THE RADIO EXPERIMENTER'S MAGAZINE

HUGO GERNSBACK
Editor

SHORT WAVE CRAFT

February 36

WORLD'S LARGEST SHORT WAVE CIRCULATION

25¢
IN U. S. AND CANADA

SEE PAGE 586

NEW WORLD GLOBES
for Short Wave Enthusiasts—
at New Low Prices . . .

THESE remarkable, new globes printed in a variety of popular colors are indispensable to short-wave fans. Notable among the many features of these world globes, is that they give life-time service. Short-wave fans are enabled to determine correct time in various centers of the world with the aid of these globes; distances from city to city can be accurately established. There is a graduated "Meridian" scale on each globe. Another feature is the movable hour scale found at the north pole—this facilitates determining the hour in any part of the world. You will be thrilled when you put the globe to actual use—measuring distances from New York to Moscow; from Cape Town to Tokio; from Los Angeles to Rio de Janeiro; etc. A flat map is deceptive for measuring, but take a small string and stretch it across the globe, from city to city, and you have the correct distances. Each globe contains a listing of several thousand cities in nations all over the world—spellings conform to International geographic standards—all globes are of 1935 production. They contain such important features as—traces of Admiral Byrd's recent voyage to Little America; Lindbergh's Paris flight; the new Japanese Empire; principal railroads; principal international short-wave radio stations and call letters; steamship routes; and other equally important data.

The colors on our fine handmade or library globe maps are refined and delicate. Nevertheless, the two types have an essential characteristic in common—their rich color harmony, in which each color of equal strength blends into a harmonious color unit.

The map surface of all models is protected by a high, glazed, water and scratch proof finish which can easily be kept fresh and new with a damp cloth. This finish will not fade, crack or become yellow with age. The colors are sun proof.

These globes add dignity to home, office, studio or laboratory—they are globes that everyone will be proud to own.

World Globe No. R-16

De Luxe World Globe No. R-16

This large, de luxe, 16" library globe is designed for those who prefer a globe of real distinction. It is the most comprehensive globe map published. It contains over 9,000 place names, new countries, geographic information, and other useful data. It is extremely easy to read—and can be used for accurate reference. Its distinctive mounting and beautiful coloring harmonize well.

POLITICAL INFORMATION

9,000 name places—Latest political changes (Suiyuan, Manchukuo)—Railroads—Steamship routes with distances—Caravan routes—Ancient ruins (Maya Persepolis)—Important sites (Boulder Dam, National Parks, Little America)—82 Shortwave radio stations and call letters listed—Submarine cable lines—Canals (Suez, Kiel)—Country and state capitals.

PHYSICAL INFORMATION

Mountain ranges—Mountain peaks, volcanos—Plateaus, steppes—Glaciers, shelf ice—Swamps—Deserts, oases—Ocean currents in white—Rivers and river systems—Important lakes—Cataracts (Nile)—Depressions (Death Valley)—Unexplored areas in white.

CONSTRUCTION

The ball is strongly made of three plies of composition board, reinforced within. The map is hand-mounted on a special prepared plaster surface which gives added strength and permits a glass-smooth finish. Water proof and scratch proof lacquer seals the map and preserves its fine colors.

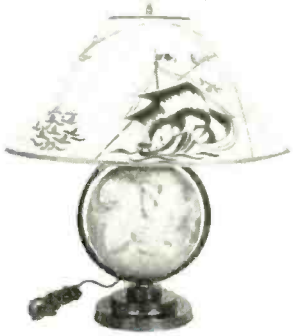
MOUNTING

Substantial, completely reversible meridian, antique brass plated with rim, numbers and degree marks brightly burnished. Revolves at a touch on ball bearings in a beautiful, solid walnut floor cradle stand of authentic Duncan Phyfe design. Heavy brass claw feet.

SCALE OF MILES

An inch on this globe's surface is equivalent to 500 miles on the earth's surface. Because of this convenient scale, the 16" globe is specified equipment in the schools of many states.

With this beautiful globe is included the 32-page illustrated booklet, entitled, "The Story of the Globe." The World Globe No. R-16 is moderately priced. Height—39¼". Shipping weight (ball and globe) 30 lbs. PRICE **$31.75**



World Globe No. L-7

This combination globe-lamp, in addition to its decorative value can be used as a reading lamp. The 7" ball, featuring 55 short-wave stations, has a full meridian, and rotates. The 16" diameter shade is parchment, handsomely wrapped in cellophane for protection. Nautical designs in harmonizing colors add to the attractiveness of the lamp shade. The metal parts are antique bronze striped with gold. Complete with plug and cord. Height—19". Shipping weight—5½ lbs. PRICE **$2.60**

World Globe-Atlas No. P-8

This combination world globe and atlas holder adds appearance and dignity to any room—it is very attractive. The globe measures 8" in diameter. It has a full, graduated, movable meridian, finished in statuary bronze and gold. Its stand is richly decorated in a walnut finish. With this world globe is included at no additional cost, a new 221-page world atlas. Height—13¾". Shipping weight—5 lbs. PRICE **$4.25**

Gentlemen:
I received the World Globe and am well pleased with its completeness, appearance and usefulness.
Short-wave listening has become a hobby with me, and this World Globe is a necessary accuracy to any short wave listener or, for that matter, to any home.
P. C. ELLIS, Supt.
Laboratory, 19th and Campbell Sts.
Kansas City, Missouri

World Globe-Atlas No. R-12

This globe-atlas combination is one of the finest pieces that could be placed in any home or office. The 12" library ball, with its brass-plated meridian, fits snugly into the finely constructed solid walnut stand. Provision is made below for the 1935 383-page atlas which accompanies each globe, at no extra charge. 67 Shortwave stations listed. Height—16½". Shipping weight—12 lbs. PRICE **$6.85**

World Globe-Atlas No. R-12

ORDER YOUR GLOBE TODAY!

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99 Hudson Street, New York, N. Y.

Gentlemen: Enclosed you will find my remittance of $..... for which please ship me the following World Globe.

( ) World Globe No. P-8 @ $4.25
( ) World Globe No. R-16 @ $31.75
( ) World Globe No. L-7 @ $2.60
( ) World Globe No. R-12 @ $6.85

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Address.....
City..... State.....

Send remittance in check or money order—register letter if it contains cash, stamps or currency. GLOBES ARE SHIPPED FROM OUR WAREHOUSE IN CHICAGO—F. O. B. FROM THAT CITY.

All globes are carefully packed in original, corrugated protected, cartons, assuring safe delivery. ORDER BY NUMBER. Send check or money order, plus sufficient postage for delivery by parcel post. Globes are shipped from our Chicago warehouse. Register letter if it contains cash, currency or stamps. Specify if shipment is to be sent express collect. ALL ORDERS ARE FILLED PROMPTLY.

SHORT WAVE CRAFT 99 HUDSON STREET, NEW YORK, N. Y.

WHAT'S NEW IN RADIO

OLD-TIME SERVICEMEN LOSING OUT WITH THEIR HIT-AND-MISS METHODS

RAPID DEVELOPMENT IN RADIO—new and improved circuits—special purpose tubes—Radio's expansion into many allied fields—have created an increasing demand for Radio servicemen. BUT—only the trained servicemen—the men who have secured a firm grounding in the fundamentals of Radio, in modern service technique, and who have kept up with all the modern developments of Radio are in a position to take advantage of this.

TODAY'S RADIO SERVICEMAN IS a different person from the serviceman of five years ago. Today, the successful serviceman must really be a trained service engineer—capable, quick, ingenious, to solve the many problems he meets with when servicing the many types of Radios and other apparatus developed along Radio principles—which he is called on to repair, sell and service. The old-timer who simply changes tubes, pulls wires, holds his breath and hopes, can't get along today. On every side he sees efficient, trained men step into his shoes—go ahead faster—and make more money.

ALL-WAVE AND HIGH FIDELITY RADIOS, with their exact adjustments have brought forth many new service problems. This kind of service work requires a man with special knowledge and training. Not the old-time, hit-and-miss fellow. He may try—but he can't succeed. It's the well trained serviceman who cashes in. That's why we see many ambitious men everywhere geting into Radio service work—with sound training such as any man can get from the National Radio Institute. And that's why many servicemen with years of practical experience are also training themselves in the modern ways of servicing.

MODERN SERVICING METHODS are helping servicemen increase their earnings by greatly reducing the amount of time required to do a job. This enables them to handle a greater volume of work per day, and have more time to build up their businesses.

AUTO RADIOS BRING SPECIAL SERVICE PROBLEMS. The increasing volume of sales of Auto Radios is bringing with it an increased demand for trained servicemen who are capable of servicing Auto Radios quickly and thoroughly. Many new problems—such as ignition noises, insulation problems, servicing complicated and compact receivers, the ability to tell whether the car chassis or the receiver is to blame, vibrator defects—are being handled by modern, well-trained servicemen who are finding Auto Radio a means of increasing their incomes. Modern Radio schools—such as the National Radio Institute—are including thorough training in Auto Radio in their courses.

NEW BOOK TELLS ABOUT RADIO'S DEVELOPMENTS. Mr. J. E. Smith, President of the National Radio Institute, Washington, D. C., the oldest and largest Institute for training men for Radio through home study, has prepared a book telling all about the need for thorough training in Radio, for either "old" servicemen who want to prepare themselves for modern Radio servicing—or for the beginner who wishes to enter Radio either as a spare time or full time expert. Read the National Radio Institute's advertisement on the right—then mail the coupon for a FREE copy of Mr. Smith's book.

IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Roberts • Crouch • Wahner • Shuart • Lynch

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

GEORGE W. SHUART, W2AMN
Associate Editor

Contents for February, 1936

Features in the March "HAM" Issue

An "up-to-date" short-wave receiver for the "Ham" and "Fan"—"Communications" type, by George W. Shuart, W2-AMN.

40-Watt Amplifier for the S G 3 Transmitter, Using Screen-Grid Tubes.

A "Switch-Type" Band Selecting Receiver for the S-W Fan, by Ernest Kahlert.

