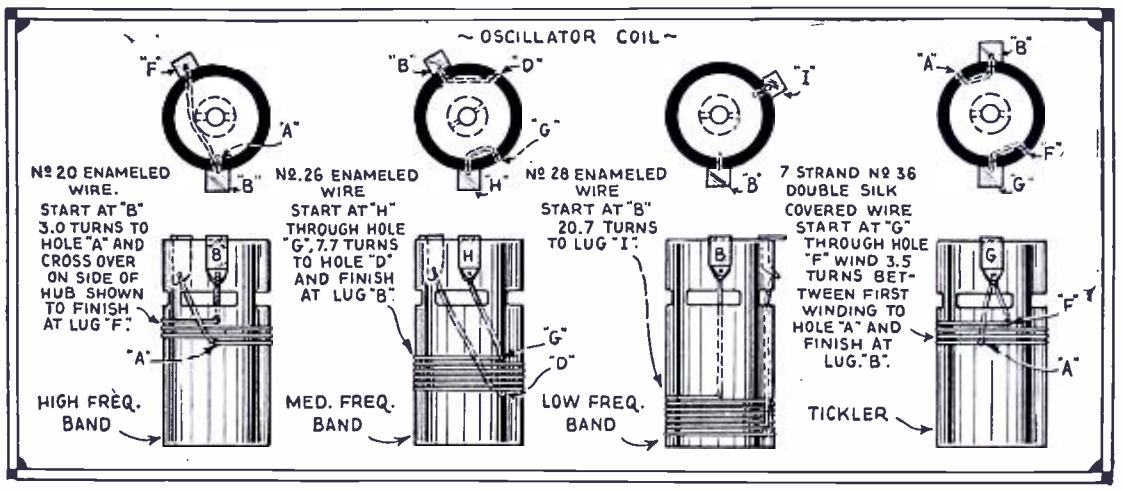
Above — Schematic diagram of the Majestic Short Wave Converter, showing arrangement of coils, condensers and the three tubes used in the converter. The broadcast receiver may be plugged into the outlet shown and then the single switch on the converter cuts in either the converter or the "B.C." receiver.

Left—Coil winding details for the detector inductances.

Below—Details of oscillator coil with windings for high, medium, and low frequency bands.

IN OUR NEXT ISSUE!

A "crystal detector" short wave receiver . . . with suitable R.F. and A.F. amplifying stages to operate a loud-speaker . . . separate regeneration tube . . . superior quality and other features. By R. Wm. Tanner.



Max Pearlman ready for an afternoon's walk with the brief-case radio here described by Messrs. Gernsback and Denton in the accompanying article. An aerial wire and ground connection are used.

Build This Short Wave IN YOUR BRIEF

By HUGO GERNSBACK and CLIFFORD E. DENTON

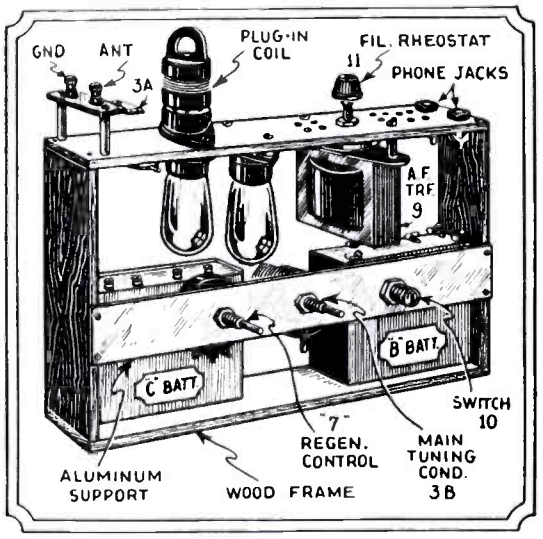
"In the spring a young man's fancy turns"—to portable short wave sets! We doff our hats to this latest radio concoction by the maestro—Hugo Gernsback, whose brain-child has been worked out and put into actual physical form by Mr. Denton. Actual tests with this BRIEF-CASE *short wave receiver, which contains all the necessary coils, condensers, batteries and a pair of light-weight phones, yielded very surprising results. Police calls and amateur stations from all over the country were tuned in easily. Aside from the "brief-case," the cost of the radio parts is insignificant. The weight is slight, while the appearance is neat and businesslike.*

NOVELTIES in the way of short wave receivers are always interesting. This latest design was conceived by the Editor one evening, and the next day Mr. Denton was told to make the idea a practical proposition. Now, a radio set to be self-contained in a brief-case must be small indeed, if the batteries and ear phones are to be included.

The final design selected for the receiver was a standard two-tube regenerative circuit with *resistance control* of the regeneration. The new, small, two-volt Eveready-Raytheon 230 type tubes were used, with a definite thought in mind. Any radio set which would be subject to the jars and knocks that a "gadget" of this kind would be, must not have *microphonic* tubes which would be sensitive to mechanical shock. Tests conducted by the author regarding tubes for use with portable receivers have shown that all sets of this kind require sturdy tubes.

The plug-in coils are made up with a large and a small winding; one being the tuning coil and the other the feed-back or tickler coil. The 100 m.m.f. tuning condenser is mounted with its vernier dial in the center of the brief-case, just under the lock.

Regeneration control, which is provided by means of the 50,000 ohm potentiometer, is mounted on the left of the tuning dial, while the key-type lock-switch is mounted on the right. The various controls are mounted through the leather and held in place with lock washers and lock nuts. The tuning condenser is of the one-hole mount type, and is placed in position and securely fastened; then the dial is mounted. In other words, the control units are more or less free to move with any stresses or forces such as dropping which may be accidentally encountered.

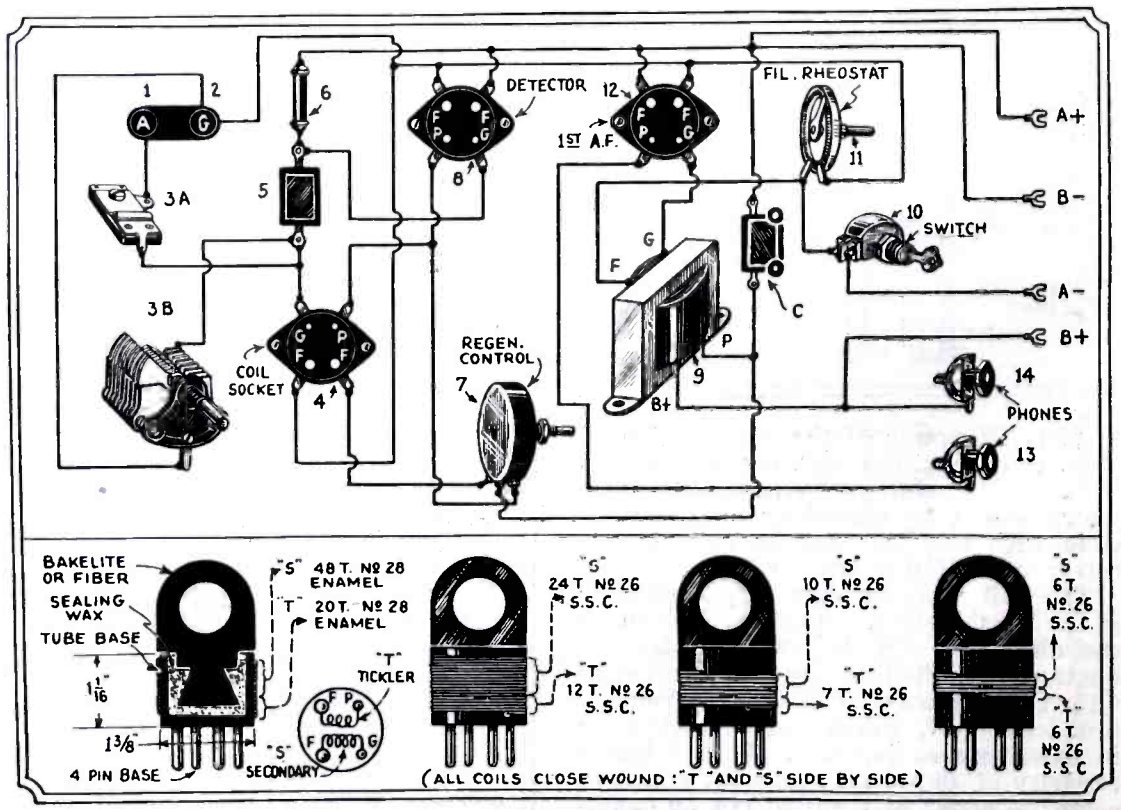


A good method to follow in mounting the radio apparatus for the "brief-case" receiver is shown above.

Half U. S. Spanned in First Test

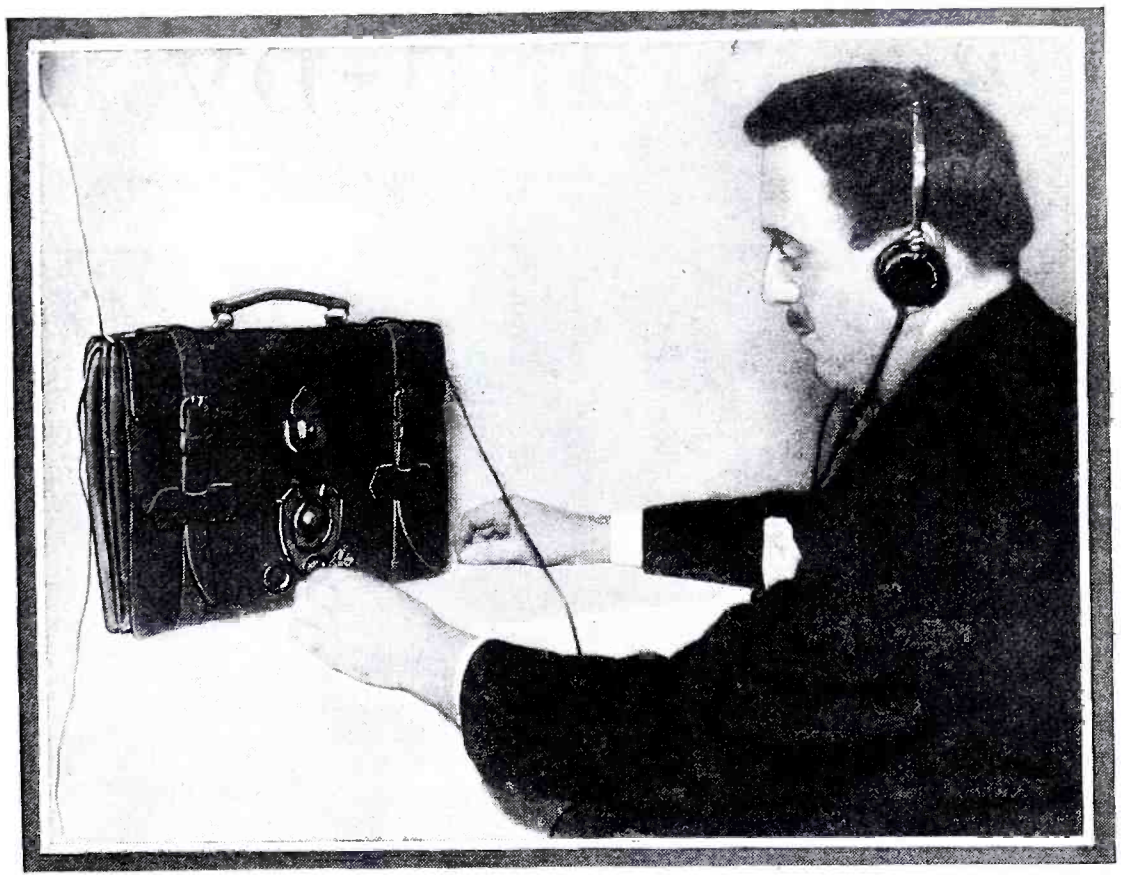
The tubes are slung upside down on the small wooden chassis upon which is also mounted the coil socket and the space with small holes drilled for carrying the extra coils. The audio transformer is one of the new, small-type units with a turns ratio of 3.1. With the regenerative detector plus the audio stage, good volume can be obtained with at least 1,500-mile (half nation-wide) coverage with a ground only! In the tests after the model had been built using a ground, police stations were heard plainly and satisfactorily way beyond the Mississippi from Forest Hills, New York.* Using an

* Verified by the Editor's tests.



A physical or "picture diagram" for building the "brief-case" short wave receiver has been specially prepared and appears above, together with winding data for the short wave plug-in coils.

Receiver CASE

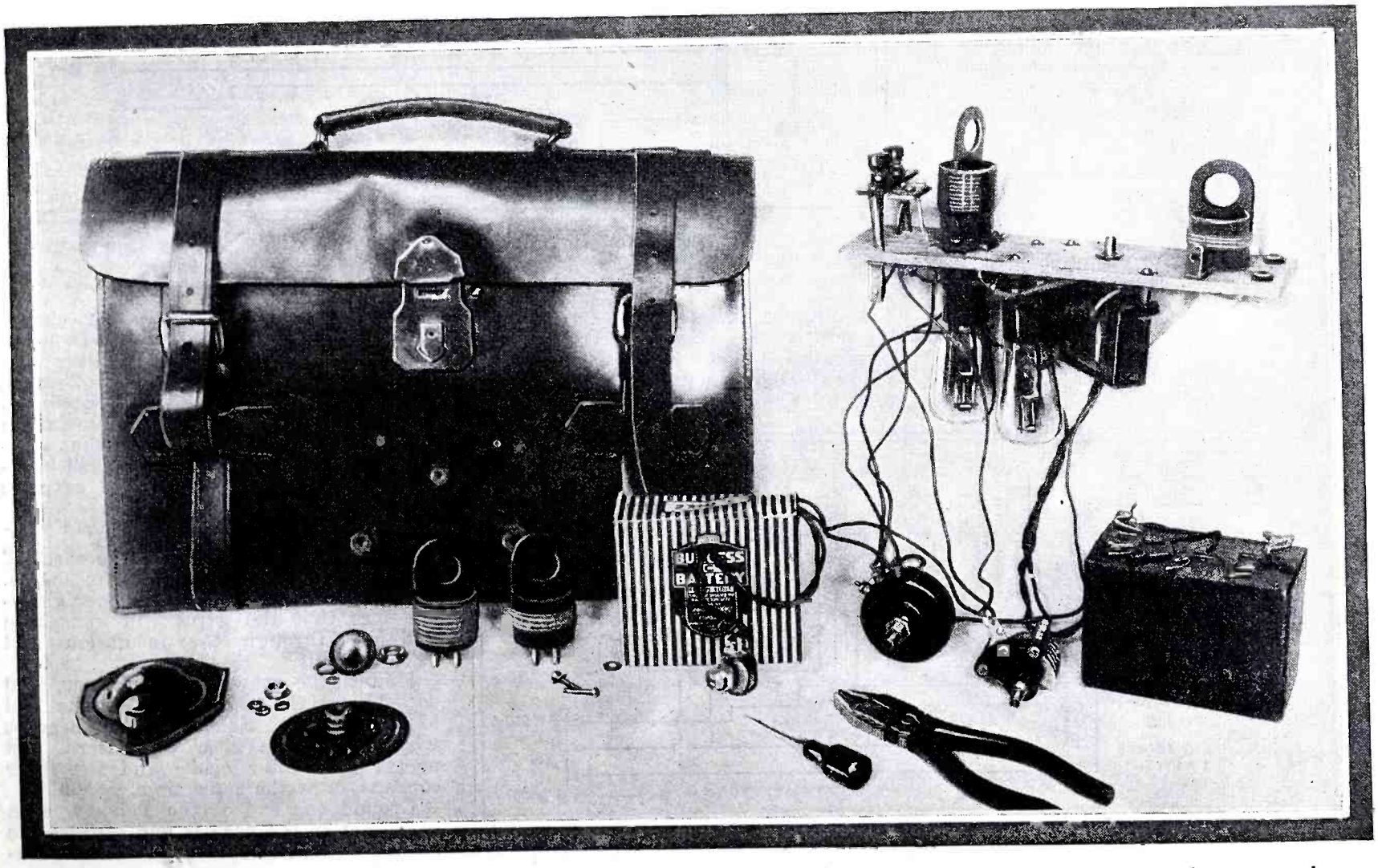


Testing the "brief-case" short wave receiver which gave surprisingly fine results—police calls and short wave phone and code stations from all parts of the country were heard. The aerial may comprise 60 to 100 feet of copper wire, and the ground connection, made to a near-by water or other grounded pipe, fence, or simply a piece of metal pushed into the ground.

aerial, the signal strength increases and more stations were heard. A further test was conducted in a totally shielded room in New York City, and this was the only place in which real satisfactory results could not be obtained. A study of the photographs will give a good idea of the method of assembly. Use a little care in handling the leather so as not to make the holes oversize.

One may question the use of solid type sockets. Generally in portable receivers the spring type have been used but in practice the spring socket tends to help keep a microphonic tube in a state of agitation. The solid socket, while it may offer severe jars to the tube, with no cushioning effect, is best in the long run when used with tubes whose elements are rigidly held in place.

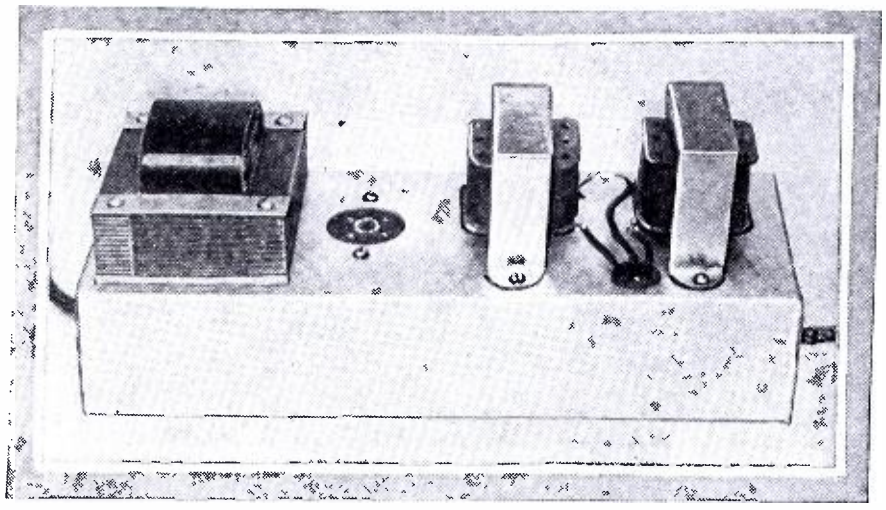
The small power supply may cause one to question the strength of signal possible with this set. Tests indicated that there was no benefit in increasing the plate voltage as long as the detector tube would oscillate at the lower one. Of course the success of this receiver lies in its regenerative action and this effect must be maintained. As the filament current consumed by the tubes is .12 ampere, the large size 4.5 volt "C" battery was used for the filament supply; this made the use of the 20 ohm rheostat a necessity. When the battery is new the full resistance of the rheostat should be used in the circuit, and as the battery ages the resistance of the rheostat is reduced. (*Continued on page* 112)



Here we have a close-up of the parts used in building the "brief-case" S.W. receiver. Two battery type tubes are used.

The "Stand-by" Electrified

By CLIFFORD E. DENTON



How finished "power supply" unit looks.

Thousands of readers of SHORT WAVE CRAFT *have written the editors to prevail on Mr. Denton to provide data and instructions for electrifying his "Stand-by" three-tube receiver, which was described in the April issue of* SHORT WAVE CRAFT. *The "Stand-by" represents the most popular idea of a short wave receiver, which shall combine low construction cost, good "D.X." or distant reception range, coupled with loud-speaker reception. All of these salient features are embodied in the Denton "Stand-by."*

IN answer to the many letters from readers requesting information which would enable them to operate the Standby receiver completely from A.C., the author has prepared this story so as to answer all the letters at once.

Receiver Changes

Referring to the April issue of SHORT WAVE CRAFT, page 396, and to the modified schematic for A.C. operation given in the present issue, shows that a small amount of work and but few parts are necessary to make the change-over to complete A.C. operation. Resistor 13 in the battery model was .1 meg. This value is increased to .25 meg. in the A.C. version. The watts rating is 1 watt; resistor 16 is changed to 3,000 ohms.

The 200-ohm potentiometer is connected in the A.F. screen grid bleeder circuit, and is used as before as a detector sensitivity control.

Screen potential is obtained from a tap on the voltage divider made up of the 200-ohm potentiometer, the 20,000-ohm, 1-watt, and the 20,000-ohm, 1-watt resistor. This places about 17 volts on the screen of the '24 tube and the cathode is varied between 0 and 2 volts. The higher plate current of the '47 requires an output coupling device, when the output is used with phones.

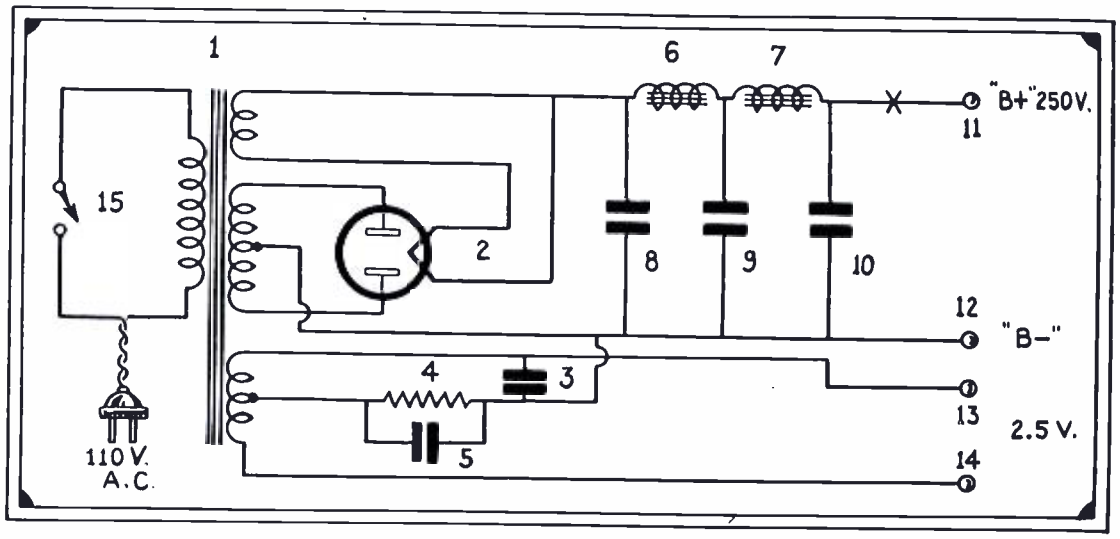
The A.B.C. Unit

The power unit is simple, inexpensive, and "hum-free." Using a single '80 type tube and connected to a 115-volt A.C. line, the unit will deliver 350 volts at 45 ma. The voltage of the secondary is quite high but can be brought down to 250 volts by using a series resistor in the positive leg. See circuit diagram of eliminator at point marked "X." A resistor of 3,000 ohms rated at 5 watts was used by the author to drop the output of the "B" supply. If possible, obtain a 10-watt resistor, as a 5-watt size runs very warm.

Physical Layout

A small aluminum box or tray, 10" long, 2" high by 3¾" wide, holds all the necessary parts for the power unit.

The power transformer, tube socket for the '80 rectifier and the power chokes are mounted on top of the chassis, while underneath are mounted the filter condenser, bias resistor with its 25 mf., 25-volt by-pass (necessary for quality), and the mica condenser which unbalances the 2.5-volt filament wiring, thus preventing the generation of so-called "tunable hums," when using the extreme short wave coil.



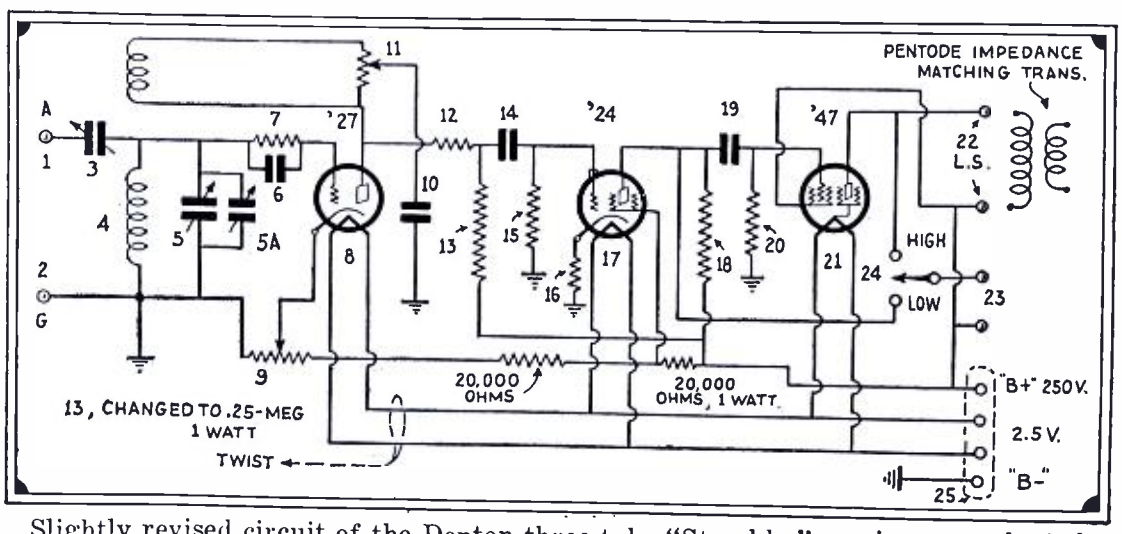
Simple wiring diagram used in building the 110-volt A.C. power supply unit for the "Stand-by" receiver.

Construction and Wiring

Lay out the chassis on a large sheet of aluminum and drill all holes as shown. The holes marked "G" have rubber grommets, so that the wires will not chafe and cut through the insulation and "short-circuit."

Mount the power transformer, '80 socket and the choke nearest the end of the chassis. Fold the small bracket which holds the filter condensers, and mount the center choke and the filter condensers at the same time.

Ground one end of the .005 mf. mica condenser to the chassis and connect the other terminal to one of the 2.5-volt filament leads.



Slightly revised circuit of the Denton three-tube "Stand-by" receiver, as adapted by its designer to electrified operation.

The 25 mf., 25-volt condenser and the 400-ohm resistor are wired into the circuit between the center tap of the 2.5-volt winding and the chassis. The balance of the wiring is point-to-point and can be run the best way. An examination of the photographs will show most of the wires very clearly.

Wire in the power cord and the female plug; this plug is important. Do not use a plug with exposed metal contacts, as they may accidentally "short-circuit" and burn out the rectifier tube or the power transformer.

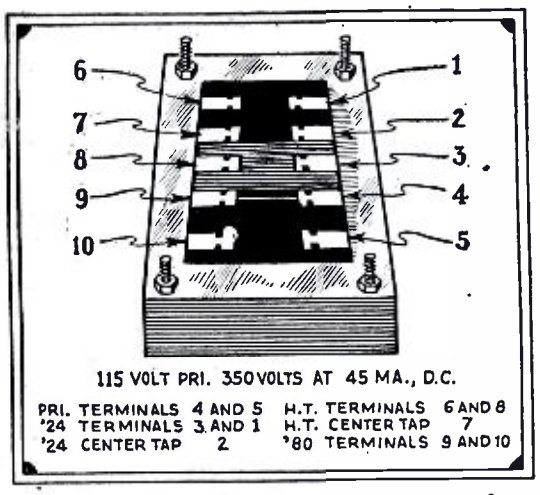
The total capacity of the filter condensers is 10 mf., which is sufficient for use with this receiver, as the total current (B) consumption is less than 35 ma.

The '47 type tube will hum if there is an unbalance in the power transformer 2.5-volt winding. If the hum is too great, use a variable resistor of 20 ohms to obtain the *electrical center* for the connection of the bias resistor and condenser.

Do not apply over 250 volts to the plate of the '47. To do so materially affects the output of the tube.

Combining Pack and Set

After the power unit has been assembled and the changes made in the receiver, the set can be tested in operation. Plug the five-prong cable into the set. Connect aerial and ground. The power



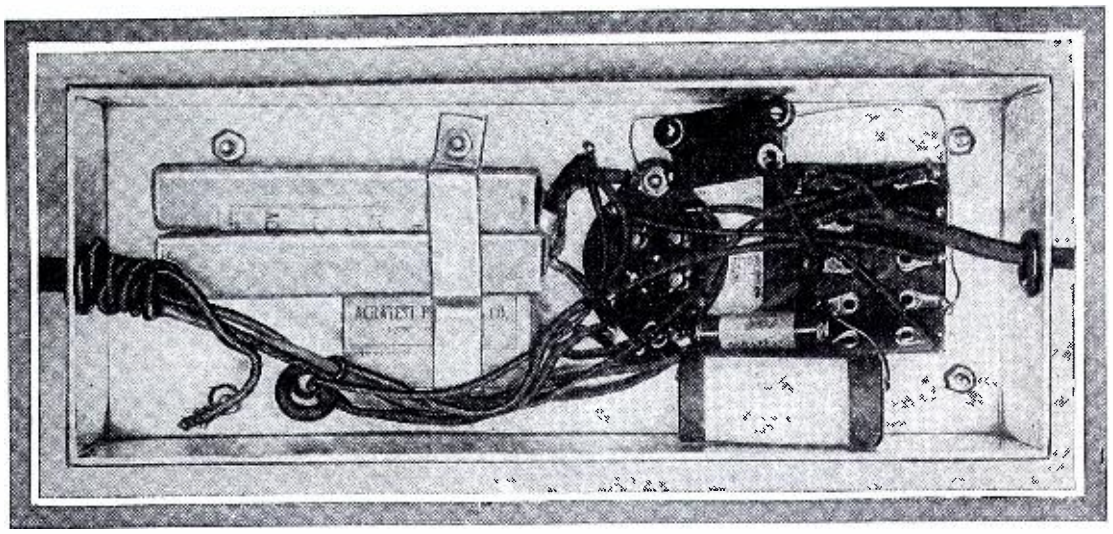
Hook-up data for the power transformer used in building the "Stand-by" power supply unit.

supply unit grounds through the set, by the way. Use phones or loud speaker with output coupling device. If the "on-off" switch on the panel of the set is to be used, two wires will have to be run from the power unit to the set, otherwise a switch in the power line of the power-pack will be handy, ignoring the switch on the set, of course.

Place an '80 type tube in the rectifier socket and the 2.5-volt A.C. tubes in their respective sockets in the receiver. Turn on the power and allow the tubes to heat up. Check the voltages with a high resistance voltmeter or set analyzer; if everything is in order the set is ready for use. Considerably more power is available from the A.C. model and the results are well worth while.

Parts List

1—Acratest No. 6027 power transformer.
2—Eby socket, '80 type.
3—Mica-mold .005 m.f. condenser.
4—400-ohm, 5-watt resistor, Acratest.
5—25 mf. 25-volt dry electrolytic condenser.
6, 7—30-henry choke No. 2505 (Acratest).
8—2 mf. dry electrolytic condenser, Acratest No. 6492.



Bottom view of finished heater and plate supply unit, showing filter condensers, resistor and by-pass condensers.

9—4 mf. dry electrolytic condenser, Acratest No. 6493.
10—4 mf. dry electrolytic condenser, Acratest No. 6493.
11, 12, 13, 14—4-wire cable and plug connecting to chassis at 25.
15—Filament switch on "Stand-by" Receiver.

Parts List for Denton "Stand-by" Receiver

1 set of Octo coils (4).
1 XL variodenser (3).
1 Eby '37 type wafer socket (8).
1 Eby '36 type wafer socket (17).
1 Eby '38 type wafer socket (21).
1 Eby antenna, ground B, postrip (1, 2).
1 Eby dial phone tip connector (23).
1 Eby L.S. tip connector (22).
1 G.E. power toggle switch (18).
1 S.P.P.T.—toggle switch (24).
1 Frost 50,000-ohm potentiometer (1) with insulated washers.
1 Carter 200-ohm potentiometer (9) with insulated washers.
1 Pilot midget condenser (5A) (J5).
1 Pilot ART dial.
2 International Durham ½-watt, 0.25-meg. resistors (18, 20).
1 International Durham ½-watt, 0.5-meg. resistor (15).
1 International Durham 1-watt, .25-meg. resistor (13).
1 1-watt, 10,000-ohm resistor (12).
1 1-watt, 3,000-ohm resistor (16).
2 Dubilier .01-mf. mica condensers (14, 19).
1 Eby 5-contact wafer male connector unit (25) with female receptacle and wire cable.
1 .001-mf. mica Aerovox condenser (10).
1 .000125-mf. mica Illini grid condenser (6).
1 5-meg. International Durham grid leak (7).
1 National .0005-mf. condenser cut down to .00015-mf. (5).

"STAND-BY" STANDS BY GREAT

Editor, SHORT WAVE CRAFT:

I have built the "Stand-by" and I'm here to say it's a wonder. The second day after it was completed, I pulled in I2RO, Rome, Italy, on 25.42 meters; HKD, Barranquilla, Colombia, on 49.59 meters.

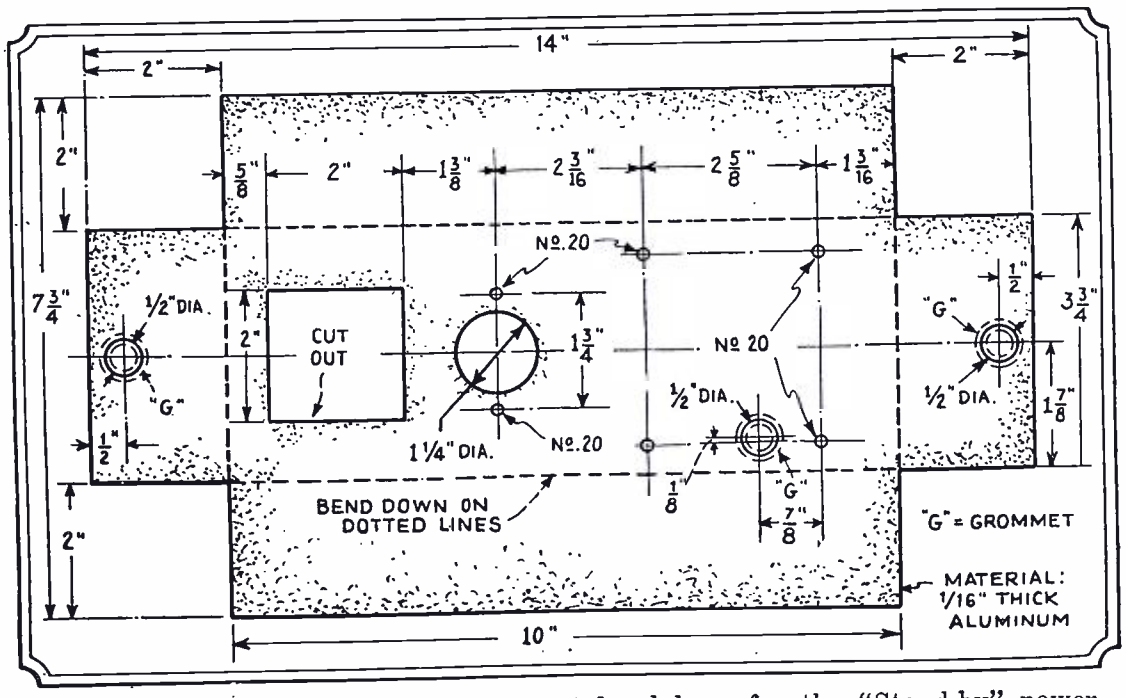
BOTH ON THE LOUD SPEAKER.

I would like to add a stage of R.F. tuned or untuned, whatever you think would be best. I am enclosing a stamped envelope. Will you send me your best R.F. circuit? I would like to tell you that all the parts, except tubes, were all "second-hand" and the chassis was made of wood, with no shielding except the tube shields.

Congratulations. I don't believe this set can be beat.

Yours truly,
Howard Metzler,
640 11th Ave.,
Moore, Pa.

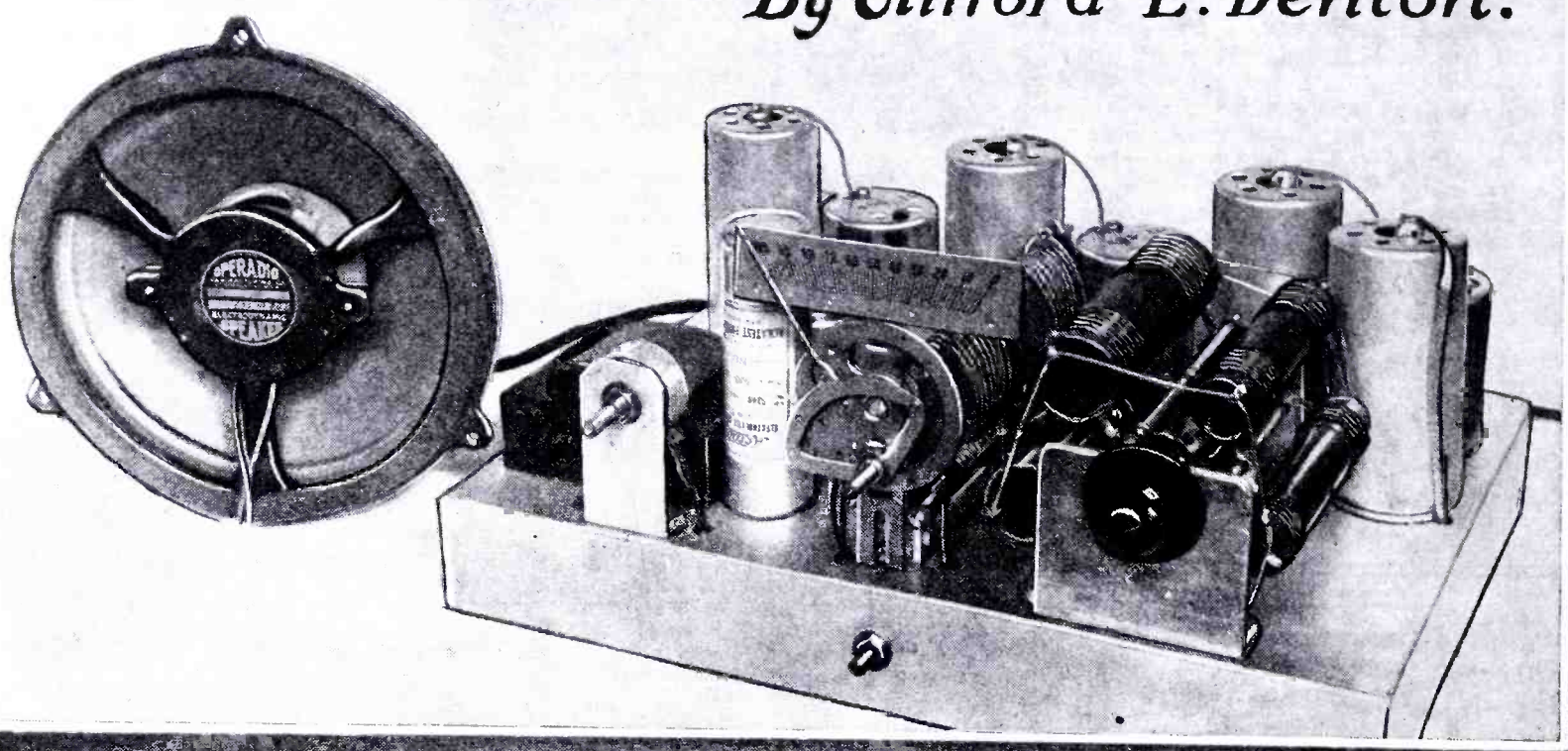
1 "Blan" aluminum box and chassis cut and drilled to specifications, with special coil cover "cap" and bakelite coil mounting assembly.
12 Insulated eyelets.
2 Grid grip screen-grid clips.
15 feet rubber-covered (push-back) wire, nuts, bolts, lockwashers, soldering lugs, etc.



Layout for the aluminum or other metal sub-base for the "Stand-by" power supply unit.

The DENTON Short Wave Plugless Superheterodyne.

By Clifford E. Denton.



Here is the complete super-heterodyne, with band-changing switch at right, together with midget dynamic speaker—all ready for a cabinet.

"WHAT will it cost me to build it?"—is probably the biggest question that confronts the constructor of a radio set today. Next—"what will this set do, that my present one will not?" Mr. Denton has evolved the "ideal" short wave super-heterodyne receiver in the design here offered, without any doubt. The cost of the parts is very nominal; the various short wave bands are instantly available at the turn of a switch and the latest high amplification tubes are utilized, to give the last quota of signal strength in the loud-speaker from every signal received. Finally, the cost of operation is reduced to a minimum by the use of but seven tubes in all. Anyone can build this "D.X." latest type S.W. super-het, by following the "picture" diagram.

IT seems that most everyone today wants a *short wave superhet* so let's see what can be done. Many readers have written to the author in regard to the various versions of short wave adaptors using the *Best* switch and coil assembly, and most of the letters close with "when will a complete receiver circuit come along?" Well, here it is:

The 7-Tube Circuit

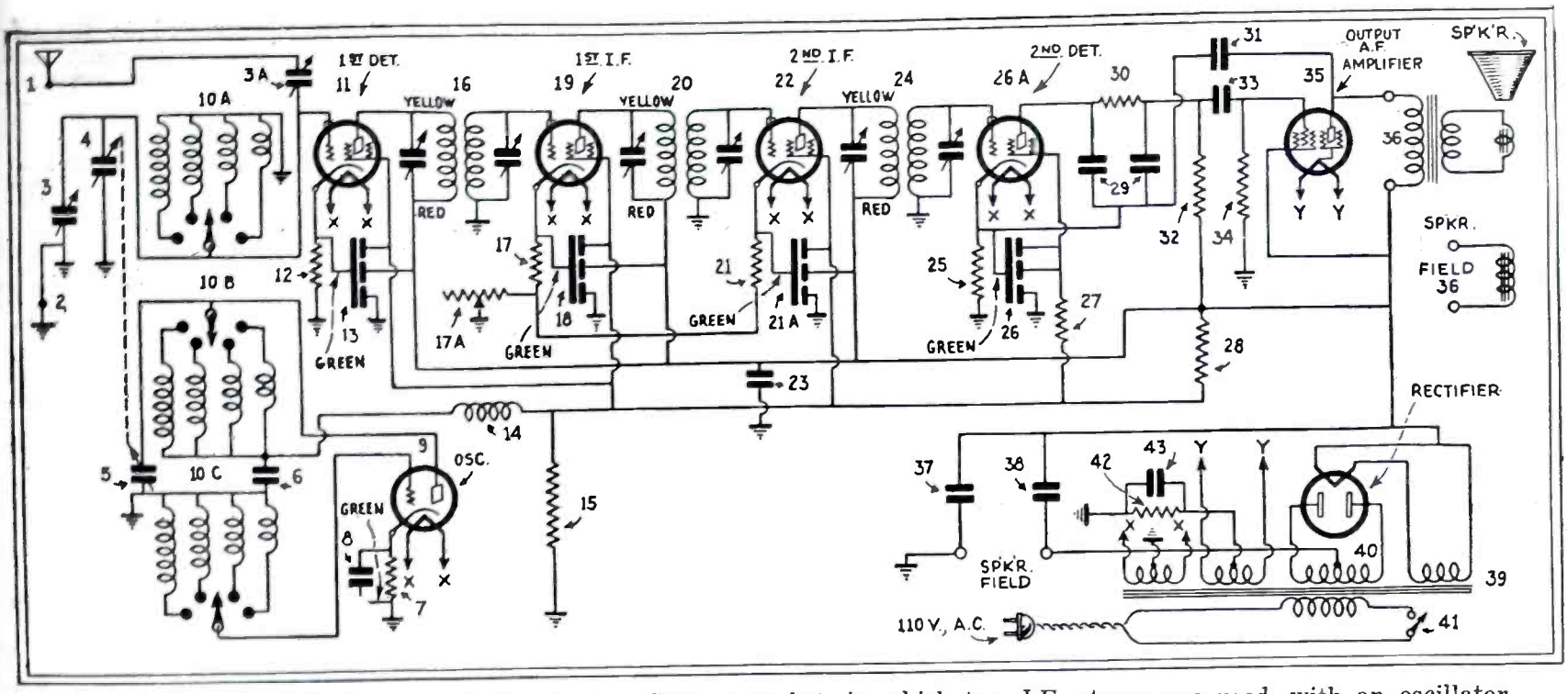
The receiver has 7 tubes, including the rectifier, with a total of eight tuned circuits. An examination of the circuit diagram shows that the antenna is connected to the grid coil of the detector tube through a small semi-variable condenser. This condenser is quite critical in adjustment and should be changed with each change of antenna. If it is too large the incoming local stations will have strong harmonic *repeat points* which are not desired. Of course, if the condenser is too small, there will be insufficient signal input with a loss of sensitivity.

The oscillator is tuned in the plate circuit and the detector and oscillator tuning condensers are ganged together for single dial control. The small compensating condenser connected across the antenna tuning condenser is used to give critical adjustment of the antenna circuit.

The two intermediate frequency (I.F.) stages are tuned to 465 K.C., this frequency being that generally used in modern short wave superheterodyne design. The transformers used in these stages consists of a dual tuning unit with two coils loosely coupled; it is surprising how sharply these coils tune. It becomes necessary to use an oscillator and tune each stage individually when aligning the I.F. stages. One half turn of the screw which tunes the individual units is enough to throw the signal out completely. In the original model illustrated in this article, the author adjusted the voltages on the intermediate frequency tubes, so that with the volume control about eighty per cent on, the I.F. section will oscillate. Thus at any ordinary signal level the I.F. amplifier is stable, but by turning the volume control full on, C.W. (code) signals can be heard and *voice carriers* tuned in easily.

The second detector is an ER224, with plate-bend rectification; the only novel thing to be noted here is the *resistance-capacity filter* used in the plate circuit, instead of the more common choke and condenser unit. The output of the detector is *resistance-capacity coupled* to the pentode, with condenser 31 used to buck out *hum* in the detector circuit.

Many times readers ask for loud-speakers to use with a given set, so a speaker of the *midget type* has been specified and used. The field coil of this small dynamic speaker is used as the *filter choke* in the "B" negative lead of the power transformer. The 800 ohms resistance of the field winding drops the voltage output of the power unit to 260 volts, which is the voltage applied to all plate circuits except the oscillator. The screens and oscillator have a potential



Here is the schematic diagram of the plugless S.W. super-het, in which two I.F. stages are used, with an oscillator, first and second detectors, and pentode power output stage.

of 55 volts, which is supplied by the resistor 28. It is necessary to use at least one insulated, dry electrolytic condenser at 38 in the circuit diagram, due to the fact that while the chassis is at the most negative value, as far as the receiver is concerned, the center-tap of the power transformer is actually more negative, due to the voltage drop in the loud-speaker field choke.

Mechanical Layout

Simplicity is the keynote in the design of this receiver. This manifests itself in analysis of the cost of the parts as well as the attractiveness of appearance.

The tuning dial with the master tuning condensers are located front and center, while the power transformer, electrolytic condensers and intermediate frequency amplifier *volume control* are grouped to the left.

The 12 coils and 3 switches for changing to the various short wave bands, which by the way are 10-20, 20-40, 40-80, 80-200 meters, is placed on the right of the tuning condensers.

The oscillator and first detector tube are placed right back of the tuning coils with the first I.F. transformer mounted in back of the first detector socket.

In the back row, looking from right to left, we find the first I.F. transformer, first I.F. tube, second I.F. transformer, second I.F. tube, third I.F. transformer, and second detector.

Directly in front of the second detector is mounted the pentode output tube and the remaining socket is used for the ER280 rectifier. All of the small by-pass condensers are mounted near the tubes which they serve to by-pass, thus insuring short leads.

The under-part of the chassis conceals the various resistors and the wiring. The resistors used are of the pigtail type and were held in place by using bus-bar, where conditions permitted, and the common push-back wire where insulation was imperative.

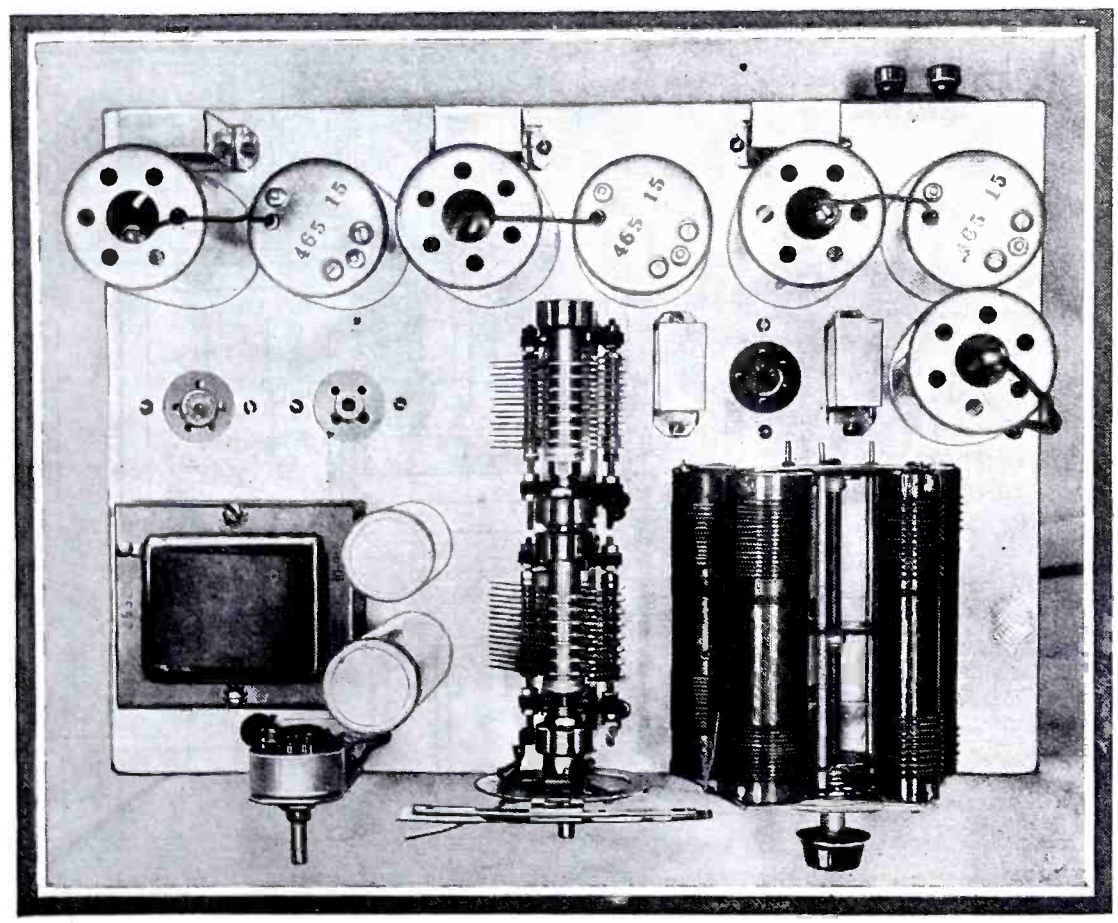
As the wiring can be plainly seen in the photographs no special mention need be made on this subject, except—*make all connections good ones.*

Operation

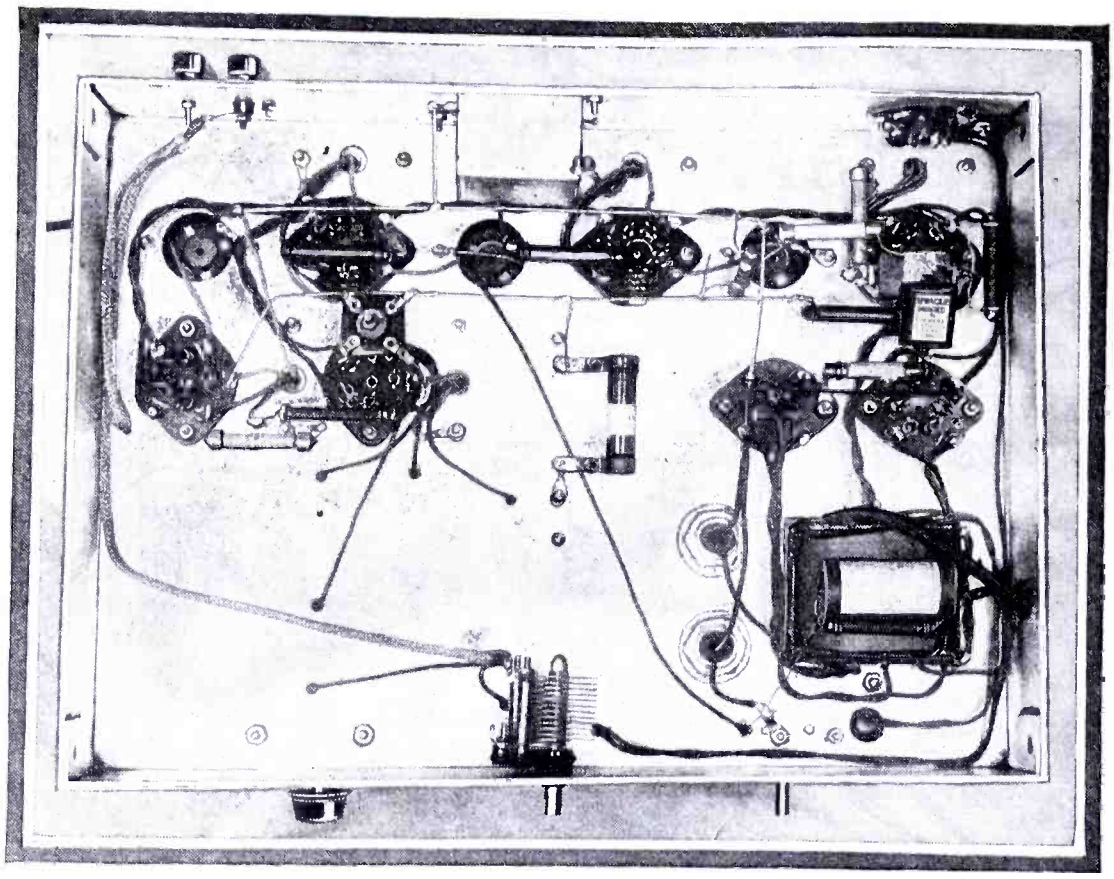
Due to the sharp tuning intermediate transformers, it is necessary to use an oscillator of some sort to tune the I.F. amplifier before signals will be heard. In testing this receiver it was found that the intermediate frequency transformer will tune from 800 K.C. to 425 K.C. So that if no oscillator is within reach, tune the intermediates to some local station which is received on the higher wavelengths of a *broadcast receiver.*

The way to do this is to connect an aerial to the control-grid terminal of the second I.F. tube and with an insulated screwdriver tune in the signal from the nearby broadcast station as loudly as possible on the third I.F. transformer. Then move the antenna over to the first intermediate frequency tube and tune the signal in on the second I.F. transformer. Place the antenna on the detector tube and tune the first I.F. transformer. The receiver is ready for operation.

Connect the antenna and ground to the binding posts, making sure that the loud-speaker cable is plugged into the chassis receptacle and after permitting the tubes to heat up, move the master tuning dial *slowly* until a signal is heard. Clear up the signal by adjusting the com-



An airplane view of the Denton S.W. super-het, showing the ganged tuning condensers and wave band coils, etc.



A view of the under-side of Mr. Denton's "plugless" short wave super-heterodyne.

pensating condenser and vary the volume control for desired gain.

Conclusion

It is desirable to note the dial settings on a chart of some kind, thus increasing the speed with which the operator can familiarize himself with the receiver.

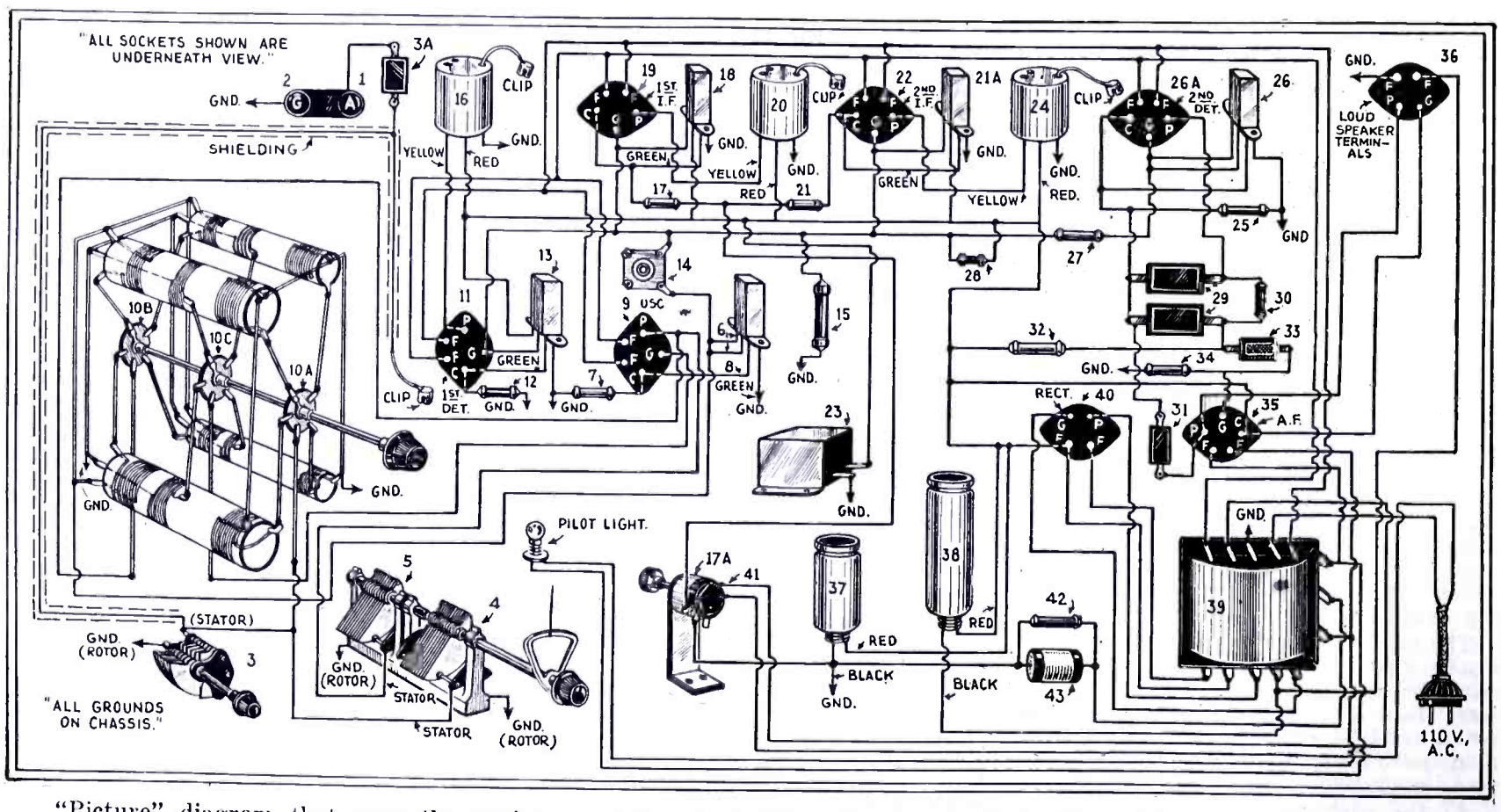
The volume of sound emitted by the midget speaker, even on distant stations, is extremely satisfactory, and considering the low cost and simplicity of the total receiver, it will prove a pleasant surprise for the builder.

The only point in the operation of this receiver that deserves special precaution is the proper adjustment of the antenna coupling condenser 3A. Each aerial and every different location needs a variation of this capacity for maximum results. Experimentation gives the correct answer.

As always, the author extends the invitation to those interested in the receiver, to write. The only requirement is—*enclose a stamped, self-addressed envelope for mailing.*

Parts List for Simple Super-het

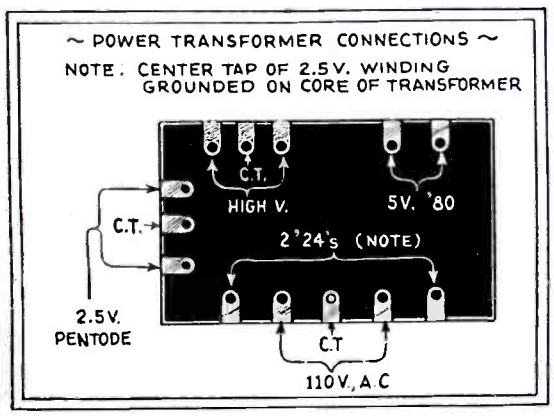
1 Eby Antenna, Ground Post (1, 2)
1 Best S.W.C. 1 kit (10A, 10B, 10C) coil and switch assembly
2 National tuning condensers (see text), (4, 5)
1 Pilot 80 mmf. trimming condenser (3)
8 Eby wafer sockets marked for tubes (9, 11, 19, 22, 26A, 35, 36, 40)
5 Blan .1 mf. by-pass condensers, 3 in each can (6, 8, 13, 18, 21A, 26)
1 Electrad volume control and fil. switch R1-202-P (17A, 41)
1 International or Lynch resistor, 2500 ohms, 1 watt (7)
1 International or Lynch resistor, 10000 ohms, 1 watt (15)
1 International or Lynch resistor, .1 meg., 1 watt (32)
1 International or Lynch resistor, .5 meg., 1 watt (34)
2 International or Lynch resistor, 500 ohms, 1 watt (17, 21)
2 International or Lynch resistor, 25000 ohms, 1 watt (12, 25)
3 International or Lynch resistor, 10000 ohms, 1 watt (30, 15, 27)
1 International or Lynch resistor, 416 ohms, 1 watt, (42)
1 International or Lynch resistor, 50000 ohms, 1 watt (28)
3 Acratest 465 K.C. I.F. transformers (16, 20, 34)
1 Blan RF. choke (14)
1 Flechtheim Filter Condenser 2 mf. 450 volts (23)
1 Sprague midget condenser .04 mf. (33)
2 Aerovox .000125 mica condensers (29)
1 Aerovox .001 mica condensers (31)
4 Hammarlund tube shields
1 Acratest power transformer 2532 (39)



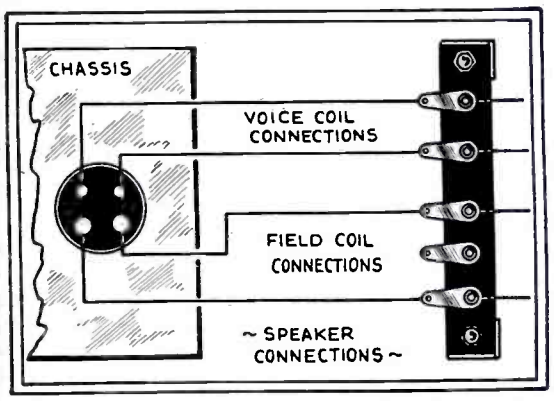
"Picture" diagram that even the novice can follow in building the Denton Short Wave Super-heterodyne. If you use a power transformer (39) other than the one specified, it's a simple matter to follow the connections as given by the manufacturer of the particular power transformer you purchase.

2 Acratest Electrolytic condensers (1-8 mf. No. 5308 and 1-4 mf. No. 5304)
1 Blan chassis and volume control m.t.g. bracket, completely drilled and folded
1 Crowe "full vision" dial and light holder
1 G.E. power cord and plug
1 Acratest 25 volts, 25 mf. No. 6646 (43)
1 Eveready Raytheon 280 tube
1 Eveready Raytheon 247 tube
2 Eveready Raytheon 224 tubes
2 Eveready Raytheon 251 tubes
1 Eveready Raytheon 227 tube
1 *Operadio* loud-speaker with output transformer for '47 pentode, with 1800 ohm field
1 Blan 4 wire plug and beads for speaker cable.

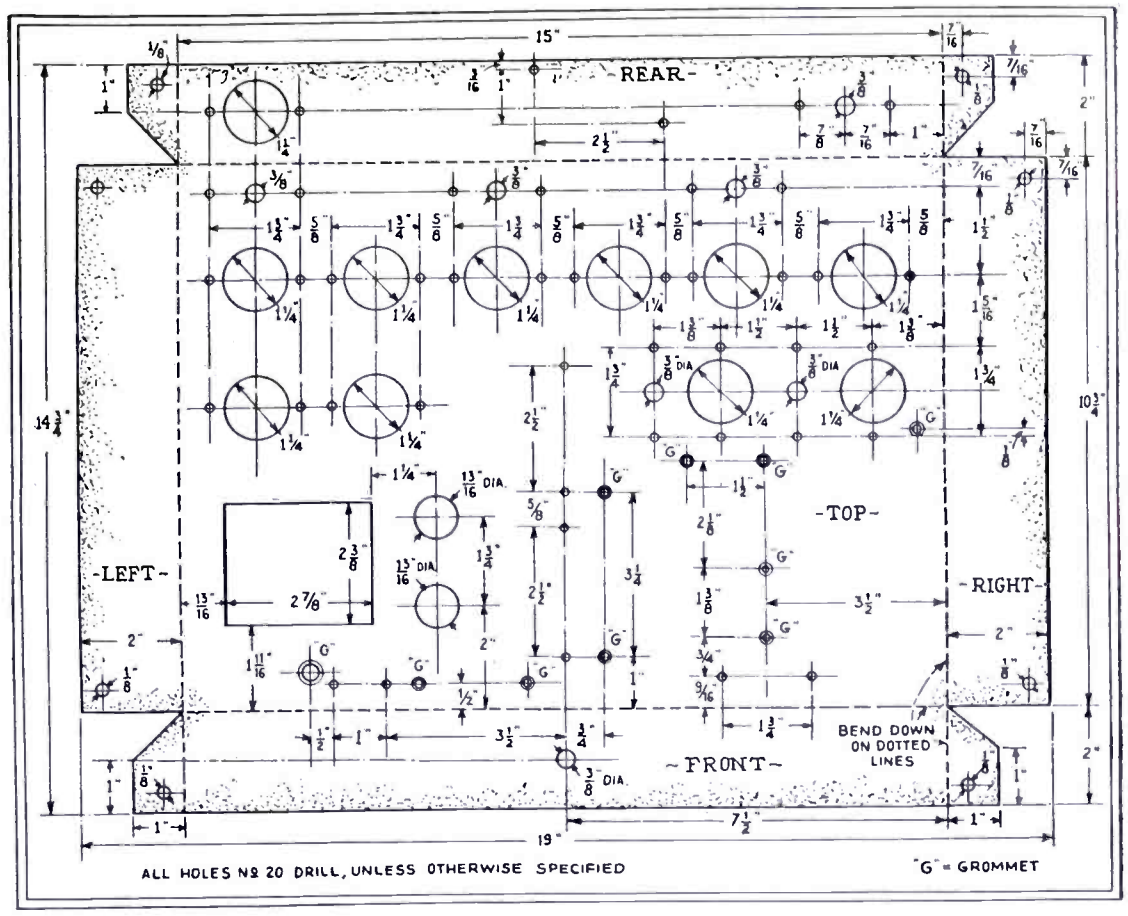
In the event that the builder wishes to use an ordinary loud-speaker, he may procure a pentode output transformer having a secondary of low impedance to match the average speaker.



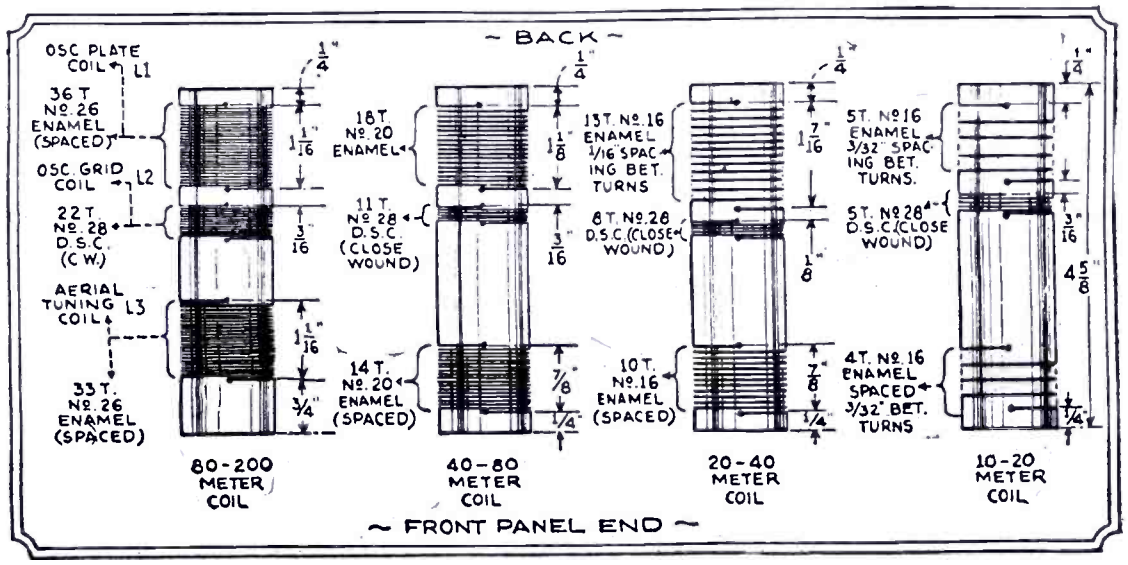
Connections of power transformer for S. W. super-het.



The four connections to the dynamic speaker are taken off through a socket mounted on the side of the chassis as shown above.

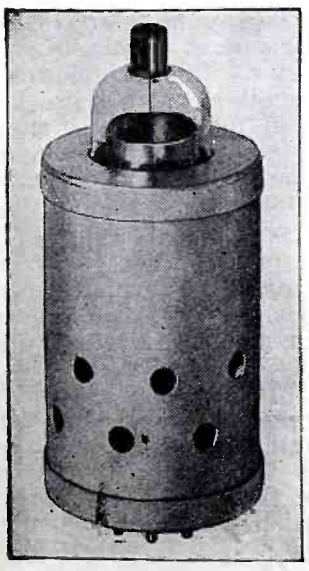


Above—Subpanel drilling layout for the "Plugless" Short Wave Superheterodyne here described. Most radio shops sell subpanels drilled and undrilled at a nominal price.



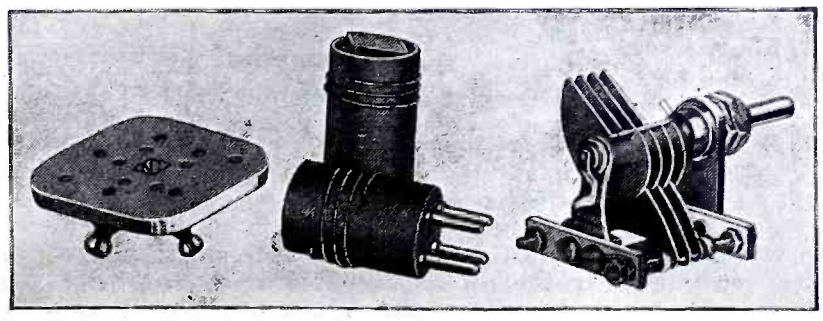
Converter Coil Data—2 coils at left 1¼" O.D.; 2 coils at right ⅞" O.D. (Outside diameter.)

New Ultra Short Wave Apparatus



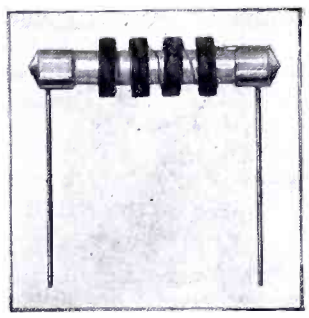
THE first, specially designed, ultra short wave apparatus has recently shown itself on the American market and is revealed in the accompanying illustrations. This new U.S.W. apparatus has been designed by the well-known National engineers. In the photo at the left we see a new tube shield, designed for use with the new series 56, 57 and 58 tubes. Below, photo shows at the left a new isolantite socket which will reduce losses in ultra short wave circuits to a minimum. This socket is available in 4, 5 and 6 prong styles and also for special 6 prong National coils. At center the new midget R-39 coil forms. The midget 270-degree SFL tuning condenser shown is insulated with isolantite; capacity 18 mmf.

← New National tube shield designed for use with the new 56, 57, and 58 tubes.



New ultra S-W R.F. choke wound on isolantite core.

Below — New ultra S-W socket; midget R 39 coil forms; midget 270° S. F.L. condenser.



SHORT WAVE LEAGUE

HONORARY MEMBERS

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

How to Organize "LOCAL CHAPTERS"

By Hugo Gernsback, *Executive Secretary*

AT the time this is written, although only ten days have elapsed since the May issue of SHORT WAVE CRAFT was placed in circulation, the results so far have been truly astounding. Laudatory letters, without end, have been received from all parts of the country, with many sections still to be heard from.

The consensus of opinion generally was that a new league was badly needed to do something particularly for the short wave transmitting amateur. What especially pleased us was the remarkable amount of propaganda broadcast by certain transmitting amateurs who, by "code" as well as "phone," told other members about the new SHORT WAVE LEAGUE *via the short waves themselves*, with the result that a special set of letters came raining in at headquarters, congratulating us on the formation of the new league.

Of course, the time is far too short at this date to form a real opinion of what the future has in store for the new *league*, but the enthusiastic response certainly has proven one thing and that is the SHORT WAVE LEAGUE certainly was needed.

As promised in our last issue, we publish herewith the *charter* of the SHORT WAVE LEAGUE, from which it will be noted that the league is a non-money-making institution, and is purely scientific in scope.

We shall also begin to publish news about the clubs, and by the next issue we hope to have a good deal about the local chapters and their activities.

May we at this time thank the thousands of well-wishers who have written such enthusiastic and sincere letters about the formation of the new league, and the only regret we have is that it is impossible to publish all of them on account of lack of space.

One reason is that we promised to give you some information as to the formation of local chapters, which we are doing here.

How to Organize and Conduct a Local Chapter of the SHORT WAVE LEAGUE

WITH the organization of the SHORT WAVE LEAGUE, the details of which were given in full in the May issue, there is opened up a wider and more promising field than ever before for the pursuit of short waves everywhere. It has been felt for many years that with the pressure of commercial radio telephony the amateurs, whether transmitting code or transmitting phone, are being shifted constantly from waveband to waveband, and their activities curtailed. Some of the amateurs even see the day dawning when there will be *no more amateurs*, because there will be no more wavebands left for them to operate. For that reason, it has been felt that the more local chapters there are in existence who can induce new members to join, the greater the chances for the survival of *amateur radio* not only in the United States, but everywhere. It is considered most important to have, as soon as possible, a large number of *local chapters*, because only in this manner will it be possible to numerically increase the number of radio amateurs to the point where their power will be even a more powerful factor than up to the present. Given the proper attention and enthusiasm, there is no city or hamlet too small, but what it could support one or more local chapters.

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 elsewhere in the accompanying article. 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.

Preliminaries

TO start a local chapter or club, there are several methods which may be employed to aid in the formation of such. One of the first things that can be done is to write a letter to the secretary of the SHORT WAVE LEAGUE stating briefly your intentions and desires. If you do not know any amateurs in your neighborhood, SHORT WAVE CRAFT will publish regularly, hereafter, a list of organizers who wish to communicate with others in their neighborhood or city and so get under way.

Inasmuch as SHORT WAVE CRAFT is the most widely read magazine of its kind, the organizers will probably get quick response from neighboring readers. It will then become a simple matter to get in touch with other amateurs and fans, and a date for meeting can be set by the organizer pertaining to the formation of local chapters.

In some cases organizations are formed and many details of the work are finished via radio as, for instance, when the organizer is a "ham" with a radio transmitter, so that he can make his wishes known to the others, either by *code* or *phone* in his neighborhood.

Still another widely used scheme is to enroll the services of the local newspaper, who very often will be glad to help in the formation of a new chapter. If the newspapers do not wish to cooperate, which is rare, a small classified advertisement under the heading of *Radio* can be inserted, which costs only a small sum, and which often brings the desired results. After contact has been made, and after sufficient would-be members have been rounded up, the next thing of importance is a temporary meeting place which usually can be arranged for at the home of the organizer or the local hotel may be glad to cooperate as a permanent abode of the league's headquarters. The hotel angle is particularly valuable where there are more than a dozen members who meet regularly, and hotels as a rule are glad to contribute rooms for this purpose.

The rules of the chapter should then be drawn up. It may be said that many of the smaller chapters do not go in for the involved regular rules usually governing such bodies. There should be a President, Vice-President, Secretary and Treasurer (the two latter offices are very often combined). It is a very good idea also, to select a capable member to act as Consulting Engineer, and whose duties shall cover visits to each of the members to look over their radio equipment and make suggestions for improvements, etc.

Maintaining Interest in the Chapter

ONCE a chapter has been formed, the most important matter is to maintain the interest in the same by the members. A good leader in all events will help to overcome most difficulties, but of course he must be aided in every way by the other officers of the club. One of the first things to be done when starting a new chapter is to select for the first few meetings at least, some particularly good radio papers which should be read before the members at the regular stated meeting. Such papers should not be too technical, and should be on some radio phase in order to arouse and sustain the interest of the members. Very often a local radio company will be glad to send a speaker to the chapter meeting, who will talk on some current radio topic, which should, of course, be "okayed" first by the chapter's officers, to make sure that it would be within the requirements of the chapter.

In case cooperation cannot be had from local radio companies, the officers may try the local school or college who frequently have good radio talent available for the asking. A letter of the proper sort addressed to such institutions will invariably result in the acceptance of a speaker.

A small radio chapter just formed, however, should not feel discouraged if they cannot immediately obtain a speaker of great learning to address them, as in many instances, there are one or more energetic and capable radio men among their own members who will probably prove better speakers for such bodies than a more mature individual of more advanced and professional inclinations.

Club Dues

THIS is an important point, and we have been asked about this very frequently. As many of the local chapters meet at the members' houses there is, therefore, no rent to be considered. Smaller clubs, of course, can run along quite nicely with a small budget or expense, except that necessary for buying stationery, having cards and literature printed, etc. The dues of these smaller clubs need not be more than 25c a month per member. This is particularly true of so-called "junior" clubs, but with chapters made up of older members than those just mentioned, and having *club quarters* which must be maintained, there will, of course, have to be higher monthly dues. Most of the larger organizations have an entrance or initiation fee of $1.00, but this, of course, will have to be considered and worked out by the officers in charge of the affairs of the local chapter. The amount of dues will naturally vary for the different localities, and with the different classes of members.

Very frequently, it will be desirable for the local chapter to own its own transmission equipment, which may be chiefly for *phone* or *phone and code*, all depending upon the inclinations of the members. It is felt that where a group of people own and operate a radio station, much better results can be achieved than by the private individual unless, of course, the latter is wealthy. The group idea is an excellent one, because the radio equipment belonging to the chapter helps to maintain interest in the club, and all members will feel equally proud of it. Furthermore, all members can make use of the station. The station itself is a powerful stimulus toward keeping the members together for years to come.

Usually special prices and price privileges can be obtained from radio manufacturers by buying equipment for such club purposes and, as a rule, wholesale prices are quoted to progressive clubs, because the manufacturers feel that they are getting good publicity.

As said before, the local chapter should encourage the reading of papers pertaining to short waves by their members. A copy of such a paper should be sent to the secretary of the SHORT WAVE LEAGUE, and if it is meritorious and of sufficient import, it will be published in SHORT WAVE CRAFT, and the local chapter will be given full credit in the title. Of course, all articles appearing in SHORT WAVE CRAFT are paid for at regular space rates, and the proceeds can go to the local chapter, if this is desired.

The SHORT WAVE LEAGUE will be happy to print every month a list of names of local chapters as they are being formed, as well as the names of their organizers.

A special reprint of the announcement of the SHORT WAVE LEAGUE, which appeared in our May issue, will be sent to anyone interested upon receipt of 15c to cover necessary mailing charges.

Short Wave League Charter

CERTIFICATE OF INCORPORATION
of the
SHORT WAVE LEAGUE, INC.

(Pursuant to the Membership Corporation Law)

STATE OF NEW YORK
COUNTY OF NEW YORK } ss.:
CITY OF NEW YORK

WE, the undersigned, of full age, being desirous of associating ourselves together for the purpose as hereinafter more particularly described, pursuant to and in conformity with Article II of Chapter 722 of the Laws of 1926, relating to Membership Corporation Law,

We do further certify and declare as follows:

FIRST: That the corporate name by which said Corporation hereby to be formed shall be known and distinguished is and shall be SHORT WAVE LEAGUE, INC.

SECOND: That the purpose or purposes for which said Corporation is formed are as follows, viz.:

(a) To group together all radio enthusiasts for the purpose of promoting and developing the short wave field of radio, especially the amateur and private radio phone applications of radio, both in the transmitting and receiving thereof.

(b) To unite as a group all radio amateurs for the purpose of forming this association, so that they may obtain technical information required by them in keeping up with the demands of the industry and to have radio amateurs become members of this association, which is formed for non-profit purposes.

THIRD: That the territory in which the operations of said Corporation are to be principally conducted is the United States and Canada.

FOURTH: That the principal office of said Corporation shall be located in the City of New York, County of New York and State of New York.

FIFTH: That the number of Directors of said Corporation shall be four (4).

SIXTH: That the names and places of residence of the persons to be the Directors of said Corporation until its first annual meeting are:

Names	Place of Residence
HUGO GERNSBACK	New York
HARRY WINFIELD SECOR,	Ramsey, New Jersey
ROBERT HERTZBERG,	Long Island City, N. Y.
CLIFFORD E. DENTON,	Forest Hills, L. I., N. Y.

SEVENTH: That all of the subscribers to the certificate are of full age; that at least two-thirds of them are citizens of the United States; that at least one of them is a resident of the State of New York and that of the persons named as Directors, at least one is a citizen of the United States and a resident of the State of New York.

IN TESTIMONY WHEREOF, we have made and signed this certificate in duplicate and have hereunto set our hands and affixed our respective seals this day of April, 1932.

(s) Hugo Gernsback (L.S.)
(s) Harry Winfield Secor (L.S.)
(s) Robert Hertzberg (L.S.)
(s) Clifford E. Denton (L.S.)
(s) Fred J. Boehm (L.S.)

How to Join the League!

Write for "APPLICATION BLANK" if you are interested in the work of the SHORT WAVE LEAGUE. You don't have to own or operate a transmitter in order to become a member of the League. Neither do you have to know the code—so if you want to further the good work of the SHORT WAVE LEAGUE write today for your "APPLICATION BLANK." If you did not read the announcement of the platform and purposes of the SHORT WAVE LEAGUE, published in the May issue of this magazine, send 15 cents for a copy of the article.

**Address: SHORT WAVE LEAGUE,
96-98 Park Place, New York.**

What Our Readers Think!

Short Wave League:

Being an ardent supporter of your publication, SHORT WAVE CRAFT, and having just obtained the May issue of it, I must say *it sure is the berries.*

Will try and organize a club here as a subsidiary of the original. I can guarantee a membership of at least twenty persons.

Now the question of "no knowledge" of code for phones on or below six meters is a very delicate one. You say that a six-meter phone can be put to general use for a distance of approximately seventy-five miles. All well and good; suppose that just at a critical moment, of a river boat using six meter phone for communication, the operator drops the microphone and breaks it, putting it completely out of commission. By what method could that oper-

(*Continued on page* 103)

A "Pendulum" Regeneration

Short Wave RECEIVER

By KARL HIRSCH

This article is a description of a short wave receiver which was awarded a prize in a well-known German radio contest. Constructional details for winding the coils and the general construction of the set are given. Switching means are provided for changing the wavelength bands. This receiver is very economical and uses but three tubes and a rectifier in order to work a loud speaker.

THE hook-up of the receiver about to be described is as a whole quite familiar to short-wave fans. It was probably first described by Dr. Busse of Jena. Later it was adopted, with small alterations, by Nittura. However, while in the case of the sets hitherto constructed, the coils had to be changed on shifting from one wave band to another, this is not so in the case of the receiver here described. With the fixed built-in coils, because of the switching possibility and the present arrangement of the rotary condensers, one can cover the entire range of about 10 to 40 meters, with no more than 30 K.C. per degree on the scale, on the average.

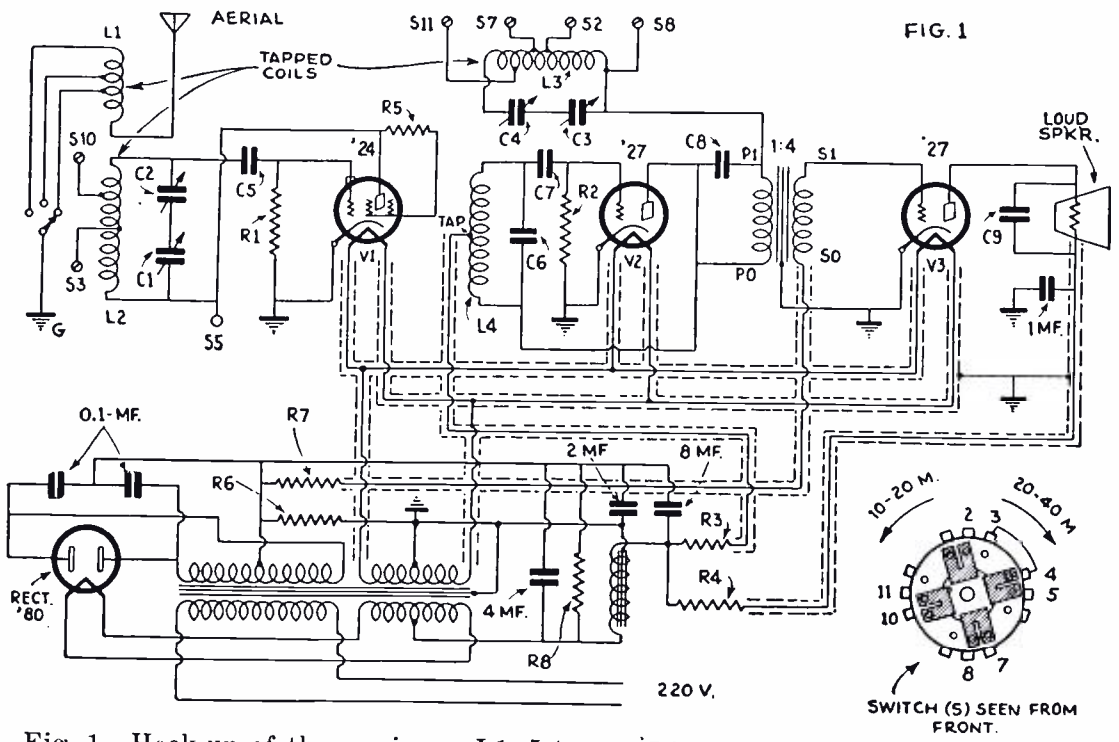


FIG. 1

Fig. 1—Hook-up of the receiver. L1, 5 turns; L2, 10 turns, tapped at 10 (S5), at 5 (S3), at 2½ (S10); L3, 9 turns, tapped at 9 (S8), 4½ (S2), 3 (S7), 1½ (S11); L4, about 1250 turns, tapped about in the middle; C1, 500 mmf.; C2, 125 mmf.; C3, 500 mmf.; C4, about 300 mmf.; C5, 250 mmf.; C6, 800 to 1000 mmf.; C7, C8, C9, each 2000 mmf.; R1, 2 megohms; R2, 1 megohm; R3, about .1 megohm; R4, about .05 megohm; R5, .005 to .01 megohm; R6, about 1000 ohms (loud speaker coil); R7, .5 megohm; R8, 1 megohm. All resistances which lie in the plate circuit must be capable of carrying considerable current.

In considering the diagram (Fig. 1) it must be noted that for the sake of clarity the drawing has been left incomplete. Between coils L2 and L3 different connections are made according to the wave range chosen. This switching takes place by means of a switch represented in Fig. 1 at the lower right corner, having in all 12 contacts and 4 two-arm switch springs, each of which connects two of the contacts. Contacts 3 and 4 of the switch are directly connected by a wire; the other numbered contacts are connected to the correspondingly numbered tap points of the coils. The switch is used in two operating positions. These two positions are drawn separately in Figs. 1a and 1b, indicating the connections made in both positions.

Fig. 1a shows the switch position for the range 10-20 meters. Of L2 only 5 turns are effective, since S5 is short-circuited with S3 over the short-circuit loop fastened on the switch and running from contact 3 to contact 4. Of L3 only 3 turns are effective, since S7 is short-circuited with S8. The middle of the effective part of L2 (S10) is connected with the middle of the effective part of L3.