At Last! A 1-Tube Super-Het Receiver, by Reginald Washburne.

The "Fan's Own" Receiver—Using 2 Metal Tubes, by Harry D. Hooton, W8KPX.

Certified Circuits

● SHORT WAVE CRAFT goes to a large expense in verifying new circuits. When you see this seal it is your guarantee that such sets have been tested in our laboratories, as well as privately, in different parts of the country. Only "Constructional-Experimental" circuits are certified by us.

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

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

OUR COVER

● Our cover illustration this month shows ultra short wave transmitter in operation aboard the ship which brought "Jimmy" Walker back to America. The important role played by ultra short waves in New York's reception to Mr. Walker is fully described and illustrated on page 586.

Published by POPULAR BOOK CORPORATION

HUGO GERNSBACK, President - - - - H. W. SECOR, Vice-President
EMIL GROSSMAN - - - - - - - - - - - - - - - - - - Director of Advertising
Chicago Adv. Office - - - - - - L. F. McCLURE, 919 No. Michigan Ave.
Los Angeles Adv. Office - - - -J. A. Kendall, Box 176, Arcade Annex
Publication Office - - - - - - - - 404 N. Wesley Avenue, Mount Morris, Ill.
Editorial and General Offices - - - - 99-101 Hudson St., New York, N. Y.
European Agent: Gorringe's American News Agency, 9A Green St., Leicester Square, London W. C. 2
Australian Agents: McGILL'S AGENCY, 179 Elizabeth St., Melbourne

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SHORT WAVE CRAFT is published on the 1st of every month. Twelve numbers per year. Subscription price is $2.50 a year in the United States and possessions. Canada and foreign countries, $3.00 a year. Single copies 25c. Address all contributions for publication to Editor, SHORT WAVE CRAFT, 99-101 Hudson St., New York, N. Y. Publishers are not responsible for lost manuscripts. Contributions cannot be returned unless authors remit full postage. SHORT WAVE CRAFT is for sale at all principal newsstands in the United States and Canada. European agents: Brentano's, London and Paris. Printed in U. S. A. Make all subscription checks payable to Popular Book Corporation.

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View of Students operating our Television Camera and Scanning Unit

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Don't let financial embarrassment hold you back . . . If you are short of money we'll send you details of an amazingly easy finance plan and consider your application. If accepted, you won't have to start paying tuition back until **five months from the date you start school** or 60 days after your required training period . . . and then you'll have **18 months** to complete your payments. This plan has enabled hundreds of ambitious fellows to get Coyne Training with very little money. It can do the same for you. Many of our graduates have found their extra earnings more than enough to cover the small monthly payments.

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NAME.....AGE.....
ADDRESS.....
CITY.....STATE.....

HUGO GERNSBACK, EDITOR

H. WINFIELD SECOR, MANAGING EDITOR

What Interests You Most In Short Waves?

A Prize Contest for Short Wave Enthusiasts

By HUGO GERNSBACK

● WHEN I started *Short Wave Craft* in 1930, over five years ago, I dedicated it to the great fraternity of Radio Experimenters. It has been edited under this policy ever since.

While radio experimenting embraces a very great endeavor, I am fully aware of the fact that times change and that readers require changes in their reading matter also. For that reason, we have made, from time to time, such changes in editorial contents which I thought were indicated by our readers' demands.

We usually follow the suggestions and advice given to us by readers, and have always been guided by such suggestions.

It has occurred to me, however, that due to various changes in the radio industry which take place right along, that it was time to take a new vote from our readers in order to find out just exactly what reading matter our readers are looking for in *Short Wave Craft* today.

For instance, when we started in 1930, the *one* and *two tube battery set* was foremost in the minds of our readers. Today that has changed, and experimenters seem to go in for multi-tube sets, as well as other endeavors. These endeavors are so multifarious, that I thought it best to inaugurate a new prize contest, whereby you would be invited to list the things which interest you most in short waves today.

Elsewhere in the magazine, you will find the rules and regulations of this simple contest, which evolves itself into the following:

WHAT ARE THE TEN THINGS IN SHORT WAVES THAT INTEREST YOU MOST TODAY?

This is the heart of the contest, and I believe that by the time this contest is over, we will have found out many new things that interest readers today, far more so than an occasional letter from you would indicate. But please, before you start out making a list, *be sure that you read the rules of the contest* as otherwise your entry may be disqualified. In any contest of this type, certain rules are required, as you probably appreciate, because of the tens of thousands of letters that pour in on the judges. For this reason there must be a certain uniformity, otherwise the judges will find it difficult to award the prizes.

This contest should prove of great interest to all of our readers because it will crystallize the opinions of thousands of short wave enthusiasts and will show all of us the prevailing tendency in short waves and how the majority feel about the subject in general.

But whether you are out to win a prize or not, I trust you will participate in the contest, because it is necessary with a major question of this type to get *all* of the opinions that the Editors possibly can get from *all* quarters.

I trust you will not disappoint me, and will enter this contest spiritedly.

$50.00 in Prizes

for the best letters answering the question,

WHAT ARE THE TEN THINGS IN SHORT WAVES THAT INTEREST YOU MOST TODAY?

First Prize	**$20.00**
Second Prize	**$10.00**
Third Prize	**5.00**
Fourth Prize	**3.00**
Fifth Prize	**2.00**
Sixth to Fifteenth Prizes, each	**1.00**

(Be sure to read the rules on page 588, before you start.)

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

This is the February, 1936 Issue—Vol. VI, No. 10. The Next Issue Comes Out February 1.

Editorial and Advertising Offices, 99-101 Hudson Street, New York City

I'LL TRAIN YOU *Quickly* FOR SPARE-TIME AND FULL-TIME JOBS IN

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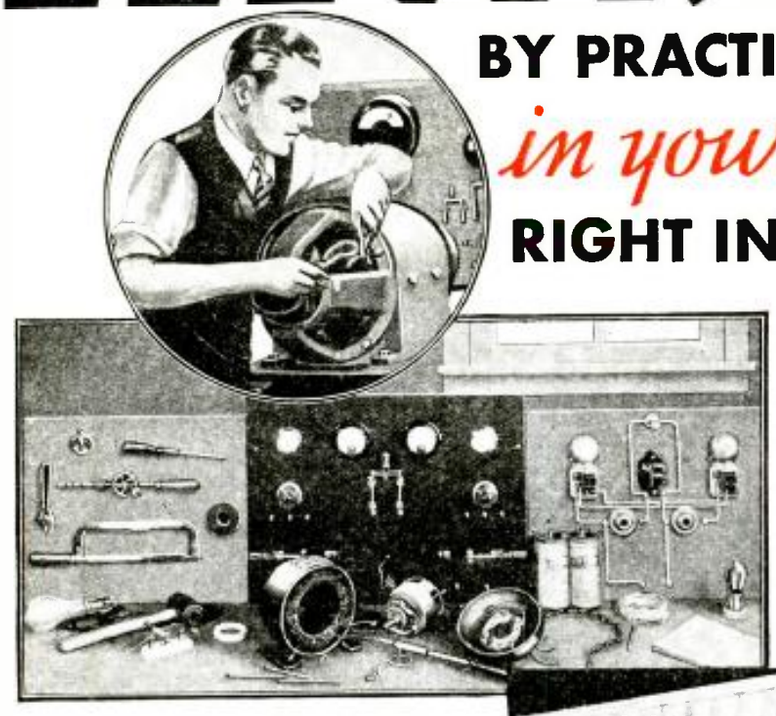

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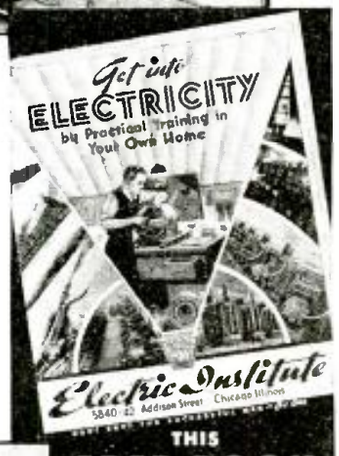

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—EARN EXTRA MONEY BY DOING PART TIME JOBS WHILE LEARNING!

Opportunities to make $5, $10, or more a week while training.

By the most practical, most amazingly easy method of home shop training, the fascinating mystery of electricity is unfolded to you step by step in a way that anyone can quickly understand and which is intended to make you a **real** practical trained man and **not** a theoretical engineer. I have designed this course so that it is possible for my **students to start earning money almost at once.** Do not confuse Electric Institute Training with a theoretical course, with dry text books and tiresome theories. By this new method, you are told—in **plain, simple words**—exactly what to do, and why . . . **then you do the actual jobs, with real, full-size electrical equipment** which we furnish without extra cost as a regular part of your training. That's the modern, easy Electric Institute way to become a **practical skilled electrician in your spare time without leaving your present job** until you are ready to step into a real electrical job.

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H. W. PETERSON
President, Electric Institute

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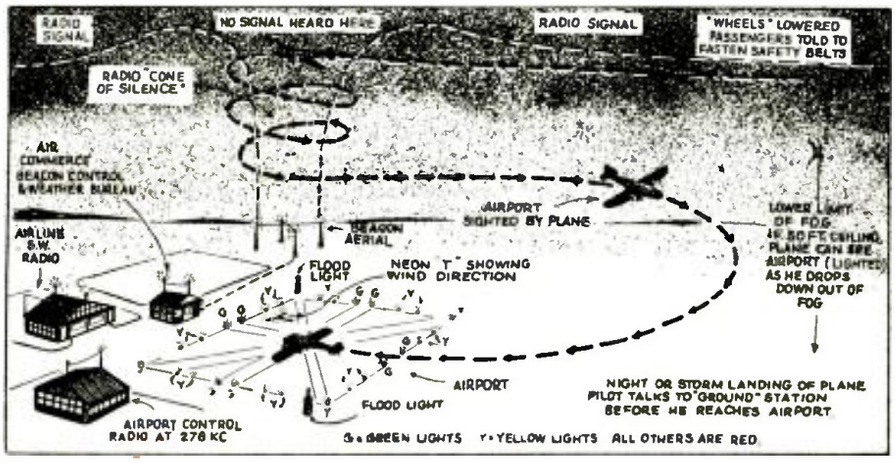


Illustrating how plane's pilot knows when he has arrived at airport; no beam signal is heard when he flies across the "cone of silence" above the radio station.