Fig. 1b shows the Switch position for the range 20-40 meters. All windings of L2 and L3 are effective. The middle of L2 (S3) is connected with the middle of L3 (S2). All other taps lie free.

The first tube works as a detector. The grid circuit lies between plate and grid. In the plate circuit of the second tube lies the circuit L3, C3, C4. The second tube furnishes the pendulum (oscillator) frequency, which is determined by the circuit L4, C6.

First a few more general remarks. The A.C. transformer supplies over 300 volts D.C.; this high voltage is not necessary; one gets along very well with about 200 volts. Whoever uses a smaller transformer, must of course also choose the resistances smaller than those indicated.

As is clear from the illustrations, all shielding plates have been left out of this receiver, yet there is not the least hand-capacity. Plate and grid bias wires are put in a grounded lead cable. At any rate, shielding the detector tube would come into question, if one uses a simple single grid tube, instead of the screen-grid tube.

Making the Coils

First we make the coils: L1 and L2 are placed together on one tube, L3 on another. The cylinders can consist of pasteboard, wood, or bakelite, and have a length of about 5.6 inches in the case of a diameter of 1.6 inches. The coils are wound on one of these cylinders. L1 has say 5 turns, L2 has 10, but L3, on the contrary, has 9 turns. The beginning and end wires of each coil are left standing out about 6 inches, so that these ends may afterward be directly used as wires. (Use .060-inch (No. 14 B. & S.) wire, with double cotton covering.) The beginning must be fastened somehow in doing the winding, so that the wire lies firmly on the body and can be drawn smooth. On taking off the coils, widen out a bit; the winding is done without leaving any intervals between.

For every cylinder are needed 4 little rods of fretsaw wood, hard rubber, or bakelite; they are .16-inch thick and .24-inch wide, with a length of about 3.24 inches. All these little rods have at top and bottom small holes for the fastening screws. They are otherwise marked as in Fig. 2, whereby it is to be considered that L1 is about .4-inch away from L2. Accordingly when the tenth turn is marked on the fourth rod, it is again the turn of the first rod, and indeed the first mark for the antenna coil is to be made .08 lower than the last mark on rod 4. The position of the marks is always .04-inch below one an-

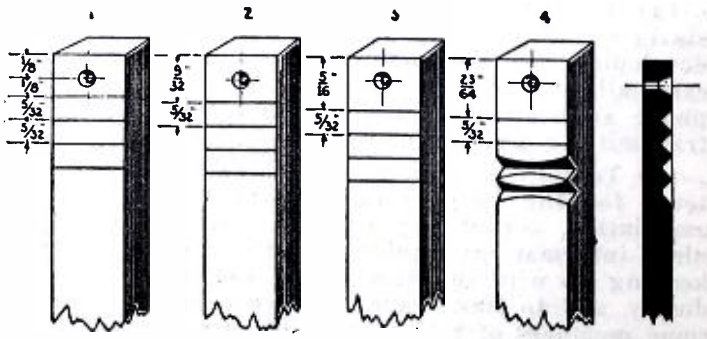


Fig. 2—Details of the supporting rods for the coils.

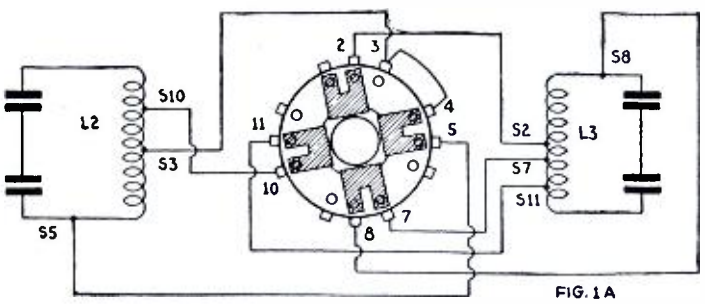


FIG. 1A

Fig. 1A, at left, shows the rotary switch position when the wave band from ten to twenty meters is covered.

Fig. 1B, at right, shows the switch position when the coils are tuned for twenty to forty meters.

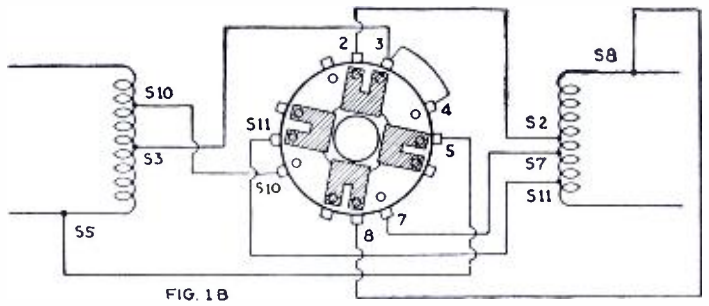


FIG. 1B

other, so that afterward, when the rods are screwed on, the filings mark an evenly progressing screw-thread line. The filing is done with a three- or four-cornered file and can be somewhat deeper at the edge, whereby the filing fits the curvature of the cylinder better. The depth of the grooves is about .08-inch. Now the rods are screwed on the cylinder in the order 1-2-3-4, so that there are two pairs exactly opposite one another. In screwing them on, it is to be noted that the filing marks must agree with the direction of winding the coil; that is, around to the right or to the left, according as the coil is wound. Now the coils are screwed on, so to speak. Since the windings are somewhat wider than the cylinder, but are narrower than the distance apart of the rods lying opposite each other, the coil lies firmly in the grooves; only the beginning and end of each coil must be fastened.

Condenser Details

Now for the making of the condensers. C1 and C3 have a common shaft of insulating material, fibre, bakelite, or the like, which is later to carry the main dial. Since they are to be mounted on a common shaft, not all condensers are well suited for this. They are screwed on a wooden or hard rubber strip, so that the front condenser is about 1.2 to 1.6 inches away from the front plate, which, we may remark casually, is likewise made of wood. The two condensers are placed about 1.2 to 1.6 inches apart. The fastening strip rests with its ends on two wooden supports 3.6 inches high. Underneath C1 (the back condenser) is screwed C2, whose shaft or its prolongation likewise consists of insulating material and has at the front the small dial located under the large one. This condenser serves for adjusting a special wave band, i.e., from 13 to 15 meters, while the upper condenser is intended for seeking this band. All condensers are so mounted that on turning the dials to the right, that is, from zero to one hundred, the capacity becomes greater. The switch S, when turned to the right, switches in a larger coil, and the antenna switch from left to right 1, 2 and 4 turns. The operation is thereby simplified. Below C3 the baseboard is sawed out, so that the rotor can move freely.

The space between C3 and the A.C. transformer is .8 to 1.2 inches. The centermost little dial belongs to condenser C4, which is likewise fastened by means of an angle fastener to the strip carrying the other condensers; the dimensions are determined by the condenser and its dial. This condenser serves for adjusting the plate circuit L3. L3 has in both wave ranges two turns less than L2, but C4 is again greater than C2; under certain circumstances C3 must also be increased by connecting in parallel a small fixed condenser of about 100 mmf. This is determined by the construction and the additional capacity caused by it. C4 can simply be a small 500 mmf. mica or other fixed condenser, which is brought to the right amount by taking away one or two plates. The correct amount is reached when in all positions of C1 and C3 resonance can be obtained by means of C4.

The finding of the right values can best be explained by an example:

If C1 and C3 are set at zero, the switch being on the low range, which would be about 10 meters, then C4 must be turned out almost the entire distance to produce resonance. If it appears that it is still too great, namely, in that the noise becomes louder and louder toward the zero position, without one's reaching the stopping of the oscillations, then C4 must be reduced by taking out a plate. If now, for example, resonance is already present, when C4 is about in the center, then to obtain the most favorable adjustment again more toward zero, one must connect the above mentioned block condenser in parallel to condenser C3. Thereby the total capacity of the circuit becomes greater, and one can again turn C4 out more.

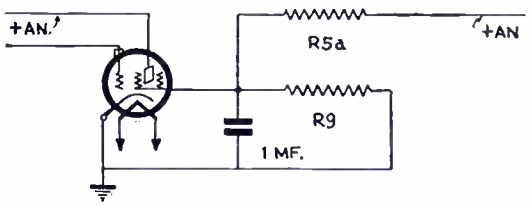


Fig. 3, shows one form of detector circuit with fixed resistors; plus A.N. means "B" plus, the A.N. representing "anode"—German terminology.

If, therefore, the assembling of the condensers is ready to this extent, then the A.C. supply and filter are mounted and connected, after which the condensers and coils are fastened and the front plate is provided with the proper holes. If the coil bodies are hollow, then one screws on to the base-board a little block of wood for each, upon which the cylinders can be firmly mounted. Between the two coils, somewhat to the right, is the switch, which is likewise carried by a wooden support. It is so mounted that the mean height of the switch lies at the mean height of the coils.

The right lower knob on the panel layout leads to the antenna switch; this is a *stage switch* with three stages. The construction of the other individual parts is probably directly evident from the diagram. The low frequency transformer is shielded, but I believe that one can without disadvantage use unshielded transformers. The tube fasteners, with the exception of the rectifier tube, are placed on wooden blocks about 1.6 inches high, to make possible a better laying of the wires.

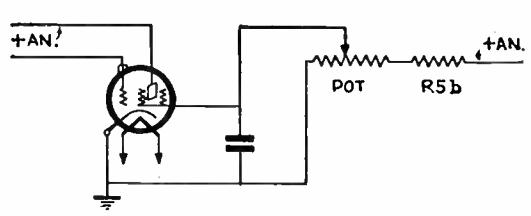


Fig. 4—Another preferred form of detector hook-up, with potentiometer at "Pot" and fixed resistor at R5b.

Now for connecting: The A.C. supply unit offers no difficulties, but it will be well to put a small safety device in each plate potential lead to the rectifier tube. I have also, for experimental purposes, built in four old small post chokes, but without obtaining a different result. In selecting the block condensers one must proceed cautiously, to avoid unpleasant surprises.

When the A.C. supply section is completed, the heater lead wires are laid for the receiver tubes (two wire lead cable). If the A.C. power transformer has no center tap, then connect a potentiometer of some 20 to 100 ohms to the two ends of the winding and connect the neutral wire to the center, to which are connected all the terminals marked with the "ground" insignia in the diagram.

Likewise all non-current-conducting metal parts are connected to it, such as the condenser casing, iron cores, etc., and above all the fifth connection of the tube sockets. To save wire, one can use for this neutral wire, directly, the lead covering of the cables; the lead coverings are soldered together by thick copper wire. Lead solders well, but it must first be scraped bright. The output of the filter ends in two pieces of .060-inch (No. 14) copper wire, on to which, easily accessible from above, are screwed the plate resistances, from whose other ends the plate wires leave, likewise covered by lead. These resistances must be capable of very high loads.

The connection of the coils to the switch is evident from Fig. 1. The contacts on the switch provided with no numbers (Fig. 1, lower right corner) remain free, while the taps of the coils marked S2, S3, etc., are connected with the switch contacts marked with the same numbers. The detector is best a screen grid tube, whose screen grid gets its potential most simply through a resistance from the plate, as may be seen from Fig. 1. On the contact strip at the back are fastened the switch and the terminals for the net and also two pairs of terminals for antenna and ground, as well as the terminals for the phone.

When this is all done, test the receiver throughout for the sake of safety. If all is found correct, then one can begin the precise equalizing. First the tubes must oscillate; almost always that is made perceptible by a more or less loud

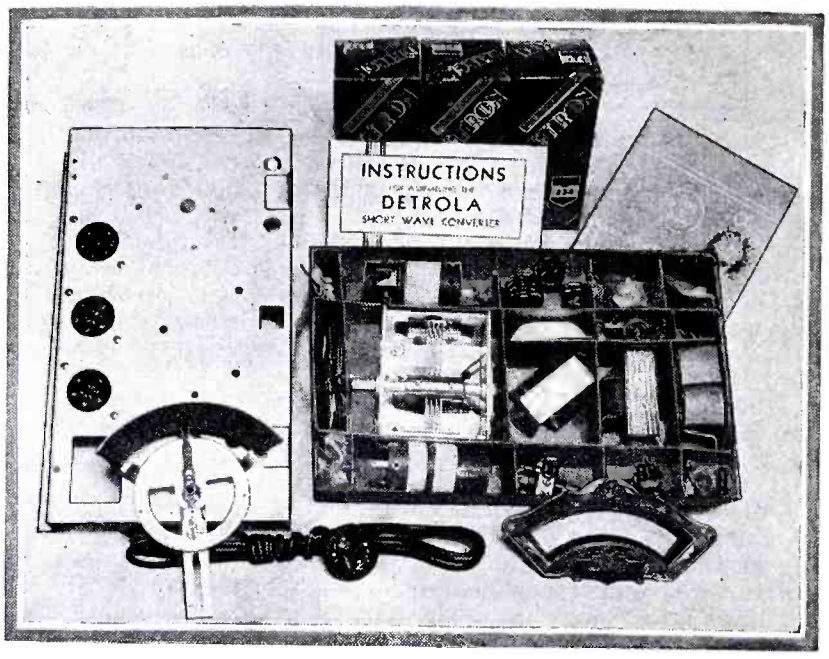
(*Continued on page* 110)

Short Waves for the Broadcast Listener

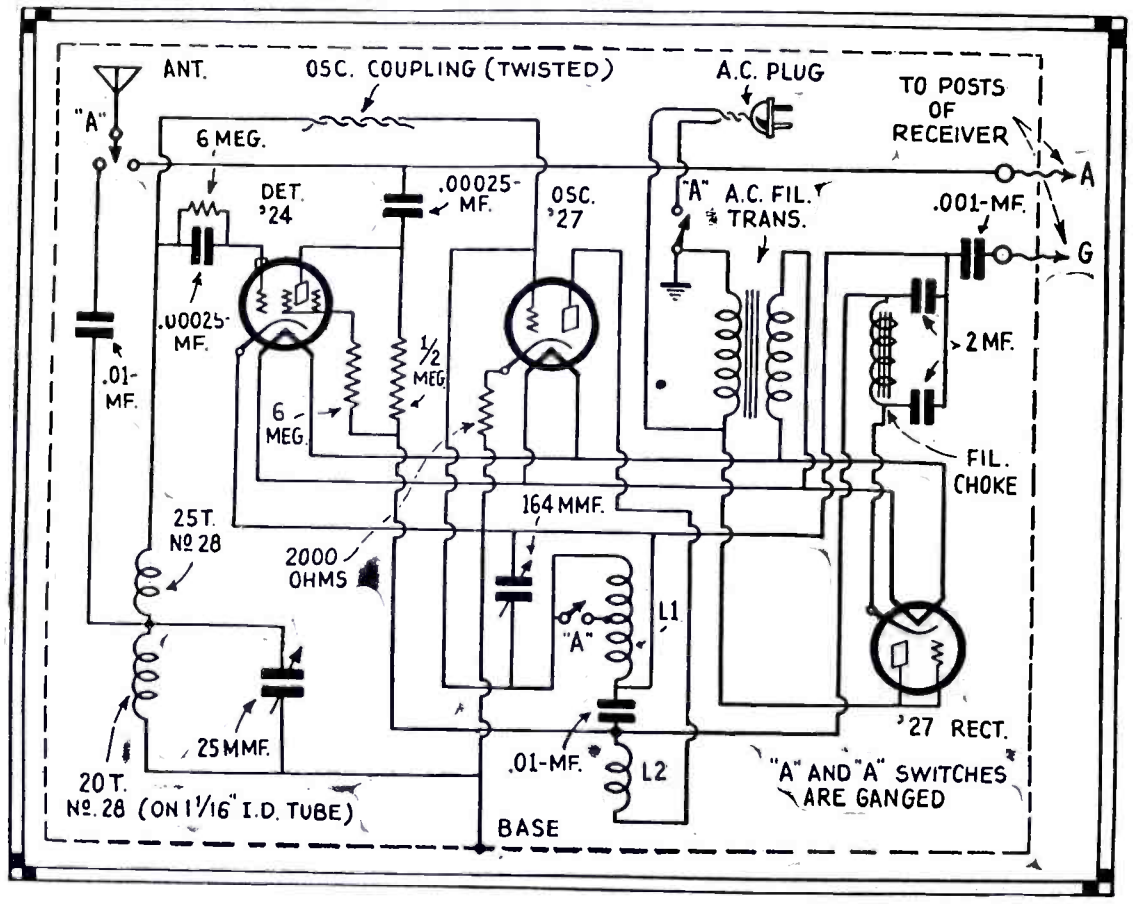
A Short Wave Converter Kit at Last!

Complete kit with instructions and blue-print.

THE Detrola short wave converter *kit* here illustrated fulfills the dream of many short wave fans, who have enough craftsmanship in their make-up to readily put together a simple three-tube converter such as this, if they are given explicit instructions and a blue-print, together with accurately made parts that will fit together in the position which they are to assume. This short wave converter can be used with any broadcast receiver, so as to permit the reception of short wave stations, including police calls, foreign and American stations, etc. The photo shows the neat arrangement of the kit of parts, all of which are of excellent quality. One of these converter kits was assembled by the editors and tested with several broadcast receivers with excellent results. The coils furnished with this kit are already wound and all that the constructor has to do is to mount the various condensers, coils, etc., in place on the metal sub-panel. Insulated wire for making the connections between the various apparatus is furnished. A suitable cabinet to house the converter is available at slight extra cost. The converter is A.C. operated and the power transformer is furnished with the kit.



The Detrola Short Wave Converter kit comes complete with instruction book, blue-print, all necessary parts and three vacuum tubes.



Left—Wiring diagram for the Detrola Short Wave Converter, which is supplied in "kit" form.

Winding details for the oscillator coil used in the Detrola Short Wave Converter. The coils are furnished already wound.

In Our Next Issue

A New "Crystal Detector" S-W Receiver, by R. William Tanner. Set has two R.F. stages, two A.F. stages and separate regeneration tube. Complete diagrams, parts, specifications, description, etc.

How Far on What K-C? With graphic curves showing day and night ranges with different frequencies or wavelengths.

Making and Using Four Inch Waves, by H. Rindfleisch and Dr. L. Rohde.

No Fading with These Aerials, by Dr. Fritz Noack (Berlin).

Automatic "CQ" Call for the Amateur," by W. Buchholz.

An Apparatus for Demonstrating Short Wave Principles, by D. L. Barr.

A Super-regenerative Receiver that Rolls 'Em In, by Ben F. Locke.

A "Coat Pocket" Receiver for Short Wave and Broadcast Bands, by Hugo Gernsback and C. E. Denton. Full constructional details.

Building a Low-powered Portable "Phone" Transmitter, by John B. Brennan, Jr., W2DJU. Uses new 6-volt "auto" tubes.

A De Luxe Amateur Transmitting and Receiving Station in a City Apartment, by "Bob" Hertzberg. Illustrated with photos. A really remarkable station. Don't miss reading this article—you'll learn many things.

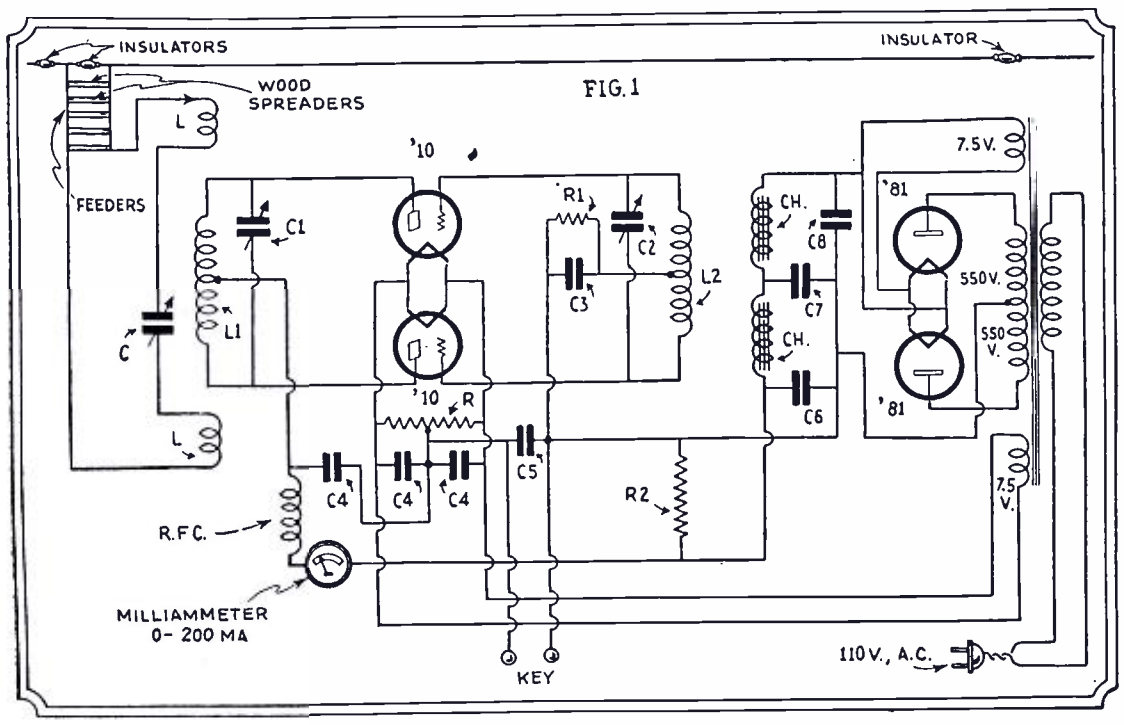
The AMATEUR'S Favorite

CODE TRANSMITTER

By R. W. TANNER

A LARGE number of requests have been received by the editors for complete details of the most popular code transmitting circuit used by Amateurs. This article is written for the benefit of these readers as well as for those new "Hams" who desire a simple, inexpensive layout.

While a pair of '45's in push-pull will give excellent results, more power can be obtained with '10 tubes in a similar circuit and where was there ever an Amateur who did not crave greater output? Therefore this circuit uses '10 tubes.



Complete wiring diagram of the C. W. code transmitter here described by Mr. Tanner.

The schematic circuit is shown in Fig. 1 from the antenna on down to the power supply. First let us start with the antenna. Assuming the 40 meter band the total length of the "sky-wire" will be approximately 62 to 65 feet long, depending upon the exact frequency of transmission. The length of the feeders will depend directly upon the space available and the distance of the antenna from the transmitter coils. The feeder wires should be separated about 10 inches with good, light-weighted wooden spreaders which have been previously boiled in paraffine.

Counterpoise and Antenna May Be Used

A regular antenna counterpoise and antenna may be used with very good results. In this case, the total length of the antenna and counterpoise, including lead-in, will be the same as the Hertz. The counterpoise need not be placed directly under the antenna: neither does it have to run in the same direction. Both may be placed on the roof if desired.

The coils are generally the next job. These may be wound with either $\frac{3}{16}$" copper tubing or No. 6 bare copper wire (solid), the difference being "less than nothing" when considering the low output from a pair of '10 tubes. A total of 5 turns 2½" diameter are needed for L1, tapped in the exact center for connection to B positive. The ends should be hammered flat and drilled so as to fit over the bolts on General Radio Co., small stand-off insulators. The grid coil L2 is constructed exactly like the plate coil. The antenna coils L will depend upon the length of feeders but 5 turns will generally be correct for each, also 2½" in diameter.

We have had many requests from "hams" who desire some constructional data for building a C. W. code transmitter and herewith a very good type is described by Mr. R. William Tanner. Details for building the copper tubing inductances and other parts of the transmitter are given in this article.

Winding the Coils

Winding the coils is not a difficult job. Place a piece of 2-inch iron pipe in a vise and wind the turns on this. After removing the finished coil from the pipe, the turns will spring out to a diameter of about 2½".

Two General Radio make stand-off insulators are required for both grid and plate coils and one for each of the antenna coils. If you have wing-nuts having the same thread as the G. R. insulator bolts, they may well be used permitting the removal of coils when experimenting on other bands.

The tuning condensers C, C1 and C2 are regular .00035 mf. units as employed in broadcast receivers. Condensers having bakelite or hard-rubber end-plates should not be used; preference should be given to such types having the insulation at the sides. The results obtained with this simple little transmitter will depend to a large extent upon the quality of these condensers. The writer has, many times, seen transmitters which would generate little or no power, due to leakage in the tuning condensers, especially in the *plate tank*.

Details of R.F. Choke

All of the by-pass condensers C4 and C5 as well as the grid condenser C3 should be of the high voltage type, rating at least 1000 volts. The by-pass C5, shunted across the key, is employed to reduce sparking at the key contacts. The *radio frequency choke* RFC may be a good short wave choke or it may consist of 300 turns of No. 36 enamel wire, wound on a wooden dowel ½" in diameter. Do not dope this coil, otherwise some of the power may be lost due to leakage.

The push-pull oscillator tubes are biased by means of a grid-leak R1 and condenser C3. The leak should have a value of approximately 10,000 ohms, although this may be reduced to 5,000 ohms with a slight increase in output.

Power Supply

The power supply is conventional in every respect, with the power transformer having a center-tapped 1100 volt winding and in addition, two 7.5 volt

(*Continued on page* 125)

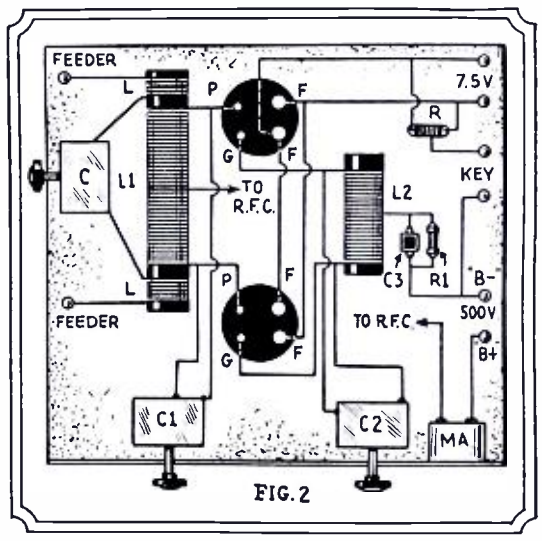


FIG. 2

Plan lay-out of the transmitter.

Panel Mounting S-W COIL Assembly

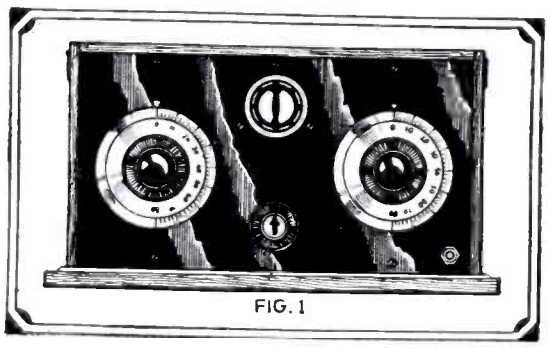


FIG. 1

Plug-in coils can just as well as not be mounted in a handy position such as between the tuning dials, as here shown.

THE following method of mounting a coil on the panel of a short wave receiver was worked out after the writer had almost jerked his receiver off the table a number of times when removing the plug-in-coil with which it was equipped.

A new panel of aluminum was procured along with several Pilot coil forms, the kind with the ring-hold, to facilitate handling.

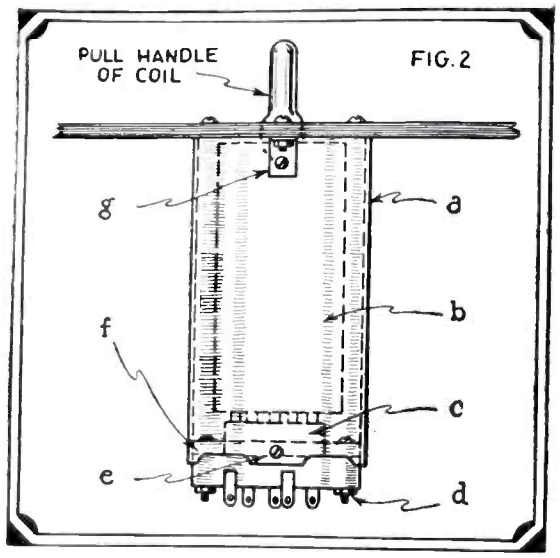
First cut a hole in the upper center of the panel, as shown in Fig. 1. This hole is one and seven-eighths inches in diameter.

Next procure a piece of black bakelite or celeron tubing two inches in diameter and three inches long. This is for the sleeve which holds the coil socket assembly. When in position it also acts as a dust shield, thereby keeping dust from creeping into the set around the coil opening.

A piece of three-sixteenths inch hard rubber or bakelite, two inches or so square is next procured, and, lastly, a five-prong Pilot tube socket.

Fig. 2 shows the mechanical details of construction.

(a) is the bakelite sleeve.
(b) is the short wave coil form.



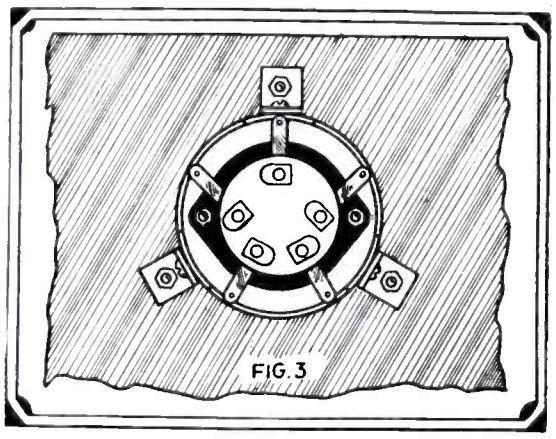
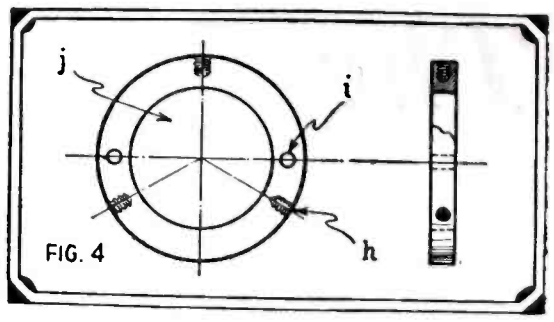


FIG. 3



Detail of socket mounting ring. Fig. 2, left — Shows side view of S-W coil mounting assembly. Fig. 3— Shows a back view of the coil socket assembly.

(c) is the Pilot tube socket.
(d) is mounting bolt holding socket to rubber ring—two required.
(e) is the offset flange to strengthen the sleeve where the bolt passes through to hold ring in position.
(f) is the hard rubber or bakelite ring cut to fit inside the sleeve snugly.
(g) is one of the three metal brackets which hold the sleeve to the panel.

Fig. 3 shows a back-view of the assembly.

Fig. 4 shows the socket mounting ring,

(h) is one of the threaded holes in the ring. They should be 4-32 thread or smaller. In drilling and tapping these holes clamp the rubber or bakelite, at these points, in a vise and then proceed; this prevents splitting the material.
(i) is the hole to take the coil socket bolt.
(j) is the section cut out to fit the upper portion of the socket.

This type of assembly is very handy and works nicely, eliminating the necessity of raising the lid of the cabinet to remove the coil.—W. G. Wheat.

DECIMETER WAVES

By DR. H. LUX

(*Berlin*)

Reception

SO long as it is merely a question of demonstrating oscillations within the sphere of physical investigations, one uses crystal detectors or thermo-elements, which are provided with dipole wires, in combination with a sensitive galvanometer. For communication over greater distances, the sensitivity of the crystal detector does not suffice; one therefore uses for reception a tube, whose hook-up is the same as for the transmitter (Fig. 1). In general it is advisable to add two or three stages of audio-frequency amplification, to increase the volume. The same purpose is also served by setting up a metal mirror behind the receiver system, taking in the radiation from as large a spatial angle as possible. In this case one puts simply the dipolar wires and tube in front of the mirror, while the rest of the apparatus is set up behind it.

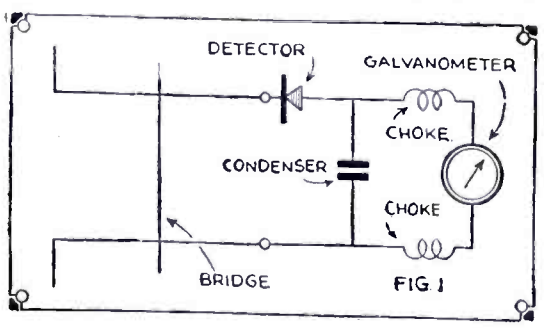


Fig. 1—Tuning for resonance is done by sliding a "bridge" wire along the Lecher wire system.

Wave Measurement

For measuring the wavelength of *decimeter* (4-inch) waves, one generally uses the so-called Lecher wires; which were first described by the Vienna physicist Prof. Lecher. The Lecher wire system consists of two long parallel wires a few centimeters (1 cm. = 0.39-inch) apart and represents an oscillatory circuit capable of resonance with divided capacity and inductance. If one couples the system capacitively or inductively to a transmitter, then "standing waves" form along the double wire, in case its length is equal to either half the wavelength, or to a multiple of that distance. Tuning for resonance is accomplished by sliding a wire loop, the so-called "bridge" along the Lecher wires. The occurrence of resonance, causing the formation of swells of potential or current, is detected by means of a crystal detector or a thermo-couple in connection with a galvanometer. These are either fastened on the bridge and moved with it, or they are fixed in one place, as shown in Fig. 2. From the distance between two or more "crests" or "nodes" one gets the wavelength.

The Use of Decimeter Waves

The properties of decimeter waves, above all the limitation of reception to the pre-supposition of "geometrical

(*Continued on page* 126)

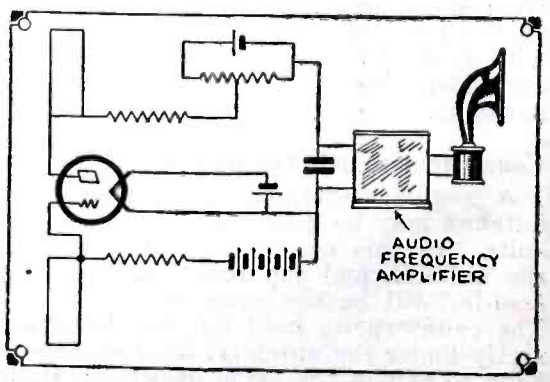


Fig. 2—Circuit showing audio frequency amplifier and loud speaker.

FREQUENCY CONTROL *Without Crystals*

By C. H. W. NASON

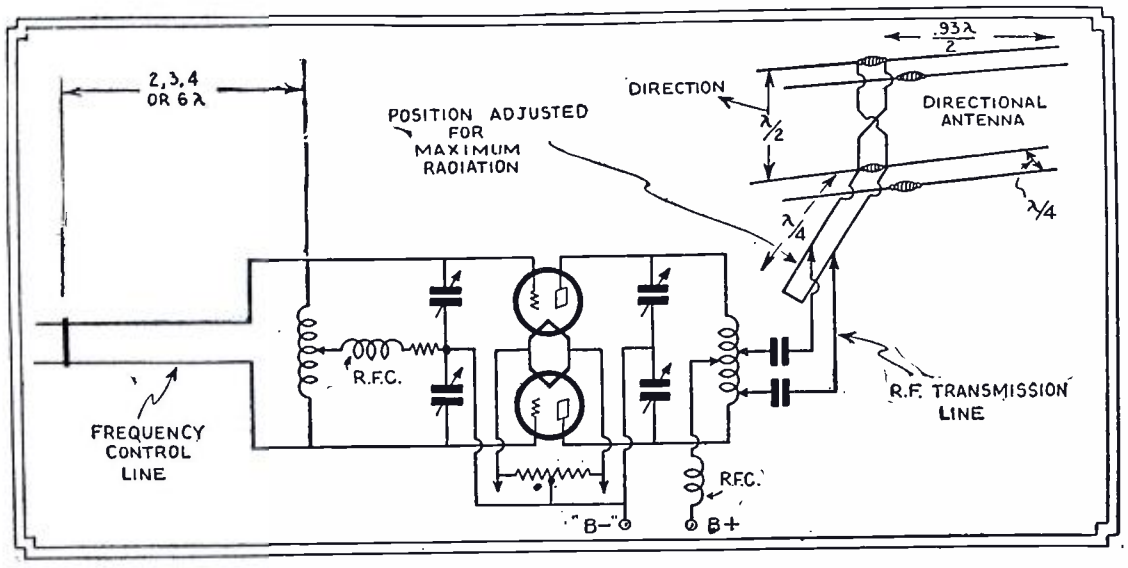


Diagram above shows how to lay out an amateur ten-meter installation with one of the new frequency control lines or circuits, which does away with the use of a quartz crystal. Fig. 5.

A new system of frequency control or stabilizing is here described by Mr. Nason, which does away with the use of quartz crystals and the use of multiplier stages. Complete data is given for building one of these new "crystal-less" frequency stabilizing circuits for an amateur ten-meter transmitter.

ALTHOUGH *crystal control* has marked advantages over the normal oscillator and oscillator-amplifier systems, so far as *frequency stability* is concerned, it has disadvantages quite as marked, under certain conditions. For an example of this we may note the fact that *crystal control*—to be applied to the very high frequencies, demands the use of a number of multiplier stages by which the frequency may be *doubled* — or less satisfactorily — *tripled* through successive radio frequency amplifier stages. The crystal is then operated at a relatively low frequency, compared with that at the antenna. Another case in point is the fact that the crystal control stage—or controlling oscillator—must be of relatively low power—requiring the use of several successive stages of amplification, in order that a high power output may be obtained.

Some years ago the writer came into possession of confidential information which, when applied to a commercial short wave transmitter, gave rather startling results. The fact that this data has at last been published by the proprietors of the patents involved, releases the information for amateur consumption and it is with considerable elation that the writer passes on such of the knowledge as is in his possession.

Frequency Control by Transmission Lines

The crystal represents an equivalent electric circuit of low power factor (ratio of resistance to reactance) and of fixed character. The new method results from the attempt of the RCA-Communications engineers to develop an economical type of frequency control, of equal stability and accuracy.

As an example of the results obtained, we might note the fact that a 40 K.W. transmitter at Rocky Point (WIK) formerly employed a total of eight radio frequency amplifier circuits. The new transmitter, employing a transmission line of a length equal to 10.25 wavelengths in length, operates with *equal frequency stability, with the two 20 K.W. output tubes alone!*

Stability Better Than With Crystals

In Fig. 1a, there is shown a *crystal control circuit* of common type, while in Fig. 1b, there appears the equivalent arrangement employing a transmission line feeding back from plate to grid. When using the system on a 40 meter set, with a transmission line 20 meters in length, *it was found that the frequency stability was better than with crystal control!* It is best, however, that the line be several wavelengths long, as the frequency stability increases materially with the number of integral wavelengths of transmission line.

(*Continued on page* 124)

Fig. 1-A shows above the usual crystal control circuit used for maintaining constant frequency; Fig. 1-B shows the equivalent arrangement employing a "transmission line" feeding back from plate to grid. Fig. 2 shows the "WIK" transmitter, revamped for frequency control by the new method. Fig. 3 shows a push-pull oscillator arranged with the new "transmission line" frequency stabilizer. Fig. 4 shows how variometer is used to match the impedance.

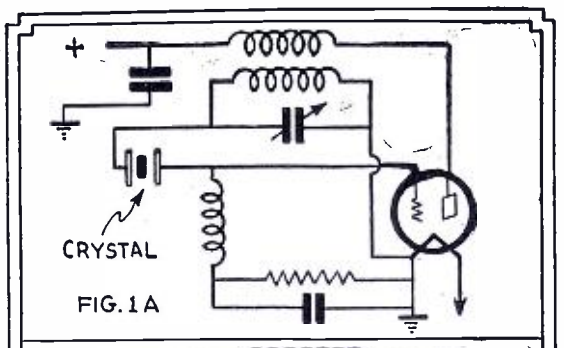


FIG. 1A

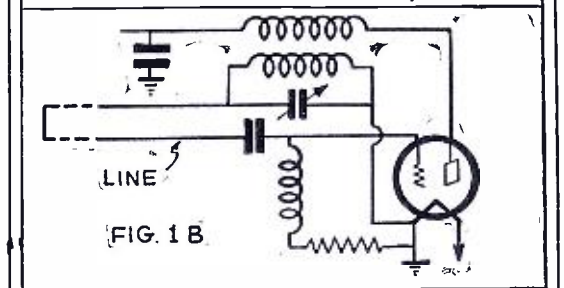


FIG. 1 B

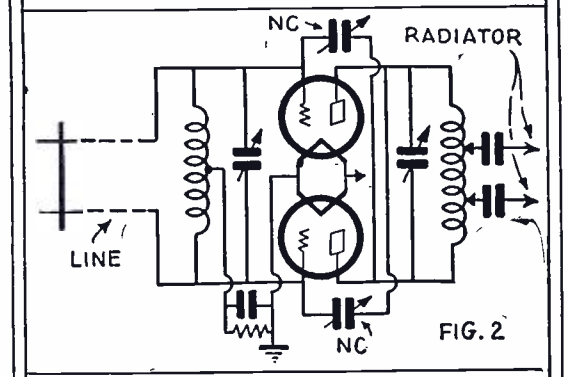


FIG. 2

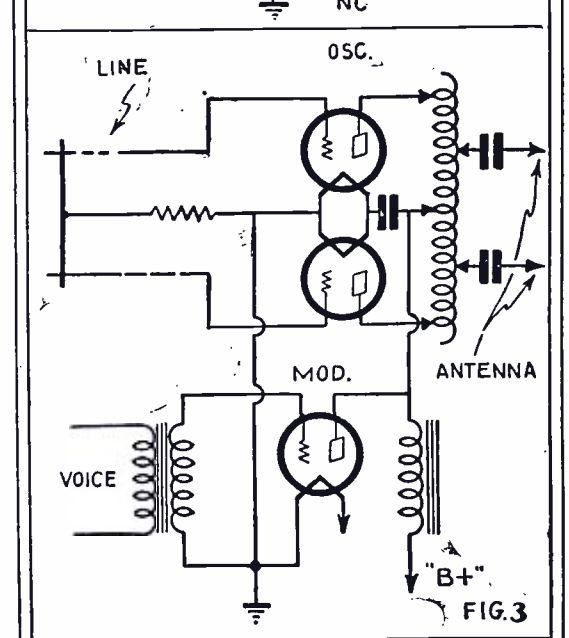


FIG. 3

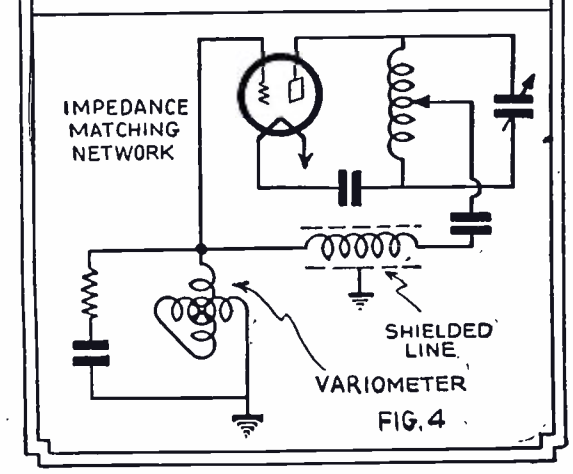


FIG. 4

SHORT WAVE *Equipment for* Service MEN

By CLYDE RANDON

THE modern Service Man is more or less alive to the fact that sooner or later (if not already!) he is to be called upon to repair, and to make himself generally useful with, short-wave sets of all descriptions. There are many important points of difference between ordinary broadcast, receiving and short-wave sets. It behooves the wide-awake Service Man to begin now to study the peculiarities of short waves, so that he will not be caught napping. This article considers some useful short-wave equipment that will furnish a wealth of practical information about short-wave apparatus. Most of the discussions in the past have been rather involved, for those who wish to break into a new game.

The best way to break into the short-wave game is to build a simple two-tube short-wave set, which operates from headphones. The circuit is shown in Fig. 1. The coils are wound on UY tube bases which plug into corresponding UY tube sockets. The size of wire to wind the coils is not especially important except that, if too heavy wire is used, the primary, secondary and tickler coils will not fit on the tube bases. The size of coils to use will depend to some extent on your individual layout; however, to cover the 15- to 100-meter range with a .00015-mf. tuning condenser, the secondary and tickler coils are respectively 4 and 5, 8 and 5 and 18 and 5 turns. Space the 8- and 5-turn windings about ⅛-inch. Wind the other two right next to each other. The primary coil may be separate and variable, if desired; or wind on each plug-in coil 7 turns, spacing it ⅛-in. from the secondary coil. The order of the coils on the form is as usual—primary, secondary, tickler. It doesn't particularly matter whether the primary is at the lower end of the tube-base or at the upper end.

Fig. 1 shows a good short-wave hook-up that works well with the new 2-volt tubes. Unless you have a storage battery handy for use with the short-wave set, better use the new 2-volt tubes and light them with two dry cells connected in series. A 10-ohm rheostat will serve for this set, if the filaments are wired in parallel. The audio amplifier is of the usual type.

Short-wave Wavemeter

With a short-wave set in operation, a wavemeter can then be constructed. A good .00035-mf. condenser, mounted in an aluminum cabinet, about 6 x 6 x 3 inches deep, a UX socket, and two tube bases furnishes the parts for the wavemeter.

This type of wavemeter (absorption) works especially well with a regenerative short-wave receiver like the one already described and gives sufficient accuracy for all ordinary work. Wire up the socket and condenser in series. Tube-base coils can be used for the wavemeter if desired, although other coils can be used to plug in.

If tube-base coils are to be used, use 6 turns of No. 20 D.C.C. wire for the 15- to 50-meter coil, and 16 turns of No. 22 wire for the 40- to 120-meter coil. If desired, another coil may be used to cover the remaining frequencies between 100 and 200 meters; although the short waves between 15 and 100 meters are probably most interesting to you.

To calibrate the wavemeter, tune in on the short-wave receiver a station whose wavelength is known; then tune the wavemeter to the receiver, listening for a stoppage of oscillations in the receiver as the wavemeter, with the proper coil inserted in the socket, tunes past the wavelength to which the receiver is tuned. Reducing the coupling between the wavemeter and the receiver's secondary coil will result in greater accuracy and closer setting. After several points have been found in the condenser scale for each coil, one can plot a calibration curve for each coil. The readings of the wavemeter will remain constant if the wavemeter is carefully handled; this cannot be said of the usual short-wave receiver, because different circuit conditions influence its dial settings.

Short-wave Test Oscillator

If you are to carry out any short-wave testing at all, you will need a laboratory oscillator as described below.

The circuit of a complete short-wave test oscillator is shown in Fig. 2. The size (3 in. diameter) and spaced 1 inch between windings) have the following specifications:

Turns	*Wire Size*	*Range (Meters)*
2	16	11-30
5	16	25-66
13	16	53-150
33	22	135-375
74 (bank-wound)	22	315-800

coils L1 and L2 (both made the same

C3 should be comparatively large, about .01-mf. C1 and C2 are .00035-mf. condensers operated on the same shaft (for which the coil specifications given above are correct); R is 10,000 ohms. The grid meter shown has a 1½-milliampere scale and is provided with shunts so that, if desired, larger tubes can be used in the oscillator. A gridmeter driver like this is about the most sensitive one can build. For the larger power tubes (for example the type '10) a low-resistance filament resistor should be used; while, for small tubes like the new 2-volt types, a larger filament resistor is essential. To arrange the circuit so that any of the usual tube types can be used, two resistors are connected in series as shown in Fig. 2. A small switch across the resistors shorts either one or the other out of the circuit; so that, for a given battery voltage, each resistor can be calibrated separately. Alternating current can be used on the filament, and a "B"-eliminator can be used for the plate supply. Batteries can be used for either plate or filament supply, if handy.

Used Parts Will Do!

For the apparatus described above, it is unnecessary to invest in many new parts. Often a radio set taken in in trade will yield more than it is actually worth in cash, if you need the parts. For example, UV sockets are useful if '01-A tubes are used. The new 2-volt tubes require a UX socket, or else a UV socket with an adapter. A 10- or 20-ohm rheostat shouldn't be difficult to extricate from some set. For the tuning condenser, cut a .00035-mf. size (ordinarily used for broadcast reception) down to 7 plates. For the regeneration control, another .00035-mf. unit can be cut down to about 13 plates. Although an ordinary "broadcast" grid condenser with a 2-meg. leak will work, somewhat better results can be obtained with a .00015-mf. size. The rest of the parts (such as audio transformers and head-phones) will ordinarily be found in the shop, or easily picked up.

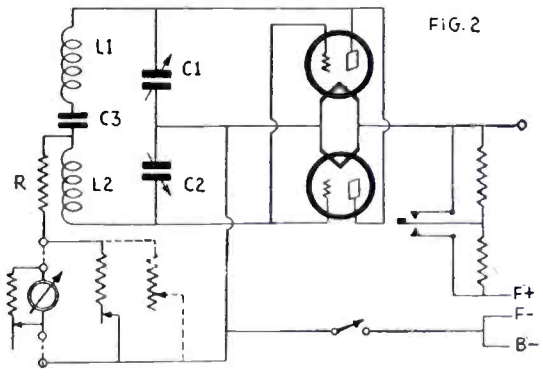


FIG. 2

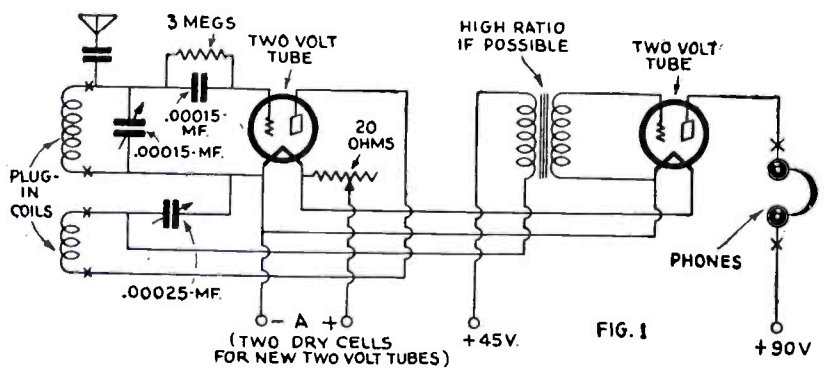


FIG. 1

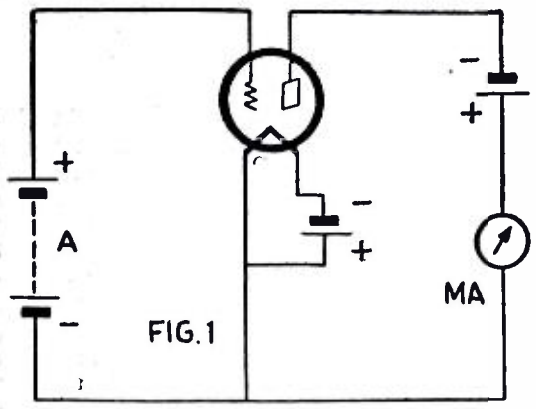
Left: Short wave "test oscillator" which will be found very useful for the service man.

Short wave receiver using the new 2-volt tubes. An R.F. choke (about 50 to 80 M.H.) should be connected in series with the lead joining the tickler and A.F. transformer primary winding.

A New Transmitter

Some of the peculiarities met with in constructing ultra short wave transmitters are here brought out; also how to connect a vacuum tube to produce waves a few inches long.

THE well-known transmitting hook-ups for ultra-short waves frequently use the arrangement reproduced in Fig. 1 (accidentally discovered a number of years ago by Barkhausen and Kurz) in which the grid of



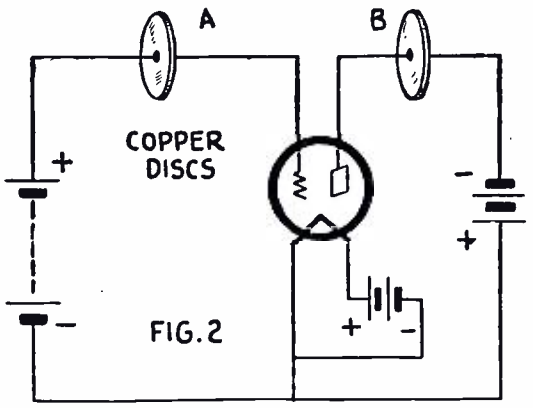
Barkhausen and Kurz hook-up for producing short waves. Note plate is negative and the grid positive.

the tube is charged with a relatively high *positive* voltage, and the anode (plate) on the contrary, with a rather low *negative* voltage as regards the cathode. In this hook-up suitable tubes (not all tubes can be thus made to oscillate) produce oscillations, which are generated by electron processes within the tubes and not, as usual, by self-induction and capacity in external circuits. Barkhausen explained this phenomenon by the assumption that the electrons oscillate about the grid, and thus produce the ultra-short waves.

Meanwhile numerous investigations have been made with this interesting hookup; partly in order to explain the processes which give rise to the oscillations and partly in order to attain shorter and shorter waves. Thereby the wavelength of 12 cm. (4.8 inches) has gradually been reached.

Naturally, the experiments in question have been extended to embrace the problem of whether such short waves, which indeed perceptibly approach the range of heat rays, can be used for transmitting messages. In this connection we recall the experiments presented at the Berlin ultra-short-wave meeting, by Dr. K. Kohl. But hitherto it has been impossible to cover any considerable distance with such short waves.

It is therefore highly interesting that now a French physicist, Pierrett by name, publishes a slight change in the Barkhausen and Kurz hook-up, which, he states, has enabled him to bridge a distance of 5-6 miles with waves only 17 cm. (6.8 inches) long. As Fig. 2 shows, Pierrett puts on the lead to the grid, and also on that to the anode (plate) of the tube, adjustable copper discs,

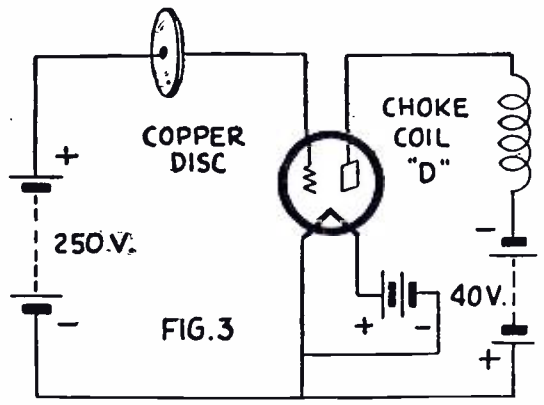


This diagram shows how movable copper discs are placed on the grid and plate wires to vary the wavelengths.

Hook-up for Ultra Short Waves

some 5 to 10 cm. (2 to 4 inches in diameter. Otherwise, the hook-up of Barkhausen and Kurz remains unchanged.

The use of these copper discs makes it possible for Pierrett to limit the oscillations to the space between the two discs

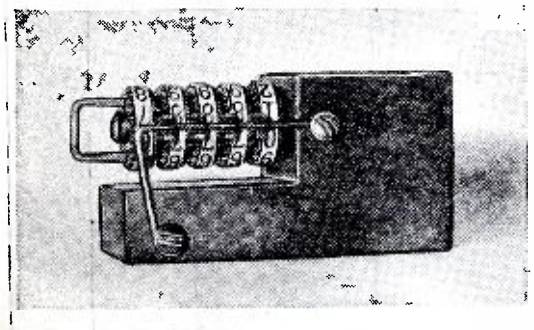


Still another hook-up for producing ultra short waves and employing a choke "D," with a single movable copper disc on the grid wire for tuning. This circuit yields waves as short as 4.8 inches.

and thereby shorten the wavelength. With the hook-up of Fig. 2, he attained waves of 30 cm. (12 inches) length. Still shorter waves were attained by the hook-up shown in Fig. 3, in which a high-frequency choke "D" is placed in the plate supply lead and there is a movable disc only on the conductor leading to the grid. With this hook-up, Pierrett got waves as short as 12 cm. (4.8 inches).

A special advantage of such short waves lies in the fact that they can be directed, with relative ease, by parabolic mirrors. Pierrett also used this possibility in the above mentioned experiments for transmitting messages to a distance of 9 km. (5.6 miles).—*Hanns Günther, in Rafa*—1931—*H.3.*

Coil Turn Counter



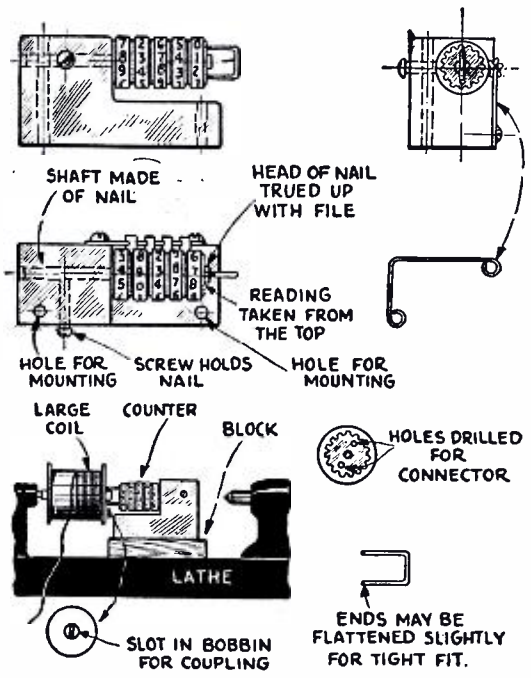
The finished coil "turn counter" which saved the author a lot of time and worry in winding up radio coils.

THIS counter needs little explanation as to constructional details, for the drawing shows everything. The wooden block should be made of some hard wood, preferably walnut. The shaft is made from a nail. Of course, the numbered dials are taken from an old speed-ometer, as are the little gear wheels used on the side of the counter. The nail head is trued up with a file to make the end wheel work freely. The bent wire, fastened to the end wheel, allows a wide variety of connections to be made to any revolving piece. The counter will work in either direction.—*Contributed by Lloyd Moore.*

At right we see construction details for building the coil "turn counter" illustrated by the photo at the left.

IN NEXT ISSUE:

7-Tube Portable Transmitter, using 6-Volt Auto Tubes — By John B. Brennan, Jr.



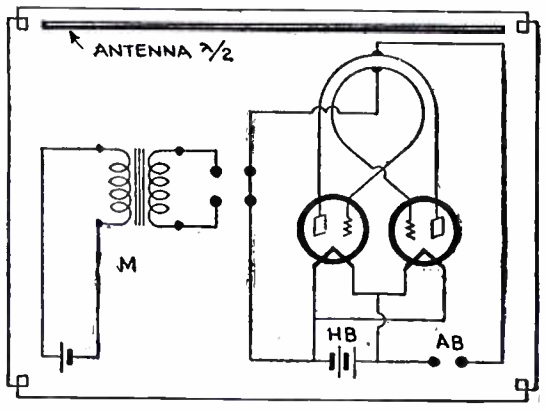


Fig. 1—Hoerner's ultra-short wave phone transmitter circuit. H.B.—heater battery; A.B.—plate or anode battery; aerial is ½ wave length; micro-phone M (not shown) connects in series with battery and transformer primary winding.

EXPERIMENTING

Waves but 2 to 3 meters in length are produced by the apparatus here described. A receiver circuit is given and also methods for checking up "resonance point" and "wave length". Dimensions for building the apparatus are given in the text and drawings

WE have frequently called attention to the fact that the *ultra-short waves* afford the amateur extraordinary opportunities of interest: they form an object of experiment of the very first rank, which indeed give a fresh new spur to the entire amateur radio movement. Of special importance in this respect is the great simplicity of the transmitting and receiving apparatus, which can be made at very slight cost. Suitable instructions have already been given at different times in SHORT WAVE CRAFT for sets suitable for the reception of the experimental ultra-short waves of from 1 to 10 meters length, which are helping to pave the way for the future ultra-short wave radio field. The sets which we shall describe this time are intended for such amateurs as wish to enter the new field by way of their own experiments—a field which indeed still contains plenty of puzzles for us, because investigation has just begun.

Transmitter and Receiver Desirable

Naturally, for such studies, there must be not only a *receiver* but also a *transmitter*. It is imperative for the reason that, apart from the few experimental transmitting stations in operation, ultra-short waves are not as yet widely available for reception purposes. Accordingly, our work should begin by building the U.S.W. *transmitter*. In practice one soon learns that such transmitting experiments give entirely new ideas in comparison with purely "receiving" experiments. At the same time they are comparatively easy to execute, because one can follow the propagation of sufficiently short waves and their behavior in space conveniently within one's four walls. This is in practice of special importance, but it must not lead to the view that a transmitting system limited in range to one's home, needs no authorization (license) from the U. S. Dept. of Commerce. All experiments with radio transmitters require official authorization.

The following instructions are based on data published about four years ago by S. Hoerner (of Munich). The editors of *Rafa* came upon them when going through older periodicals and reports on ultra-short waves. Since the testing of the Hoerner reports led us to most excellent results, we should not like to miss acquainting our readers with them, particularly the beginners in this field, for whom the simple apparatus indicated by Hoerner seem especially suited.

Experiments are best begun by constructing a makeshift transmitter, the appearance of which is illustrated. It is made in a quarter of an hour out of two ordinary receiver tubes, four binding posts, a strip of insulating material, a base-board, and a few inches of wire. It takes five minutes more to build a proper receiver, which is made according to the hook-up of Fig. 2, of a crystal detector, a head phone, a fixed condenser, and a loop of wire.

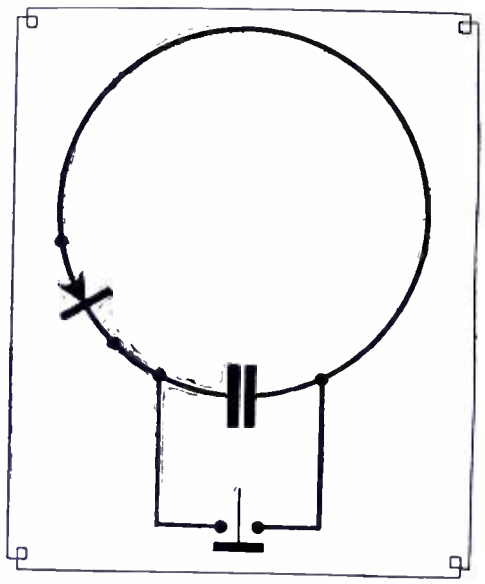


Fig. 2—Hoerner's "crystal detector" receiver hook-up; phone shunts condenser; arrow-head indicates crystal detector.

The hook-up of the transmitter operating on a wavelength of 2 to 3 meters appears in Fig. 1. The initiated S-W enthusiast will see that this is a question of the familiar Mesny push-pull hook-up. The seemingly missing capacity of the oscillation circuit is formed by the capacity of the tubes. The frequency of the circuit can therefore only be changed by changing the wire loop; therefore the tuning is done in this way. Naturally it is a rather crude method, which however suffices for crystal reception, for the value of the self-induction is here not critical, though it must not be neglected. The start of the oscillations can be determined in various ways. If one connects a phone in the plate wire, then one recognizes the "setting in" of the oscillations exactly as in the ordinary regeneration audion, by the crackling and roaring occurring at this moment. If one replaces the head phone by a milliammeter (range 20-50 milliamps.), the sudden dropping of the plate current indicates the commencement of the oscillations. If one uses the house current as a source of current for the plate circuit, in which case the oscillations are modulated by the 60 cycle sounds, or if one uses a "buzzer" for this, then one hears the oscillation sound very softly when the receiver is brought within 8 inches of the transmitter. If the detector is sensitive enough, then one can receive in this way, without any antenna, up to 5 meters (about 16 ft.). The finest experiments can be performed simply with the modulation of the 60 cycle (house current) sounds.

The construction of the little transmitter appears clearly from the illustrations. As one sees, the two tubes and their wire loops are supported perfectly freely by the circuit wires fastened to the terminal board. Naturally the wires must be stout enough for that. The circuit wires are simply wound around the prongs of the tubes, but the turns must be put on well, to avoid shifting contacts; whoever wants to proceed with certainty in this respect, does better to use a drop of solder. Thereby we, at the same time, achieve a reduction of the effective capacities. The inner wire loop, representing the grid circuit, is insulated against the plate circuit (see Fig. 1) by a simple rubber tube. For experiments without a coupled antenna, the coupling of the two circuits can be very loose, without the oscillations breaking off. The length of the battery wires plays no part, since the hook-up, in consequence of its symmetrical construction, prevents high frequency currents from getting into the circuit wires. Consequently also the high frequency

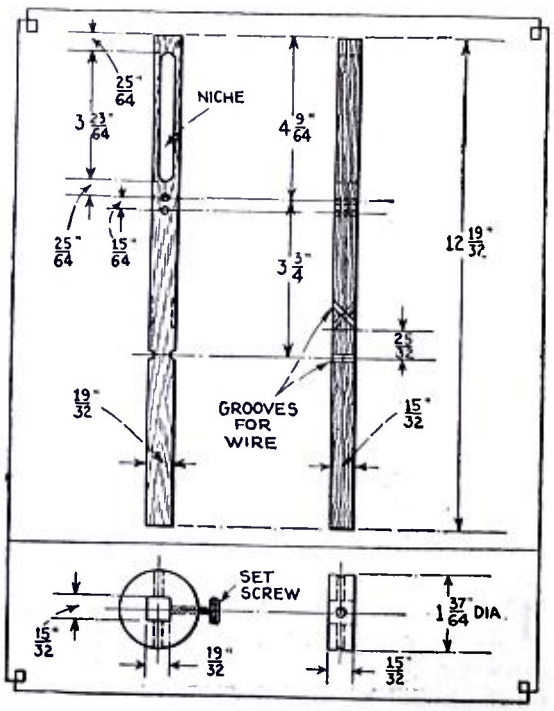


Fig. 3—The "antenna" column with the antenna holder shown below.

With ULTRA SHORT WAVES

By HANNS GÜNTHER (Germany)

choking system generally advocated by means of "chokes" placed in the lead wires just ahead of the tubes is here superfluous. (Such chokes usually have about 10 turns of wire.)

If one wishes to replace the makeshift design shown by a more durable arrangement for longer experimenting, then it is well to take as a model, Fig. 7, which in principle exactly corresponds to Fig. 2. As a supplement there serve the Figs. 3 to 6, which contain all the data for the individual parts to be made by oneself. This transmitter is also built, as we see, without heater resistance, rotary condenser, tube sockets, or the like. The two tube loops are supported by a bakelite pillar, which at the same time holds the antenna. The connecting of the circuit wires with the tube prongs is done by winding and soldering. The antenna consists of 3 brass tubes (.24 inch thick) stuck together (of the kind used for window curtains). Since one can push the tubes into one another, the antenna length is most conveniently changeable. The middle tube is fastened with acetone in the hole bored through a piece of bakelite, which on its part is supported by two bakelite strips glued together to form the pillar. The antenna runs in a niche in the column (see Fig. 3). The piece of bakelite serving as an antenna holder is pushed over the column and is clamped fast at the right height by a set-screw. This arrangement allows adjusting the distance between the antenna and the wire loop at any distance desired between ⅜ and 4 inches, and changing the degree of coupling accordingly.

The base of the column is soldered together out of sheet brass; details appear in Fig. 4. The two wire loops go through holes drilled in the column, while the heater and grid conduction wires lie in notches sawed in. To protect the wire loops from displacements, they are glued fast in their holes with acetone, or other cement. The leads to the wire loops run the shortest way; to avoid shifting contacts, they are soldered. The terminal board (Fig. 5) rests on the hard rubber parts of two screw bases, through the holes in which two wood screws go down into the base board. (Fig. 6.)

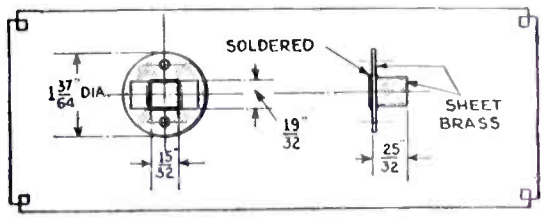


Fig. 4—Base fitting of "antenna" column.

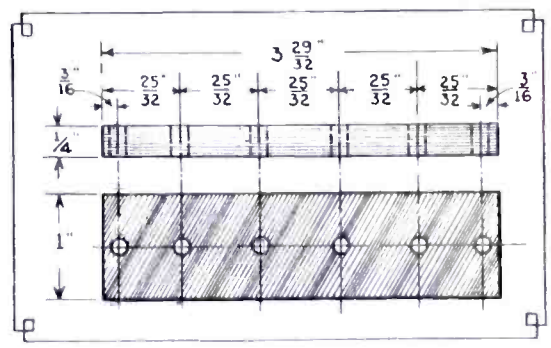


Fig. 5—Details of the terminal post panel.

Coupling Crystal Receiver to Aerial

If one likewise wishes to couple the initially mentioned crystal receiver to an antenna, it is well to use the arrangement shown in Fig. 7, likewise indicated by Hoerner, which forms an exact counterpart to the transmitter just described. Accordingly for the antenna there holds what was said about the antenna made for the transmitting set, only in this case the antenna is made fast, so that the coupling is invariable. The length is exactly equal to that of the transmitting antenna, which for its part is determined by the wave length.

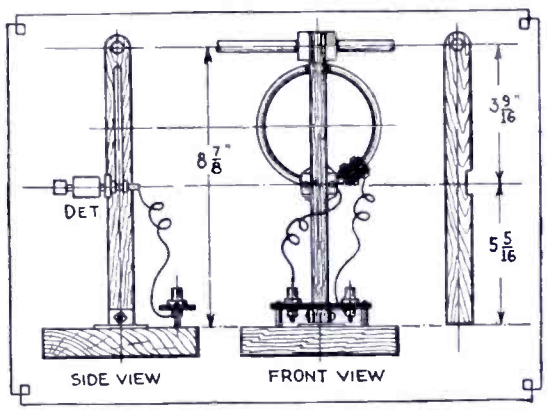


Fig. 7—Design for a permanent "crystal detector" U. S. W. receiver, a counterpart to the U. S. W. transmitter described.

As stated, the transmitter furnishes, according to the dimensions of the oscillation current, wave lengths of 2-3 meters. For the two meter wavelength, the diameter of the oscillation circuit loop must be about 8 cm. (3.2 inches, while a diameter of about 12 cm. (4.8 inches), gives a wave length of about 3 meters; the length of the antenna is always half the wave length. The antenna can be very exactly tuned to the oscillation circuit; resonance is recognized by a marked drop in the plate current or by a total stopping of the oscillations, when the antenna absorbs too much energy, in the case of very close coupling. The antenna length may be determined to within 2 cm. (.8 inches) of exactness. According to this method measurements showed that the wave length of the transmitter shown, with an 8-cm. (3.2 inch) loop, was almost exactly 1.92 meters.

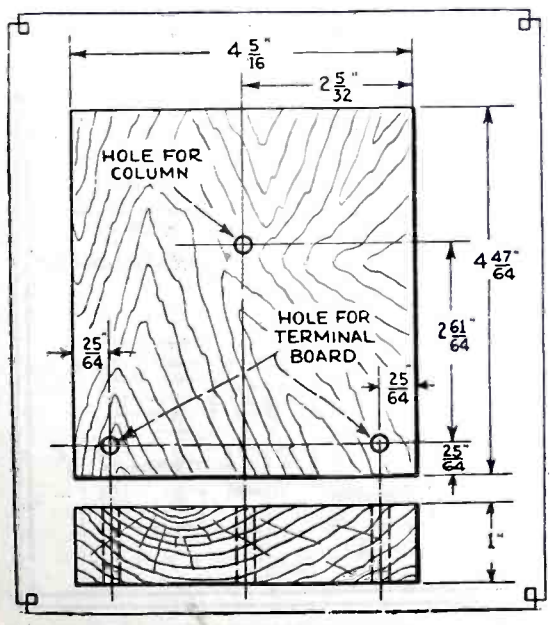


Fig. 6—How base-board is laid out and drilled.

Determining the wave length by the Lecher wire process is not easily possible here, because the transmitter energy is too slight. But for this purpose the following method, indicated by Hoerner, is excellent:

A wire about 10 meters (32.8 ft.) long is so stretched horizontally that one end runs by the transmitter circuit about 2 cm. (.8 inch) away. After one has been convinced that oscillations are present, one passes the loop of the make-shift crystal receiver shown in Fig. 2 along the wire at a very slight distance away. A uniform decrease and increase in sound intensity received shows the wave nodes and loops of the stationary waves oscillating in the wire. The distance between two loops or two nodes, when doubled, gives the wave length. As already mentioned, the coupling of the oscillation circuit in the case of operation without an antenna may be very loose, without the oscillations stopping. But with a coupled antenna the coupling of the oscillation circuit must be very tight; in this case the coupling at the same time has a capacitive effect. Hoerner found purely capacitive coupling by small metal disks very hard to attain. We have not tested out this method. With tight coupling of the oscillation circuit, the antenna can be brought as close as 2 cm. (.8 inch) without the stopping of the oscillations.

If one goes around in the "transmitting room" with the *receiver* in one's hand, one can observe the most remarkable refractions of the radiated waves. They are reflected by a piano, so that standing (i.e., stationary) waves are formed. In the neighborhood of electric wires the sound intensity increases.

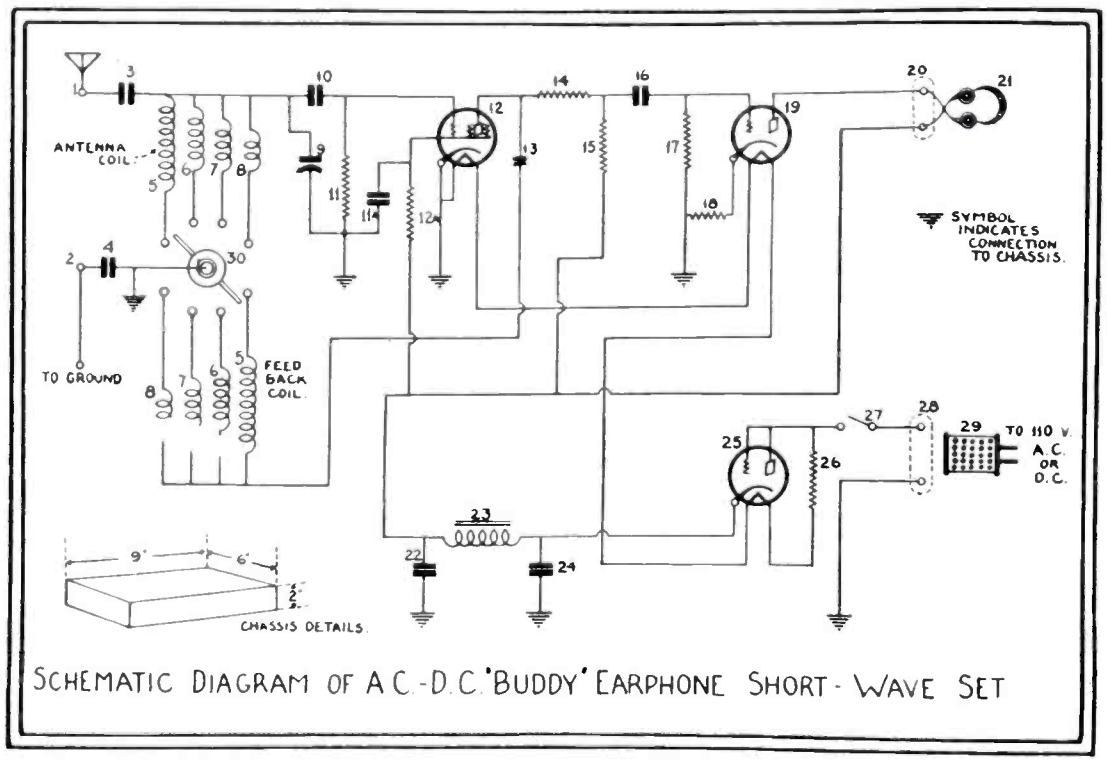
It is very easy to start telephonic experiments with the transmitter described. The hook-up in Fig. 1 termed "telephonic addition" shows that it needs only a transformer, a microphone connected at M, and a two-volt battery. The secondary winding of the transformer is to be

(*Continued on page* 110)

"BUDDY" Earphone Set
Works on 110 Volts A.C. or D.C.

By H. G. CISIN, M.E.

This compact short wave receiver employs one detector and one amplifier tube and also a rectifier tube; the coil winding data is given as well as the values of all resistors, condensers, etc., so that anyone may easily build this receiver. It can be plugged into any 110-volt A.C. or D.C. lamp socket.



Above we see the simple schematic diagram for the 110-volt A.C. or D.C. "Buddy" earphone short-wave receiver designed by Mr. H. G. Cisin. The filaments of the three tubes are connected in series with a suitable resistor to cut down the voltage to the proper value.

INTEREST in short-wave reception continues to increase with such rapidity that soon there will be as many short-wave fans as broadcast listeners. Short waves are deservedly popular, since they offer many fascinating features. Those who are interested in real distance reception find the short-wave receiver a never-ending source of pleasure. Police calls often bring in important news regarding cases of national interest. Such calls can be heard from all over the country on the short waves. Then there are the ship-to-shore and transatlantic conversations, airplane communications, amateur and experimental messages, code calls and many other special short-wave programs of extreme interest. The above is merely a very sketchy outline of the new thrills awaiting the short-wave listener. One must actually listen in to appreciate the interesting entertainment available on the short waves.

The A.C.-D.C. "Buddy" Short-Wave set has been designed especially for the novice. This receiver is very easy to assemble and it is compact and inexpensive. It needs no batteries and will bring in short-wave stations over a range of from 20 meters to 200 meters. It has remarkable distance-getting possibilities and after a little practice in tuning, it should establish some surprising records.

The circuit employed is a very simple one consisting of a regenerative detector and a single resistance-coupled audio stage. A 136-A screen grid Arcturus tube is used in the detector stage and a 137-A tube is employed in the audio stage. Another 137-A tube (25) serves as a rectifier.

200 to 10 Meter Range

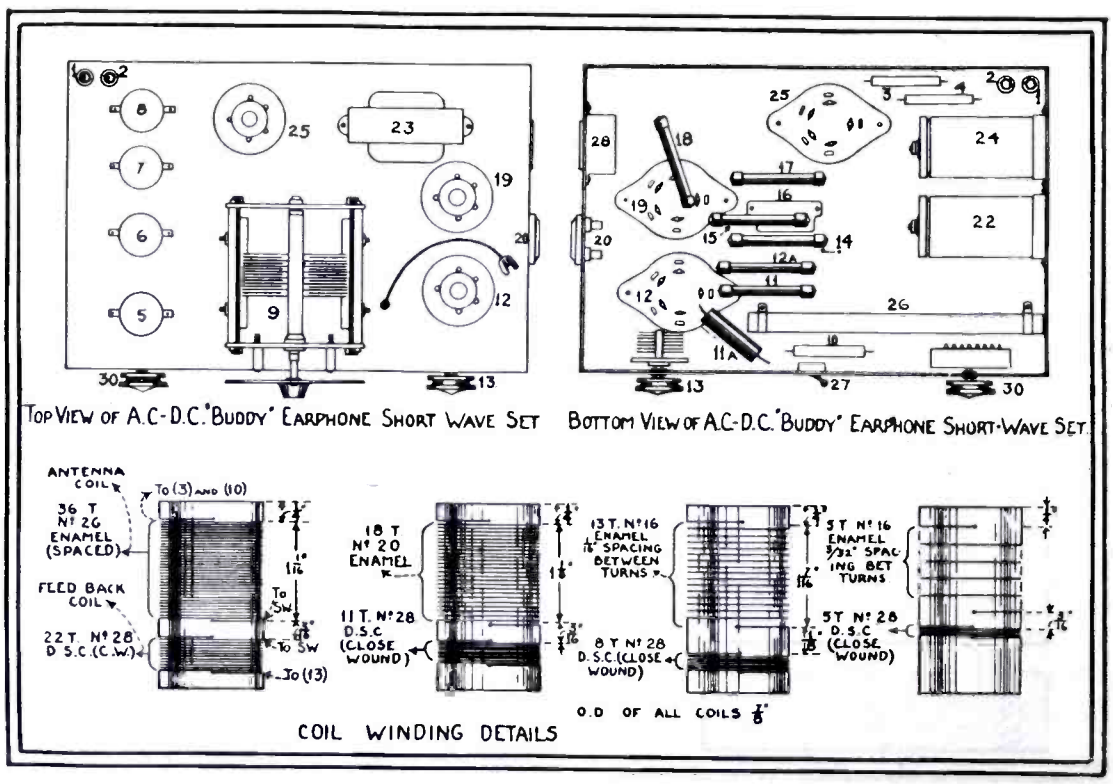
Four specially-wound short-wave coils are used. These cover the following bands: 200 to 80 meters; 80 to 40 meters; 40 to 20 meters and 20 to 10 meters. Each coil has two windings, an antenna coil and a feed-back coil. By means of the Bud double-pole selector switch (30), it is possible to change over rapidly from one coil to another, thus covering the entire band from 10 to 200 meters without having to bother with plug-in coils.

The Cardwell "Balancet" condenser (13) provides a convenient means of regeneration control. The use of earphones, instead of a loud speaker, not only simplifies the circuit, but also allows the set to be used at any hour of the night without disturbing others. The distance fan will appreciate the importance of this feature.

The Arcturus tubes specified are of the latest cathode heater type, designed especially for interchangeable A.C.-D.C. operation. The filaments of all three tubes are in series and correct operating voltage is obtained by means of the Electrad Truvolt resistor (26), which cuts the line voltage down to the correct value. This is equally effective on alternating and on direct current. When the set is used on alternating current, rectified plate and grid voltages are obtained by means of tube (25). Adequate filtering is obtained by means of the Trutest choke (23), by-passed on either side by the two Aerovox electrolytic condensers.

The mica condensers (3) and (4), serve to isolate the circuit from the line, thus preventing short circuits. The Clarostat Automatic Line Voltage Regu-

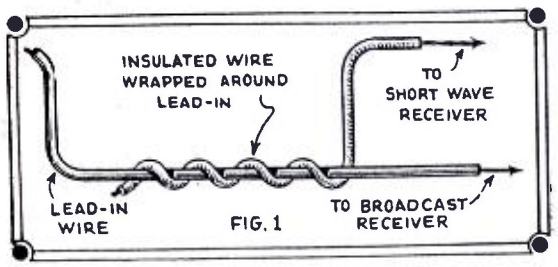
(*Continued on page* 123)



Data for winding the various short-wave band coils are given in the drawing above; also top and bottom views of the earphone short-wave receiver.

TWO SETS ON ONE AERIAL

A BROADCAST receiver and a short-wave receiver can be operated simultaneously on the same aerial, without interference. The lead-in wire is connected directly to the aerial post on the broadcast set; but is bridged to the short-wave outfit through a small condenser, of any capacity between .0001- and .00001-mf.



How to make a capacity coupling for a second receiver.

In the absence of a condenser, the wire from the short-wave receiver may simply be wrapped around the lead-in, for a distance of about ten inches. See Fig. 1. If the aerial is connected directly to both sets, the volume of the broadcast receiver suffers noticeably, although the short-wave signals do not seem to be affected very much. This is probably due to the relative impedances of the primary windings of the antenna tuning transformers. The broadcast coil, having appreciable inductance, acts as a good R.F. choke, as far as the S.W. signals are concerned, and shunts them off to the S.W. receiver. The S.W. primary, on the other hand, consists of only a few turns of wire, has practically no impedance to signals of broadcast frequency, and therefore short-circuits them nicely to ground.

LOG BOOK FORM

"KEEP a log book." This advice is given to every owner of a short-wave receiver. But what form is the log to take?

Probably the cheapest, simplest and best log book is an ordinary stiff-covered school notebook, measuring about 7 by 9 inches, with the pages ruled horizontally. A good book of this type can be bought for ten cents in any stationery store.

Divide the book into as many sections as you have ranges on your set, and cut away the edges of the pages for a distance of about one-quarter inch to form a convenient thumb index. Mark the tops of the pages with the respective identifying colors of your plug-in coils, and also indicate the wavelength or frequency range. Then simply rule off five vertical sections as shown in Fig. 2. Date, station call, dial setting, and time are all you will want to record, along with a few remarks about the program,

RED COILS 23-41 METERS

DATE	STATION	DIAL	TIME	REMARKS

FIG. 2

Suggested style for your "Log" book pages.

$5 Monthly for Best SHORT WAVE KINK

Beginning with the next issue of SHORT WAVE CRAFT, the editors will award a five dollar prize each month for the best short wave kink submitted by our readers. Look over these "kinks" which were prepared by "Bob" Hertzberg, and they will give you some idea of what the editors are looking for. Send a typewritten or ink description, with sketch, of your favorite short wave kink to the—"Kink" Editor, SHORT WAVE CRAFT.

such as names of selections, etc. Skip a space between records to indicate the listening done on different days. *Write in ink;* pencil smudges too easily.

The back of the log book is the logical place to keep newspaper and magazine clippings. Paste a piece of stiff paper across the lower half of the back cover, to form a "pocket" for this material.

USEFUL TIME CHART

ONE of the most useful gadgets the short-wave fan can have on his operating table is the Standard Time Conversion Chart sold by the U. S. Government. This is printed on heavy cardboard, 8 by 10½ inches, and costs only ten cents (coin or money order; *no stamps*). It takes all the trouble out of time conversion, because it is "direct-reading" and "foolproof".

Write to the Superintendent of Documents, Government Printing Office, Washington, D. C. Ask for Miscellaneous Publication No. 84.

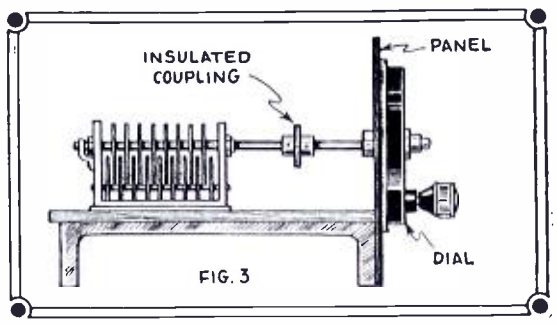
THOSE HARMONICS AGAIN

MANY listeners who report the reception of short-wave signals from certain American stations are informed, much to their surprise, that these stations are not transmitting on the short waves at all! What they have picked up are "harmonics" of the regular broadcast waves.

Harmonics are secondary oscillations or vibrations that appear in any oscillating system. The harmonics you may hear on a S.W. receiver are of higher frequency (lower wavelength than the fundamental). Some types of radio transmitting circuits are more virulent producers of harmonics than others; even in the best systems, harmonics may be created as a result of the antenna's own radiation. Fortunately, most of the harmonics that appear in the short-wave bands are pretty weak, the strongest being heard between about 100 and 150 meters.

ELIMINATING CONDENSER NOISE

IN some sets, the use of an insulated coupling between the variable tuning condenser and its dial will eliminate the "grinding" noise heard when the dial is turned. See Fig. 3. This coupling breaks up the small loop circuit consisting of the condenser shaft, the vertical side of the condenser, the section of the sub-panel from the condenser to the front panel,



Condenser noises can frequently be eliminated by using an insulating coupling between the condenser and dial.

the piece of the front panel up to the condenser shaft, and the metal mechanism of the dial. Faulty contacts in the dial change the resistance of this loop and, in a very sensitive receiver, the change is enough to affect the tuned circuits. The insulated coupling is not a sure cure, but certainly does help in many cases.

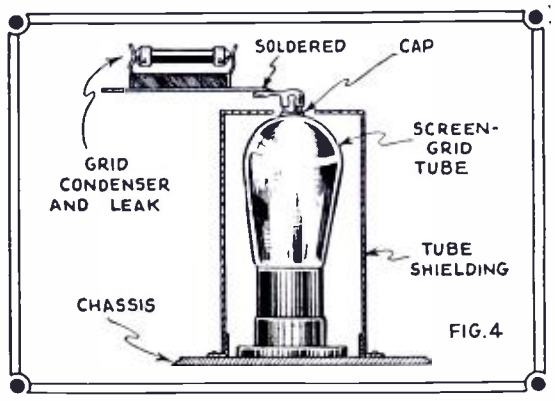
INCREASING SELECTIVITY

IN some of the early-model, screen-grid short-wave receivers the R.F. tube is not shielded; the designers having figured that shielding is not necessary with an untuned antenna stage. However, in many cases, the use of a tube shield helps the selectivity of the set very noticeably.