● Very few people are aware of the important rôle short waves play in guiding over 600 giant passenger Air Liners, night and day, across the country. Mr. Roberts, who specially prepared the accompanying description of how modern airplanes frequently fly "blind" through fog and storm, actually made the described flight for SHORT WAVE CRAFT and much of his time was spent in the cockpit with the pilots. The method of handling dispatches to and from the air liner, and the manner in which the radio beacon signals are used to guide the liner, are authentically here described by Mr. Roberts, who is also a pilot himself.

Flying the Radio Beam

How Short and Long Waves Guide Planes Along Airways

By Henry W. Roberts

Pilot and Aviation Expert

● A DIAMOND star burst brilliantly before our eyes. A myriad of white snowflakes, caught in the gleam of our lights, sped out of black nothingness, to be lost again in the night, their brief trails radiantly streaking the darkness in a never-ending scintillating brilliance, a bursting shower of white sparks. . . . A click of the switch, and the lights are out—the magic is gone, and again we are suspended motionless in a dark opaque void without an end. Seven thousand feet below lies an invisible earth.

Flying Through Snow!

Seven thousand feet, and climbing . . . Outside, the snowstorm is raging in cold fury. It is chilly in the cockpit. The pilots had put on their smart blue overcoats half an hour ago. Earphones clamped over their visored gold-braided caps, they sit at the controls, calmly competent, occasionally moving the wheel a fraction of an inch, or glancing at the maze of instruments before them. The instrument board glows faintly with soft green luminous dials; a tiny light is shining over the flight instruments. There is no sense of motion; only the distant muffled roar of the powerful engines, and the dry rustle of snow against the windshield to tell us that we are moving. Close to two hundred miles an hour. Eight thousand feet now. Still climbing . . .

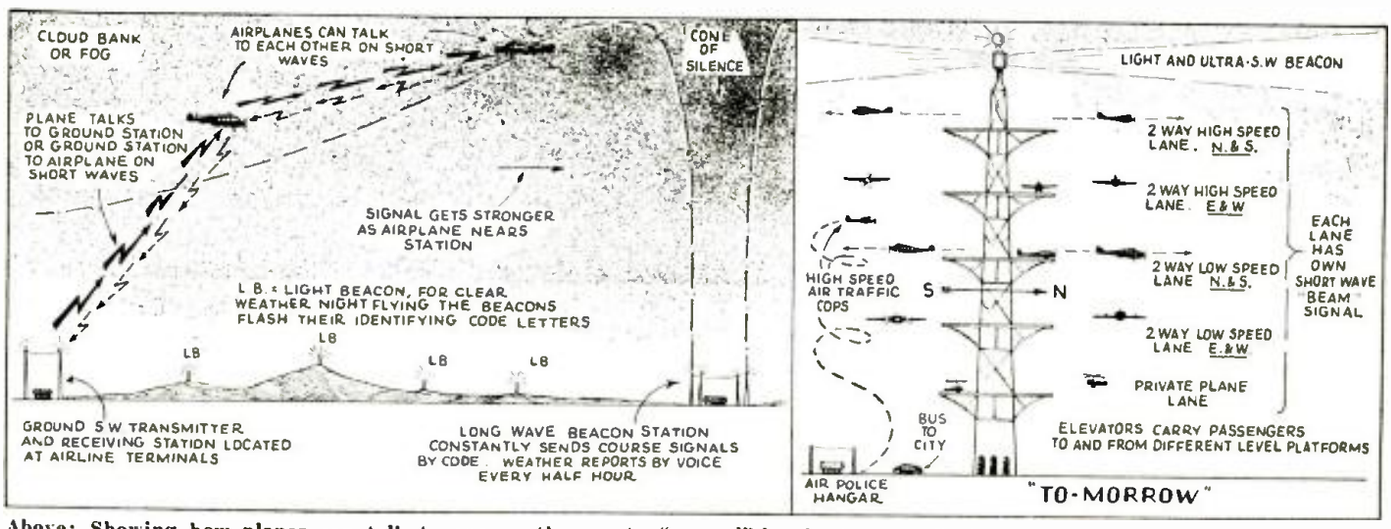
In the darkened cabin, a dozen passengers are dozing through the storm. It is warm here. The little girl in seat number four curled up like a kitten, fast asleep. Across the aisle and two seats further down, an elderly man is reading a magazine by the shaded reading light above his seat. In the back of the cabin, two cigarettes glow in the dark, momentarily revealing a tousled blonde head and a sleek dark one, suspiciously close together. It is snowing hard outside. Far out, at the wingtips, the red and green navigation lights are glowing nebulously through the driving snow. Let it snow. It is warm and cozy here.

Every Night at Ten . . .

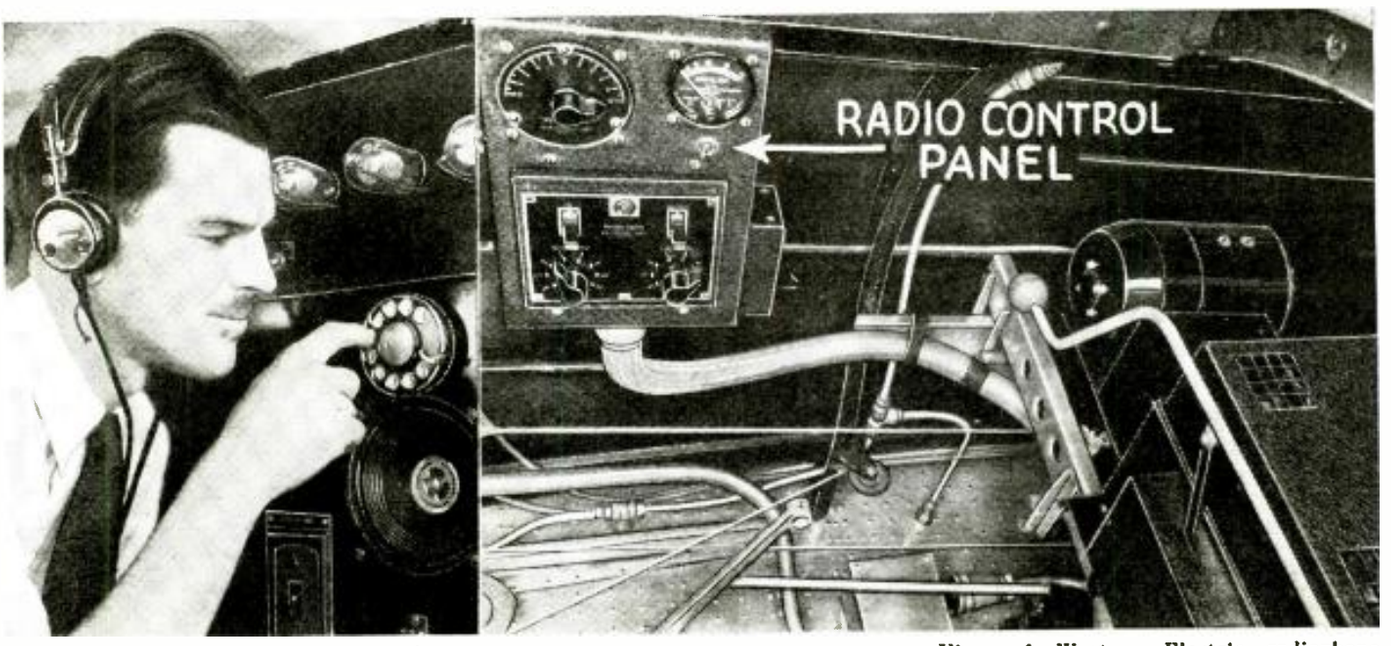
It was blowing half a gale at New Orleans this afternoon when our ship left the runway at the Shushan airport. It rained all the way across Alabama, but the sun shone warmly over Georgia as we approached Atlanta for a landing. We watched the sun set over the hills of the Carolinas, and saw the stars shining crisply in the clear winter sky over Washington. This afternoon and evening, in three easy strides, our ship flew twelve hundred miles, and is now winging her way through a snowstorm on the last leg of her journey North. Every night at ten a ship looms in the southern sky at the Newark airport, and five minutes later taxies up to her hangar, bringing passengers, mail and express from the Gulf. We are aboard that ship tonight—safely, *and on time!*

Radio Waves Guide Airplanes

Since the moment our propellers started turning at New Orleans, we were never alone. Radio signals crackled through the air, telling us where we were; unseen voices followed our prog-



Above: Showing how planes can talk to one another or to "ground" by short waves. Right: Fourteen years ago Hugo Gernsback, the editor, proposed the graduated air-lane and "Air-Traffic" Tower shown at the right.



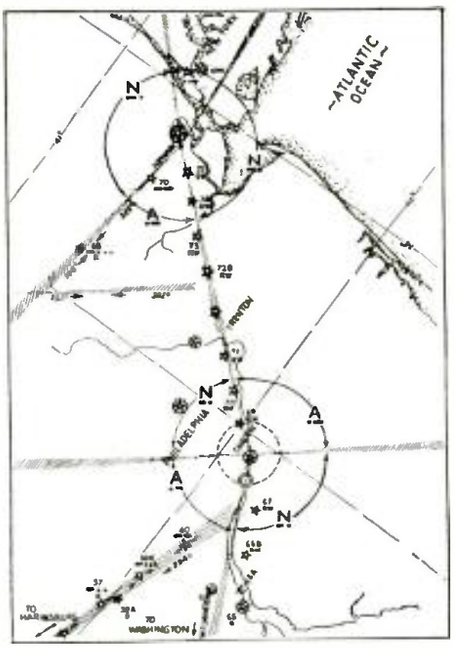
Station dispatcher at a "ground" station of the Eastern Air Lines, using the selector dial which serves as remote control. By means of this dial, the dispatcher can switch frequencies, control volume and switch the receiver.

View of Western Electric radiophone equipment installed in plane. Rectangular panel at the left is the 8-C control unit containing: in the upper left the on-off switch for the short-wave receiver, upper middle the frequency shift indicator which lights until a shift in frequency has been properly completed, upper right the on-off switch for the radio transmitter, lower left the gain and sensitivity control and lower right the volume control for the short-wave receiver. Above and to the right of this panel is the antenna meter, which indicates the "power output" in the antenna. At the right is first the 1,050 volt dynamotor for the transmitter plate circuit and then the short-wave receiver; just below it is the transmitter. The curved white shaft running diagonally towards the lower right is the frequency shift.

ress, told us of the weather ahead, and guided us past other ships in the air. Now, as we fly through the storm, the invisible tentacles of the radio beacon reach into the darkness and guide us on our way.

Day and night, on both sides of the broadcast band, the air is throbbing with radio messages, by voice and code, as the speeding ships talk to their airports. Ninety-four long-wave radio range beacons stretch from coast to coast in a mighty network, guiding aircraft along the highways of the sky; every half hour, Federal weather stations cut in with the latest forecasts; low-powered marker beacons along the route tell the pilots of their progress. On the short-wave side of the broadcast band, a hundred air liners talk to each other and to their ground stations.

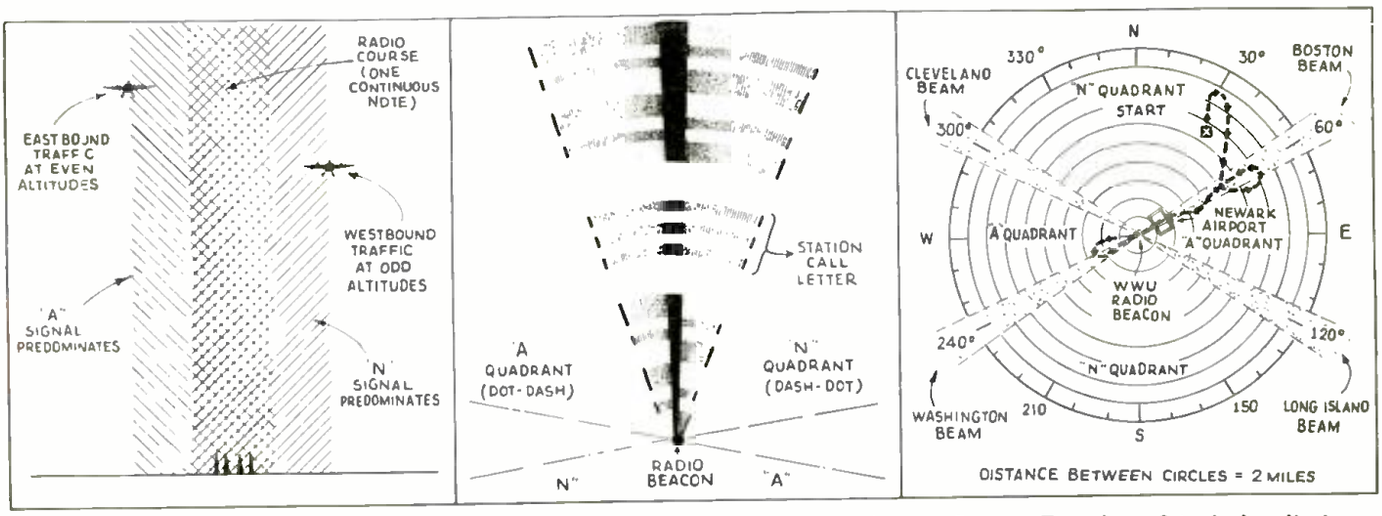
The backbone of radio air navigation is the radio range beacon system. Operated by the Bureau of Air Commerce, it serves 18,655 miles of principal airways, and is used by the Government, the air lines, and the private fliers whose



Typical flying map, showing "radio beams"; the identifying code signals are marked on the original map, also all important towns, light marker beacons, etc.

ships are equipped with radios. A few sensible rules govern the use of the radio beacons in bad weather, and the whole system works so simply and efficiently that there has never been a mid-air collision while flying by radio, nor need ever be.

The beacons operate on frequencies between 200 and 400 kilocycles, and each beacon is assigned its own frequency and identification call letters. Two intersecting directional antennas divide the space around the beacon into four quadrants, (*Continued on page* 624)

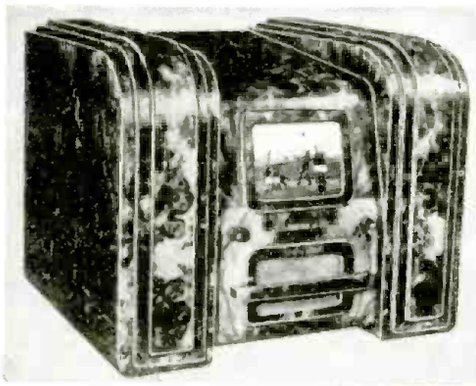


Left: How "A" and "N" signals overlap to form central radio beam to direct planes. Center: Top view of typical radio beam. Right: Simplified diagram of radio beacon showing how pilot finds airport "blind."

Short-Wave Picture Gallery

Short waves are finding many new and extremely useful applications every day—the photos herewith illustrate short waves applied to Television, Calling Firemen from Their Homes—Yes, even Popping Corn by Short Waves.

Right—Miss Alice Watherell is here shown popping corn, placed in a glass jar between two other glass containers of cold salt water; the short waves emitted are absorbed by the popcorn and converted into heat, thus popping the corn. A short-wave diathermy machine did the trick.

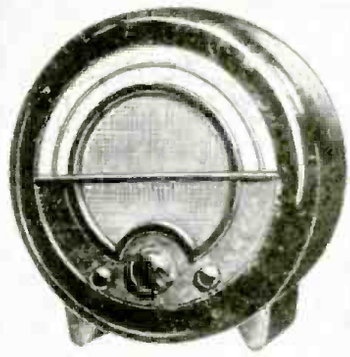


Above—The new Television Receiver made by an Italian company. The size of the image projected by the cathode-ray tube measures 8 by 10 inches, 240 lines, at 25 frames per second. Price, $640.00! Loudspeaker grill shown below image.

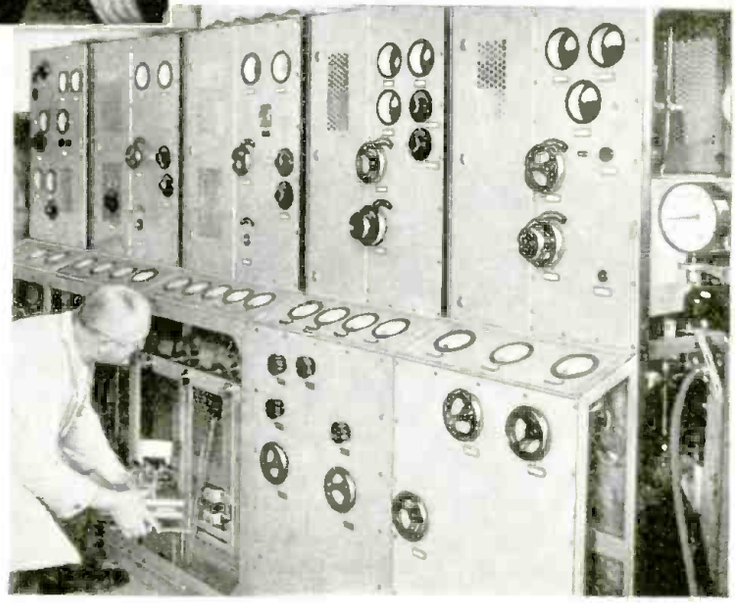
Left—Continuing our story of the French fire-alarm system operated by short waves; this system is installed in the town of Asnieres. This system was first described and illustrated a year ago in *Short-Wave Craft*, at which time it was merely a suggestion. Short-wave receivers and calling devices are placed in the homes of the volunteer firemen, and when an alarm is sent out, the firemen are thus summoned to headquarters.

Photos at right and below show short-wave apparatus used in France to call volunteer firemen from their homes and thus call them to headquarters in the event of a fire.

The small photo below, at right, shows new English receiver with extra large tuning dial bearing the names of the stations. With this length dial, tuning becomes a pleasure.