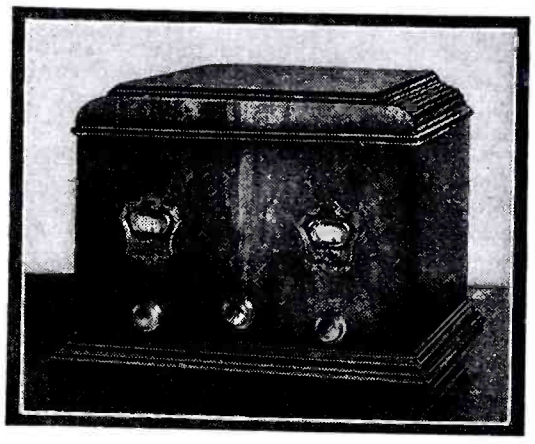
MOUNTING THE GRID CONDENSER

IN revamping old-style S.W. receivers to use screen-grid detection, many experimenters are stumped by the problem of what to do with the grid condenser and leak. The "G" post of the detector socket, to which they were connected before, is now the terminal of the screen-grid element, the control grid being up at the top of the tube, sticking out through a shield can.

The simplest and best thing to do is to solder one lug of the grid condenser directly to the snap clip that fits on the control-grid electrode. This arrangement looks a bit odd, but it makes for extremely short and direct wiring, which is highly desirable in any short-wave set.



A good method for mounting the grid condenser and leak in shield-grid tube circuits.



The handsome-looking, well engineered short wave converter seen above is the new "Crosley." It can be used to convert any modern A.C. operated broadcast receiver for short wave reception.

The CROSLEY SHORT WAVE *ADAPTER*

One of the latest short wave converters developed by a leading broadcast set manufacturer is here described, with coil and condenser data.

WITH the new Crosley *Short Wave Adapter* it is possible to bring in those otherwise unattainable short-wave broadcasts, such as reception from foreign countries, ships at sea, local police, and amateur broadcast stations.

The new Crosley short wave adapter can be used with any modern A.C. radio receiver to adapt it to the reception of short-wave stations. It is easily and quickly installed, only four connections being necessary.

The cabinet is of selected walnut veneer. The ends of the cabinet top are beautifully reeded and finished in walnut. Cabinet dimensions: 9¼" high, 12½" wide, 10½" deep. The chassis of the Crosley short wave adapter employs one type -24 detector tube, one type -27 oscillator tube, and one type -80 rectifier tube.

Five sets of frequency coils are furnished with each receiver, each set consisting of one four-prong and one five-prong coil, for various frequency ranges in the short-wave region. The approximate frequency range obtained with these coils is from 1,490 to 30,000 kilocycles.

Coil and Condenser Specifications for No. 7-2 Short Wave Adapter

Coil No. 1.—Range 1,450 to 3,000 kilocycles:

Antenna Winding—55¼ turns No. 31 Enam. tapped at 7¼ turns. 1/56 pitch right hand threaded—90 degrees.

Oscillator Winding—tuned plate winding, 26¾ turns No. 26 Enam. 1/32 pitch right hand thread—90 degrees. Grid tickler winding, 12¾ turns No. 36 D.S.C. 1/32 pitch, right hand thread—90 degress. Threads for this winding cut midway between threads for plate winding.

Coil No. 2.—Range 2,750 to 5,700 kilocycles:

Antenna Winding—28¼ turns No. 26 Enam. tapped at 3¼ turns. 1/32 pitch, right hand thread—90 degrees.

Oscillator Winding—tuned plate winding, 15¾ turns No. 26 Enam. 1/32 pitch, right hand thread—90 degrees. Grid tickler winding, 6¾ turns No. 36 D.S.C. 1/32 pitch, right hand thread—90 degrees. Threads for this winding cut midway between threads for plate winding.

Coil No. 3.—Range 5,350 to 11,000 kilocycles:

Antenna Winding—18¼ turns No. 26 Enam. tapped at 3¼ turns. 1/16 pitch, right hand thread—90 degrees.

Oscillator Winding—tuned plate winding, 13¾ turns No. 26 Enam. 1/16 pitch, right hand thread—90 degrees. Grid tickler winding, 4¾ turns No. 31 Enam. 1/16 pitch, right hand thread—90 degrees. Threads for this winding cut midway between threads for plate winding.

Coil No. 4.—Range 10,000 to 22,250 kilocycles:

Antenna Winding—6¼ turns No. 26 Enam. tapped at 1¼ turns. 1/16 pitch, right hand thread—90 degrees.

Oscillator Winding—tuned plate winding, 5¾ turns No. 26 Enam. 1/16 pitch, right hand thread—90 degrees. Grid tickler winding, 4¾ turns No. 31 Enam. 1/16 pitch, right hand thread—90 degrees. Threads for this winding cut midway between threads for plate winding.

Antenna and Oscillator Tuning Capacities—.000125 mf. each.

Oscillator Trimmer Condenser Capacity—.000035 mf.

Detector Plate By-pass Condenser—.01 mf.

Oscillator Plate and Detector Screen By-pass Condenser—0.1 mf.

Detector Cathode By-pass Condenser—0.1 mf.

Oscillator Cathode By-pass Condenser—0.1 mf.

Details of Coil Forms:

Coil No. 1—1¼" outside diameter. Threads—V-shaped, .010" deep. Osc& Ant ¾" apart.

Coil No. 2—1¼" outside diameter. Threads—V-shaped, .010" deep. Osc& Ant ¾" apart.

Coil No. 3—1" outside diameter. Threads—V-shaped, .010" deep. Osc& Ant ¾" apart.

Coil No. 4—1" outside diameter. Threads—V-shaped, .010" deep. Osc& Ant ¾" apart.

Coil and Condenser Specifications for No. 7-1 Short Wave Adapter

Coil Data:

Group No. 1—Range 1,490 to 3,440 kilocycles:

Antenna Coil—Antenna winding, 15 turns No. 26 Enam. 1/32 pitch, right hand thread—90 degrees. Grid winding,

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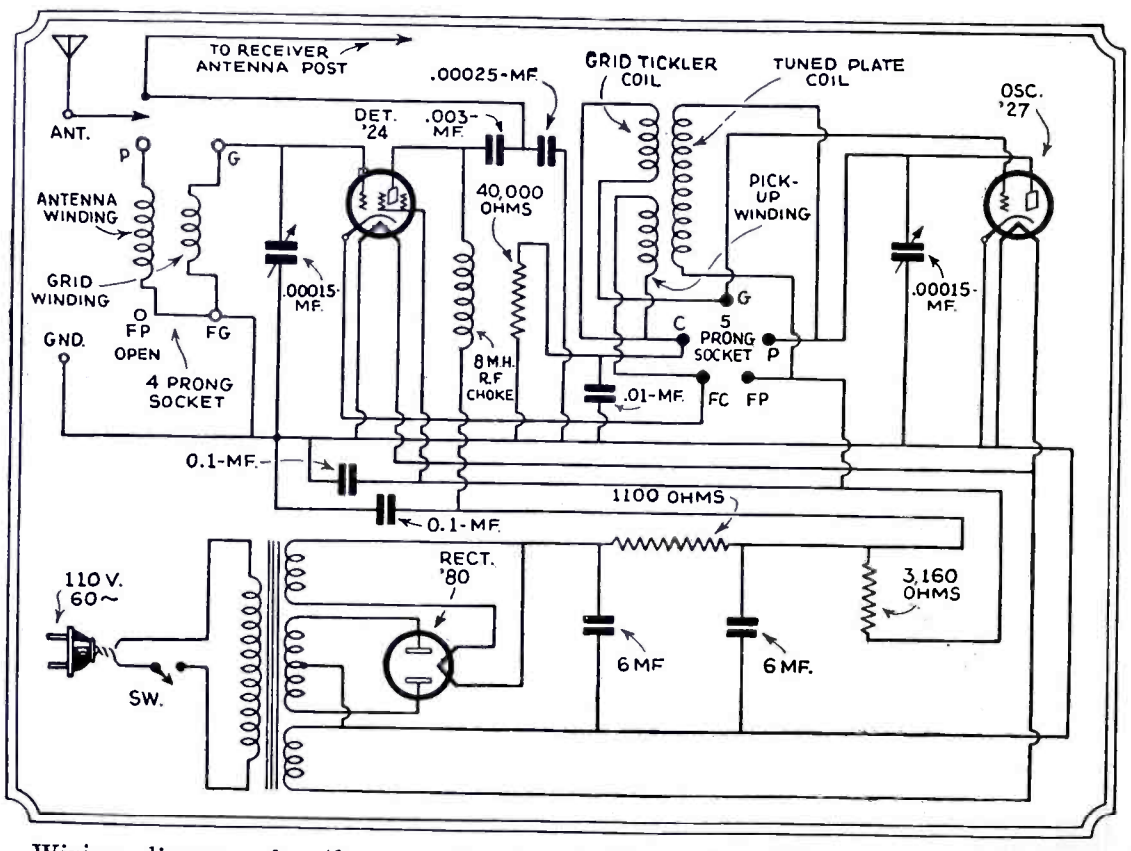


Wiring diagram for the new Crosley S-W adapter. When connected to your broadcast receiver, it forms a "Super-Het" for S-W reception. The coils have been drawn in as they are actually connected to the pins of the plugs fitting into sockets indicated.

$500.00 SHORT WAVE BUILDER'S

Contest—$100 in Monthly Prizes for Best Models

IN the May number of SHORT WAVE CRAFT, we announced, in considerable detail, this new contest and the rules for those desiring to enter sets in the contest. For the benefit of those who did not read the original announcement in the May number, we mention here some of the more important points that you should bear in mind.

The closing date for the May contest is given in the box below. The keynote of this contest is expressed by the single word—SIMPLEST!

Short wave set builders may submit any one of the following apparatus:

SHORT WAVE SET
SHORT WAVE ADAPTER
SHORT WAVE CONVERTER

These sets can be "AC" or "battery" operated and the main requirements that the judges wish the contestants to keep actively in mind in building sets to be entered in this contest are: **Simplicity, compactness, ingenuity, novelty of circuit used, portability, workmanship.**

Note particularly that this prize contest does not center itself about a single type of set. You can build and submit any one of the three classes; either a short wave adapter, a converter, or a "straight" short wave receiver.

You will please note that the set itself must be *built by you* and furthermore *the sets themselves* must be sent, *prepaid*, preferably by express, to the editorial offices of SHORT WAVE CRAFT. Remember that *workmanship* will be one of the strong factors that the judges will have in mind in awarding prizes. Sets may be sent with or without phones or loudspeaker. Data is given below on the length of descriptive article, diagrams and other information required by the judges. Have your article typewritten, if at all possible; diagrams need not be finished mechanical drawings, as our draughtsman will re-draw diagrams for publication, but make neat sketches in ink. All coil and condenser data must be given; also all resistor and speaker (or phones) ohmic or impedance values.

Rules for $500.00 Short Wave Builder's Contest

DURING the next five months, SHORT WAVE CRAFT will award a total of $500.00 in prizes in an important new contest. You are asked to build a home-made short wave set which should fill one or more of the following requirements: 1, Simplicity; 2, Compactness; 3, Ingenuity; 4, Novelty of Circuit Used; 5, Portability; 6, Workmanship.

Read carefully the text of the adjoining article, and observe the following simple rules:

1.—Short wave sets submitted may be in either of the following classes:
"Straight" S-W Receiving Set (battery operated or A.C. operated)
Short Wave Converter
Short Wave Adapter

2.—Sets must be home-made and built by contestants themselves. Manufactured sets are absolutely excluded from this contest.

3.—Sets submitted may be for ONE, TWO, THREE and NOT MORE THAN FIVE TUBES. Any type of tube as selected by the builder can be used. Crystal operation or crystal-tube combinations allowable, at the option of builder. Sets may be of any size or shape, at the option of the builder.

4.—In order to win a prize, it is necessary that the set itself be submitted to the editors. The five best models submitted each month will be awarded the prizes as scheduled here.

5.—All sets submitted to SHORT WAVE CRAFT Magazine will be returned to their owners after they have been judged and described for the benefit of SHORT WAVE CRAFT readers in the magazine.

6.—This is a monthly contest, beginning May 1st, 1932, and lasting for five months. Each monthly contest closes on the 1st of the following month. Thus the contest for May closes Midnight June 1st, 1932, at which time all entries for this month must be in the editorial offices of SHORT WAVE CRAFT. The first prize-winning announcements will be made in the August, 1932, issue of SHORT WAVE CRAFT.

7.—Every set must be accompanied by an article written by the builder, and contain not more than 2,000 words, giving minute instructions with wiring (schematic) diagram, list of parts with values of all resistors, condensers, coil data, including number of turns, etc., how the set was built, its operating characteristics, what stations have been received with it, and other information considered important by the builder. Such article should be typewritten or written in ink, and should be sent separately by mail, and should not be included with the set itself!

8.—All sets must be shipped in strong wooden boxes, NEVER in cardboard boxes. All sets must be sent "prepaid"! Sets sent "charges collect" will be refused. SHORT WAVE CRAFT Magazine cannot be held responsible for breakage in transit due to improper packing of sets. Before packing the set, be sure to affix tag with string giving your name and address to the set itself, IN ADDITION, PUT YOUR NAME AND ADDRESS ON THE OUTSIDE OF THE WRAPPER OF THE PACKAGE.

FIRST PRIZE	$50.00
SECOND PRIZE	25.00
THIRD PRIZE	12.50
FOURTH PRIZE	7.50
FIFTH PRIZE	5.00

9.—Employes and their families of SHORT WAVE CRAFT are excluded.

10.—The judges will be the Editors of SHORT WAVE CRAFT Magazine, and the following short wave experts: Robert Hertzberg, Clifford E. Denton. Their findings will be final.

11.—Address all letters, packages, etc., to Editor, SHORT WAVE BUILDER'S CONTEST, care SHORT WAVE CRAFT Magazine, 96-98 Park Place, New York.

ator communicate or let the world know what happened to that ship? If he has no knowledge of code he may as well jump overboard. Whereas knowing the code he could easily rig up a key, if nothing more than two wires.

Yours sincerely,
MILTON O. SMITH,
5124 Kenmore Ave.,
Chicago, Ill.
Ex. "W6BPQ"

Radio Interference Surveys

WICHITA, KANSAS

Short Wave League:

I noted with interest the article in the SHORT WAVE CRAFT pertaining to the organization of the SHORT WAVE LEAGUE. Also rule No. 5 of the platform concerning the efforts to eliminate radio noises interests me.

I have a short wave receiver and would be pleased to belong to this organization and will be glad to answer any questions pertaining to the location and elimination of man-made static. Regarding that responsibility, we need a national systematic method of handling that work, since investigations reveal that the large percentage of noises are out of jurisdiction of power companies.

My opinion is that those interested in better reception should encourage states and cities to employ radio inspectors. Much more could be accomplished when a radio interference inspector is employed in a mutual capacity, given jurisdiction, to find general radio noises.

L. L. ROBINSON.

Short Wave League Letters

(*Continued from page* 89)

Short Wave League:

I have been a reader of SHORT WAVE CRAFT the last two months. I sure like to read it because it has the *kind* of information that I have always wanted. I would like to subscribe for a year or two, the best in the world. On account of my crippled condition I am not financially able to do so. I think I can buy a copy every month, but I am not sure of that. I have been crippled the past six years and get about only on crutches, which is very unpleasant. I am 28—sex, male.

Now, about the short wave telephone. I *am* in favor of persons owning a phone station whether they know the "code" or not, below 6 meters. I have a two tube S.W. receiver and on account of me not knowing the code, I haven't a transmitter, which otherwise I could. I have been trying to master the code, *but it seems to get the best of me.* If I was permitted to operate below 6 meters without knowledge of code and license my friend who is a S.W. fan, who lives four blocks away, could carry on a conversation with me. I can't see why the Radio Commission hasn't done this a long time ago.

Lots of fellows that haven't a station of their own would be *proud* to own a station and operate on 4 to 5 meters. I know I would. I hope that the Radio Commission will make this possible.

I believe that owning a station and operating on 5 meters will help a good deal to learn the code; after once it is mastered one can move up in the 40 or 80 meter band. Let's go! Wishing you and your publication every success, I am,

Sincerely,
VIVIAN D. KINARD,
P. O. Box 1403, Big Spring, Tex.

Short Wave Stations of the World

Short Wave Broadcasting Stations

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
19.56	15,330	W2XAD	General Electric Co., Schenectady, N. Y. Broadcasts 3-6 p.m. daily; 1-6 p.m. Sat. and Sunday.
19.68	15,240	FYA	Pontoise (Paris), France. 9:30-12:30 a.m. Service de la Radiodiffusion, 103 Rue de Grenelle, Paris.
19.72	15,210	W8XK	Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Tues., Thurs., Sat., Sun., 8 a.m. to noon.
		DJB	For address, see listing for DJA. Mondays, 10-11 p.m.
19.83	15,120	HVJ	Vatican City (Rome, Italy) Daily, 5:00 to 5:15 a.m.
		JIAA	Tokio, Japan. Irregular.
19.99	15,000	CM6XJ	Central Tuinucu, Cuba, Irregular.
20.50	11,620	XDA	Trens-News Agency, Mexico City, 2:30-3 p.m.
20.95	14,310	G2NM	Gerald Marcuse, Sonning-on-Thames, England. Sundays, 1:30 p.m.
21.50	13,940	.....	University of Bucharest, Bucharest, Roumania, 2-5 p.m., Wed., Sat.
23.35	12,850	W2XO	General Electric Co., Schenectady, N. Y. Antipodal program 9 p.m. Mon. to 3 a.m. Tues. Noon to 5 p.m. on Tues, Thurs. and Sat.
		W2XCU	Ampere, N. J.
		W9XL	Anoka, Minn., and other experimental relay broadcasters.
23.38	12,820	.....	Director General, Telegraph and Telephone Stations, Rabat, Morocco. Sun., 7:30-9 a.m. Daily 5-7 a.m. Telephony.
25.16	11,920	FYA	Pontoise, France. 1-3 p.m. daily.
25.24	11,880	W8XK	Westinghouse Electric & Mfg. Co., Pittsburgh, Pa. Tues., Thurs., Sat., Sun., 11 a.m.-4 p.m., and Sat. night Arctic programs. Television, Mon. and Fri. 2:30 p.m., 60 lines, 1200 r.p.m.
		W9XF	National Broadcasting Co., Downers Grove (Chicago), Ill. 9-10 p.m. daily.
25.26	11,870	VUC	Calcutta, India. 9:45-10:45 p.m.; 8-9 a.m.
25.34	11,840	W2XE	Columbia Broadcasting System, 485 Madison Ave., N. Y., Jamaica, New York. 7:30 a.m. through to 2 a.m. Sundays 8 a.m. to midnight.
		W9XAA	Chicago Federation of Labor, Chicago, Ill. 7-8 a.m., 1-2, 4-5:30, 6-7:30 p.m.
25.42	11,800	VE9GW	W. A. Shane, Chief Engineer, Bowmanville, Canada. Daily, 1 p.m.-10 p.m.
25.47	11,780	VE9DR	Drummondville, Quebec, Canada. Irregular.
25.50	11,760	XDA	Trens-News Agency, Mexico City. 3-4 p.m.
25.53	11,750	G5SW	British Broadcasting Corporation, Chelmsford, England. Mon. to Sat., 1:45-7 p.m.
		VE9JR	Winnipeg, Canada. Weekdays, 5:30-7:30 p.m.
29.30	10,250	TI4	Amondo Cespedes Marin, Heredia, Costa Rica. Mon. and Wed., 7:30 to 8:30 p.m.; Thurs. and Sat., 9:00 to 10 p.m.
31.10	9,640	HSP2	Broadcasting Service, Post and Telegraph Department, Bangkok, Siam. 9-11 a.m. daily.
31.28	9,590	VK2ME	Amalgamated Wireless, Ltd., 47 York St., Sydney, Australia. Sun., 1-3 a.m. 5-9 a.m., 9:30-11:30 a.m.
		VK3ME	Amalgamated Wireless, Ltd., 47 York St., Melbourne, Australia. Wed. and Sat., 5-6:30 a.m.
31.30	9,580	W3XAU	Byberry, Pa., relays WCAU daily.
31.33	9,570	WIXAZ	Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. 6 a.m. - 10 p.m. daily.
		SRI	Poznan, Poland. Tues. 1:15-4:45 p.m., Thurs. 1:30-8 p.m.
31.38	9,560	DJA	Reichspostzentralamt, 11-15 Schoenberge Strasse (Berlin). Konigswusterhausen, Germany. Daily, 8 a.m.-7:30 p.m.
31.48	9,530	W2XAF	General Electric Co., Schenectady, N. Y., 5-11 p.m.

All Schedules Eastern Standard Time: Add 5 Hours for Greenwich Mean Time.

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
31.49	9,520	OXY	Skamleboek, Denmark. 2-7 p.m. daily.
31.70	9,460	.....	Radio Club of Buenos Aires, Argentina.
32.00	9,375	EH9OC	Berne, Switzerland. 3-5:30 p.m.
32.26	9,290	.....	Rabat, Morocco. 3-5 p.m. Sunday, and irregularly weekdays.
35.00	8,570	RVI5	Far East Radio Station, Khabarovsk, Siberia. 5-7:30 a.m.
38.6	7,790	HBP	League of Nations, Geneva, Switzerland. 3 - 8 p.m., irregular.
39.80	7,530	.....	"El Prado," Riobamba, Ecuador. Thurs., 9-11 p.m.
40.00	7,500	.....	"Radio-Touraine," France.
40.20	7,460	YR	Lyons, France. Daily except Sun., 10:30 to 1:30 a.m.
40.50	7,410	.....	Eberswalde, Germany. Mon., Thurs., 1-2 p.m.
40.70	7,370	X26A	Nuevo Laredo, Mexico. 9-10 a.m.; 11 a.m.-noon; 1-2; 4-5; 7-8 p.m. Tests after midnight, I.S.W.C. programs 11 p.m. Wed. A.P. 31.
40.90	7,320	ZTJ	Johannesburg, So. Africa. 9:30 a.m.-2:30 p.m.
41.46	7,230	DOA	Doeberitz, Germany.
41.50	7,220	HB9D	Zurich, Switzerland. 1st and 3rd Sundays at 7 a.m., 2 p.m.
		.....	Budapest, Hungary 2:30-3:10 a.m., Tu., Thurs., Sat. Budapest Technical School, M.R.C., Budapest, Muegyetern.
41.67	7,195	VSIAB	Singapore, S. S. Mon., Wed. and Fri., 9:30-11 a.m.
42.00	7.140	HKX	Bogota, Colombia.
42.70	7,020	EAR125	Madrid, Spain. 6-7 p.m.
42.90	6,990	CTIAA	Lisbon, Portugal. Fridays, 5-7 p.m.
43.00	6,980	EARI10	Madrid, Spain. Tues. and Sat., 5:30 to 7 p. m.; Fri., 7 to 8 p.m.

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

43.60	6,875	F8MC	Casablanca, Morocco. Sun., Tues., Wed., Sat.
46.40	6,480	TGW	Guatamala City, Guat. 8-10 p.m.
46.70	6,425	W9XL	Anoka, Minn.
46.70	6,425	W3XL	National Broadcasting Co. Bound Brook, N. J. Relays WJZ. irregular.
46.72	6,420	RV62	Minsk, U.S.S.R. Irregular.
47.00	6,380	HCIDR	Quito, Ecuador. 8-11 p.m.
47.35	6,335	VE9AP	Drummondville, Canada.
		CN8MC	Casablanca, Morocco. Mon. 3-4 p.m., Tues. 7-8 a.m., 3-4 p.m. Relays Rabat.
47.81	6,270	HKC	Bogota, Colombia. 8:30-11:30 p.m.
48.00	6,250	HKA	Barranquilla, Colombia. 8-10 p.m. ex. Mo,, Wed., Fri.
48.62	6,170	HRB	Tegucigalpa, Honduras. Monday, Wednesday, Friday, Saturday 5-6 p.m. and 9-12 p.m.
48.83	6,140	W8XK	Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. Tues., Thurs., Sat., Sun., 5 p.m. to midnight.
48.99	6,120	.....	Motala, Sweden, "Rundradio." 6:30-7 a.m., 11-4:30 p.m. Holidays, 5 a.m. to 5 p.m.

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
48.99	6,120	F3ICD	106 Boulevard Charner, Chi-Hoa (Saigon), Indo-China. 6:30-10:30 a.m.
		W2XE	Columbia Broadcasting System, 485 Madison Avenue, New York, N. Y. 7:00-a.m. to midnight.
		FL	Eiffel Tower, Paris. 5:30-5:45 a.m., 5:45-12-30, 4:15-4:45 p. m.
		.....	Toulouse, France. Sunday, 2:30-4 p. m.
49.10	6,110	VE9CG	Calgary, Alta., Canada.
49.15	6,100	W3XAL	National Broadcasting Company, Bound Brook, N.J., Irregular.
		VE9CF	Halifax, N. S., Canada. 6-10 p.m., Tu., Thu., Fri.
49.17	6,095	VE9GW	Bowmanville, Ontario, Canada. Irregular.
49.31	6,080	W9XAA	Chicago Federation of Labor, Chicago, Ill. 6-7 a.m., 7-8 p.m., 9:30-10:15, 11-12 p.m. Int. S. W. Club programs. From 10 p.m. Saturday to 6 a.m. Sunday.
49.40	6,070	VE9CS	Vancouver, B. C., Canada. Fridays before 1:30 a.m. Sundays, 2 and 10:30 p.m.
		.....	Johanesburg, South Africa, 10:30 a.m.-3:30 p.m.
49.46	6,065	SAJ	Motala, Sweden. 6:30-7 a.m., 11 a.m. to 4:30 p.m.
49.50	6,060	W8XAL	Crosley Radio Corp., Cincinnati, O. Relays 6:30-10 a.m., 1-3 p.m., 6 p.m. to 2 a.m. daily. Sunday after 1 p.m.
49.50	6,060	VQ7LO	Imperial and International Communications, Ltd., Nairobi, Kenya, Africa. Monday, Wednesday, Friday, 11 a.m.-2:30 p.m.; Tuesday, Thursday, 11:30 a.m.-2:30 p.m.; Saturday, 11:30 a.m.-3:30 p.m.; Sunday, 11 a.m. - 1:30 p.m.; Tuesday, 3 a.m.-4 a.m.; Thursday, 8 a.m.-9 a.m.
		W3XAU	Byberry, Pa. Relays WCAU.
49.59	6,050	VE9CF	Halifax, N. S., Canada. 11 a.m.-noon, 5-6 p.m. On Wed., 8-9; Sun., 6:30-8:15 p.m.
		HKD	Barranquilla, Columbia.
49.67	6,040	PK3AN	Sourabaya, Java. 6 9 a.m.
49.75	6,030	VE9CA	Calgary, Alta., Canada.
49.80	6,020	W9XF	National Broadcasting Co., Downers Grove (Chicago), Ill.
49.97	6,000	YV2BC	Caracas, Venezuela. 7:45-11 p.m. daily ex. Mon.
		.....	Eiffel Tower, Paris, France. Testing, 6:30 to 6:45 a.m.; 1:15 to 1:30, 5:15 to 5:45 p.m., around this wave.
		VE9CU	Calgary, Canada.
49.97	6,000	.....	Administration des P. T. T., Tananarive, Madagascar. Tues., Wed., Thurs., Fri., 9:30 - 11:30 a.m. Sat. and Sun., 1-3 p.m.
50.26	5,970	HVJ	Vatican City (Rome). 2-2:15 p.m., daily. Sun., 5-5:30 a.m.
50.80	5,900	HKO	Medellin, Colombia, 8-11 p.m., except Sunday.
51.40	5,835	HKD	Barranquilla, Colombia. 7:45-10:30 p.m. Mon., Wed. 8-10:30 p.m.; Sunday 7:45-8:30 p.m. Elias J. Pellet.
52.50	5,710	VE9CL	Winnipeg, Canada.
54.02	5,550	W8XJ	Columbus, Ohio.
58.00	5,170	OKIMPT	Prague, Czechoslovakia, 1-3:30 p.m., Tues. and Fri.
		PMY	Bandoeng, Java.
		PMB	Sourabaya, Java.
60.30	4,975	W2XV	Radio Engineering Laboratories, Inc., Long Island City, N. Y. Irregular
62.56	4,795	W9XAM	Elgin, Ill. (Time signals.)
		W3XZ	Washington, D. C.
		W9XL	Chicago, Ill.
67.65	4,430	DOA	Doeberitz, Germany. 6-7 p.m., 2-3 p.m., Mon., Wed., Fri.
70.00	4,280	OHK2	Vienna, Austria. Sun., first 15 minutes of hour from 1 to 7 p.m.
70.20	4.273	RVI5	Far East Radio Station, Khabarovsk, Siberia. Daily, 3-9 a.m.
80.00	3,750	F8KR	Constantine, Tunis, Africa. Mon. and Fri.
		I3RO	(Prato Smeraldo), Rome, Italy. Daily; 3-5 p.m.
82.90	3,620	DOA	Doeberitz, Germany.
84.24	3,560	OZ7R	Copenhagen, Denmark. Tues. and Fri. after 6 p.m.

(Continued on opposite page)

Short Wave Stations of the World

(*Continued from opposite page*)

Experimental and Commercial Radio-Telephone Stations

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
5.83	51,400	W2XBC	New Brunswick, N. J.
7.05	42,530	.....	Berlin, Germany. Tues. and Thurs., 11:30-1:30 p.m. Telefunken Co.
8.67	34,600	W2XBC	New Brunswick, N. J.
9.68	31 000	W8XI	Pittsburgh, Pa.
10.79	27,800	W6XD	Palo Alto, Calif. M. R. T. Co.
11.55	25,960	G5SW	Chelmsford, England, Experimental.
11.67	25,700	W2XBC	New Brunswick, N. J.
12.48	24,000	W6XQ	San Mateo, Calif. (Several experimental stations are authorized to operate on non-exclusive waves of a series, both above this and down to 4 meters.)
			Vienna, Austria, Mon., Wed., Sat.
13.92	21,540	W8XK	Pittsburgh, Pa.
14.00	21,420	W2XDJ	Deal, N. J. And other experimental stations.
14.01	21,400	WLO	American Telephone & Telegraph Co., Lawrence, N. J., transatlantic phone.
14.15	21,130	LSM	Monte Grande, Argentina.
14.27	21,020	LSN	(Hurlingham), Buenos Aires, Argentina.
14.28	21,000	OKI	Podebrady, Czechoslovakia.
14.47	20,710	LSY	Monte Grande, Argentina. Telephony.
14.50	20,680	LSN	Monte Grande, Argentina, after 10:30 p.m. Telephony with Europe.
		LSX	Buenos Aires. Telephony with U. S.
		FSR	Paris-Saigon phone.
14.54	20,620	PMB	Bandoeng, Java. After 4 a.m.
14.62	20,500	W9XF	Chicago, Ill.
11.89	20,140	DWG	Nauen, Germany. Tests 10 a.m.-3 p.m.
15.03	19,950	LSG	Monte Grande, Argentina. From 7 a.m. to 1 p.m. Telephony to Paris and Nauen (Berlin).
		DIH	Nauen, Germany.
15.07	19,900	LSG	Monte Grande, Argentina. 8-10 a.m.
15.10	19,850	WMI	Deal, N. J.
15.12	19,830	FTD	St. Assise, France.
15.20	19,720	EAQ	Madrid, Spain.
15.45	19,400	FRO, FRE	St. Assise, France.
15.50	19,350	.....	Nancy, France. 4 to 5 p.m.
15.55	19,300	FTM	St. Assise, France. 10 a.m. to noon.
15.58	19,240	DFA	Nauen, Germany.
15.60	19,220	WNC	Deal, N. J.
15.94	18,820	PLE	Bandoeng, Java. 8:40-10:40 a.m. Phone service to Holland.
16.10	18,620	GBJ	Bodmin, England. Telephony with Montreal.
16.11	18,620	GBU	Rugby, England.
16.33	18,370	PMC	Bandoeng, Java.
16.35	18,350	WND	Deal Beach, N. J. Transatlantic telephony.
16.38	18,310	GBS	Rugby, England. Telephony with New York. General Postoffice, London.
		FZS	Saigon, Indo-China, 1 to 3 p.m, Sundays.
16.44	18,240	FRO, FRE	Ste. Assise, France.
16.50	18,170	CGA	Drummondville, Quebec, Canada. Telephony to England.
16.57	18,100	GBK	Bodmin, England.
		W9XAA	Chicago, Ill. Testing, mornings.
16.61	18,050	KQJ	Bolinas, Calif.
16.80	17,850	PLF	Bandoeng, Java ("Radio Malabar").
		W2XAO	New Brunswick, N. J.
16.82	17,830	PCV	Kootwlik, Holland. 9:40 a.m. Sat.
16.87	17,780	W8XK	Westinghouse Eletcric and Mfg. Co., East Pittsburgh, Pa.
17.00	17,640	Ship, Phones to Shore: WSBN, "Leviathan"; GFWV, "Majestic"; GLSQ, "Olympic"; GDLJ, "Homeric"; GMJQ, "Belgenland"; work on this and higher channels.	
17.25	17,380	JIAA	Tokio, Japan.
17.34	17,300	W2XK	Schenectady, N. Y. Tues., Thurs., Sat. 12 to 5 p.m. General Electric Co.
		W8XL	Dayton, Ohio.
		W6XAJ	Oakland, Calif.
		W7XA	Portland, Ore.
		W7XC	Seattle, Wash.
		W2XCU	Ampere, N. J.
		W9XL	Anoka, Minn., and other experimental stations.
17.52	17,110	WOO	Deal, N. J. Transatlantic phone.
		W2XDO	Ocean Gate, N. J. A. T. & T. Co.
17.55	17,080	GBC	Rugby, England.
18.40	16,300	PCL	Kootwijk, Holland. Works with Bandoeng from 7 a.m.
		WLO	Lawrence, N. J.
18.50	16,200	FZR	Saigon, Indo-China.
18.56	16,150	GBX	Rugby, England.
18.68	16,060	NAA	U. S. Navy, Arlington, Va. Time signals, 11:57 to noon.
18.80	15,950	PLG	Bandoeng, Java. Afternoons.
18.90	15,860	FTK	St. Assise, France. Telephony.
18.93	15,760	JIAA	Tokio, Japan. Up to 10 a.m. Beam transmitter.
19.60	15,300	OXY	Lyngby, Denmark. Experimental.
		W6XAL	Westminster, Calif.
20.65	14,530	LSA	Buenos Aires, Argentina.
20.70	14,480	W8XK	East Pittsburgh, Pa.
		GBW	Radio Section, General Post Office, London, E. C. 1. Rugby, England.
		WNC	Deal, N. J.
20.80	14,420	VPD	Suva, Fiji Islands.
21.17	14,150	KKZ	Bolinas, Calif.
22.38	13,400	WND	Deal Bench, N. J. Transatlantic telephony.
23.46	12,780	GBC	Rugby, England.
21.41	12,290	GBU	Rugby, England.
24.46	12,250	FTN	Ste. Assise (Paris), France. Works Buenos Aires, Indo-China and Java. On 9 a.m. to 1 p.m. and other hours.
		GBS	Rugby, England.
		PLM	Bandoeng, Java. 7:45 a.m.
24.68	12,150	GBS	Rugby, England. Transatlantic phone to deal, N. J. (New York).
		FQO, FQE	Ste. Assise, France.
24.80	12,090	.....	Tokio, Japan. 5-8 a.m.
24.89	12,045	NAA	Arlington, Va. Time signals, 11:57 to noon.
		NSS	Annapolis, Md. Time signals, 9:57-10 p.m.
24.98	12,000	FZG	Saigon, Indo-China. Time signals, 2-2:05 p.m.
25.10	11,945	KKQ	Bolinas, Calif.
25.65	11,680	YVQ	Maracay, Venezuela. (Also broadcasts occasionally.)
25.68	11,670	KIO	Kahuku, Hawaii.
26.00	11,530	CGA	Drummondville, Canada.
26.10	11,490	GBK	Bedmin, England.
26.15	11,470	IBDK	S.S. "Elettra," Marconi's yacht.
26.22	11,435	DHC	Nauen, Germany.
26.44	11,340	DAN	Nordeich, Germany. Time signals, 7 a.m., 7 p.m. Deutsche Seewarte, Hamburg.
27.30	10,980	ZLW	Wellington, N. Z. Tests 3-8 a.m.
28.20	10,630	PLR	Bandoeng, Java. Works with Holland and France weekdays from 7 a.m.; sometimes after 9:30.
28.44	10.540	WLO	Lawrence, N. J.
		VLK	Sydney, Australia. 1-7 a.m.
28.80	10,410	PDK	Kootwijk, Holland.
		KEZ	Bolinas, Calif.
		LSY	Buenos Aires, Argentina.
28.86	10,390	GBX	Rugby, England.
29.54	10,150	DIS	Nauen, Germany. Press (code) daily; 6 p.m., Spanish; 7 p.m., English; 7:50 p.m., German; 2:30 p.m., English; 5 p.m., German. Sundays: 6 p.m., Spanish; 7:50 p.m., German; 9:30 p.m., Spanish.
30.15	9,950	GBU	Rugby, England.
30.30	9,890	LSN	Buenos Aires, phone to Europe.
		LSA	Buenos Aires.
		EAQ	Madrid, Spain.
30.61	9,790	GBW	Rugby, England.
30.75	9,750	.....	Agen, France. Tues. and Fri., 3 to 4:15 p.m.
		WNC	Deal, N. J.
30.90	9,700	WMI	Deal, N. J.
30.93	9,600	LQA	Buenos Aires.
31.23	9,600	LGN	Bergen, Norway.
32.13	9,330	CGA	Drummondville, Canada.
32.21	9,310	GBC	Rugby, England. Sundays 2:30-5 p.m.
32.40	9,250	GBK	Bodmin, England.
32.50	9,230	FL	Paris, France (Eiffel Tower). Time signals 4:56 a.m. and 4:56 p.m.
32.59	9,200	GBS	Rugby, England. Transatlantic phone.
33.26	9,010	GBS	Rugby, England.
33.81	8,872	NPO	Cavite (Manila), Philippine Islands. Time signals 9:55-10 p.m.
		NAA	Arlington, Va. Time signals 9:57-10 p.m., 2:57-3 p.m.
33.98	8,810	WSBN	S.S. "Leviathan."
34.50	8,690	W2XAC	Schenectady, New York.
31.68	8,650	W2XCU	Ampere, N. J.
		W9XL	Chicago.
34.68	8,650	W3XE	Baltimore, Md. 12:15-1:15 p.m., 10:15-11:15 p.m.
		W2XV	Radio Engineering Lab., Long Island City, N. Y.
		W8XAG	Dayton, Ohio.
		W4XG	Miami, Fla.
		W3XX	Washington, D. C. And other experimental stations.
34.74	8,630	WOO	Deal, N. J.
		W2XDO	Ocean Gate, N. J.
35.02	8,550	WOO	Ocean Gate, N. J.
35.50	8,450	PRAG	Porto Alegre, Brazil, 8:30-9:00 a.m.
36.92	8,120	PLW	Bandoeng, Java.
37.92	8,100	EATH	Vienna, Austria. Mon. and Thurs., 5:30 to 7 p.m.
		JIAA	Tokyo, Japan. Tests 5-8 a.m.
37.80	7,930	DOA	Doeberitz, Germany. 1 to 3 p.m. Reichpostzentralamt, Berlin.
38.00	7,890	VPD	Suva, Fiji Islands.
		JIAA	Tokio, Japan (Testing).
38.30	7,830	PDV	Kootwijk, Holland, after 9 a.m.
38.60	7,770	FTF	Ste. Assise, France.
		PCK	Kootwijk, Holland. 9 a.m. to 7 p.m.
39.15	7,660	FTL	Ste. Assise.
39.40	7,610	HKF	Bogota, Colombia. 8-10 p.m. p.m.
39.74	7,520	CGE	Calgary, Canada. Testing, Tues., Thurs.
43.70	6,860	KEL	Bolinas, Calif.
		Radio Vitus,	Paris, France. 4-11 a.m., 3 p.m.
43.80	6,840	CFA	Drummondville, Canada.
44.40	6,753	WND	Deal, N. J.
44.99	6,660	F8KR	Constantine, Algeria, Mon., Fri., 5 p.m.
		HKM	Bogota, Colombia. 9-11 p.m.
45.50	6,560	RFN	Moscow, U.S.S.R. (Russia) 2 a.m.-4 p.m.
46.05	6,515	WOO	Deal, N. J.
62.80	4,770	ZL2XX	Wellington, New Zealand.
63.00	4,760	Radio LL	Paris, France.
63.13	4,750	WOO	Ocean Gate, N. J.
63.79	4,700	WIXAB	Portland, Me.
72.87	4,116	WOO	Deal, N. J.
74.72	4,105	NAA	Arlington, Va. Time signals, 9:57-10 pm., 11:57 a.m. to noon.
92.50	3,256	W9XL	Chicago, Ill.
95.00	3,156	PK2AG	Samarang, Java.
96.03	3,124	WOO	Deal, N. J.
97.53	3,076	W9XL	Chicago, Ill.
			Motala, Sweden, 11:30 a.m.-noon, 4-10 p.m.

(*Continued on next page*)

"STAR" SHORT WAVE BROADCASTING STATIONS

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

G5SW, Chelmsford, England. 25.53 meters. Monday to Saturday 1:45 p.m. to 7 p.m. Signs off with the midnight chimes of Big Ben in London.

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

I3RO, Rome, Italy. Daily on 80 meters, from 3 to 5 p.m. Woman announcer.

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

VK3ME, Melbourne, Australia. 31.28 meters. Wednesday and Saturday, 5 to 6:30 a.m.

FYA, Pointoise, France. On 19.68 meters, 9:30 a.m. to 12:30 p.m.; on 25.16 meters, from 1 to 3 p.m.; and on 25.63 meters from 4 to 6 p.m.

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

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

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

HRB, Tegucigalpa, Honduras. 48.62 meters. Monday, Wednesday, Friday and Saturday, 5 to 6 and 9 to 12 p.m.

T14, Heredia, Costa Rica, Central America. 29.3 meters. Monday and Wednesday, 7:30 to 8:30 p.m.; Thursday and Saturday, 9 to 10 p.m.

XDA, Mexico City. 25.5 meters. Daily, 3 to 4 p.m.

F3ICD, Chi-Hoa, French Indo-China. 49.1 meters. Daily from 6:30 to 10:30 a.m.

RV15, Khavarovsk, Siberia. 70.2 meters. Daily from 3 to 9 a.m.

Short Wave Stations of the World

(*Continued from preceding page*)

Airport Stations

Wavelength (Meters)	Frequency (Kilocycles)	Call Letters	Address and Schedule
98.95	3,030	VE9AR	Saskatoon, Sask., Canada.
53.25	5,630	WQDP	Atlanta, Ga.
86.00	3,490	WSDE	Tuscaloosa, Ala.
		WSDB	Jackson, Miss.
		KGUK	Shreveport, La.
		KGUF	Dallas, Tex.
		KGUC	Fort Worth, Tex.
		KGUL	Abilene, Tex.
		KGUG	Big Springs, Tex.
		KGUA	El Paso, Tex. (Southern Air Transport Lines.)
53.53	5,600	WQDU	Aurora, Ill.
94.52	3,170	KQQ	Iowa City, Iowa.
		KQM	Des Moines, Iowa.
		KMP	Omaha, Neb.
		KRF	Lincoln, Neb.
		KMR	North Platte, Neb.
		KQE	Cheyenne, Wyo.
		KQC	Rock Springs, Wyo.
		KQD	Salt Lake City, Utah.
		KKO	Elko, Nevada.
		KJE	Reno, Nevada.
		KFO	Oakland, Calif.
		KRA	Boise, Idaho.
		KDD	Pasco, Wash. (Boeing Air Lines).
54.00	5,560	WAEF	Newark, N. J.
96.77	3,100	WAEE	Camden, N. J.
		WAED	Harrisburg, Pa.
		WAEC	Pittsburgh, Pa.
		WAEB	Columbus, Ohio.
		WAEA	Indianapolis, Ind.
		KGTR	St. Louis, Mo.
		KSY	Tulsa, Okla.
		KSW	Amarilla, Tex.
		KSX	Albuquerque, N. M.
		KGPL	Kingman, Ariz.
		KGTJ	Las Vegas, Nev.
		KSI	Los Angeles, Calif.
		KGTD	Wichita, Kan.
		KST	Kansas City, Mo. (Transcontinental Air Transport).

Television Stations

6.89	43,500	W9XD	Milwaukee Journal, Milwaukee, Wis.
		W3XAD	Camden, N. J. (Other experimental television permits: 48,500 to 50,300 k.c., 43,000-46,000 k.c.).
101.7 to 105.3 meters—2,850 to 2,950 kc.			
		WIXAV	Short Wave & Television Corp., Boston, Mass. 1-2, 7:30 to 10:30 p.m. daily ex. Sun. Works with WIXAU 10-11 p.m.
		W2XR	Radio Pictures, Inc., Long Island City, N. Y. 4 to 10 p.m. exc. Sundays. Silent 7-7:30 Sat.
		W9XR	Chicago, Ill.
105.9	2,833	W6XAN	Los Angeles, Calif.
		W7XAB	Spokane, Wash.
105.3 to 109.1 meters—2,750 to 2,850 kc.			
		W2XAB	Columbia Broadcasting System, 485 Madison Ave., N. Y. 2-6, 8-11 p.m. On. Sat. and Sun. to 10 p.m. Works with W2XE on 48.99 meters.
		W2XBO	Long Island City, N. Y.
		W9XAA	Chicago, Ill.
		W9XG	West Lafayette, Ind.
108.8	2,758	VE9CI	London, Ont., Canada.
136.4 to 142.9 meters—2,100 to 2,200 kc.			
		W2XBS	National Broadcasting Co., New York, N. Y., 1,200 R.P.M., 60 lines deep, 72 wide. 2-5 p.m., 7-10 p.m. ex. Sundays.
		W2XR	Radio Pictures, Inc., Long Island City, N. Y. 48 and 60 line. 5-7 p.m.
		W3XAD	R. C. A.-Victor Co., Inc., Camden, N. J.
		W2XCW	Schenectady, N. Y.
		W8XAV	Pittsburgh, Pa. 1,200 R. P.M., 60 holes. 1:30-2:30 p.m., Mon., Wed., Fri.
		W9XAP	Chicago, Ill.
142.9 to 150 meters—2,000 to 2,100 kc.			
		W2XAP	Jersey City, N. J.
		W2XCR	Jersey City, N. J. 3-5, 6-9 p.m. ex. Sun.
		W3XK	Wheaton, Maryland, 10:30 p.m.-midnight exc. Sun. Works with W3XJ.
		W2XCD	Passaic, N. J. 2-3 p.m. Tues., Thurs., Sat.
142.9 to 150 meters—2,000 to 2,100 kc.			
		W9XAO	Chicago, Ill.
		W9XAA	Chicago, Ill.

Police Radio Stations

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

Marine Fire Stations

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

Short Wave Broadcast From Speeding Train

(*Continued from page* 75)

aerial to receive the signals sent out from the train. In addition to the small antennas set up at both Laurel and Beltsville, a carrier system was made available by terminating this 30-mile telegraph wire at both receiving stations. Thus if the regular short wave antennas failed to provide adequate reception, the carrier system could be used. Further precautions were taken by arranging the short wave receivers at the ground pick-up points into a selective system—that is, the signals from all the receivers were carefully monitored and mixed at Laurel, the master control point, and the best signal selected for transmission to the nation-wide network.

New Microphone Used on Train Broadcast

Edwin K. Cohan, director of technical operations, and A. B. Chamberlain, chief engineer of the Columbia Broadcasting System, decided to use the new electro-dynamic microphones, latest product of the research laboratories, on the speeding Baltimore & Ohio railroad train from which the program was broadcast on Sunday, March 27. The moving coil principle employed in these microphones entails a number of features particularly suitable to the technical exigencies of such a broadcast.

Among the advantages of the electro-dynamic microphone are: the fact that it gives an approximately uniform response over the complete band of audible frequencies, from 20 to 10,000 cycles per second; its transmission characteristics are not affected by variations in temperature, humidity, or barometric pressure—a matter of extreme importance in the temporary studio rigged up in a rapidly moving dining car, where all three of these factors are likely to change continually as the car speeds from one point to another, and cannot be controlled as in a regular studio. Similarly the small size of the new microphone, as compared with the dimensions of the older models now in use, made it more convenient to handle in the crowded space within the dining car.

For the unique attempt to broadcast from a car moving at a rate of more than a mile a minute, one active and one emergency microphone were suspended from the ceiling.

Letters From S-W Fans

WE'RE DOING IT

Editor, SHORT WAVE CRAFT:

I get a great kick out of SHORT WAVE CRAFT, especially the "Swappers" and "Among the Hams" column. I am fifteen years old and intend to build an amateur transmitter in the near future. Why not put a department in for kids of about fifteen or sixteen? Put it so they can understand it and I'm sure that boys of my age would greatly appreciate it. Even the "full-fledged ham" would like to brush up a bit on the fundamentals. I would be very much pleased to see this letter published, as I am eager to get acquainted with other "would-be hams."

Much luck with 73's.

Carl Penk,
693 Washington St.,
Bedford, Ohio.

(Now, that's a fine idea, Carl, and that's the sort of suggestion we like to get, because it's constructive. We have already started printing some of the simple sets and will continue right along.—Editor.)

ONLY 1,350 STATIONS!

Editor, SHORT WAVE CRAFT:

Tell those broadcast short wave listeners to "lend an ear." Many of you get good results on broadcast (phone) short wave, but wait until you learn the code. Will you get anything? Don't ask! Here are some of the following "commercials" strong enough to operate a small speaker, the set being a two-tube, battery-operated job similar to the "Doerle" hook-up: EAJ, Araryriez, Spain; RXC, Panama City; YVQ, Maracay, Venezuela; XDA, Mexico City; JNA, Nagoya, Japan; SUY, Cairo, Egypt; others which I picked up with the set on headphones are: K1O, Kahuku; RKB, Moscow; VIC, Queenstown, Australia; FZV, Taranarive, Madagascar; PLL, Malabar Radio, Java; FZH, Bamaka, W. Africa; KUW, Manila, P. I.

The stations just mentioned are only a few of the 1,350 amateur and commercial stations that I received, so let's see how fast those short wave BCL's will learn code and get a new "earful."

Best wishes.

C. Bayard Smack,
5500 Groveland Ave.,
Baltimore, Md.

(Well, Bayard, we really should not publish your letter, because we were not sure that you received only a few or the whole of the 1,350. Anyhow, the sample list is not bad and we hope that by the time this is printed, you have gotten the whole works.—Editor.)

HE'S LOOKING FOR TROUBLE

Editor, SHORT WAVE CRAFT:

First, I want to thank you for making a monthly magazine out of SHORT WAVE CRAFT. I certainly do like it. I am not a "key-clicker" yet, but I hope to be soon. I have built the "Doerle" short wave receiver and I want to say *it does all you say it will.* I have built about fifteen sets, since I have been playing the radio experimenter, and I have found SHORT WAVE CRAFT the best magazine that I have ever used, as the *Radio News* and *Radio-Craft* is more for the service man. So here's to success for SHORT WAVE CRAFT. I would like to hear from other short wave experimenters. I will answer all letters.

Yours truly,
J. Joseph Whalley,
401 Springdale St.,
Cumberland, Md.

(Well, Joseph, it's your own fault and you have only yourself to blame for it. We are printing your letter and as a punishment we expect you to answer each and every one of the letters you will get from our readers.—Editor.)

SUPER-REGENERATION

Editor, SHORT WAVE CRAFT:

I would like to get in touch with anyone interested in *super-regeneration* and its application to short wave receivers—i.e., under 200 meters. I have experimented for some years and find super-regeneration a more interesting field than trying out two-volt or screen grid tubes.

No circuit is better than its parts, i.e., its tubes, grid-leak, "B" control, etc., but "super-reg." very often gets ahead of even moderately priced experimental material and encourages one to rebuild the circuit with the best obtainable. In some circuits one uses 1500 and 1250 L/c coils—well, they can be shielded and are still obtainable! Very frequently fixed condensers do the trick, as in the Flewelling and the modified Flewelling circuits.

GOOD WORK!

Editor, SHORT WAVE CRAFT:

I wish to congratulate you on SHORT WAVE CRAFT; truly, it is a real LIVE magazine for the short wave fan and experimenter. Every set that I have built from "hook-ups" in your magazine has given me perfect results! I am the proud owner of the set that was described in Feb.-Mar., 1932, issue on page 339, by "Bob" Hertzberg, and what results! VE9GW, VE9CL, VE9DR, W8XK, G5SW, W1XAZ, W3XAL, W9XAA, HRB, W2XE, W9XF, W2XAF, I2RO, and CMCI.

On the broadcast band it is a wonder, 10 KC. selectivity; I have logged 63 stations on the broadcast band alone so far. Some of my DX stations are WIOD, Fla.; XEB, Mexico; KMOX, St. Louis, Mo.; and XDR, Del Rio, Texas, all with loud-speaker volume. I received station CMCI last month and got a card from them verifying reception. I will quote it to you: "Havana, Cuba. This card is to verify that you heard station CMCI located on 49.50 meters. Short Wave of The International Broadcasting Co., of Havana, Cuba. Broadcasting a program on last Feb. 29, 1932. We are broadcasting every evening at 8:30 E. S. T." They sign off at 10:30 p.m. You might add this station to your "dandy" list of short wave stations. My best wishes to SHORT WAVE CRAFT.

Arthur Ricketts,
95 Radford St.,
Yonkers, N. Y.

(We are of course tickled silly, Friend Arthur, that we received a letter from you boys telling us that one of our feature sets is "perking" favorably.—Editor.)

There seems to be a big field for "super-reg." and if broadcast sized coils can be used, then substitute them with the short wave type, such as Pilot, Octo, Hammarlund, National, Air-King, etc. The circuit remains the same, provided .00014, .00015 or .00016 variable S.L.F. condensers are used.

Why not allow those interested in *super-regeneration* under 200 meters a small corner or page in SHORT WAVE CRAFT? I have every number from No. 1 and try nearly every circuit and every improved circuit I can find—in "regeneration"—*but* super-regeneration, I find, gives the experimenter lots of research! My old Flewelling, modified Flewelling, Bishop and Autoplex "come out" periodically and "do their stuff" as gamely as ever.

Sincerely,
Ricard P. West,
Gunter Apt. B 3,
41st Baltimore Ave.,
Philadelphia, Pa.

(This is the sort of letter we like to receive, Ricard, and we can't get too many of them. We also think that "super-regeneration" is the coming thing in short waves, and if we get enough dope from you readers, we promise not only a small corner, but several pages in SHORT WAVE CRAFT. Let's have all the data and all the innovations on super-regeneration.—Editor.)

IT PULLS 'EM IN!

Editor, SHORT WAVE CRAFT:

I am the owner of the Two-Tube "SWC" Portable, published in your book, "How to MAKE AND OPERATE SHORT WAVE RECEIVERS," and wish to inform you that this set has some "wallop."

Following are some of the stations I received, many of them coming in on the loud speaker: DLJ, Königswusterhausen, I2RO, FTN, FYA, LSN, HVJ, PCQ, G5SW, VE9CL, VE9GW, W5AEJ, W6XI, W8XK, Canada, W8XAL, W9XF, W2XE, W3XAL, W2XAF, W3XAU, and numerous other stations.

I am also a reader of SHORT WAVE CRAFT and "believe me you" I think each copy is better than the one before. *Keep up the good work!*

Very truly yours,
George Lachmann,
133 Church St.,
New Rochelle, N. Y.

(Yes, George, we do admit the 2-tube portable was the "berries." Hundreds of other readers have obtained the same sort of results.—Editor.)

FOR THE "D.X." S. W. HOUNDS

Editor, SHORT WAVE CRAFT:

Having been a regular reader of SHORT WAVE CRAFT for some time and never having contributed to your pages I thought I might as well get ambitious and write to you. First a short list of stations I received in my wanderings on short waves since early 1926. Outside of the U. S. I have heard programs from: G2NM, FTN, GBS, FZG, FYA, I2RO, UOR2, G5SW, CJRX, PLF, LSX, NRH, EAQ, LSA, PCJ, PCL, VK2ME, VK3ME, HS2PJ, DOA, EH90C, W6XI, VE9DR, VQ7LO, HKX, HCIDR, HKA, HRB, CTIAA, YV2BC, CMCI and numerous others. Numerous American stations have been received, also Canadian.

CJRX at Winnipeg is now working on their original 25 meter wave, after playing with other frequencies. They belong on 25 meters.

EAQ, located in Madrid, Spain, located on 30.30 meters as announced, as I see you also have them listed 30.30 which is O. K.: can be heard every Saturday from 1:30 P. M. to 8:30 P. M. or thereabouts. They come in the whole time with very good volume and quality right to the "sign-off." Announcements are made after every selection and sometimes selections are cut off for announcements. Spanish and English is used and the announcer in a low, slow, drawling voice says, Hello, Hello, Hello: EAQ, Madrid, Spain, calling. Thus it can be easily identified. I have a two-tube converter using '27 oscillator and '24 detector; circuit taken from Radio Amateur's hand-book. I am using it on a 1932 Philco seven-tube broadcast receiver, and it works O. K., as you can see.

I receive FYA-5SW and I2RO every day without fail, rain or shine. FYA is the best one after 5:00 P. M. E.S.T. I hope the latter part of my letter will be of some help to Bob Hertzberg. I would like to help him fill up his column "When to Listen In," as he has been a great help to me in locating stations. You need not print all of this, only the part which I hope will be of some help to the holy "DX" hounds.

Yours very truly,
Ben Ingham,
537 Mt. Auburn St.,
Watertown, Mass.

(A mighty fine list, Friend Ben, and of sure interest to all the "DX" short wave hounds. Keep up the good work.—Editor.)

Short Wave Question Box

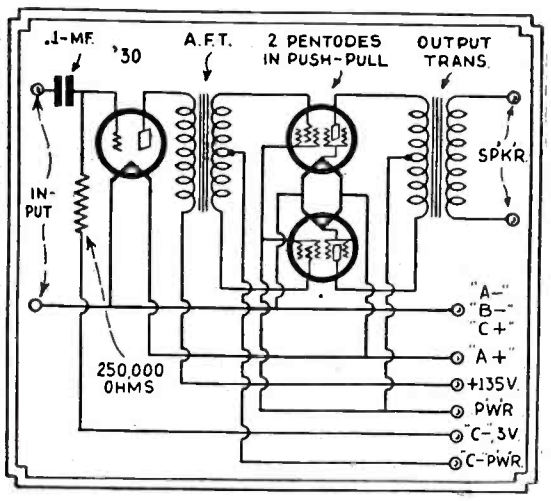
Edited by
R. William Tanner

Pentodes in Push-Pull Stage

Daniel Martin, Savannah, Ga., wants:

(Q) A circuit of a two-stage audio amplifier, using 2 volt pentodes connected push-pull style in the output stage.

(A) The circuit is given in these columns. A '30 is used in the first stage.



Above—Circuit for two-stage audio amplifier using two-volt pentodes, connected in push-pull.

Converter

Clem Ceccerelli, Archbald, Pa., asks:

(Q) Can you give coil details on the Hoodwin converter described in a past issue?

(A) This is a manufactured unit and details on this particular model are not available.

2-Volt Tubes More Sensitive?

Richard Booth, Jennings Lodge, Ore., writes:

(Q) I have been told that the 2-volt tubes are far more sensitive than '99 types. Is this correct?

(A) No. The '99's will be found as sensitive as the '30's but, of course, the 2-volt screen grid '32 is considerably more sensitive.

(Q) I have built the set described by Mr. Doerle, but "hand-capacity" effects cause much trouble. How can this be eliminated?

(A) The trouble can be eliminated by shielding the back of the panel with tinfoil, copper sheet or other metal and then *grounding* this to the "B" negative.

Best Detector for Television

M. R. Marlowe, Ithaca, N. Y., wants to know:

(Q) What type of detector is most suitable for television reception, also second choice?

(A) 1st—Crystal (Carborundum or Zincite-tellurium preferred). 2nd—Fleming two-electrode (diode). 3rd—Screen grid (tetrode). 4th—Three-electrode (triode).

(Q) Would it be advisable to replace a '27 detector with a diode detector?

(A) Most assuredly; response on the high frequencies (image) far surpasses that obtained with any other tube detector. It will, however, probably be necessary to add another R.F. stage, if the television signals are weak, since, in a diode, there is no amplification. Two circuits are given in these columns for diode.

(Q) Using .00014 mf. tuning condensers, how many turns are needed to cover the television band?

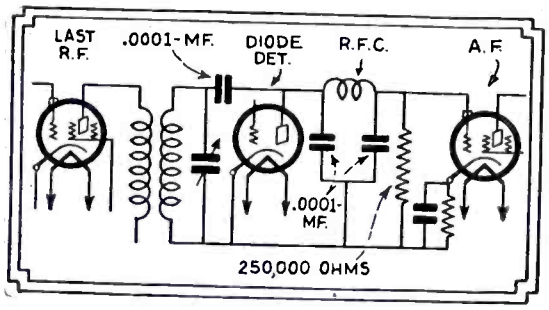
(A) On a form 1-inch in diameter, about 30 turns of No. 26 enamel will be needed.

Transmitter Queries

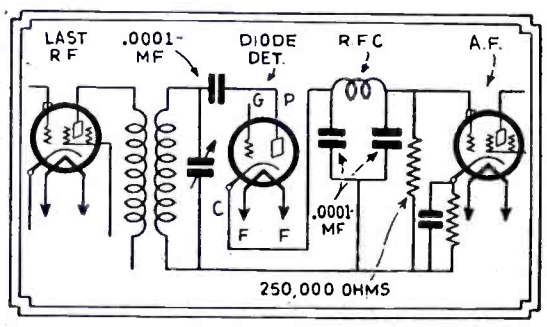
Carl Trottier, Wilder, Vt., wants to know:

(Q) The values of the condensers, resistors and coils used in the Hartley transmitter shown on page 215, October issue.

(A) For the 80 meter band the antenna coil may have 6 to 10 turns, plate and grid coil 10 turns. The antenna series condenser and oscillator tuning condenser each .0005 mf. The grid and plate blocking condensers .001 mf. Filament bypass condensers .006 mf. The filament center-tapped resistor should be 40 ohms. Any good short wave R.F. choke will be satisfactory. The range of the plate meter may be to 50 M.A. The antenna meter MUST be a radio frequency type, with a range of 0 to 1 amp.



Another hook-up for a Diode detector, using shunt connection, directly coupled to A.F. stage.



Diode detector hook-up with series connection, direct-coupled to A.F. stage.

Long Wave Receiver

Albert LePage, Fall River, Mass., asks:

(Q) Referring to the long wave circuit, page 188, Oct.-Nov., 1931, can "honeycomb" coils be used without changing the circuit?

(A) Yes. Of course it will be necessary to add an antenna tuning condenser of .0005 to .001 mf. The tuning range then will be up to 25,000 meters.

Tube Bias

H. H. Megley, Medicine Hat, Alberta, Canada, writes:

(Q) In regard to the circuit, page 205, Oct.-Nov., 1931, issue, what is the bias on the first audio tube?

(A) With an American made tube (201A) the bias would be approximately 4.5 volts.

(Q) What is the value of the detector R.F. choke?

(A) 85 to 90 millihenries.

(Q) Can a Pilot audio transformer be used in place of a Ferranti?

(A) Why not?

How Many Turns on R.F. Choke

V. B. Coe, Mt. Vernon, Ohio, asks:

(Q) How many turns of wire in the R.F. choke in the circuit of the Hartley transmitter, page 346, Feb.-Mar. issue?

(A) This may consist of 300 turns No. 36 enamel wire on ½" diameter form.

(Q) What size wire or tubing is used in the oscillator and antenna coils?

(A) Copper tubing, 3/16" to ¼", is generally employed in amateur transmitters. However, since the power is low, No. 12 or 14 wire will give as good results.

(Q) Is the .0005 mf. condenser a regular 23 plate receiving condenser?

(A) An ordinary receiving condenser with a good grade of insulation can be employed, but the number of plates will depend upon their exact size and spacing.

Microphone Modulation Circuit

Elwood McQuade, Battle Creek, Mich., asks:

(Q) For a diagram on how to hook up a microphone for "loop modulation" for a 160 meter phone transmitter.

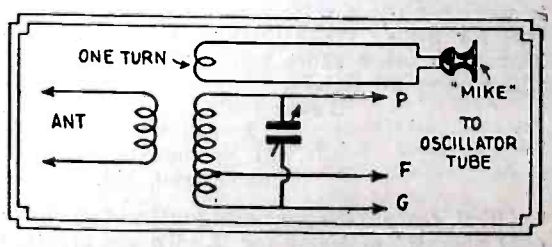
(A) The circuit is given in these columns. However, loop modulation is not advisable, since the output is "wobulated" and not modulated. Loop modulation is not used by amateur or commercial stations for the reason stated.

(Q) Is a single wire antenna good enough for 160 meter operation?

(A) If of the proper length and a Hertz, it will radiate efficiently but only in the directions in which it is run. A *flat-top* or cage antenna of 4 to 8 wires in conjunction with a suitable *counterpoise* will give better results and require less space.

(Q) I now have a Pilot super-wasp receiver which I used for phone reception. It has not the volume for such work. What circuit would you recommend as giving sufficient sensitivity and selectivity for the phone bands?

(A) I would advise nothing but a superhet. An ideal combination would be as follows: vario-mu tuned R.F., screen-grid first detector, '27 oscillator, three vario-mu I.F. stages, Carborundum crystal second detector, '27 A.F. and pentode power stage. The resulting sensitivity, selectivity and volume leave nothing to be desired.

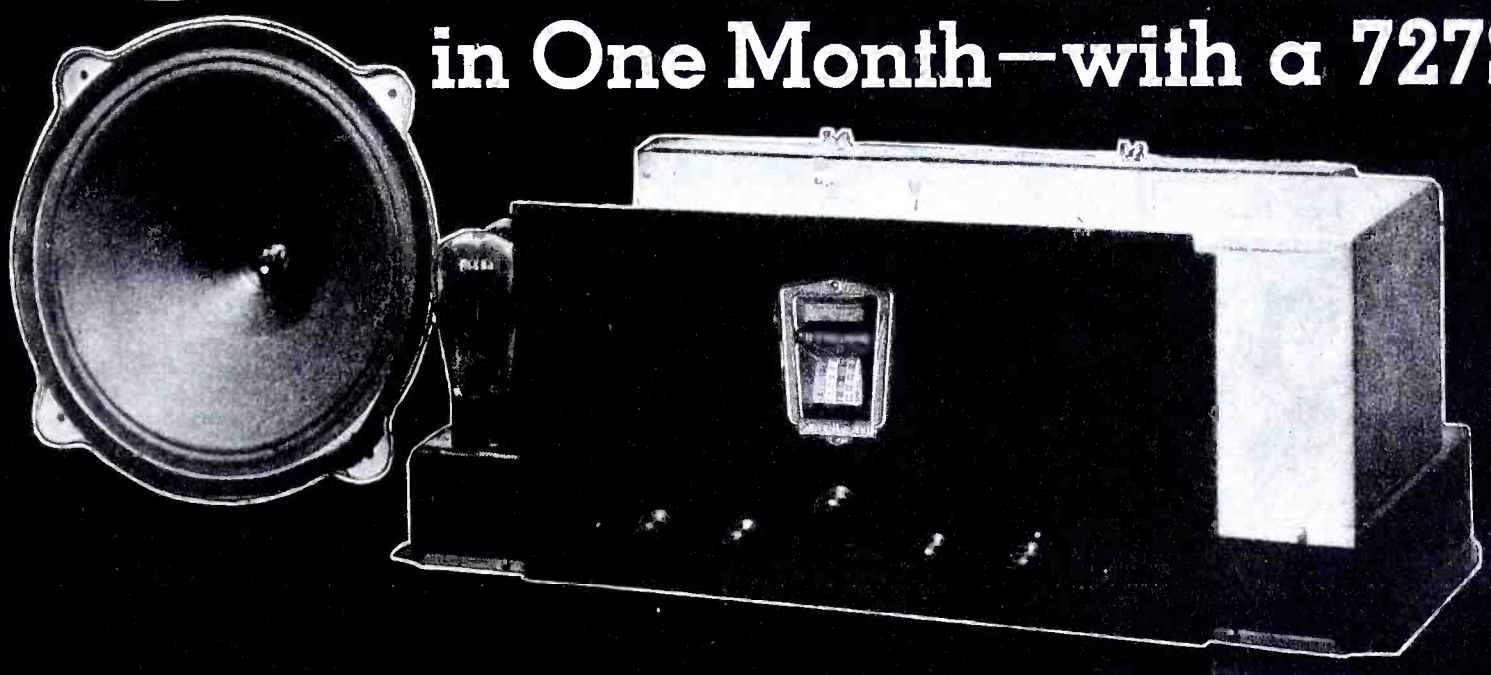


For laboratory or experimental use, a microphone absorption modulation circuit may be used as shown.

SM

Beat This Record!

31 Countries and 5 Continents in One Month—with a 727SW



For the First Time in Radio History—the Best AND the Cheapest . . . . .

$58.51 NET

The Silver-Marshall all-wave 727SW (550 to 18,000 kilocycles) is a receiver that cannot be outperformed station for station. It has 10 tubes that all operate on both broadcast and short-wave. Automatic volume control that eliminates fading on distance tuning. Meter tuning. Fractional microvolt sensitivity. 10kc selectivity. And it has an EXCLUSIVE S-M feature—COLOR TUNING. It is a dial on which ALL the bands are accurately calibrated. It is as easy to find HRB, Tegucigalpa, Honduras, as it is to find KDKA.

The price of the 727SW chassis and speaker (factory wired and tested under the personal supervision of McMurdo Silver) is $58.51 NET.

Tear out part of this page—pin a $5 bill to it with your name and address, and the 727SW will be shipped balance C. O. D. Play with it for 10 days—give it every operating test. And if it is not the best receiver you ever tuned, return it and your money will be promptly refunded.

The 727DC (550 to 15 00 kc) chassis and speaker for operation with the new Eveready Air-Cell battery is $40.87 NET. Write for details.

Let us send you a photostatic copy of the 6-page log G. H. Hanson, in Maine, got on his 727SW in less than 30 days. It covers every continent, very nearly every state, and 31 foreign countries! And he has just begun.

SILVER-MARSHALL, Inc.

6419 West 65th Street Chicago, U. S. A.

SILVER-MARSHALL, Inc.
6419 W. 65th St.
Chicago, U. S. A.

☐ Enclosed find $5. Send 727SW balance C. O. D. for ten day trial.

☐ Please send me FREE a copy of G. H. Hanson's log.

☐ Send 727DC details.

Name.....

Address.....

Experimenting With Ultra Short Waves

By HANNS GUNTHER

(*Continued from page* 99)

connected in the circuit leading from the heater battery to the grid circuit loop. The connection points are indicated in Fig. 2; the connection bridging them is of course removed. Naturally such a simple apparatus is not very free from distortion, but in the case of suitable experiments, in which a plate battery was used instead of the usual 110-volt, 60-cycle A.C. connection (to shut out network disturbances), phonograph music was heard fairly clearly through three successive rooms at a distance of about 45 feet, while Hoerner in his experiments even reached a range of 64 feet. Oscillations modulated by a buzzer are heard considerably more stronger at this distance; such experiments are therefore very interesting. The same holds for range experiments with vertical antennas, but then the oscillations pass beyond the limits of one's dwelling and for reception one would need a suitably built tube receiver. Contrasting with this, we see the main advantage of the apparatus just described in the fact that the radiation of waves remains limited to a relatively small space; for this purpose the horizontal antenna is preferable.—*Rafa.*

A Pendulum Regeneration Short Wave Receiver

(*Continued from page* 90)

crackling in the phone, if one grasps the plate of the tube with the dampened finger. By changing plate resistance R5, whose amount will vary by about 10,000 ohms, the audion can be made to oscillate. The oscillation tube will cause far less trouble or none at all.

Finally, it would be desirable to make the heating of the detector capable of regulation; this is not easy to manage. Instead of this one can use instead of R5, a variable resistance.

The following hook-up represented in Fig. 3 is also recommended. The screen-grid has a special plate lead, in which resistance R5a lies, but at the same time there lies in the screen-grid lead also a resistance R9, which is bridged by a block condenser of about 1 mf. R5a and R9 evidently form a potentiometer, at whose one tap-off the screen grid lies. The value of these two resistances in their sum is surely not critical, but it might be rather difficult so to select the ratio of the two resistances that the screen-grid actually gets the correct potential. Therefore I propose the hook-up given in Fig. 4, where a high resistance potentiometer is used with a 10,000 to 50,000 ohm resistance R5b.

'Musical Arc' a Spectacular Phenomenon

(*Continued from page* 76)

modulation. This action set up air wave vibrations similar to thunder, but instead of the roar and roll of thunder it was a musical sound similar to the music being broadcast. Men working 300 or 400 feet away thought they were hearing the output of a giant loudspeaker! If the arc were allowed to continue it moved out toward the end of the antenna, due to the movement of the hot gases, arced across the insulators, cracking them open, and finally the intense heat melted the copper and caused the antenna to drop.

The trouble was solved in two ways. Antenna wire of larger diameter was adopted, and a large corona plate or half-sphere was placed at each end of the antenna. These measures reduced the voltage gradient at the wire surface, due to the increased radius of curvature of conducting surface. It is now possible to get 35 kilowatts of power, modulated 100 per cent, in the antenna, without wasteful and destructive coronas.

ANENT THE WORD "THRILL BOX"

In the last issue the name "Police Thrill Box" was used as the title of the cover feature article. The name was chosen quite inadvertently and innocently by the editors, but we have been reminded by the National Company, well-known builders of short wave apparatus, that the name "Thrill Box" has been publicized and advertised by them for a number of years; We are therefore glad to give credit where it is due. Whenever a new short wave converter or other apparatus is given a name by the editors, they always strive to assign a name to it that will not conflict in any way with a name or phrase that has been registered, advertised or publicized.

NEW TRANSMITTER TUBE

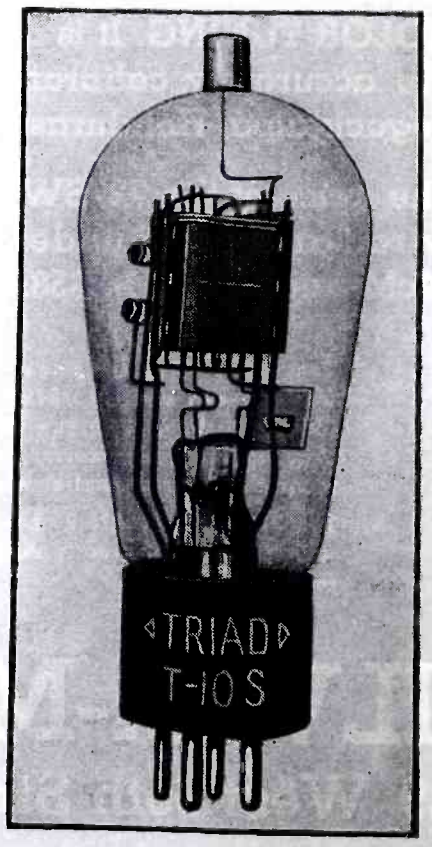
THIS new type of 210 tube for amateur transmitters, which is known as the Triad 210-Special, incorporates a number of improvements which make it possible to use this tube in circuits which, up to now, were a practical impossibility. For instance, the type 210-Special is conservatively rated to carry a maximum of 800 volts on the plate, as compared to the present rating of 425 volts, states H. T. Himeon, Chief Engineer of the Triad Company.

The principal external difference in the appearance of the tube comes as a result of the plate connection being removed from the base and being brought out at the top of the bulb. This change brings about several important improvements. The output capacity of the tube is materially reduced and this makes transmitting circuits much easier to balance. The plate potential is completely isolated from the socket. Very few sockets will withstand the application of 800 volts on the plate, which this new type of tube makes possible, even if the tube itself could be used with such a high voltage.

When the tube is used in an oscillator circuit, all of the radio frequency current is removed from the base of the tube itself. With the ordinary type of tube, used in circuits of this character, when the voltage or frequency is too high, the sockets cometimes break down or become short-circuited and so do the bases of the tubes themselves. There is also the prevalent fault of blowing up the stems of the tubes. The higher the frequency the quicker the base and the stem is likely to develop leaks.

These new tubes are extremely *hard* tubes. resulting from the use of specially designed vacuum exhausting systems. The advantages of tubes of this nature are immediately obvious.

Furthermore, the new type of tube oscillates very readily at very high frequencies and are being used on wave lengths well below 10 meters. With the ordinary type of 210 tube it is usually difficult to work consistently much below 40 meters. Here we have a frequency ratio of 1 to 4 in favor of the new tube.



The New Triad 210-Special Transmitting Tube.

Enjoy WORLD-WIDE Reception

30 DAYS FREE TRIAL

Hear London, Paris, Rome South America, Australia

With the New MIDWEST SHORT-WAVE CONVERTER!

If you now have a late model super-heterodyne of ample power—9 tubes or more—you can easily convert it to an ALL-WORLD, ALL-WAVE set by adding a Midwest Converter to it. This new, self-powered Midwest Converter easily converts any AC set of adequate sensitivity into a short-wave receiver that will bring in foreign stations of England, Holland, France, Germany, Italy, South America, Mexico, Australia and many other countries. This is not only the best and most powerful but the lowest-priced super-het converter on the market. Buying direct from the factory saves you 50% or more. And every Midwest Converter is backed by 30 days FREE trial and a positive guarantee of satisfaction.

Self-Powered

Many converters recently put on the market depend on the radio for power which puts a strain on the power supply of the set. Not so with the Midwest Converter. It has its own power supply which not only avoids overloading the transformer and other parts of the set as well as poor reception due to reduced voltage.

NO PLUG-IN COILS
Every Important Feature

1. Ball-bearing variable condenser floated in rubber
2. Accurately peaked I. F. at 575 K. C.
3. No changes required in set
4. Complete power unit fil. and B supply (80 rectifier)
5. Self-healing electrolytics
6. Scientifically shielded
7. Noiseless low-loss switching device
8. Thoroughly filtered
9. Non-regenerative detector
10. Vernier 6-1 slow motion dial (illuminated)
11. No troublesome body capacity.
12. Proven circuit
13. Shielded output cable
14. Extremely simple to connect

only $16.75 COMPLETELY ASSEMBLED—

Enjoy Radio All Summer Long!

Short-wave reception is at its best during the Spring and Summer months. When static and other interferences make your ordinary set unenjoyable, you can have hour after hour of delightful entertainment listening to foreign stations, ships at sea, airplane calls, Police messages and other short-wave broadcasts. That's what it means to have your set equipped with a Midwest Converter.

Read These Letters!

NEW ZEALAND USER HAS LOGGED 141 STATIONS ALL OVER THE WORLD

"I would stack my Midwest up against any other make on the market. I have a log of 141 stations, 'Midwest gets 'em all over the world.' 36 stations in New Zealand, 34 Australian, 10 in Japan, 1 in China, 2 in India, 1 in Czechoslovakia, Bratislava, and Siam, 'Radio Bankok,' 2 in Honolulu, and a total of 156 stations in the U. S. A., including New York, Cincinnati and Los Angeles. This is a log which would be hard to eclipse by any other make of any power."—Fred W. Morley, 1000 Fitzroy Ave., Hastings, Hawks Bay, New Zealand.

GETS MANY FOREIGN STATIONS

"During the past week I logged the following: FYA Pontoise, France; GBW Rugby, England; HVJ Vatican City, Italy; XLA Mexico City; VK2ME Sydney, Australia; VE9GW Bowmanville, Canada; 12Ro, Rome, Italy; G5SW Chemlsford, England; CGA and VE9DR Drummondville, Canada. Also picked up many amateur and airport stations from all over United States. Numerous ships, shore and transatlantic phones from both sides and an Hawaiian Test Station came in clear and sharp. Several Spanish and German speaking stations have also been received but not yet identified. Have received every broadcast from FYA, morning and afternoon, for over a week with wonderful tone and volume. The Midwest Combination Set is certainly one to be proud of."—Wm. S. Teter, Winterpark, Fla.

MIDWEST RADIO CORP.

Established 1920

DEPT. 85 CINCINNATI, OHIO

USE WITH ANY GOOD SUPER-HET.

The Midwest Converter is usable with any standard super-heterodyne of ample power and selectivity. If you do not now have such a set, mail coupon at once for the big new Midwest catalog showing sensational direct - from - factory bargains in 9 and 11-tube super-heterodynes, 13 and 15-tube ALL-WORLD, ALL-WAVE COMBINATIONS, battery sets, auto radios, etc. Deal direct with the Midwest factory and SAVE UP to 50%, whether you need just a Converter or a complete new set.

TERMS AS LOW AS $5.00 DOWN

MAIL FOR BIG FREE CATALOG AND LIBERAL TRIAL OFFER

Midwest Radio Corp.
Dept. 85,
Cincinnati, Ohio

( ) Send me SPECIAL USER AGENT'S PROPOSITION

Without obligation send me your new 1932 catalog and complete details of 13- and 15-tube All-World, All-Wave Combinations, 4-tube Converter, 9- and 11-tube Super-Heterodynes, low factory prices, easy terms and liberal 30-day free trial offer. This is NOT an order.

Name.....

Address.....

Town.....

State.....

Short Wave Events of the month

5 Meter Waves Link Plane to Earth

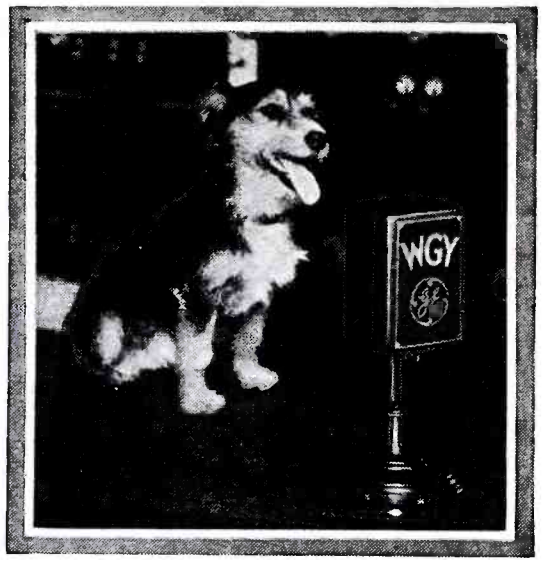
The possibility of restricted or virtually private radio communication was recently demonstrated in an ultra-short wave or ultra-high frequency test under the auspices of the American Radio Relay League. The test, the results of which are thought by experts to be of great importance, was carried on between a plane and amateur radio stations between Boston and New York.

The plane, equipped with five-meter radio apparatus, left Boston for New York. In accordance with prearranged instructions, some 200 amateur radio operators attempted to establish communication with the plane, using the ultra-short wave. The Relay League, using a station on Sheldon Hill, established voice communication with the plane when the latter was over Worcester. The importance of the test lies in the restriction of the communication. Experimentation with the ultra-high frequency or ultra-short wave shows its limitations to be within the "line of sight." This limitation would enable direct communication between a plane and a ground station from which other receiving apparatus beyond the "line of sight" would be excluded. It would be possible also for two planes flying at a high enough altitude, to communicate with each other, without any ground station not within the limitation zone being able to intercept the message.

Dog's Bark Heard 'Round the World

Here is "Shorts," the sky-terrier, who worked himself into a lather, barking at himself around the world. WGY's short wave station, W2XAD at Schenectady, N. Y., was experimenting with a round-the-world relay, Schenectady to Kootwijk, Holland, to Bandoeng, Java to Sydney, Australia and back to Schenectady. "Shorts" barked once during the test, heard the answering bark and kept going in the belief that he was working up a fight with an unseen rival. "Shorts" is old enough to know he can't catch his stubby tail, no matter how fast he runs, but he still expects to catch up with his bark as it travels around the world in 1/8th second.

(*Continued on page* 121)



Build This Short Wave Receiver in Your BRIEF-CASE

By HUGO GERNSBACK and C. E. DENTON

(*Continued from page* 81)

Cautions

Remember, the two-volt tube filament is sensitive to over-voltage and the tube action is quickly impaired. This makes the filament rheostat one of the most important items in the receiver, and it was deliberately mounted so as to be accessible but not so handy as to provide the inexplicable desire to turn a knob so that the signal will be louder. Leave the knob off the filament rheostat so that it will be harder to turn.

The wiring of the set should be done with solid wire on all contacts permanently mounted to the tube and coil-assembly rack. The leads (wires) to the balance of the set should be flexible and rubber-covered so as to reduce the danger of twisting and breaking while the set is being handled around. All joints should be soldered with a non-corrosive flux.

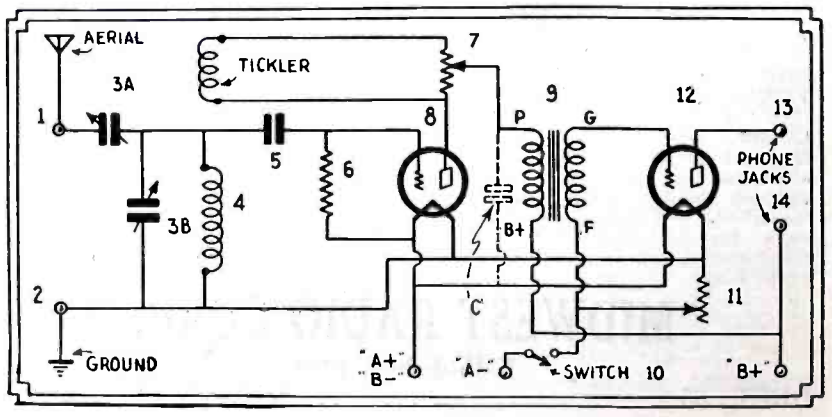
The key-switch for filament control was used, as a small toggle or push switch would be unsatisfactory due to the possibility of accidental circuit closing and draining of the "A" battery. The *key-type lock switch* is the answer to this problem, as the only method of battery waste is then through the owner's carelessness. The plug-in coils cover the bands from 15 to 200 meters and thus a real short wave reception can be had at ear phone volume.

Everyone that has had an opportunity to test out this receiver has been surprised by the facility of tuning, distance covered, light weight and remarkable compactness. As usual, the stamped and self-addressed envelope will bring answers to your questions by the author.

Parts List for Brief-Case Receiver

No. *Name of Part.*

1—Eby antenna post.
2—Eby ground post.
3A—100 mmf. trimmer Hammarlund.
3B—Dijur or Pilot 100 mmf. midget condenser.
4—1 set of S.W. plug-in coils (Air King), 15 to 200 meters.
5—.00025 Aerovox mica condenser.
6—1 meg. grid leak International resistor.
7—50,000-ohm Frost potentiometer.
8—4-prong Pilot socket.
9—3.5 to 1 audio transformer (small size).
10—H & H key type filament switch.
11—20-ohm Carter filament rheostat.
12—4-prong Pilot socket.
13, 14—Yaxley insulated tip jacks.
15 (Optional)—.001 m.f. Aerovox fixed condenser. If set does not regenerate easily, try this condenser at "C".
One Brief-case—leather—quality to suit your pocket-book.
Two 230 type Eveready-Raytheon 2-volt tubes.
1 pair Trimm 2,000-ohm "featherweight" phones.



Schematic diagram of "Brief-Case" S-W Receiver.

WHEN TO LISTEN IN

By "BOB" HERTZBERG

(Note: This department is prepared just before SHORT WAVE CRAFT *goes to press, and contains the latest, last-minute "dope." This may conflict in some details with the information in the regular list of short-wave stations of the world (printed elsewhere in this issue), as the long list must of necessity be made up in advance. You can easily make corrections or additions to the list on the margins of the pages.)*

The German Stations

Following is a letter that is self-explanatory:

"On the chance that the verification of reception I received from the Reichspostzentralamt offices at Berlin (address: Berlin Templehof, Schoneberger Strasse 11-15) may be of help to you in preparing your short-wave log, I am forwarding this information to you.

"The lengthy vertification, written in German, points out that the German station broadcasts on two wavelengths—31.38 meters and 19.737 meters. The call letters of the station on 31.38 meters are DJA, while the call of the station on 19.737 meters is DJB.

"The 19.737 band station is approximately .1 meter above the logging in your last issue for Konigswusterhausen. The writer of the letter also points out that DJB broadcasts special programs for North America every Monday, and apparently he is very grateful for reports of reception.

"My compliments to you for your excellent efforts to give us a short-wave log. Yours is the only magazine I have found that is of any aid in the short-wave field."