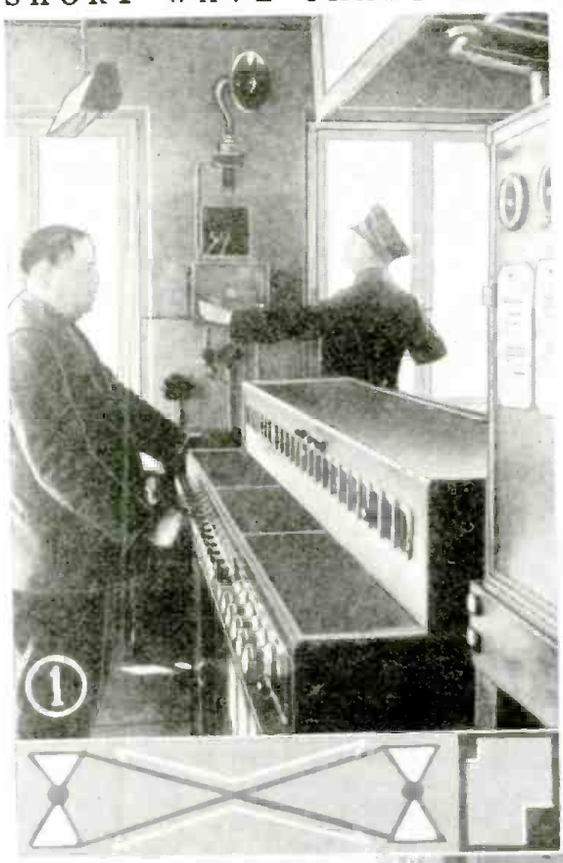


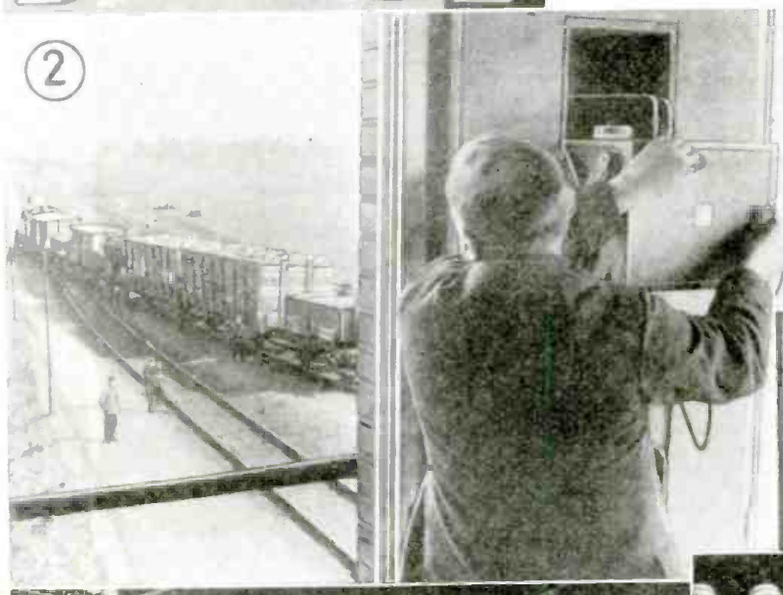
Below—16 kw. ultra short-wave transmitter of the Berlin Television Station for sending the "sound" impulses, the image being transmitted by another set of similar design, using a different wavelength.

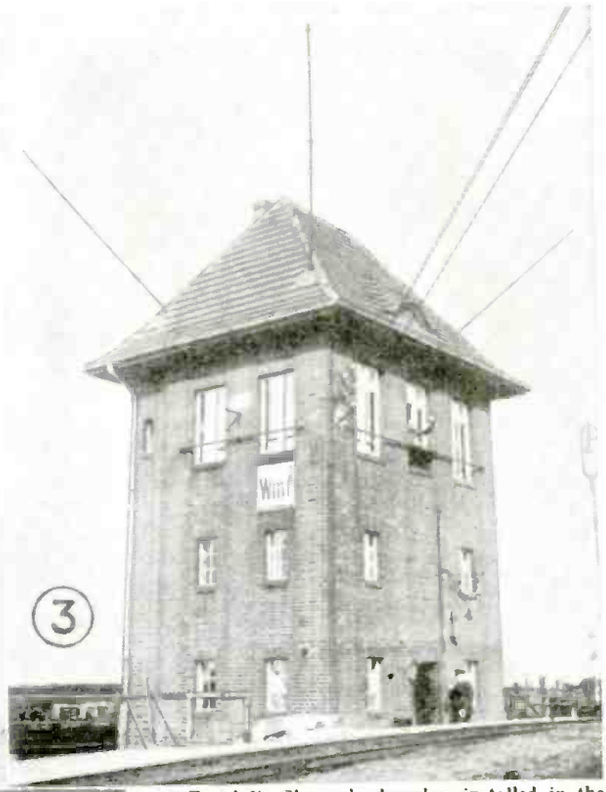


Ultra Short Waves Direct Trains

● AS these photos show, ultra short-wave transmitting and receiving apparatus has been practically applied to railroad trains in Germany. This method of transmitting orders verbally to the engineers direct from switch towers, greatly expedites the accurate shunting of trains. The usual visual signals along the track are sometimes misinterpreted, especially in foggy weather and the new ultra short wave phone system allows two-way conversation between the engineers and switch towermen as well as station train dispatchers. Directions can be given to the engineers or questions asked direct from the engine while the train is in rapid motion. After two years of experience, German locomotives are gradually being equipped with this apparatus.







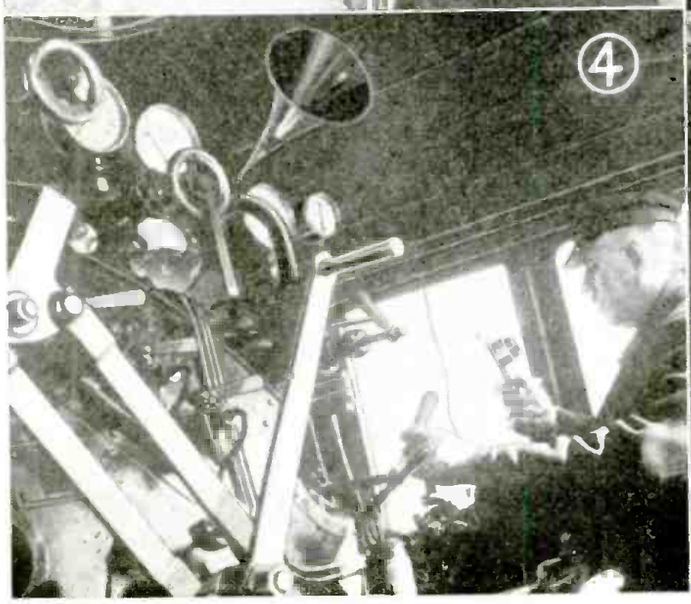
1. Top left—Shows loudspeaker installed in the switch-tower; a two-way conversation is afforded between the tower and the locomotive engineer.

2. Left—shows ultra short-wave phone apparatus installed in a switch tower with train being shunted.

3. Above—One of the switch towers of the Reich railway, showing the antenna masts for the short-wave two-way phone system.

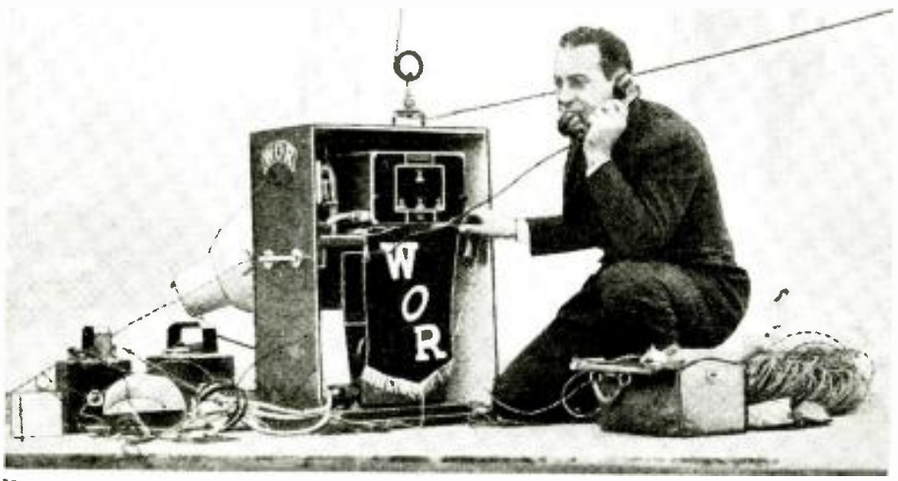
4. Lower left—Engineer with microphone and also loudspeaker in engine cab.

5. Below—Shows box in engine cab containing the whole ultra short-wave transmitter and receiver.



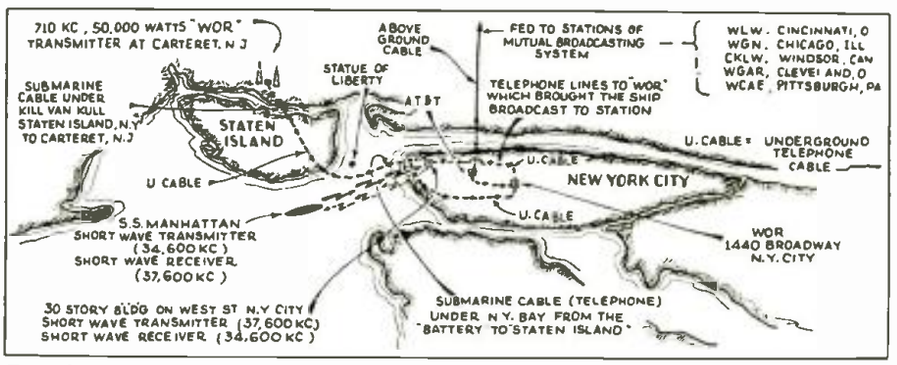
SHORT WAVES HELP WELCOME "JIMMY" WALKER

Short waves on the order of 7 meters were used to establish communication between the "S. S. Manhattan," bearing "Jimmy" Walker back to America, and Station WOR. A new portable short-wave transmitter was carried aboard the ship and was set up ready for action in ten minutes. A new light-weight ultra short-wave receiver was also used. A single 6-volt storage battery served both transmitter and receiver.



Here we see the operator in charge of the ultra short-wave transmitter and receiver aboard the S. S. Manhattan talking to the land station located in a downtown sky-scraper in New York City, from which point the voice was relayed through a wire circuit to the WOR master control room from which point the radio conversations were broadcast over the stations of the Mutual Broadcasting System.

● JAMES J. WALKER, more affectionately known as "Jimmy" to his many friends and admirers, recently returned to America from his sojourn in Europe, and ultra short waves played a very important part in the reception accorded Mr. Walker. Speeches of welcome flitted merrily back and forth between the *S. S. Manhattan* which carried "Jimmy" and his wife back to America, thanks to the ultra short-wave transmitter and receiver which was installed aboard the ship in ten short minutes, while the ship was at quarantine. The voices from aboard ship were picked up on the short waves, which were in the neighborhood of 7 to 8 meters in length, at a special *pick-up* station located in a tall building in downtown New York, at which point another ultra short-wave transmitter and receiver were also set up for the purpose of maintaining *two-way* communication with the station on the ship.



This diagram shows the relative locations of the ultra short-wave transmitting and receiving station erected on the upper deck of the S.S. Manhattan so that reception to James J. Walker could be instantly relayed to a land station located in one of the New York skyscrapers.