LEE ERHARD,
Tulsa World.
Tulsa, Okla.

According to the letter sent to Mr. Erhard, the German short-wave station at Zeesen (near Berlin) transmits daily from 8:00 to 9:00 a. m., 10:30 a. m. to 1:30 p.m., 2:00 to 6:30 p. m., and often up to 7:30 p. m., E. S. T.

Vienna

The short-wave station known as "Radio Wien," located in Vienna, Austria, is back on the air again. It is testing on Tuesdays and Thursdays from 8:30 a. m. to 12 noon, and from 2:00 to 5:00 p. m., E. S. T. The wavelength is 49.4 meters, which is plumb in the middle of the American and Canadian stations. However, some people manage to hear the station anyway. Its call letters are UOR2.

New Schedule for W8XAL

Many WLW features are now being dialed by radio fans the world over as a result of these programs being broadcast simultaneously over W8XAL, the 10,000 watt short-wave station of the Crosley Radio Corporation, Cincinnati, Ohio. The latest schedule of this station is as follows: 6:00 to 10:30 a. m., 1:30 to 3.30 p. m., and 6:00 p. m. to 1:30 a. m., E. S. T., daily.

News from Guatemala

Editor, SHORT WAVE CRAFT:

"I had the great pleasure of receiving your recent letter and I appreciate very much your willingness to give publicity to my station TGX. I have some news for you, as follows:

"Station TGW, which is the government station, has 100 watts of power and is working from 9:00 to 11:00 p. m., C. S. T. Their wavelength is 45 meters.

"Station TGX, which is mine, is not working every day, but I am always on the air Saturday night from 9:00 p. m. to 11:00 p. m. or midnight, C. S. T. Also I have test transmissions irregularly from 1:00 to 2.00 or 3:00 a. m. I have 100 watts now, and have been reported as far as Los Angeles, Cal., and in Colombia, S. A. My wavelength is 33.5 meters. Announcements are made in both Spanish and English. I have a very popular Spanish song

(Continued on page 115)

Amateurs who made good

In answer to many requests we introduce a new department this month—"RADIO AMATEURS WHO MADE GOOD"—and we know you will find these personality sketches of radio celebrities intensely interesting. (*Clip and paste this column in your scrap-book and in the course of a year, you will have an interesting and valuable list of the prominent men affiliated in some manner with this great industry.*)

McMURDO SILVER

"FROM amateur to executive in twelve years" would be a good description of the progress of McMurdo Silver, president of Silver-Marshall, Inc., since its inception in 1924, and now just past his twenty-ninth birthday.

McMurdo Silver's first interest in radio dates to the electrolytic and crystal detector days of 1912, and in the years from 1912 to 1916 he assisted in the development and operation at amateur station 8VM at Geneva, New York.

In 1916, Mr. Silver moved to New York City, experimenting with radio until the war, and then, being too young to enlist, engaging in the antique gun business for amusement. After the war he again took up radio, and in 1920 joined the laboratory force of the Westinghouse

McMurdo Silver, father of the "kit" set idea, has had a meteoric rise and started in the radio business as an amateur operator at stations 8VM and 2-BEA. Mr. Silver is today president of the Silver-Marshall Company.

Lamp Co., at Bloomfield, N. J., then engaged in developing transmitting and receiving tubes, during his spare time building sets and developing amateur station 2BEA. In 1922 he became the first employee of the Haynes-Griffen Radio Service of New York, where he was responsible for the introduction of the first "kit" set in the world, and in 1923, of the first practical "superheterodyne kit," and the world's first "portable superhet."

1924 saw him start "on his own" in Chicago, and the history of Silver-Marshall since then is common knowledge to our readers. "Mac" in nine years has been responsible for thirty-nine new radio developments, now universally used in home radio receivers. He is the "father" of the "kit" set business, if there is one. Yet he has only a grammar school education—the rest is hard work, curiosity, and much study by the midnight oil.

LOUIS GERARD PACENT

RADIO, in its larger, popular aspects, is a comparatively new field. But there are a few men whose active contact with it date back far beyond the year 1921, when the lure of radio broadcasting first began to sweep this country. One of those few is Louis Gerard Pacent, who as early as 1906 was experimenting on early systems of transmission and reception. Today his enthusiasm for radio is as unstinted as it was twenty-four years ago, when very few, if any, could hope to visualize the marvelous possibilities of the field.

By persevering study, personal experimentation and grasping every opportunity at education relating to his hobby, young Pacent sought to achieve his ambition of becoming a radio engineer. Today he is President of Pacent Electric Company engaged in the production and distribution throughout the world of his own inventions and designs. Other companies which he heads include the Pacent Reproducer Corporation, which boasts the second largest number of talking picture installations in the world and the Pacent Radio Corporation, devoted to the manufacture of radio apparatus.

During the war, Mr. Pacent divided his activities between business and the radio service of the United States Army and Navy. He succeeded in designing and putting into service devices which helped to do their bit to win the war.

Louis Gerard Pacent, who needs no introduction to radio men; he is also well known to the "talkie" world, having developed one of the best and most widely used "talkie" apparatus. Mr. Pacent is one of the radio pioneers and a member of numerous radio and other societies.

Among Mr. Pacent's numerous inventions are: Universal Plug, Twin Adapter, Multi-Jack, Mesco Hi-Tone Radio Buzzer, several Sending Keys, Duplex Inductances Mounting, several Inductance Attachments and several receiving and transmitting sets. His contributions to radio literature include: "Manual of Wireless Telegraphy," "How to Make a Trans-Atlantic Wireless Receiving Set," a number of papers and articles, including: "The Wavemeter in Wireless Telegraphy and Telephony," which was read before The Radio Club of America as early as 1911, "A Radio System for Simultaneous Sending and Receiving," "The Relay Antenna Transfer Switch," "Radio Telephony," etc.

WILLIAM EDWARD HARRISON—W2AVA

WILLIAM E. HARRISON started radio construction and experimentation in 1919. He obtained his operator's license in 1926. Was elected to the presidency of the DeWitt Clinton Radio Club and held that office for two years. Organized code and theory classes and started many now prominent amateurs on their way in this most fascinating hobby.

In 1926 he established an Amateur supply mail order house under the name of William Harrison & Co. Reorganized same as the Harrison Radio Co., in 1930 and moved to 189 Franklin Street. The response to his fair business methods was so overwhelming that the company was forced to take larger quarters in 142 Liberty Street, New York.

Mr. Harrison is also the founder of the Royal Short Wave & Television Co., pioneer manufacturers of short wave receivers and transmitters. His years of radio experience and thorough knowledge of short wave apparatus, have enabled him to design several very efficient receivers and transmitters which bear this company's emblem.

He has also done extensive research in sound recording. Has designed several instantaneous recording machines for the Radio Recording Co., of New York. These machines are widely used in professional recording studios. Several outstanding radio stars discovered they had a "radio voice" by making a record and were thus started on their way to fame and fortune.

Mr. Harrison owns and operates radio station W2AVA, but of late he finds that the great demand for Royal sets prevents his being "on the air."

William Edward Harrison, W2AVA.

WHEN TO LISTEN IN

(*Continued from page* 113)

as my identification signal and to anyone who will tell me the name of that song I will mail absolutely free of charge a wonderful Indian souvenir. Will appreciate mention of this in your magazine.

"Station TGCA, mentioned in one of your previous issues, has been disqualified by the government for causing interference and they are off the air until they get a new license."

MIGUEL ANGEL MEJICANO NOVALES,
Station TGX,
Guatemala City, 11 Av. Nt. 45,
Central America.

Canadian Short Wave Stations

We are indebted to the *Radio Service Bulletin* for a complete list of the Canadian experimental S-W broadcasting and television stations. stations.

SHORT WAVE EXPERIMENTAL BROADCASTING STATIONS

Call Signal	Name and Address of Owner	Location	Frequency (kilocycles)
VE9AK	Alberta Pacific Grain Co., Calgary, Alberta.	Red Deer, Alberta.....	2,830
VE9CF	William C. Borrett for CHNS, Halifax, Novo Scotia.	Halifax, N. S.	6,050
VE9CS	United Church of Canada, Vancouver, British Columbia.	Vancouver, B. C.	6,070
VE9CG	Calgary Herald (Ltd.), Calgary, Alberta.	Calgary, Alberta	6,110
VE9BJ	C. A. Munro (Ltd.), St. John, New Brunswick.	St. John, N. B.	6,090
VE9CL	James Richardson & Sons (Ltd.), Winnipeg, Manitoba.	Middlechurch, Manitoba....	6,150
VE9DR	Canadian Marconi Co., Montreal, Quebec.	Drummondville, Quebec.....	11,780
VE9GW	Gooderham & Worts (Ltd.), Toronto, Ont.	Bowmanville, Ontario.....	6,095 11,810 24,380
VE9CA	Western Broadcasting Co. (Ltd.), Calgary, Alberta.	Calgary, Alberta.....	6,030 11,860
VE9DN	Canadian Marconi Co., Montreal, Quebec.	Montreal, Que..	6,005 9,580 11,895
VE9BA	Canadian Nat'l Railways, Montreal, Que.	Montreal, Que..	6,130 11,705 15,190

TELEVISION STATIONS

VE9RM	Rogers Majestic Corporation (Ltd.), Toronto, Ontario.	Toronto, Ont...	2,004-2,100
VE9EC	LaPress Publishing Co., (Ltd.), Toronto, Ont.	Montreal, Que..	2,004-2,100
VE9DS	Canadian Marconi Co., Montreal, Quebec.	Mt. Royal, Que.	2,100-2,200
VE9BZ	Radio Service Engineers, Vancouver, British Columbia.	Vancouver, B.C.	2,750-2,850
VE9AR	A. R. MacKenzie, Saskatoon, Saskatchewan.	Saskatoon, Saskatchewan...	2,850-2,950
VE9AF	Jas. A. Ogilvy's (Ltd.), Montreal, Quebec.	Montreal, Que..	2,850-2,950
VE9ED	Dr. Joseph L. P. Landry, Mount Joli, Que.	Mt. Joli, Que..	2,850-2,950

New Features of Royal Model "RP" Receiver

IN accordance with their established policy of supplying the latest in short wave equipment, The Harrison Radio Company has announced new valuable and improved features in the ROYAL Model RP Short Wave Receiver. After extensive experimentation they have succeeded in eliminating the second switch necessary to open the "B" battery circuit in this type receiver. It is now possible to turn the entire set off, simply by turning but one knob. Besides simplifying the control, this is advantageous where the operator wishes to leave the set tuned to a certain frequency.

The crackle-finished cabinet of these sets measures only 11 x 7 x 7 inches. This compact size is a boon to the average fan whose desk or table space is limited. A neat battery cable supplied with the set enables the batteries to be placed in any convenient location. A good point of this feature is that it removes a large metallic mass from the immediate vicinity of the set, which results in better operation. Also, as the size of battery is not limited by the size of cabinet, the more economical large-sized batteries may be used.

To fully utilize the great gain of the screen grid detector, a power output tube must be used. The ROYAL RP uses a type '33 pentode output tube (the only screen grid tube that operates efficiently as an output tube).

WHAT FREQUENCY INTERMEDIATES?

By WALDO A. SMITH

Chief Engineer, Midwest Radio Corporation

THE intermediate frequency amplifier in super-heterodynes has climbed from fifty thousand cycles per second in the early years of radio, until last year the popular standard was 175 kc. This year everything from 512 kc. down to 112 is being considered. What will be finally accepted, and why?

The advantage of the super-heterodyne lies mainly in its selectivity and sensitivity. Both of these are a function of the intermediate frequency amplifier, which is contained only in the super-heterodyne type of radio. Such selectivity and sensitivity is possible only because the intermediate frequency amplifier operates at a fixed frequency and the transformers in this amplifier may be designed for a very high gain and selectivity.

In the early days of radio, before shielding was thoroughly understood, it was found that feed-backs were small and much higher gain could be obtained if low frequencies were used. This limitation is totally unnecessary now because electrostatic and electromagnetic shielding may be applied and any gain desired may be obtained at any frequency up to, and including, the American broadcast band. We therefore have to look elsewhere for the limitation which dictates the frequency to be used. It is not a matter of selectivity or sensitivity.

The word "heterodyne" was intended to convey that there was other force operating. The word "super" referred to Audio frequencies and the practice was probably that of carrier current, as used extensively by the telephone companies. So super-heterodyne means frequency above audibility, say, 20,000 cycles per second.

"Sum" and "Difference" Frequencies

The common practice in super-heterodynes is to lower the frequency used by the American broadcasters by heterodyning their carrier wave with a local oscillator. Two new frequencies are produced, one falling below the frequency of signal (the difference) and the other one falling above the signal frequency (the sum). The latter method was used by the "Infradyne." Let us first consider the one which has a lower frequency than the signal. The lowest frequency used in the United States is 550 kc. Therefore, our intermediate frequency lies between audibility and the American broadcast or between 20 kc. and 550 kc., considering only "difference frequency."

The *sum* frequency could be used, and very efficiently, were it not for the fact that it would fall within the short wave bands that are now being developed.

We must now consider the difficulty of designing a local oscillator; the main limitation is one of range or ratio of maximum frequency to minimum frequency. This ratio is known to be about three to one as a maximum. Most oscillators are called upon to give a range of about 2½ or less, and considerable difficulty is encountered in making them oscillate uniformly even over this limited range.

Now, the frequency of the oscillator is equal to the frequency of the signal, plus the frequency of the intermediate amplifier. Therefore, the higher the intermediate frequency, the smaller the range. For illustration, assume an intermediate amplifier of 20 kc. The American broadcast band goes from 550 to 1500; the oscillator must therefore go from 570 to 1520. This is a ratio of about 2.66. Now consider an intermediate frequency of 500; the oscillator must run from 1050 to 2000 and this is a ratio only of about 1.9; thus the higher the intermediate frequency, the lower the range of the oscillator and the more uniformly it may be made to oscillate. This fact may be used as an argument in favor of higher intermediate frequencies.

The Super-het Bugaboo—"Images"

The main fault with super-heterodynes is the reception of false points known as *images.* It is necessary that there be a difference between the signal and the oscillator. Reception is possible with the oscillator above or below the signal. The R.F. selector must accept the signal only at one of these points; it is customary to align the condensers so the signal is accepted when the oscillator is set at the higher frequency. If the signal is accepted even slightly, at the other point, the signal is duplicated, and these duplications will be separated on the dial by twice the intermediate frequency; this is frequently noted on local stations.

Now, if these duplications are close together the selectivity must be great; if they are separated farther apart, the rejection is easier. Therefore, if the i.f. is raised, the selectivity of the r.f. tuner may be made much poorer. This theory may be carried to an extreme in practice, by having the intermediate frequency equal to, or greater than, one-half of the American broadcast spectrum. This extends from 550 to 1500 kc., or a difference of 950. If the i.f. is chosen as one-half of this, or 475, there can only be one image and that would be the 1500 kc. station falling exactly at 550. If an i.f. is chosen above 475, then there can be no image and the selectivity of the r.f. is required only to eliminate noise. This noise would result as an image of static located at twice the intermediate frequency from the desired signal.

Selectivity of R.F. Stages

Now, the selectivity of the r.f. must be such that when the dial is tuned to 550 and the local oscillator killed by pulling its tube from the socket, no noise shall get through

the r.f. selector into the intermediate frequency or it will be amplified and superimposed upon any signal it is desired to pick up at this part of the dial. This is a common fault in many of the high frequency intermediate frequency super-heterodynes on the market today. They rely too much upon the lack of image and cut the selectivity of their intermediate frequency so far that noise does get through without the proper heterodyne action.

It is evident, then, that the intermediate frequency must be far enough removed from the lowest frequency end of the American broadcast band to eliminate noises at this end of the dial. This is a matter of pre-selection and with high grade apparatus it has been proven that 500 kc. and even slightly higher is permissible as the intermediate frequency. We can now establish our intermediate frequency as lying between 20 kc. and 500 kc. with a probable preference for something between 475 and 500.

It has been noted that the word American has been used in limiting the phrase, broadcast band. This is because there is being developed in Europe another broadcast band lying between 150 kc. and 300 kc. Stations in this band have never been consistently received in this country yet, but next season they probably will be. If a receiver is to be designed for receiving these stations, the intermediate frequency must lie below 150 kc. or above 300 kc. If the lower frequency is chosen, the problem is practically the same as designing for the American broadcast band; if the higher frequency is used, several interesting problems are encountered.

The oscillator frequency is again equal to the signal frequency, plus the intermediate frequency. If an intermediate frequency of 500 kc. is chosen, the range of the oscillator becomes 650 kc. to 800 kc. and the ratio between these limits is 1.25. The limitation of the oscillator to this range is fairly easy and involves merely a matter of fixed condensers in series with, and in parallel with, the variable condenser. The ratio is such that very uniform energy should be derived throughout the entire band.

Selectivity of R.F. Selector

The intermediate frequency should be located far enough from the signal that the selectivity of the radio frequency selector prevents noise from getting through into the i.f. amplifier, without the heterodyne action from the oscillator. The selectivity of the long wave selector is not as good as that of the American broadcast band selector and it is intended to receive foreign stations only so that the coupling would be very tight; therefore it is desirable to remove the i.f. as far as possible from the signal frequency. It is probable from a consideration of this portion of the set that the intermediate frequency would be located at around 500 kc.

Whether or not the radio set shall receive the European stations, it certainly must receive short wave signals. The development of these bands will be the feature of 1932-33. Strides in this part of the spectrum will be comparable to that made in our American broadcast spectrum in the years immediately following the war. So let us consider the bearing of the intermediate frequency upon reception of these waves.

In the present transition period between "converters" and "built-in" tuners designed to cover the short wave bands, an interesting comparison very favorable to the converters has been noted. In the first place, the converters used in conjunction with a sensitive and selective modern radio set gives stronger signals with better selectivity and greater ease in tuning, probably due to the greater amplification encountered by the addition of tubes to a radio receiver that is already sensitive.

Another point extremely favorable to the converter is that the repeat points are very weak and sometimes impossible to receive. Only the image of the fundamental of the oscillator has been noted. In no case has it been noted that the harmonic of the oscillator produces reception. This is certainly not true of several of the latest receivers incorporating short wave tuners. In every case, these receivers have had a frequency of 175 kc. and it is probable that if the intermediate frequency had been raised to around 500, these images and harmonic reception points would have disappeared on account of the added ability of the r. f. selector to reject signals at undesired points. Experiments are being conducted along these lines by several companies and it is prejudged that a favorable decision will be given to a higher frequency intermediate amplifier.

What frequency shall be used for the intermediate frequency amplifier this year? Something very close to 500 kc. I am sure.

Book Review

The Federal Radio Commission—Service Monographs of the United States Government, No. 65. Published by the Brookings Institute, Washington, D. C., 1932. Price, $1.50.

This book contains, in compact form, a wealth of valuable information regarding the activities and scope of the Federal Radio Commission. This book was prepared by Mr. Laurence F. Schmeckebier and the work opens with a brief history of radio from 1896-1921; the development of broadcasting from 1921-26; radio act of 1927; the first and second year's work of the commission, with the legislation and proposed legislation during 1931.

Later chapters cover the activities of the commission, including various classes of radio stations, the licensing of transmitting stations, including basis of licensing power; procedure on applications, appeals, work of the Department of Commerce, organization details including Engineering and Examiner's divisions, etc. An appendix includes a list of publications, radio laws, information to be submitted by applicants for licenses, a lengthy bibliography and an index to all the subjects covered in the book.

A Stenode for Short Waves

By JOHN B. BRENNAN, JR.

(*Continued from page* 78)

Now supposing you were to be given a gadget which, when connected with your receiving apparatus, could be employed in such a way that it would almost miraculously eliminate all interference and leave only the clear strong signal of the station to which you cared to listen. Such is the *Stenodapter*.

How It Works

In the published works of Dr. Robinson, in the technical bulletins issued by the Stenode Corporation of America, and in the numerous technical articles appearing in the country's leading technical publications, it has been definitely established that a quartz crystal, properly ground to a desired frequency response and mounted in a fashion which, from experience, has proved to be satisfactory, can, when it is connected in the proper part of a receiving circuit, be used to obtain a degree of selectivity hitherto thought impossible of attainment.

All the frequencies transmitted by a given station and picked up by the antenna of the receiver employing the Stenode feature, where passed along through the crystal, but at a ratio which was inversely proportional to the frequencies received. A curve of the voltage output from the detector of such a receiver, when plotted against frequency, would look something like that shown in Fig. 1. This is not an actual curve but is merely a hypothetical representation of the frequency-attenuation property of the Stenode principle of operation. A mechanical analogy of the operation of the crystal and its inversely proportional discrimination against frequencies can very nicely be illustrated by the many-toothed wheel and ratchet shown in Fig. 2. If the wheel is rotated at a uniformly fast rate of speed the ratchet will seemingly ride over the crests of the teeth which are spaced closely together but it will go down further into the troughs of the coarser teeth. In other words, the coarser teeth affect the ratchet to a greater degree than the finer teeth, the former being likened to low frequencies and the latter being likened to the higher frequencies. In broadcast reception where only well-nigh perfect tone reproduction can be tolerated, some audio compensating means would have to be incorporated in the audio channel of the receiver so as to restore the discriminated frequencies to their original relative values. This is most effectively accomplished by the use of an audio stage working out of the detector whose response is *directly proportional* to frequency. (See Fig. 3.) In amateur phone operation, however, great fidelity of tone is a consideration which is secondary to that of intelligibility of signal and some overemphasized base-note reception can be tolerated. However, in those cases where the base-note overemphasis is objectionable, some degree of audio correction can be added without a great deal of difficulty.

What the Stenodapter Is

In the simple unit whose construction is described here for those who are becoming sated with the ordinary run of "rehashed" receiver designs, there will be found a field of experiment which will repay those who undertake the job. It must be remembered that the particular design shown and described here is not advanced as the one and only of its kind which will provide satisfactory operation. The vagaries of short-wave receiver design are only too well known and appreciated by the author to make such a claim for his brain child. Rather it indicates a trend which will bear the scrutiny and investigation of those dyed-in-the-wool experimenters who are ever on the lookout for something new.

For the sake of simplicity of construction the Stenodapter has been designed as a single simple unit comprising a tuned circuit, crystal tube and radio-frequency amplifier stage which can be connected, as a unit, between any reputable short-wave converter whose output or difference frequency is 570 kilocycles and a broadcast receiver. In effect, it adds a stage

of radio-frequency amplification to the broadcast receiver, this additional stage and the tuned r.f. portion of the broadcast receiver functioning then as the intermediate-frequency amplifier of a super-heterodyne circuit. The tuning condenser in the Stenodapter unit makes provision for tuning the i-f input circuit to the resonant frequency of the crystal, to which the ganged tuned section of the broadcast receiver must also be tuned. The circuit is shown in Fig. 4. The extreme selective properties of the quartz crystal make the Stenodapter unit a veritable *narrow gate* through which *only the desired signals can be passed, to the exclusion of all others!*

By means of a balancing capacity which is provided in the Stenodapter unit, heterodynes which occur within the frequency response of the crystal, may be eliminated by a simple manipulation of the knob controlling this variable capacity. In this respect the Stenodapter differs not one whit from those broadcast Stenode receivers whose theory of operation and construction have been described previously.

Flexible connecting leads are brought out from the unit through holes drilled in the walls of the shield can for convenient connection to accessible parts of the broadcast receiver, so as to supply filament and plate voltages to the unit. Binding posts for input and output of the unit are provided.

The parts employed in the construction of the Stenodapter unit are as follows:

L1—One radio-frequency coil wound to tune to broadcast frequencies.
C1—One .00035 mf. variable condenser, with dial.
C2-C3—Two mica fixed condensers, .0001 mf., matched (see text).
C4—One three-plate balancing condenser, about 10 mmf., with knob.
C5-C6-C7—One three-unit bypass condenser, each unit .1 mf.
R1—One metallized grid leak, ¼ megohm.
R2—One metallized cathode bias resistor, 1000 ohms.
R3—One s-g dropping resistor, metallized, 22,-500 ohms.
X—One 570 kc. Stenotube (quartz crystal).
Four binding posts.
One four-prong socket for Stenotube.
One five-prong socket for r.f. tube VI (224).
One shield box, as per detail drawings.
Wire, screws, solder, etc.

Constructional Details

When the parts listed above have been obtained, the metal shield box should be constructed as shown in the accompanying detail drawing, Fig. 5. A suggested layout of the parts to fit this type of shield box is shown in Fig. 6. Fastened to the underneath side of the metal base of the box are the two wafer sockets, the bypass condenser unit and the cathode and s-g voltage dropping resistor. On the back of the front wall of the shield box is mounted the tuning condenser, C1, to which is attached the r.f. inductance unit, L1. The balancing condenser, C4, is also mounted on this front panel and is located just below the tuning condenser. The two mica condensers, C2 and C3, are mounted on the coil-condenser combination in such a fashion as to provide a symmetrical layout.

The grid leak, R1, connects from the center connection of these two condensers to one side of the balancing condenser.

Since both sides of the two variable condensers must be kept above ground (shield) potential it is necessary to employ insulating washers in mounting these parts on the front wall of the shield box. If insulating washers are not available then it will be necessray to mount these units on sheet bakelite and fasten the latter on the wall.

It is of especial importance to obtain two mica condensers which match each other as closely as possible, in respect to capacity. Fig. 7 shows why this is necessary. In the first place their total capacity must be low enough so as not to seriously raise the total effective capacity of C1. The second and most important reason that two similar capacities are required is so as to obtain a true mid-point of the inductance-capacity combination L1-C1. If, for instance, Cb in Fig. 7 is less in capacity than Cc then a lesser potential will exist across points 1 and 2 than across points 1 and 3. In practice, this means that less working potential (signal) will be passed to the Stenotube while more will be passed around it through the balancing condenser. The third reason for the selection of two mica condensers whose capacities are as identical as is possible to obtain is that if any difference in these two capacities were allowed to exist it would be difficult to obtain a true balanced condition of the circuit and it follows that the elimination of some heterodynes would not be accomplished.

Practically all constructional details can be observed from the drawings which accompany. There are no special rules which must be observed and much leeway in the exercise of originality of design and construction is possible.

How the Stenodapter Works

After construction of the unit has been completed its wiring should be checked against the schematic circuit (Fig. 4) so as to guard against errors.

Now, let's assume that the two filament supply leads coming out of the unit have been connected to some convenient portion of the broadcast receiver so that the correct filament voltage is supplied the Stenodapter r.f. tube. Also, that the plate supply lead has been similarly connected to some correct convenient B supply point on the broadcast receiver.

Ordinarily, if the Stenodapter were not used, the output posts of the short-wave converter being used in conjunction with the broadcast receiver (to make the whole outfit a short-wave superheterodyne), would connect directly to the antenna and ground posts of the broadcast receiver. Previously the antenna and ground should have been removed from their posts on the receiver and connected to their respective posts on the converter unit. However, when the Stenodapter is used, then the output of the converter connects to the input posts of the Stenodapter unit and its output connects to the antenna-ground posts on the broadcast receiver. These connections are clearly shown in the schematic circuit, Fig. 4.

To adjust the Stenodapter unit so that it will function correctly, note and pursue the following procedure:

First, refer to a newspaper radio program or a call list and locate a station that transmits at a frequency on or near 570 kilocycles. Temporarily connect the antenna to the antenna post of the broadcast receiver and tune in this station. Or, if it is not possible to obtain such an approximate setting of the broadcast receiver to the frequency of 570 kilocycles then a more time-taking means will have to be employed. This consists of plotting the positions of known, received stations (in terms of their transmitting frequency) on cross-section paper, plotting the frequency against dial setting. In this way a curve will be obtained when the various plotted points are joined together with a pencil line and it is then a simple matter to determine arbitrarily the dial position of 570 kilocycles.

In the event that a station can be tuned in on the broadcast receiver at this dial setting, the antenna can then be removed from the receiver and connected to the upper input post of the Stenodapter. Now temporarily "short out" the Stenotube and then tune the condenser C1 to resonance with the signal previously tuned in at 570 kilocycles. Thus, both the broadcast receiver and the Stenodapter unit are tuned to 570 kilocycles or very near to it.

Next, without removing the "short" from the Stenotube, replace the antenna to its post on the converter and reconnect the output of the converter to the input of the Stenodapter. In effect, what we have is an added stage of r.f. to the broadcast receiver, the whole being tuned to 570 kilocycles, the frequency to which the Stenotube will respond.

In its present condition tune the converter to an "80-meter" phone signal, one preferably which is being heterodyned by another amateur transmitter. Now, remove the short from the Stenotube and notice the immediate sharpness of tuning which has been effected. As a matter of fact, some retuning of the converter may be necessary to retune the signal to resonance with the crystal frequency. If for any reason a heterodyne still exists in the received output the adjustment of the balancing condenser C4 will remove all traces of it.

The principle of operation is not difficult to understand. The crystal, possessing an ex-

tremely narrow resonance curve of only some few hundred cycles in width acts as an infinitesimally narrow "gate" through which only the desired signal will pass to the exclusion of all others. In practice this is not absolutely true, because the metal electrodes between which the crystal is placed sets up a capacity effect, which tends to bypass some of the undesired signals. For this reason the balancing condenser is employed and its function is to balance out or neutralize the crystal electrode capacity so that only the pure unaffected action of the crystal is obtained.

It should be borne in mind that the unit whose construction and principle of operation is described here is not presented to the reader as a finished perfected article. Rather, it is described with the idea in mind that from it a wealth of investigation and experimentation will result and that finally some units may be evolved which will provide an answer to a Q R M problem which daily is becoming more and more irksome, destructive of effort and achievement and costly.

The Crosley Short Wave Adapter

(*Continued from page* 102)

66¾ turns No. 26 Enam. 1/32 pitch, right hand thread—90 degrees. Antenna and grid windings on same thread, top of antenna winding directly adjacent to bottom of grid winding.

Oscillator Coil—Plate winding, 33-1/6 turns No. 26 Enam. 1/22 pitch, right hand thread—90 degrees. Grid tickler winding, 12¼ turns No. 26 Enam. 1/22 pitch, right hand thread—90 degrees. Pick-up winding, 5⅙ turns No. 26 Enam. 1/22 pitch, right hand thread—90 degrees. Threads for grid and pick-up windings cut midway between thread for plate winding. Pick-up winding starts ⅓ turn after start of plate winding. Grid winding starts ⅔ turn after finish of pick-up winding.

Group No. 2.—Range 3,160 to 5,535 kilocycles:

Antenna Coil—Antenna winding, 10½ turns No. 26 Enam. 1/28 pitch, right hand thread—90 degrees. Grid winding 34¾ turns No. 26 Enam. 1/28 pitch, right hand thread—90 degrees. Threa t for antenna winding cut midway between threads for grid winding. Antenna and grid widings start directly adjacent to each other.

Oscillator Coil—Plate winding, 16⅙ turns No. 26 Enam. 1/20 pitch, right hand thread—90 degrees. Grid tickler winding, 8¼ turns No. 26 Enam. right hand thread—90 degrees. Pick-up winding, 5⅙ turns No. 26 Enam. right hand thread—90 degrees. Threads for grid and pick-up windings cut midway between threads for plate winding. Pick-up winding starts ⅔ turn after start of plate winding. Grid winding starts ⅔ turn after finish of pick-up winding.

Group No, 3.—Range 5,350 to 9,830 kilocycles:

Antenna Coil—Antenna winding, 3½ turns No. 26 Enam. 1/28 pitch, right hand thread—90 degrees. Grid winding, 18¾ turns No. 26 Enam. 1/28 pitch, right hand thread—90 degrees. Thread for antenna winding cut midway between threads for grid winding. Antenna and grid windings start directly adjacent to each other.

Oscillator Coil—Plate winding, 11⅙ turns No. 26 Enam. 1/14 pitch, right hand thread—90 degrees. Grid tickler winding, 5¼ turns No. 26 Enam. right hand thread—90 degrees. Pick-up winding, 5⅙ turns No. 26 Enam. right hand thread—90 degrees. Threads for grid and pick-up windings cut midway between threads for plate winding. Pick-up winding starts ⅓ turn after start of plate winding. Grid winding starts ⅓ turn after finish of pick-up winding.

Group No. 4.—Range 9,440 to 16,800 kilocycles:

Antenna Coil—Antenna winding, 1½ turns No. 22 Enam. 1/12 pitch, right hand thread—90 degrees. Grid winding, 7 turns No. 22 Enam. 1/12 pitch, right hand thread—90 degrees. Thread for antenna winding cut midway between threads for grid winding. Antenna and grid windings start directly adjacent to each other.

Oscillator Coil—Plate winding, 5 11/12 turns No. 22 Enam. 1/12 pitch, right hand thread—90 degrees. Grid tickler winding, 4¼ turns No. 26 Enam. right hand thread—90 degrees. Pick-up winding, 2⅙ turns No. 26 Enam. right hand thread—90 degrees. Thread for grid and pick-up winding cut midway between threads for plate winding. Pick-up winding starts ⅔ turn after start of plate winding. Grid winding starts ¼ turn before start of pick-up winding. Grid and pick-up windings wound in same groove.

Group No. 5.—Range 16,300 to 30,000 kilocycles:

Antenna Coil—Antenna winding, 1½ turns No. 26 enamel, 1/16 pitch, right hand thread—90 degrees. Grid winding, 3½ turns No. 22 enamel, 1/16 pitch, right hand thread—90 degrees. Thread for antenna winding cut midway between threads for grid winding. Antenna and grid windings start directly adjacent to each other.

Oscillator Coil—Plate winding, 3 turns No. 22 enamel, 1/16 pitch, right hand thread—90 degrees. Grid tickler winding, 2 turns No. 26 enamel, right hand thread—90 degrees. Pick-up winding, 1 1/16 turns No. 22 enamel, right hand thread—90 degrees. Threads for grid and pick-up windings cut midway between thread for plate winding. Pick-up winding starts ⅓ turn before start of plate winding. Grid winding starts ⅓ turn after finish of pick-up winding.

All coils wound on 1½" forms. Thread V-shaped 0.008"—0.012" deep.

Oscillator and antenna tuning condensers—0.00015 mf.

Detector plate bypass condenser—0.1 mf.

Oscillator plate and detector screen bypass condenser—0.1 mf.

Oscillator cathode bypass condenser—0.1 mf.

Short Wave Events of the Month

(*Continued from page* 112)

Shot Heard 'Round the World by S-W's

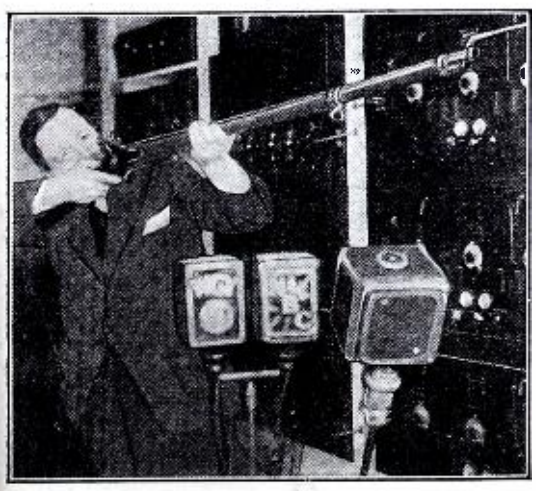
Governor J. B. Ely of Massachusetts fired a musket that was actually used in the battle of Concord 157 years ago, before the microphone of General Electric's short wave station in Schenectady. This shot was actually "heard 'round the world," the sound going by short wave radio via Holland, Java, Australia, and back to Schenectady, returning in one-eighth of a second.

This event brings into reality that famous line of Emerson's poem:

"Here once the embattl'd farmers stood,
And fired the shot heard 'round the world."

The shot was fired at 8:50 o'clock Tuesday morning, April 19, the 157th anniversary of the shot from Concord's bridge, which started the Revolution.

Flashed out across the Atlantic over W2XAD, the sound of the shot was picked up at Kootwijk, Holland, according to the plans of the radio engineers. Thence, it was relayed eastward again to Bandoeng, Java. From there it was retransmitted to Sydney, Australia, where it was relayed once more to its starting point in Schenectady. The time consumed in the actual transmission of the sound around the world, was about one-eighth of a second, the radio engineers calculate, or approximately the time required for sound to echo back from a wall seventy-five feet distant from its starting point.



The "shot heard 'round the world."

Schenectady to Melbourne via Short Waves

A radio message "around the world" and a "two-way broadcast" between Australia and America, featuring an address by Sydney J. Pascal, president of Rotary International, speaking before the microphone in Melbourne, featured the radio entertainment provided delegates from 55 Rotary Clubs of the 29th district, who gathered at Schenectady, N. Y., on April 22 for their 10th annual conference. More than 1,000 delegates were present.

Twice in recent tests the voice of the speaker in Schenectady has "completely encircled the world" and returned with sufficient volume to be reproduced by a loud-speaker. The chats with Australia were carried on with comparative ease, the signals from the other side of the world being received almost as clear and distinct as a local telephone conversation.

Marconi Talks on ½ Meter Waves

Senator Guglielmo Marconi, wireless inventor, announced on April 6th a successful experiment in two-way communication by ultra-short wave radio (code) and telephone.

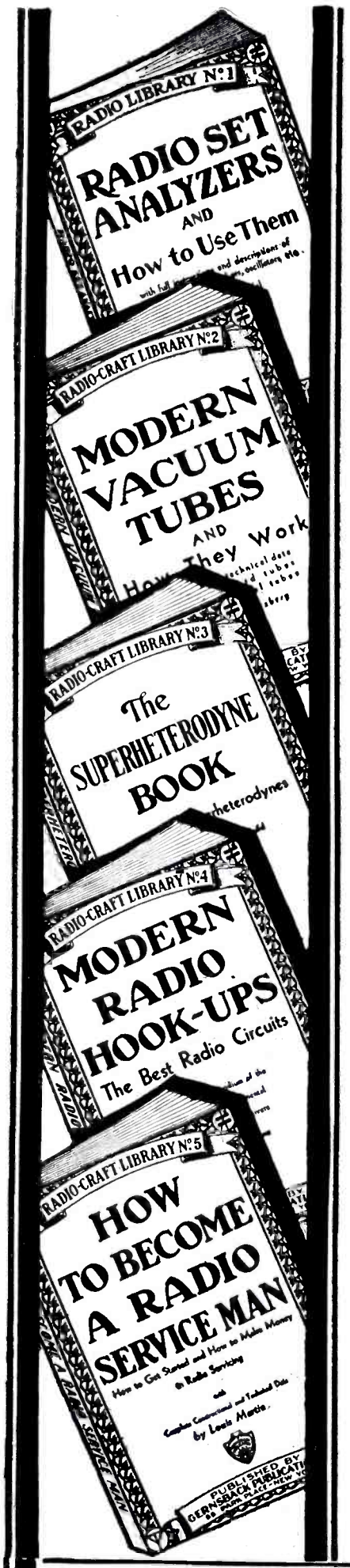
"I believe that with this new development in ultra-short waves this apparatus will enable communication with any telephone subscriber within a radius of 100 miles," Senator Marconi said. "The apparatus can be carried in an automobile, on trains, buses, yachts, or coastwise steamships to permit them to communicate with any point by telephone and radio."

The new development should not be confused with ordinary short waves, Marconi said. It uses ultra-short waves of 52 centimeters (20.4624 inches) of much greater frequency than any now used.

Normal short wave communication today is from five to 200 meters. The Marconi invention permits use of a wave little longer than one-half meter.

Senator Marconi said his experiments had been made between his villa and his yacht Elettra, anchored in the bay.

The apparatus consists of a parabolic reflector, which permits reception and re-transmission of a conversation on a telephone wire. It reverses the conversation from the telephone wire to the radio wave. It is not affected by atmospheric conditions, and the new developments have eliminated static disturbances, Senator Marconi said. He has discovered a method of overcoming obstacles such as mountains, houses and the curvature of the earth.



10 NEW BOOKS in the Radio-Craft

Presented on these two pages are the new books of the RADIO-CRAFT LIBRARY—the most complete and authentic set of volumes treating individually, important divisions of radio. Each book has been designed to give radio men the opportunity to specialize in one or more of the popular branches of the industry. The material contained in these books will increase your knowledge; you will find them a real help in your work and they will contribute to your money earning capacity. Read these books during your spare time at home.

The authors of these books are well-known to everybody. Each one is an expert radio man; an authority on the subject—each is thoroughly familiar with the field which he represents.

Book No. 1

RADIO SET ANALYZERS

And How To Use Them

With Full Instructions and Descriptions of Set Analyzers, Tube Checkers, Oscillators, Etc.

By L. VAN DER MEL

This book explains thoroughly the operation of set analyzers, tube checkers, oscillators and other testing equipment. For every radio man this book is extremely helpful. It covers every phase of testing and gives you valuable short cuts; completely illustrated with photographs and diagrams to facilitate the use of modern testers.

The following chapters briefly outline the contents. INTRODUCTION; THE ANALYZER; Fundamentals, Switches, A.C. and D.C. Voltmeters, Calibration and Design; TROUBLE SHOOTING WITH THE ANALYZER; Classification of Trouble, Analysis of Troubles, Uses of Various Analyzers, Care and Maintenance; CONCLUSION.

Book No. 2

MODERN VACUUM TUBES

And How They Work

With Complete Technical Data on All Standard and Many Special Tubes

By ROBERT HERTZBERG

MODERN VACUUM TUBES describes the fundamental electron theory which is the basis of all vacuum tube operation, and goes progressively from the simplest two-element tubes right up to the latest pentodes and thyratrons. It is written in clear, simple language and is devoid of the mathematics which is usually so confusing. Valuable reference charts and characteristic curves of standard and special tubes are to be found, also diagrams of sockets and pin connections.

Here are some of the chapters: The Edison Effect and The Electron Theory; Electron Emitters and the Ionization Effect; The Three-Electrode Tube; Vacuum Tube Characteristics; Four- and Five-Element Tubes; Light Sensitive Cells and Other Special Tubes.

Book No. 3

THE SUPERHETERODYNE BOOK

All About Superheterodynes How They Work, How to Build and How to Service Them

By CLYDE FITCH

There is no more fascinating a subject in the large array of radio circuits than the famous superheterodyne circuit. Whether you are a Service **Man** or experimenter, first-hand knowledge about the construction of superheterodyne receivers is very important. The book on Superheterodynes gives underlying principles of their construction, right from the very first set made.

The following is a short list of contents: Basic Principles of the Superheterodyne; The Oscillator; First Detector; Single Dial Tuning Systems; Intermediate Amplifier; Second Detector, Audio Amplifier and Power Supply; Commercial Superheterodyne Receivers; Servicing Superheterodynes.

Book No. 4

MODERN RADIO HOOK-UPS

The Best Radio Circuits

A Complete Compendium of the Most Important Experimental and Custom-built Receivers

By R. D. WASHBURNE

It is fascinating to the experimenter, or even to the up-to-date Service Man, to take a commercial set and to change it into one using a famous hookup that is not found in any manufactured set. Many excellent circuits have never been commercialized, but limited only to home-set builders. Thousands of these popular circuits have been requested from time to time, and in this book we have included over 150 circuits, which include the famous Peridyne, Cash-Box A.C.-D.C. Set and others.

The circuits cover the following: Broadcast Receivers, All-Wave Receivers, Short-Wave Receivers, Converters and Adapters, Television Receivers, Home Recording Apparatus, Automobile Receivers, Audio and Power Amplifiers, Power Units and Miscellaneous Equipment.

Book No. 5

HOW TO BECOME A RADIO SERVICE MAN

How To Get Started and How To Make Money in Radio Servicing

By LOUIS MARTIN

The ambition of many men in radio today is to become a first-grade Service Man. It is not as difficult as one might believe, but it cannot be done in a few short months. Following very carefully the advice of Mr. Martin, who has dealt with the problems of thousands of Service Men, this book deals very carefully with the essential stages in the preparation for qualifying as a Service Man.

Here are the chapters; The Small Independent Service Man; Advanced Commercial Aspects; The Radio Set; Semi-Technical Considerations; Advanced Service Data. Each chapter is again subdivided to bring out in minute detail every point of importance.

Book No. 6

BRINGING ELECTRIC SETS UP TO DATE

With Pentodes, Multi-Mus, Dynamic Speakers—Complete Information How to Modernize A.C., D.C. and Battery Operated Receivers

By CLIFFORD E. DENTON

In this country there are over ten million electrically operated receivers that could be modernized—by placing in them new type tubes, new speaker equipment and other modern improvements. This business of improving old sets can go to the experimenters and Service Men if they will quickly jump into action.