Wavelengths of 7 to 8 Meters Used

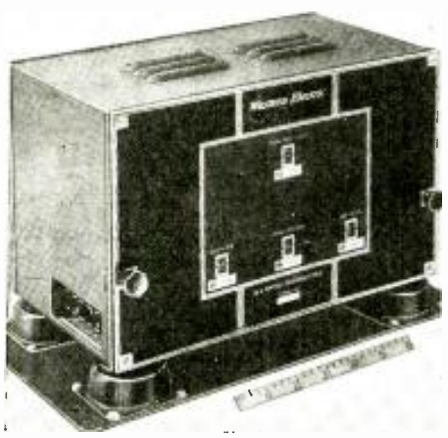
At the short-wave *pick-up* station ashore, transmission was carried on at a frequency of 37.6 megacycles and reception on 34.6 megacycles (wavelengths of 7.97 and 8.66 meters, respectively). Transmission aboard the ship was on a frequency of 34.6 megacycles and reception, for cueing purposes, on 37.6 megacycles.

The engineers of Station WOR have kindly supplied the data on this interesting transmission and reception on ultra short waves, and they report that this is the first time that this type of transmitter, which was originally designed for police radio cars, has been used for a broadcast pickup of this type. It is extremely interesting for radio men to note first, that the ultra short-wave transmitter and receiver used for the "Jimmy" Walker reception aboard the ship are both *battery-operated*, and further that a single 6-volt storage battery lighted the tube filaments in both sets. The high potential plate voltage was supplied from a dynamotor, the motor side of which operated from the same 6-volt storage battery which lighted the tube filaments.

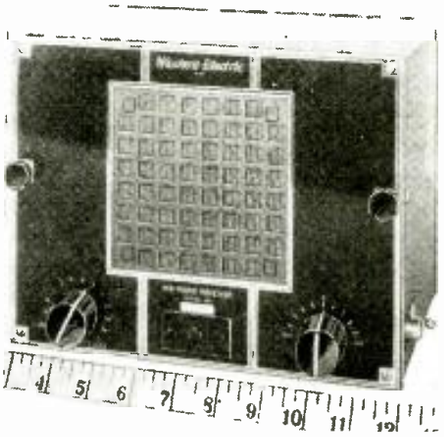
Antenna and Sets Mounted High

It is important in transmitting on waves as short as 7 to 8 meters, that both the apparatus and the antenna be mounted in as high a location as possible, so that the waves radiated from the relatively short antenna will have an unobstructed path to the receiving station. For this reason, the trans-

(*Continued on page* 614)



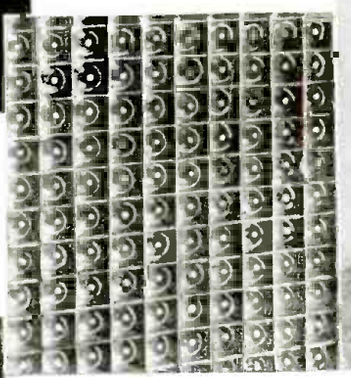
The new light-weight model 18A ultra short-wave transmitter, weighing about twenty pounds, and battery-operated, delivers 5 watts into the antenna; range, 30 to 42 megacycles.

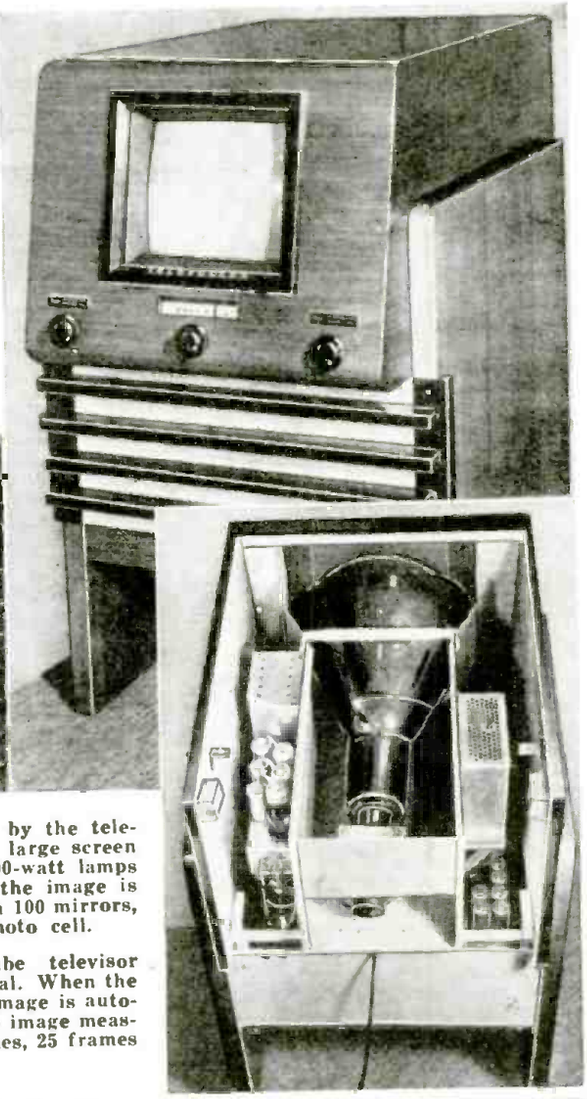


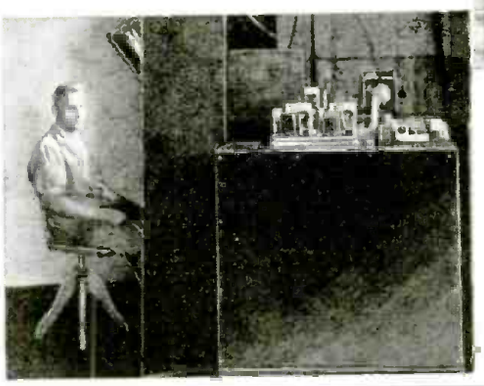
Appearance of the ultra short-wave superhet receiver, model 18. The filaments operate from a 6-volt battery and the plate voltage is supplied by a battery-driven dynamotor. Size 6x9x7 inches.

Television Advances in Germany

Above—Large theater-size television screen recently displayed at Berlin radio show. The screen measures 6.3 feet square and contains 10,000 small bulbs, close-up view of which appears at the right.







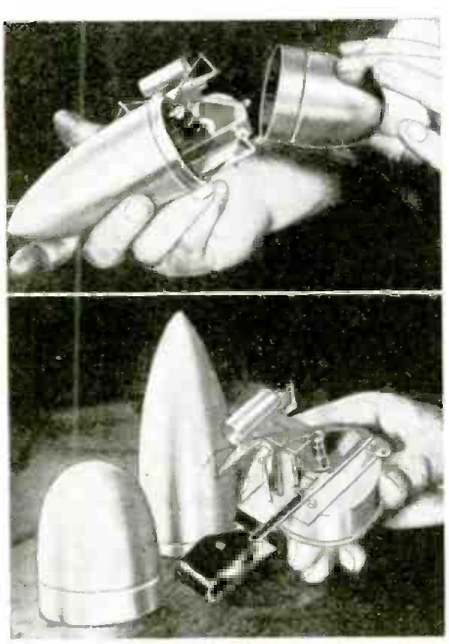
Left—Person being scanned by the televisor in connection with the large screen image shown above. Five 200-watt lamps illuminate the subject, and the image is scanned by a drum fitted with 100 mirrors, in connection with a photo cell.

Right—German cathode tube televisor which uses but one tuning dial. When the sound is tuned in okay, the image is automatically tuned in also. The image measures 7.5 by 10 inches; 180 lines, 25 frames per second.

Radio Weather Balloon

● THE photos below show a remarkable new instrument—a short-wave radio-meteorograph, recently perfected at the Blue Hill Meteorological Observatory at Harvard University, Cambridge, Mass. This instrument, combined with a 5-meter transmitter, is carried aloft by airplane or balloon, and transmits automatically every thirty seconds, signals which are instantly recorded by the Observatory on a revolving drum called a chronograph. These signals provide records of temperature, humidity, and barometric pressure. This very interesting instru-

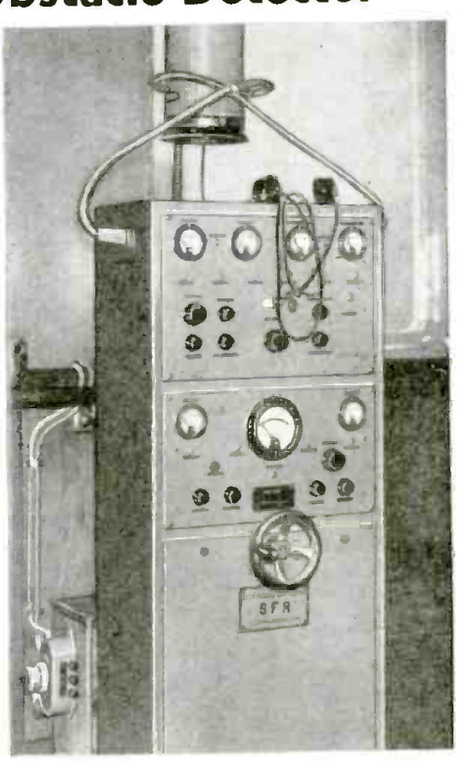
(*Continued on page* 615)



Short-wave radio meteorograph, open and closed.

S-W "Obstacle Detector"

● THE new Queen of the Seas, the S. S. *Normandie*, carries a marvelous new short-wave apparatus which is shown in the accompanying picture—it detects any "obstacle" ahead of the ship, such as an iceberg, a derelict, etc., by the reflection of ultra-short waves. This "obstacle detector" should be on every large passenger ship, and would have prevented many a disastrous collision in the past if it had been installed. By sending out an ultra-short wave and noting if there is any reflection of the wave, as indicated by a signal picked up on a sensitive receiver, the officers can tell whether the path ahead of the *Normandie* is "clear" or not. The distance of any obstacle ahead of the ship is also indicated. The apparatus is the invention of the French scientist and engineer M. Ponte.



Short waves actuate this "obstacle" indicator carried aboard the giant S. S. "Normandie."

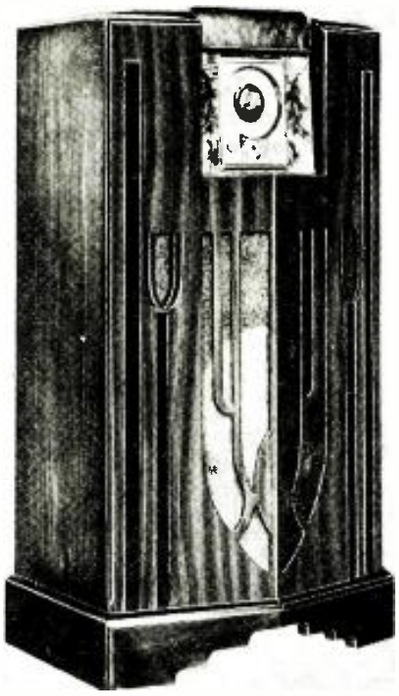
Awards in $200 "Cover Title" Contest

Veto M. P. Twaska of Pittsburgh, Pa., wins the handsome Midwest $200.00 Receiver for his "title"—

"The Shortest 'Wave' to a Man's Heart"

● WE are happy to announce the prize winners in our $200.00 cover title contest which closed on November 25th. Thousands of title suggestions flooded the editors who had a pretty tough time crawling out from under the avalanche of titles.

The winning title—*"The Shortest 'Wave' to a Man's Heart!"*, which took first prize—the $200.00 Midwest All-Wave Receiver of the console type here illustrated—was submitted by Veto M. P. Twaska, 3321 West Carson St., Pittsburgh, Pa., and this magnificent up-to-the-minute receiver in its beautiful cabinet, has been sent to Mr. Twaska by its manufacturers, The Midwest Radio Corp., of Cincinnati, Ohio, who so kindly offered this fine receiver for the best cover title submitted, as announced in previous issues of *Short Wave Craft*.



Mr. Veto M. P. Twaska, First Prize Winner, won this magnificent 18-tube radio set, complete in console cabinet of beautifully matched woods. It is valued at $212.50 by the makers, the Midwest Radio Corp.

As announced previously, 25 "Honorable mention" prizes were awarded for 25 next best titles submitted, and the winners of these prizes, 12 yearly subscriptions to *Short Wave Craft* and 13 yearly subscriptions to *Short Wave Listener* Magazines are as follows:

Awarded one year's subscription to *SHORT WAVE CRAFT*

"She Radiolizes Him," by Richard Davis, Ramsey, (R-1) Ind.

"Ethernal Love," by J. Kent Hogan, Toronto, Ont., Can.

"73-OM-ES-88-DE-XYL," (Best regards-old man-and love and kisses from-Wife), by George Fournier, Fall River, Mass.

"In Hands of the Receiver," by Nathan Solomon, New York, N.Y.

"She's Short Wave Crafty," by William Thurston, Jr., Springdale, Conn.

"The SHORTest, CRAFTiest WAVE to his Heart," by William H. Meredith, Philadelphia, Pa.

"And Dial Console You," by Ben Rickerson, Waco, Tex.

"Reception—Overwhelming!" by Hal R. Doolittle, Allenhurst, N. J.

"Happy Y-ears," by L. V. Longhway, Oklahoma City, Okla.

"Now Life Should be 'Tweeter'," by P. M. Ohlinger, Portsmouth, Iowa.

"Long Raves over Short Waves," by David J. Shinn, Elgin, Kans.

"A set he'll all-waves (always) remember," by Edw. Hoffman, Ft. Wayne, Ind.

Awarded one year's subscription to SHORT WAVE LISTENER.

"Dx'er to Woo Hiz Kay," by W. H. Fraser, Bracebridge, Ont.

"A Gift that is 100% Air-Conditioned," by Joseph T. Gleason, Brooklyn, N.Y.

"The Speaker of the Evening," by Leon Hennessy, Toledo, Ohio.

"A Short Wave Fan Dance," by David Bowman, Cincinnati, Ohio.

"High Fidelity begins at 22," by Mrs. C. A. Pickett, University City, Mo.

"Ham'n Megs!" by J. Kent Hogan, Toronto, Ont., Can.

"Hi' Frequency Love Amplified, Hi," by Jack Kogan, Philadelphia, Pa.

"Result of Close Mutual Coupling," by Chester Kaney, Forreston, Ill.

"There Antenna (Aint any) Better Birthday Gift," by Milton Shalda, Detroit, Mich.

"The Ohm is Now Complete," by John Ternosky, Toronto, Ohio.

"He's a Resistor, but She's a Transformer," by William Thurston, Jr., Springdale, (*Continued on page* 625)

$50.00 Cash Prize Contest

(See Editorial Page 580)

● $50.00 in prizes will be awarded to the best letters which, in the opinion of the judges, answer the following question in the most satisfactory manner:

WHAT ARE THE TEN THINGS IN SHORT WAVES THAT INTEREST YOU MOST TODAY?

1.—Answers to be written only on regular letterhead size paper, 8x10½".

2.—These letters must be either typewritten or written in ink, *no pencilled matter considered.*

3.—List each answer separately, and observe the following style: (example)

WHAT ARE THE TEN THINGS IN SHORT WAVES THAT INTEREST YOU MOST TODAY:

The following ten subjects are of most interest to me:

$50.00 CASH PRIZE CONTEST

First Prize	$20.00
Second Prize	10.00
Third Prize	5.00
Fourth Prize	3.00
Fifth Prize	2.00
Sixth to Fifteenth Prizes each	1.00

1.—Short wave set building. I continue to build these sets, mostly of the four tube A.C. variety, because I get best results from this type of set, etc., until ten subjects have been covered.

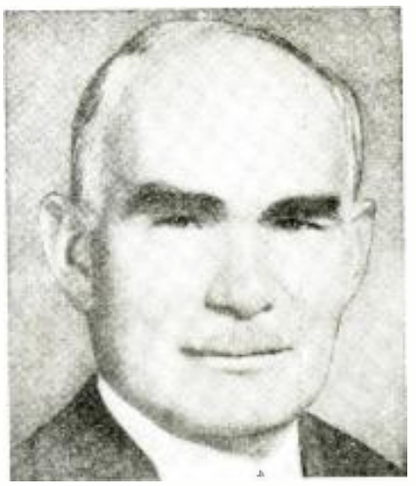
4.—The above is only a suggestion. Of course, you are to use your own ideas in answering each of the ten subjects, but be sure that you *give the reason* as shown in the example above for the guidance of the judges.

5.—It is essential that when you mention short-wave sets which you either build or which you may buy, *that you mention the number of tubes* as shown under the example, paragraph 3.

6.—Only one sheet of paper can be used, written on one side only. This means that (*Continued on page* 625)

"Modern" Aerials Invented 34 Years Ago By Dr. Lee de Forest

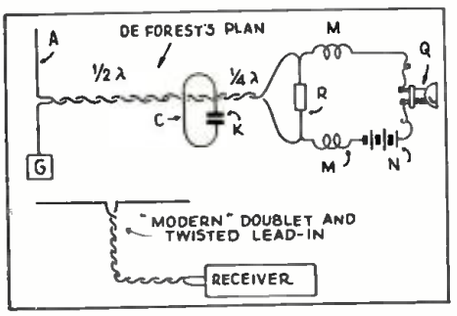
It is really remarkable to learn that 34 years ago patents were taken out by Dr. Lee de Forest, which covered all sorts of "newly invented" antennas, including the far-famed "concentric" transmission line and "twisted lead-in." U. S. Patent No. 730,246 and two sister patents—No. 730,247 and No. 730,819 covering fundamental antenna and Lecher wire "transmission lines" have been donated by Dr. Lee de Forest to the "inventors" of the host of present-day aerials, labeled with all sorts of fancy names, and with wires twisted into every conceivable contortion.



Dr. Lee de Forest, who experimented with and patented practically every one of the "new" short-wave aerials, including "twisted lead-ins," which we are using today!

● DR. LEE DE FOREST, pioneer American radio inventer, has undoubtedly enjoyed many a good laugh at the grand scramble of present-day inventors to devise new short-wave aerials with twisted lead-in or transmission lines, concentric conductors employing a wire within a tube, etc., for he could look back at the drawings in his U. S. Patent No. 730,246 (filed in 1902) and also Patents No. 730,247 and No. 730,819 and find therein practically everything that we have dished up to us today as *new* antenna inventions.

Dr. de Forest in a recent letter to the editor, said: "So much is appearing today in radio magazines regarding the use of the Lecher wire *co-axial* conductors and *twisted* Lecher wire *transmission lines*, in connection with ultra short-wave transmission and reception, particularly with reference to co-axial, and *reflecting one-quarter wavelength* antennae, etc., that I believe my patent No. 730,246, filed March 8, 1902, and issued June 9, 1903, would prove very interesting to the readers of *Short Wave Craft*.



The famous "twisted pair" lead-in, so popular to-day, was described in Dr. de Forest's patent granted in 1903!

"I am sure that you and your contributing engineers will be interested to know that at such an early date, I pointed out and patented the numerous advantages of the Lecher wire conductors in various types and forms for wireless communication.

"Even today, radio engineers have not yet realized some of the advantages to be obtained with twisted, tuned conductors, coiled up in convenient form. Such a condensed transmission line for ultra-short waves, comprising several half wave lengths, should be available today to insure accurate and stable tuning in place of crystals and frequency multiplier systems."