Read in this book by Mr. Denton, how easily you can modernize any obsolete set, and with little additional costs.

Here are the high lights of this book: Tubes Available for Replacements; Electrifying Battery Receivers; Use of the New 2- and 6-Volt Tubes; Operating Sets with Single Control; Conversion of A.C. Sets into D.C. and D.C. into A.C.; Replacing Output Tubes with Higher Output Tubes; Improving Old Supers; Loftin-White Amplifiers; Adapters and Their Use.

Book No. 7

RADIO KINKS AND WRINKLES

For Service Men and Experimenters

A Complete Compendium on the Latest Radio Short-Cuts and Money-Savers

By C. W. PALMER

It often becomes necessary for experimenters and Service Men to call upon their memory for some short cut or radio wrinkle that will solve a problem quickly. In business, "short cuts" mean time and money saved, and to the Service Man "time saved" means money earned.

This book is a compilation of important radio kinks and wrinkles and discusses only such items as are constantly used today.

Here are some of the more important chapters: Introduction; Servicing Short-Cuts; Testing Equipment and Meters; Vacuum Tubes and Circuits; Volume-control Methods; Amplifiers and Phonograph Reproducers; Power Supply Equipment; Coils and Tuning Circuits; Short Waves; Loud Speakers; Tools and Accessories.

Book No. 8

RADIO QUESTIONS AND ANSWERS

A Selection of the Most Important of 5,000 Questions Submitted by Radio Men During the Course of One Year

By R. D. WASHBURNE

There has been collected a wide variety of questions which have come into our editorial offices during the past two years, and only those whose answers would benefit the majority of men engaged in radio have been incorporated in this amazing question and answer book.

The tremendously long list of topics better explains the subjects which are treated. Here are the titles:

Radio Servicing; Receiver Design; Home Recording; Television; Sound Equipment; Short Waves; Antennas; Operating Notes; Test Equipment; Tubes; Ultra-Short-Waves; Police Radio; Reproducers; Superheterodynes; Automotive Sets; Power Packs; Automatic and Remote Control Devices; Aligning Procedure; Photoelectricity; Adapters; Measuring Apparatus; Band-Selectors; Converters; Public Address Equipment; Midget Sets; Oscillators; Phonograph Pickups.

Book No. 9

AUTOMOBILE RADIO AND SERVICING

A Complete Treatise on the Subject Covering All Phases from Installing to Servicing and Maintenance

BY LOUIS MARTIN

Automobile radios are up and coming, and someone has to service them properly. It therefore behooves you to read this immensely important new book on the art of Automobile Radio. The book is concise, and full of illustrations, photographs, diagrams and hookups.

Here are only a few of some of the really interesting chapters: Introduction; Automotive Radio Installations; Complete Descriptions of Commercial Automotive Receivers; Servicing Automotive Receivers; The Ignition System; General Service Considerations; Effects of Temperature on Power Supply; Conclusion.

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"Buddy" Earphone Set Works on 110 Volts, A.C. or D.C.

By H. G. CISIN, M.E.

(*Continued from page* 100)

lator provides additional protection, since it acts as a fuse whenever extreme, abnormal electrical conditions prevail. Furthermore, it smooths out line voltage irregularities, giving more stable operation and thus permitting better all-around reception.

Making Chassis Frame

The aluminum sheet for the chassis is cut to the correct dimensions. Socket holes and hole for receptacle (28) are drilled and the four sides are then bent. Socket fastening holes are drilled and holes are also drilled for mounting the binding post assembly, the coils (5, 6, 7, 8), the choke (23) and the Cardwell condenser (9). Mounting holes are also drilled for the parts which are to be fastened to the front and side chassis walls.

The sockets are mounted—also the binding post assembly (1, 2) and choke. The variable condenser (9) is fastened to the chassis by means of small brackets. The "Balanceet" condenser (13), and the two Bud switches (27) and (30) are mounted on the front chassis wall. The twin jack unit (20) and the receptacle (28) are mounted on the right-hand chassis wall as shown. The two Aerovox electrolytic condensers are then mounted on the left chassis wall. The Electrad Truvolt resistor (26) is fastened beneath the chassis deck, using mica or composition insulating washers to prevent short-circuiting between resistor and chassis. The four small mica condensers may be fastened to the underside of the chassis.

The metallized resistors may be soldered in place while set is being wired or they may be mounted on a piece of insulating fibre 2½"x5"x ⅛", which in turn, is fastened beneath the chassis by long screws so that it is about 1" from the bottom of the chassis deck. The tubular condenser (11A) and the flexible resistor (18) are soldered to the grid terminal of socket (12) and to cathode terminal of (19) respectively. The four short-wave coils are wound next in accordance with the directions given in the "Coil Winding Details" sketch. The coil at the left is the 80 to 200 meter coil; the one at the right is the 10 to 20 meter coil. The coils may be fastened in place after most of the wiring is completed.

Wiring the Set

The filaments are wired in first. The heaters of all three tubes are in series. One heater terminal of tube (12) is soldered to the cathode terminal which in turn is grounded to the chassis. The Electrad Truvolt resistor (26) is in series in the filament circuit, one end being connected to a heater terminal of tube (25) and the other end connecting to grid and plate of the same tube and also to the "dead" side of the toggle switch (27). The other side of the switch connects to one of the receptacle terminals at (28). The other terminal of the receptacle is grounded to the chassis. If set is to be used on a 110-volt circuit, resistor (26) is adjusted by means of the sliding clip until its resistance is 303 ohms. If set is to be used on 120 volts, resistance of (26) is adjusted to 337 ohms. If a dial light is used, this should be a standard Mazda 3.2 volt, .35 amp. pilot light and it should be connected in series in the heater circuit, with resistor (26) adjusted to 293 ohms (for a 110-volt circuit).

The grid circuits are wired in next. Fixed condenser (10) and resistor (11) are connected to the *cap* of tube (12) by a flexible lead brought up through a hole in the chassis. Plate circuits are wired, then cathodes and then filter condensers to the chassis. Isolating condensers (2) and (4) are wired into the circuit. The coils (5, 6, 7, 8) are mounted and the wiring is completed from the Bud switch (30). Both arms of the switch are grounded to the chassis, with the terminal points connected to the respective coils. Directions for connecting the coils are indicated on the coil shown on the left. These also apply to the other three coils. Thus, the top of the antenna coil connects to

(3) and (10), while the bottom of the winding goes to the switch terminal. The top of the feed-back winding connects to the diagonally opposite switch terminal, while the bottom is connected to the rotor of the "Balancet" condenser (13).

COMPLETE LIST OF PARTS REQUIRED FOR THE A.C.-D.C. "BUDDY" EARPHONE SHORT-WAVE SET

1—Cardwell .00015 mf. "Midway" Featherweight Variable Condenser, type 405-B (9)
1—Cardwell .00005 mf. "Balancet" Variable Midget Condenser, type 613-A (13)
1—Electrad Truvolt Wire-Wound Resistor, 75 watt, type D-4 (26)
1—Electrad 2500 ohm Flexible Resistor, type 2G-2500 (18)
2—Aerovox 4 mf. Dry Electrolytic Condensers, type E5-4 (small) (22, 24)
1—Aerovox .00005 mf. Mica Condenser, type 1460 (3)
1—Aerovox .0001 mf. Mica Condenser, type 1460 (10)
1—Aerovox .00025 mf. Mica Condenser, type 1460 (4)
1—Aerovox .01 mf. Mica Condenser, type 1455 (16)
1—Aerovox .1 mf. Tubular Condenser, type 270 (11A)
1—I.R.C. (Durham), 10,000 ohm, 1 watt Metallized Resistor, type M.F.4 (14)
1—I.R.C. (Durham) 100,000 ohm, 1 watt Metallized Resistor, type M.F.4 (15)
1—I.R.C. (Durham) 250,000 ohm, 1 watt Metallized Resistor, type M.F.4 (17)
1—I.R.C. (Durham) 500,000 ohm, 1 watt Metallized Resistor, type M.F.4. (12A)
1—I.R.C. (Durham) 2 megohm, 1 watt Metallized Resistor, type M.F.4 (11)
1—Arcturus 136-A Universal A.C.-D.C. Screen Grid Tube (12)
2—Arcturus 137-A Universal A.C.-D.C. Tubes (19, 25)
1—*Truetest Light-Weight "Super-Sensitive" Headset (21)
1—*Truetest 30 henry (200 ohm) Audio Choke (23)
1—*Trutest 115-volt Depressed Outlet Receptacle (Hubbell type) (28); 6-ft. lamp cord; 1—Attachment Plug
4—*Trutest ⅞" Diameter Coil Forms; 10 to 20 meter coil (8); 20 to 40 meter coil (7); 40 to 80 meter coil (6); 80 to 200 meter coil (5). (See Winding Details.)
1—Bud 5-Point Double-Pole Selector Switch, type 219 (30)
1—Bud Single-Pole Toggle Switch with 6" leads, type 294 (27)
1—Bud Push-Button Antenna and Ground Binding Post Assembly, type 335 (1, 2)
1—Bud Twin Tip Jack Unit, type 333 (20)
3—Bud 5-Prong Sub-Panel Sockets, type No. 114 (12, 19, 25)
1—Bud Vernier Dial, type 144
1—Bud Screen Grid Cap, No. 107
1—Bud Indoor Aerial, type 132
1—Clarostat Automatic Line Voltage Regulator, 50-watt type (29)
1—Aluminum Chassis, 9"x6"x2" high.

*Trutest products marketed by Wholesale Radio Service Co.

NOTE: Numbers in parentheses refer to corresponding numbers marking parts on diagrams.

Frequency Control Without Crystals

By C. H. W. NASON

(*Continued from page* 95)

The lines need not be open structures—indeed in test work simple solenoids were employed to a great extent. The best results have been obtained where actual two wire lines were employed. The circuit arrangement shown in Fig. 2, is that of the WIK transmitter, revamped for frequency control by the new method. This transmitter operates on a frequency of 13,930 kc. or about 22 meters. The line employed was 10.25 wavelengths in length and was stretched under the roof of the building in which the transmitter was housed. The line was constructed from two No. 6 B. & S. copper wires. A push-pull oscillator of this type may be operated at frequencies much higher than this—even down into the 5 meter range! A transmitter circuit of this type operating on a frequency of 35,000 kc.—about 8.6 meters—is shown in schematic in Fig. 3. This type of transmitter is now in use for inter-island communication for the telephone network in Hawaii. The transmitters in this service are operated on frequencies ranging from 35,000 kc. to 50,000 kc. (8.6 meters to 6 meters); frequency instability in these transmitters is largely due to temperature variations affecting the constants of the line. The divergence amounts to a mere .02 per cent, for a temperature variation of 10 degrees Centigrade.

"Stabilizing Line" May Be in Attic

In the construction of *amateur transmitters* applying these principles, it is necessary that the builder have available a suitable area for stretching out the line. In the case of extremely short wave sets, it is possible that a line in the attic or in the cellar will be sufficient, providing the space is ample. For longer waves (lower frequencies) it will probably be necessary to get out-of-doors—thus involving the loss in frequency stability due to temperature variations. In adjusting the lines it is necessary that a good wave meter be available. When the correct adjustment of the bridge has been accomplished, it will be found that the plate tuning condenser can be varied "all over the lot" without causing a substantial variation in the tuning. The less variation in frequency found when the plate tuning is varied, the more effective is the line and the required length for a given degree of frequency stability may thus be judged. It is not likely that a line much less than from two to four wavelengths in run will be found suitable.

Those interested in more complete information should read the original paper by Conklin, Finch and Hansell in the November, 1931, *I. R. E. Proceedings.* Data on lines employing simple solenoids is incomplete and not sufficiently detailed to warrant the publication of the information. These lines, however, have the advantage of limited space and are therefore of interest to the amateur. In constructing lines of this type it should be remembered that due to *end effects,* the connections should be made so as to leave a few dead-end turns at each end of the line. In such cases it is necessary to match the impedances at the ends of the lines by means of a variometer as shown in Fig. 4.

Data for 10-Meter Stabilizing Circuit

Where commercial installations are involved, the economies of the system, insofar as the number of tubes involved are concerned, warrant one providing the necessary space for the transmission line (even at relatively low frequencies) as at Rocky Point. For the radio amateur living in more or less cramped quarters, the system is more or less limited to use in the 10 or 5 meter ranges. Here a straight transmission line two, three or four times the wavelength in physical extent, can be used. The use of such a system at the very high frequencies, will permit the use of simple heterodyne reception, where the poor frequency stability of an uncontrolled device might demand the use of some means of reception of less simple character.

A typical layout for a ten meter transmitter with push-pull oscillators and a directive antenna array, is shown in Fig. 5. Modulation by voice may be accomplished by the simple constant-current or Heising system.

THE SMALLEST B.C. and S.W. RECEIVER In the Next Issue!

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MATHEW J. WROBLE
527 27th St., Niagara Falls, N. Y.
RAYMOND A. YOUNG
Box 451, Sandston, Va.

The Amateurs Favorite Code Transmitter

By R. W. TANNER

(*Continued from page* 93)

windings for the rectifier and oscillator tube filaments.

The filter chokes CH, each have a rating of 30 henries at 150 M.A.

The first filter condenser C8 of 2 mf. capacity *must* be rated at 1000 volts (or higher) D.C. Otherwise blow-outs may occur, generally resulting in burning out the filament of one or both rectifier tubes. The center section C7 has a capacity of 4 mf., also rated at 1000 volts. The output section C6 is 4 mf. but may be of lower voltage rating, say 600 to 750 volts.

Preventing Voltage Surges

The resistor R2 connected directly across the high-voltage is used to prevent *voltage surges* if the load of the oscillator tubes should happen to be removed. This is quite important and if omitted blown filter condensers may result. It also improves regulation of the high-voltage when *keying*.

The layout of the transmitter parts is shown in Fig. 2. Some of the smaller parts such as R.F. choke, by-pass condensers, etc., are mounted underneath the baseboard. The layout was not designed to be something elegant to look at, but rather for efficiency and short leads. The size of the base is of no importance and can be readily determined by placing all of the parts on a bench according to Fig. 2 so that the leads in the tank circuits are not unduly long. When you think you have everything as it should be, merely measure the space the parts require and cut your baseboard accordingly.

Condenser Leads of Copper Ribbon

When wiring, the leads from coils to condensers *must* be made with heavy copper ribbon or the same material as used for the coils. It would be entirely useless to construct nice coils out of tubing or large wire and then connect to the condensers with *small hook-up wire*. The filaments should be made with No. 14 wire or larger. The remaining wiring may be made with the usual variety.

The layout of the power supply will not be given, since the dimensions and shape of the various makes of chokes, transformers, etc., differ greatly.

The adjustments are extremely simple and if the set is properly constructed and used with a good antenna system, no one should go wrong. Adjust condensers C1 and C2 for the proper wave, the milliammeter showing a low value, around 40 to 60 M.A. Then vary C until the reading on the plate meter is a maximum. No radiation meter is at all necessary, the plate meter serving to determine resonance.

List of Parts for Transmitter

L, L—Antenna coupling coils
L1—Oscillator plate coil
L2—Oscillator grid coil
RFC—Any good short wave R.F. choke
C—.00035 mfd. antenna condenser
C1—.00035 mfd. plate tuning condenser
C2—.00035 mfd. grid tuning condenser
C3—.00025 to .001 mfd. grid condenser
C4—.002 to .006 mfd. bypass condensers
C5—.5 mfd. bypass condenser
C6, C7, C8—Filter condensers, see text
R—40-60 ohm center tapped resistor
R1—10,000 ohm grid leak
R2—50,000 ohm 50 watt resistor
Ch—30 henry filter chokes
T—Power transformer (At right of diag.)

Decimeter Waves

By DR. H. LUX

(*Continued from page 94*)

vision" (that is, to points above the horizon of the transmitter) open only a few special fields to the practical use of these waves. The making of communications between the Continent and islands (for example, across the English Channel or from the southern coast of France to Sardinia, which astonished the public on its occurrence) may be limited to a few cases marked by favorable position and will hardly reach general importance.—(*From "Radio Amateur," Germany.*)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of SHORT WAVE CRAFT, published monthly at Mt. Morris, Illinois, for April 1, 1932.

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 Corporation, 98 Park Place, N. Y. C.; Editor, Hugo Gernsback, 98 Park Place, N. Y. C.; Managing Editor, H. Winfield Secor, 98 Park Place, N. Y. C. 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 Corporation, 98 Park Place, N. Y. C.; D. Gernsback. 98 Park Place, N. Y. C.; H. Winfield Secor, 98 Park Place, N. Y. C.

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.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only).

H. GERNSBACK.
Publisher.

Sworn to and subscribed before me this 30th day of April 1, 1932.

(Seal.)

JOSEPH H. KRAUS.

Queens County Clerks No. 2205; Queens County Reg. No. 7479; New York County Reg. No. 3K357; New York Clerks No. 601.

This Set Makes All Others Obsolete!

The New 4-Band, All-Wave

PILOT DRAGON

$59.50 COMPLETE WITH TUBES

Now is the time to buy a new radio, a DRAGON all-wave receiver which produces such totally new results as to make all other sets obsolete.

Make your own comparisons. Hear the difference between the DRAGON and your old set on broadcast waves. Try the one-control short-wave tuning which brings in stations from 18 meters up.

WRITE today for the DRAGON circular, giving the name of your local dealer. We will have him arrange to give you a demonstration.

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Everything for the service man, set builder, and experimenter is to be found in the new PILOT catalog.

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REPLACEMENT PARTS. All PILOT's replacement parts are listed. They include power transformers, all types of resistors, dry electrolytic condensers, loudspeakers, chokes, and other manufacturers' type parts for Service Men.

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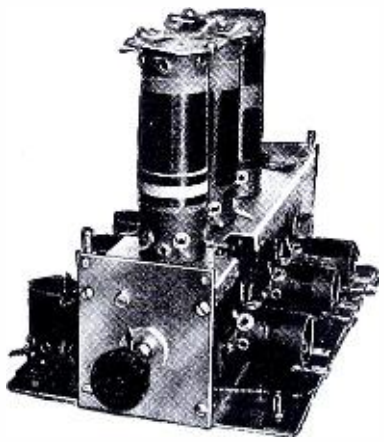


PILOT RADIO & TUBE CORP.

(Short Wave Headquarters - Established 1908)

FACTORIES - LAWRENCE, MASSACHUSETTS

JUNE SPECIALS!!

EVERY month we list on this page certain *STAR* ★ items, which are NOT LISTED IN OUR CATALOG. These are all specials of which the quantities on hand are not sufficient to catalog them. *Once sold out, no more can be had.* First come, first served. Save yourself disappointment by ordering NOW.

STOP SHOPPING. The lowest prices are right on this page. *No one undersells us.* We meet any price on ANY NEW Merchandise. Order direct from this page and save money. 100% satisfaction on every transaction. Take advantage of these special offers. ORDER NOW, TODAY.

NEW! IMPROVED READRITE MODEL 700 ANALYZER NEW!

MOST POPULAR LOW-PRICED ANALYZER ON MARKET

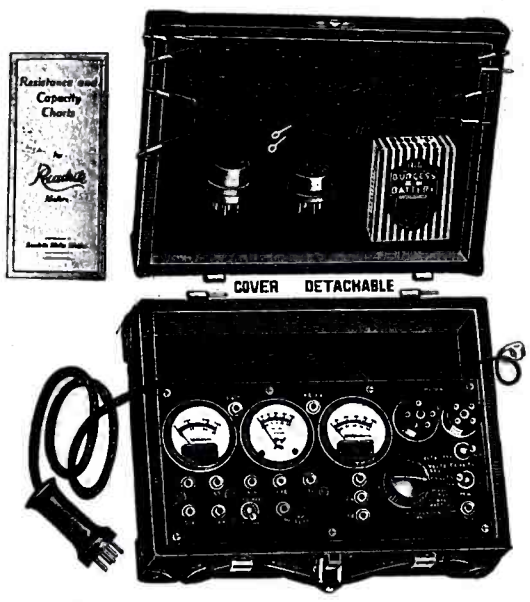
This new Readrite precision instrument embodies features which have always been desired in any instrument built for service work: (1) low cost; (2) simplicity of design; (3) accuracy of measurements; (4) ruggedness of the complete unit. It is needless to add that the kit is capable of testing anything from old battery models to the latest screen-grid, pentode, and multi-mu receivers.

EIGHT METER SCALES AVAILABLE

The "Model 700" is an extremely compact device. The outside dimensions of the carrying case are only 10¾ by 7¾ by 3¾ inches. The analyzer contains a D.C. voltmeter, an A.C. voltmeter and a milliammeter. The D.C. voltmeter has three ranges: 0 to 60; 0 to 200; and 0 to 600 volts. The A.C. voltmeter has also three ranges: 0 to 10; 0 to 140; and 0 to 700 volts. The milliammeter has two ranges; one for 20-mill, reading and the other for 100-mill. **This variety of ranges makes it possible to test every conceivable radio circuit;** high voltage secondaries of power transformers, current drain of all radio tubes, including the high power 250 and 210 tubes, etc.

CONVENIENT SELECTOR SWITCH

The instrument is equipped with a six-position bi-polar selector switch; by means of which readings may be obtained of "C" volts, "C" volts reversed, "K" volts, "K" volts reversed, plate voltage, and screen-grid voltage. A 4½-volt battery is supplied with the analyzer, to provide "C" bias, for grid tests, continuity tests, etc.



TESTS PENTODES —"MULTI-MUS"— & '80 RECTIFIERS

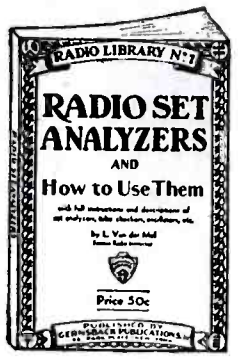
There are two sockets on the panel of the analyzer, one for four-prong tubes and the other for five-prong tubes. There is a "grid-test" push-button. Pin jacks are available for the individual use of all meters, externally, in every range. There is a screen-grid pin jack, and there are two pin jacks for connecting the external battery. A two-way toggle switch controls the testing circuit for either regular or pentode tubes. Both plates of the '80-type rectifier may be tested by use of a special adapter furnished. Charts are provided for measuring resistances and capacities.

IN LEATHERETTE CASE—REMOVABLE COVER

The Model 700 now comes in a handsome black leatherette case, substantially constructed and equipped with nickel plated corners and trimmings. **By a novel hinge arrangement the cover of the case may be swung back and removed,** thus affording a completely unobstructed view of the testing apparatus.

FREE with each Analyzer

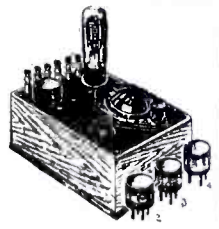
We take pleasure in offering with the purchase of each analyzer—**ABSOLUTELY FREE OF CHARGE**—the latest radio publication to come off the press. **THE BOOK IS INTENDED FOR SERVICEMEN OF ALL CLASSES,** whether junior grade or expert. **NOTHING HAS BEEN LEFT TO YOUR OWN INGENUITY; EVERYTHING IS COMPLETE.** Contains detailed descriptions, photographs and circuit diagrams of all commercial set analyzers and testers. **A real book. Contains information on every analyzer on the market. 64 big pages. Heavy cover. Profusely illustrated throughout.**



The Analyzer is furnished complete with test leads, connecting cables, Burgess 4½ volt battery, several battery leads, UY to UX adapter, '80 rectifier adapter and resistance and capacity charts. Shipping weight, 8 lbs.

Model 700 Analyzer. List Price $35.00. YOUR PRICE $14.70

WORLD-WIDE SHORT-WAVE SET



Range 18 to 200 meters. Employs low current drain 230 tube. Requires but 1/45 volt "B" battery, 2 No. 6 drycells and earphones to operate.

No. 1666—S.W. Set. Your Price $6.25

A.C. SHORT WAVE CONVERTER KIT

Contains all parts and instructions to build a three-tube S. W. converter. Range 10 to 200 meters. Includes filament transformer for 110 volts, 60 cycles, A.C. Complete with set of 3 plug in coils. Ship. wt. 8 lbs.

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SCREEN-GRID CAP CONNECTORS

Small, neat in appearance and ruggedly constructed. A stark necessity in service work. Sold only in lots of 12 or more. Ship. wt. 4 oz.

No. 1672—Caps. Per doz. Your Price.. $0.12

ADJUSTABLE VOLTAGE DIVIDER

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No. 2276—25,000 ohms. Your Price $0.75

★8 MF. ELECTROLYTIC CONDENSERS

These guaranteed units will perform miracles in eliminating objectionable A.C. hum from A.F. and filter circuits. Easily mounted through use of bayonet socket. Ship. wt. 1 lb.

No. SP 9054. Condenser. Your Price $0.49

AUTOMATIC BLOW TORCH

Heat intensity over 1200° Fahr. Requires no mouth-blowing. Entirely automatic. Used for heavy duty soldering, aluminum soldering, metal tempering, etc. Ship. wt. 1 lb.

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"245" POWER TRANSFORMER

For 110 volts 60 cycle A.C. operation. 5 v. @ 2 a., 2½ v. @ 3 a. Ct., 2½ v. at 10½ a., 2½ v. at 3a. Ct., 340 V-340 V Ct.

No. 1450—Transformer Your Price $3.84

FREE 76 Page Radio Treatise

100 New Hook-Ups, Etc. 675 Illustrations.

The new Winter edition, No. 24, of our RADIO SERVICE TREATISE is positively the greatest book in print—NOT JUST A CATALOG. It contains a large editorial section with valuable information **not found anywhere else.** Among the new technical information listed are the following: 1932 Complete Radiotron Characteristics **Short Wave Tuners and Phono-Pickups.**— Constructional Data for **Servicemen's Test Oscillator—all about Tone Controls—Short Wave Adapters and Converters—Constructing a 3-tube Super-Het Short-Wave Converter—Modernizing old radio sets—Latest type Multi-Mu and Pentode Tubes—All about DC Receivers—Vacuum Tube Treatise.** — And dozens of new radio experiments, hints to Servicemen, valuable tables of useful data, etc., etc.

WRITE TODAY. Enclose 2 cents for postage. Treatise sent by return mail.

A.C. SUPERHET S.W. CONVERTER

Converts any broadcast receiver into a full-fledged superhet S.W. Receiver. Range 20 to 115 meters. Requires no plug-in coils. Has built-in filament transformer for 110 volts 60 cycles A.C. Employs 3 227 tubes. Single dial control. Instructions included. Shipping wt. 8 lbs.

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MICROPHONE & PRE-AMPLIFIER OUTFIT

Excellently suited for P. A. work, inter-communication systems, etc. Comprises sensitive single-button microphone, microphone coupling transformer and battery, cut-off switch, gain control and output terminals. Put up in neat black crackle-finished metal case, equipped with convenient carrying handle. Measures 5"x6½"x6¾". Will correctly match the input impedance of practically all type amplifiers. Easily connected to the broadcast receiver for home recording. Ship. wt. 10 lbs.

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Naval observatory time right from your light socket! No spring to wind, no batteries. Never out of order. For 110 volts 60 cycle A.C. operation only.

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Operates from 110 volt 60 cycle A.C. line. 9" high by 9½" wide by 7½" deep. Ship. wt. 19 lbs.

No. 1506—Speaker Your Price $7.45

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A clever device for looking around corners or other inaccessible spots on the radio chassis. Comprises pen flashlight and magnifying mirror. Complete with battery and bulb.

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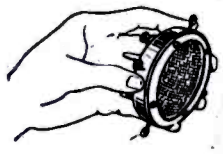
★POWER PACK-CHOKE UNIT

Comprises power transformer for 5—226's, 2 227's, 2—171A's and 1 280, as well as 1—500-ohm filter choke. Put up in neat metal case. Ship. wt. 10 lbs.

No. SP 9053 — Power Pack Unit. Your Price.. $2.75

★MIDGET MICROPHONE



A real microphone of single button type. Extremely sensitive. Excellent for P.A. work, etc. Standard resistance of 100 ohms. Responds up to 2500 cycles. Ship. wt. 1 lb.

No. 1655—Mike. Your Price $2.25

MIDGET DYNAMIC SPEAKER

A real dynamic speaker with surprising volume and tone. 6¼" overall, 4½" diaphragm. Standard 2500 ohm field coil. Output transformer to match all type output tubes. Wt. 5 lbs.

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Equivalent to one 227 detector and one 245 Power tube. Constitutes a two-stage direct-coupled amplifier in itself. Filament, 2 A.C. 2½ v.; plate voltage 250. Large undistorted output. Ship. wt. 12 oz.

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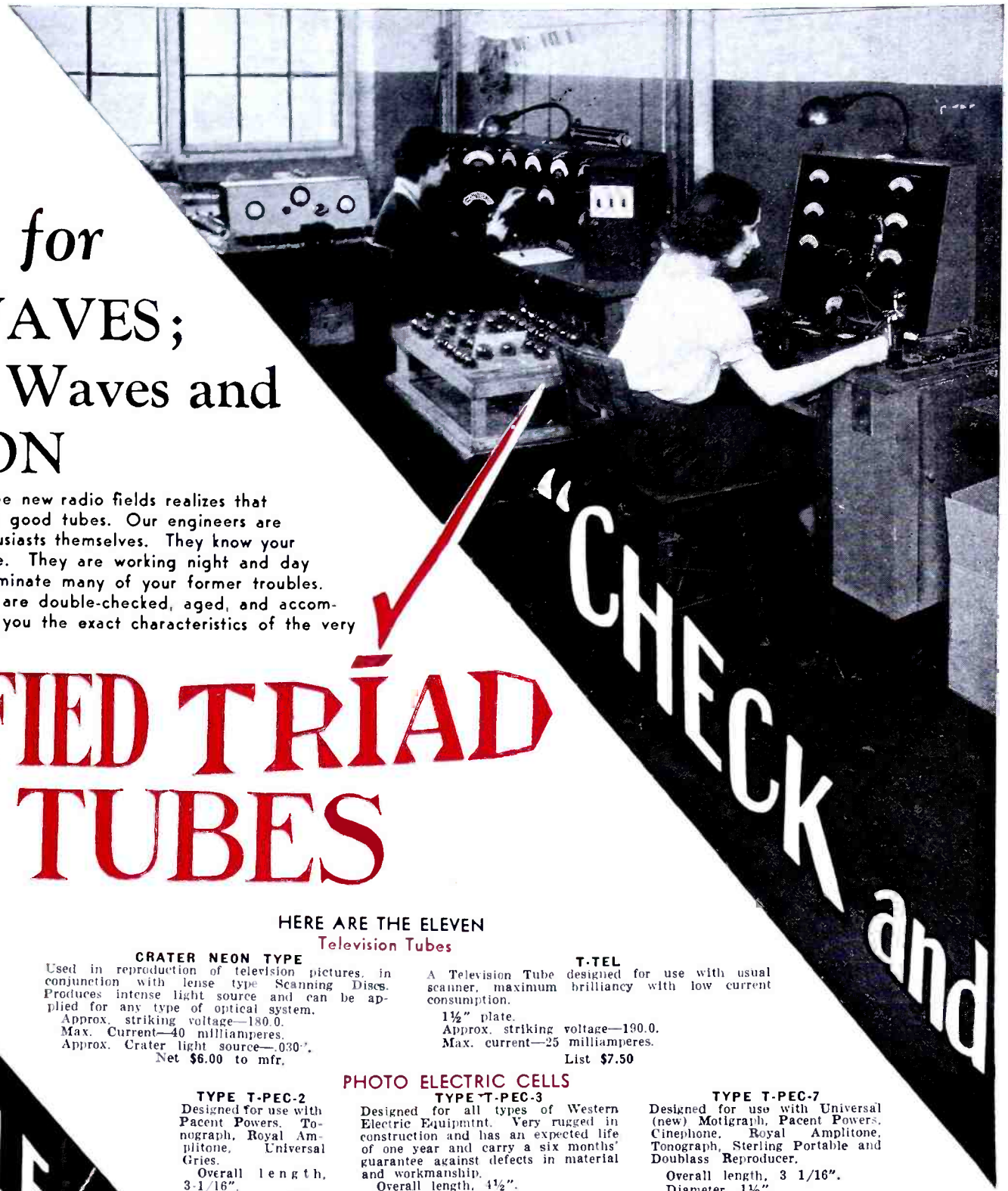
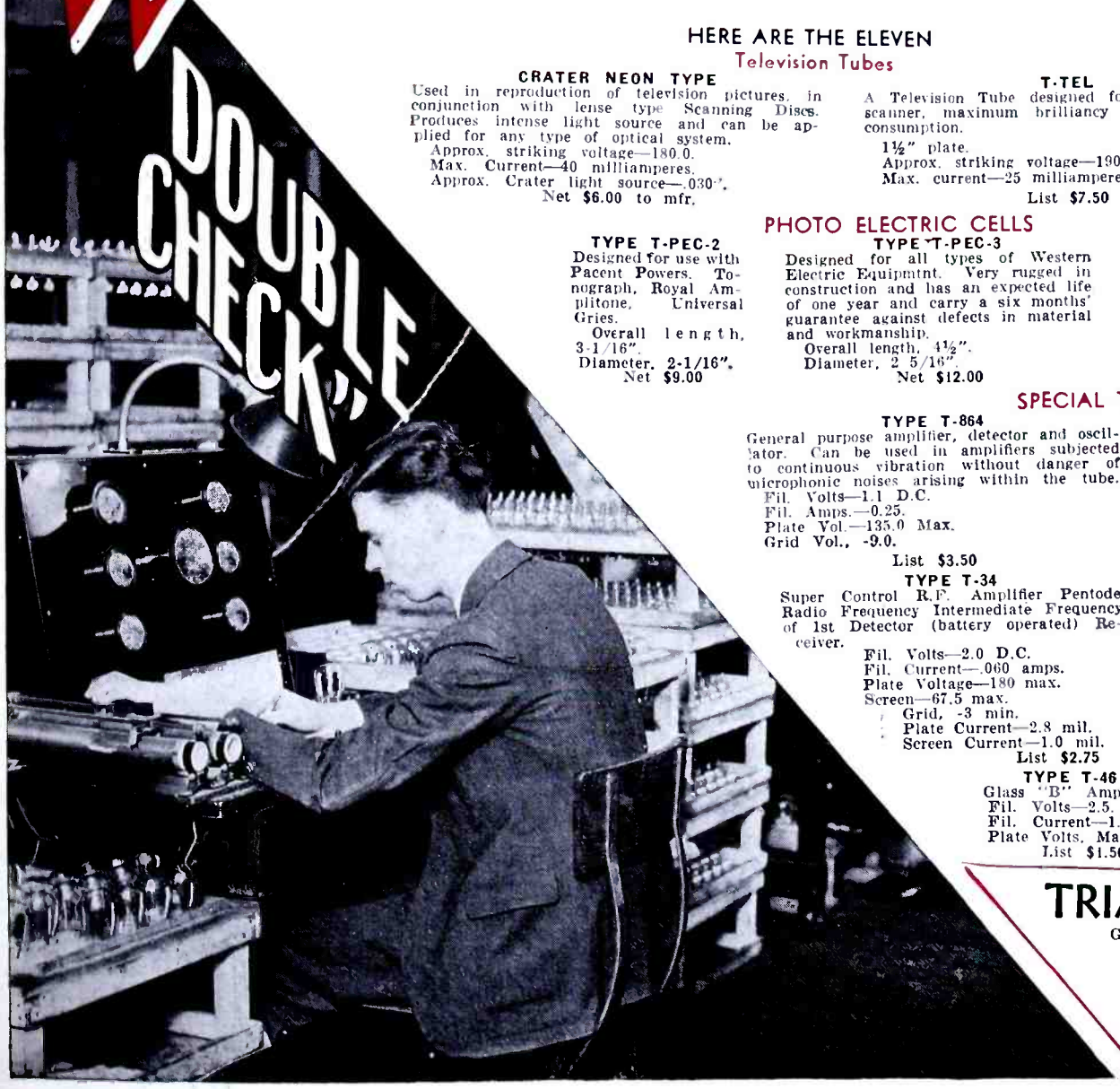
11 NEW TUBES *for* SHORT WAVES; Ultra-Short Waves and TELEVISION



Every experimenter in these three new radio fields realizes that satisfactory results depend upon good tubes. Our engineers are Short Wave and Television enthusiasts themselves. They know your problems from actual experience. They are working night and day to give you tubes which will eliminate many of your former troubles. Therefore Certified Triad Tubes are double-checked, aged, and accompanied by a certificate—giving you the exact characteristics of the very tube you get.

CERTIFIED TRIAD TUBES



HERE ARE THE ELEVEN Television Tubes

CRATER NEON TYPE
Used in reproduction of television pictures, in conjunction with lense type Scanning Discs. Produces intense light source and can be applied for any type of optical system.
Approx. striking voltage—180.0.
Max. Current—40 milliamperes.
Approx. Crater light source—.030".
Net **$6.00** to mfr.

T-TEL
A Television Tube designed for use with usual scanner, maximum brilliancy with low current consumption.
1½" plate.
Approx. striking voltage—190.0.
Max. current—25 milliamperes.
List **$7.50**

PHOTO ELECTRIC CELLS

TYPE T-PEC-2
Designed for use with Pacent Powers. Tonograph, Royal Amplitone, Universal Gries.
Overall length, 3-1/16".
Diameter, 2-1/16".
Net **$9.00**

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Designed for all types of Western Electric Equipmtnt. Very rugged in construction and has an expected life of one year and carry a six months' guarantee against defects in material and workmanship.
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Designed for use with Universal (new) Motigraph, Pacent Powers, Cinephone, Royal Amplitone, Tonograph, Sterling Portable and Doublass Reproducer.
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Diameter, 1½".
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SPECIAL TUBES

TYPE T-864
General purpose amplifier, detector and oscillator. Can be used in amplifiers subjected to continuous vibration without danger of microphonic noises arising within the tube.
Fil. Volts—1.1 D.C.
Fil. Amps.—0.25.
Plate Vol.—135.0 Max.
Grid Vol., -9.0.
List **$3.50**

TYPE T-34
Super Control R.F. Amplifier Pentode Radio Frequency Intermediate Frequency of 1st Detector (battery operated) Receiver.
Fil. Volts—2.0 D.C.
Fil. Current—.060 amps.
Plate Voltage—180 max.
Screen—67.5 max.
Grid, -3 min.
Plate Current—2.8 mil.
Screen Current—1.0 mil.
List **$2.75**

TYPE T-46
Glass "B" Amplifier.
Fil. Volts—2.5.
Fil. Current—1.75.
Plate Volts, Max. 400.
List **$1.50**

TYPE T-866
A mercury vapor rectifier tube that will give a uniform voltage output regardless of the current drain up to the maximum peak plate current of the tube.
Fil. Volts—2.5.
Fil. Current—5.0 Amp.
Max. Peak Inverse Volt—7,500.
Max. Peak Plate Cur.—0.60 Amp.
Approx. Voltage Drop—11 volts.
List **$7.50**

TYPE T-82
Mercury Vapor Full Wave Rectifier. (Not interchangeable with Type T-80.)
Fil. Volts—2.5.
Fil. Current—3.0.
A.C. Volts per plate—400 max.
D.C. Output—125 mils.
List **$1.25**

TYPE T-205D
Special power amplifier. For use in special amplifiers and sound moving picture equipment.
Fil. Volts—4.5 volts.
Fil. Current—1.90 amperes.
Plate Voltage—350.0 volts.
Grid Voltage, -15.0 volts.
List **$7.50**

TRIAD MANUFACTURING CO.
TELEVISION MFG. CO.
Pawtucket, R. I.

Gentlemen:
Please send me the following Certified-check
Triad tubes, for which my money order for cash
$..... is enclosed.
Name.....
Address.....
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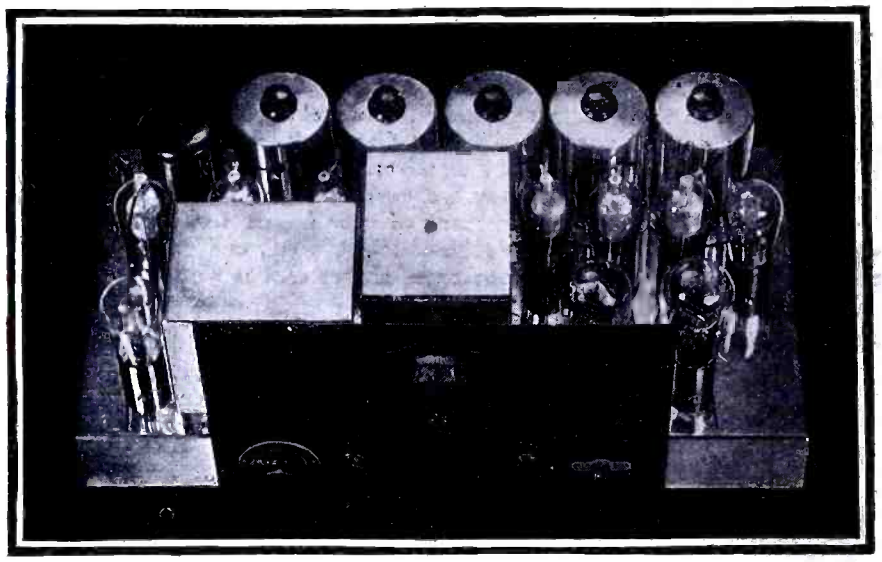
Your Ultimate Choice will be a *Super-Powered* LINCOLN

Super Power *Spans Atlantic, on* **Broadcast Band,** *in Broad Daylight*

St. Pierre and Miquelon.
I was surprised of the reception we have obtained on the broadcast band of 200 to 550 meters receiving by daylight many American stations in full strength as well as Radio Maroc, Africa on 416 meters and also as good results on the short wave band.

15 to 550 meters.
Six screen grid tubes. Four tuned I. F. stages deliver exceptionally high amplification. Each band of short wave frequencies is tuned through permanently placed coils and a small non-capacity selector switch on the front panel gives instant access to the four short wave and broadcast bands.



Lincoln DeLuxe Chassis

SW-32-110 V. 60 Cycles AC.—DC-SW-10-Battery Model

ALL-WAVE, WORLD-WIDE RECEPTION WITHOUT PLUG-IN COILS—

LINCOLN'S PHENOMENAL RECORD OF SPECTACULAR ACHIEVEMENTS GUARANTEES SUPER PERFORMANCE

SPEAKING ot records, reaa what Lincoln owners are actually getting . . . Three months of daily contact with Chicago from Baffin land, in the Arctic, by MacMillan expedition.

Exclusive news from Lindbergh Plane flying over Arctic, relayed to press by Lincoln Radio. Five continents tuned in two hours.

644 Verified stations on the Broadcast Band alone, by one Lincoln owner. JOFK, JOGK, JOCK, JOIK, JOHK, JOAK, JOBK (seven Japanese stations on broadcast band received by Lincoln owner in Oklahoma in one morning).

2YA Wellington, New Zealand; 2BL Sydney, Australia, brought in on broadcast band by Texas owner.

TELEGRAM: "Again congratulations this A.M. four to five logged 2 FC Sydney six eighty kilo JOBK Osaka eight hundred kilo KGMB Honolulu thirteen twenty kilo stop. This noon twelve CST logged WOPI, WLAC, WEHC, WSVJ, WROL, WDOD, KRLD, WTAM, WOWO, WBT, WJAX, WENR, WABC, KWKH, WHAS, XED, WBAP, WJZ, WBBM, WSB, XER, WGN, WOR, WLW, WPTF, WEAF, WSM, WEAO, WSAZ, WWNC, WNOX, WKRC. How is that for broadcast Mr. Hollister."

CHICKEN, ALASKA reports—"Under favorable conditions here in mid-winter we can pick up Germany, Sweden, England, France and Russia on the broadcast band. From ten to one P. M. in broad daylight they come in best."

SHORT WAVE RECEPTION

Enthusiastic reports of world-wide reception by Lincoln owners everywhere are too numerous to list in detail. One Lincoln owner has received 93 stations out of 131 stations listed in International Short Wave Club Log.

LINCOLN RADIO CORPORATION
Dept. SWC-8, 329 S. Wood St., Chicago, Ill.

LINCOLN
DeLuxe Receivers

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Please send literature to

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Address.....

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