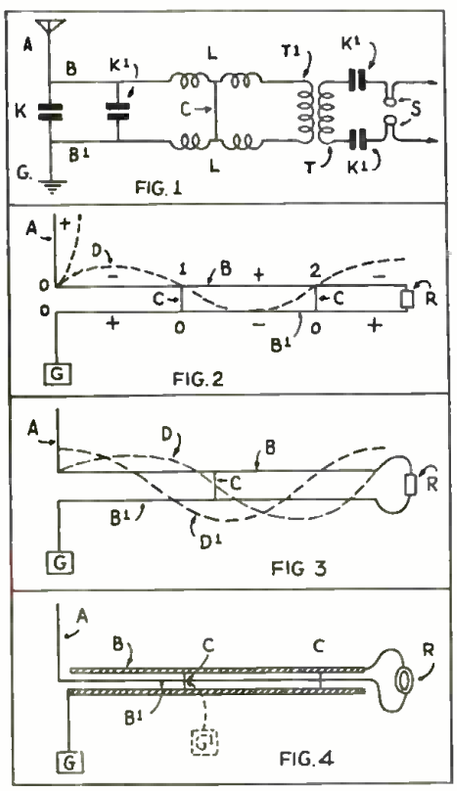
Patent No. 730,246—It Covered 'em All!

In Fig. 1, (all of these drawings are taken from the patent No. 730,246) shows a tuned antenna lead-in system which employs both inductance coils L and condensers K1 for adjusting the frequency of the line.

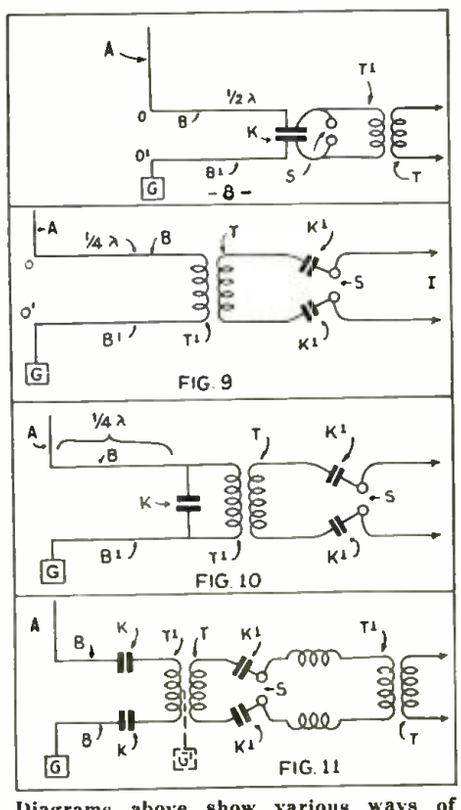
Fig. 2 shows a Lecher wire "transmission line" in use with a receiver or detector R, one wire B connected with an antenna wire A, and the other B1 to a ground G *or other capacity*, (which covers the widely-used present-day "doublet" antenna, which uses two equal-length antenna wires without any ground—Ed.). The wavelength or frequency relations between the length of the aerial wire and the lengths of the two wires, comprising the Lecher "transmission line," are all carefully specified in Dr. de Forest's patent. The bridges C may cross or "short" the wires at the nodes as the patent states, without destroying or seriously affecting the oscillations or propagation of the waves. These bridges may also be grounded as shown by the dotted lines at G1 in Fig. 4, without affecting the period of vibration.

In Fig. 3, the relative position of the electro-static and the electro-magnetic waves, separated along the wire by 90°, or by a quarter wavelength, are shown by the dotted lines, D representing the electro-static wave, and D1, the electro-magnetic wave. A detecting device operated by current or electro-magnetic waves is located at any loop of an electro-magnetic wave, as at R1 in Fig. 3.

(Continued on page 626)



Figs. 1 to 4 above, taken from the de Forest 1903 patent, show that the "Lecher" transmission line is not so new!



Diagrams above show various ways of connecting Lecher wire transmission line to transmitter, with equalizing condensers, etc.

The OCTODE "Metal Tube 3"

By JOHN CROUCH

—This 3-tube short-wave receiver covers all bands between 15 and 200 meters, and the tubes of the 6.3 volt type can be operated from batteries or A. C. Plate voltage may be taken from batteries, B-eliminator, or power supply unit.

Here we see the Octode "Metal Tube 3" in actual operation—one of its "new features" is the improved Sensitivity Control.

Photo at right shows rear view of the Octode "Metal Tube 3" receiver, which is ideally adapted to the requirements of the short-wave "Fan."

● THIS receiver meets the S-W "Fan's" demands for a small set employing the new metal tubes. The receiver about to be described employs a stage of untuned R.F. amplification feeding into a regenerative detector and finally into a single-stage audio amplifier. The receiver as built is for headphone reception, although it can be used for loud-speaker reception by the addition of another audio stage.

Octode Tube Provides New Control Feature

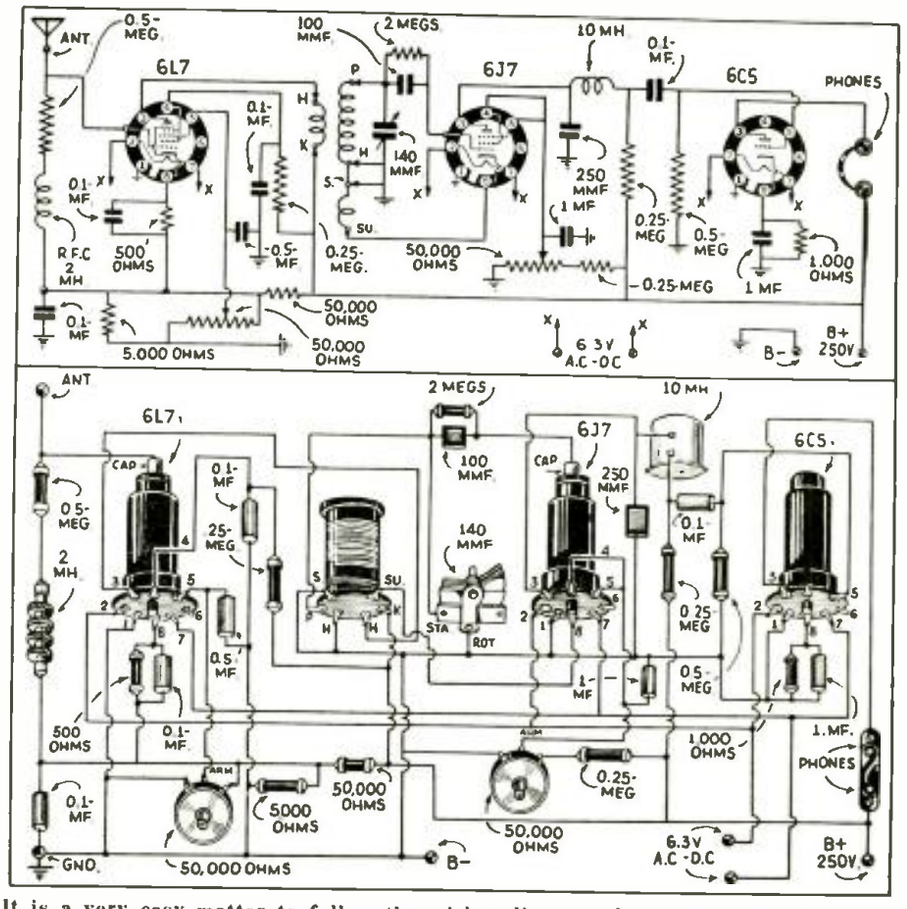
The R.F. amplifier employs a 6L7 tube. This tube is an *Octode* and is primarily intended to be used as mixer tube in a superhet. However it lends itself to many other uses and it was selected for this set because it offers a novel method of controlling the sensitivity. The 6L7 is in many respects similar to an R.F. pentode tube, but in addition it contains an extra control grid. This extra grid is used to feed the oscillator voltage to the 1st detector circuit in super hets.

In this little 3 tube set however the extra grid is connected to a potentiometer and a suitable negative voltage supply. Variation of the bias applied to the extra grid varies the sensitivity of the R.F. stage. The potentiometer thus acts as a *sensitivity control*. The advantage of this arrangement is that it keeps the volume control away from the signal circuits, where it might cause losses. It works very well in practice and has only a minor effect on the setting of the regeneration control.

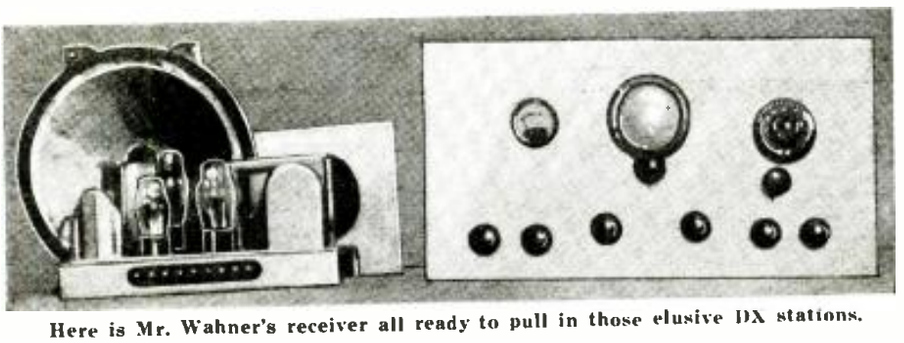
Detector Circuit Uses 6J7 Tube

The detector circuit employs a 6J7 tube. This is an R.F. pentode tube, similar to a 57 or 6C6. Regeneration is obtained by the electron coupling method with the tickler or feed-back winding of the plug-in coils connected to the cathode of the 6J7. Regeneration is controled by varying the screen voltage on the 6J7 tube. This is a tried and reliable method and works very well. The regeneration control is very smooth in action, with no "plopping" in and out of oscillation. The suppressor of the detector tube is connected to the screen-grid. Resistance coupling is employed between the detector and first audio, as it is the simplest and cheapest method and performs very well.

Ordinary 3-winding, 6-prong plug-in coils are employed in this set. With a 140 mmf. tuning condenser, four coils will cover the range from 14 to 200 meters. Band-spread is not incorporated in this (*Continued on page* 613)



It is a very easy matter to follow the wiring diagram shown above for the 3-tube receiver, which takes its name, "Octode," from the fact that it employs as an R.F. amplifier, a 6 element tube—the 6L7. This tube provides a new method of controlling the sensitivity.



Here is Mr. Wahner's receiver all ready to pull in those elusive DX stations.

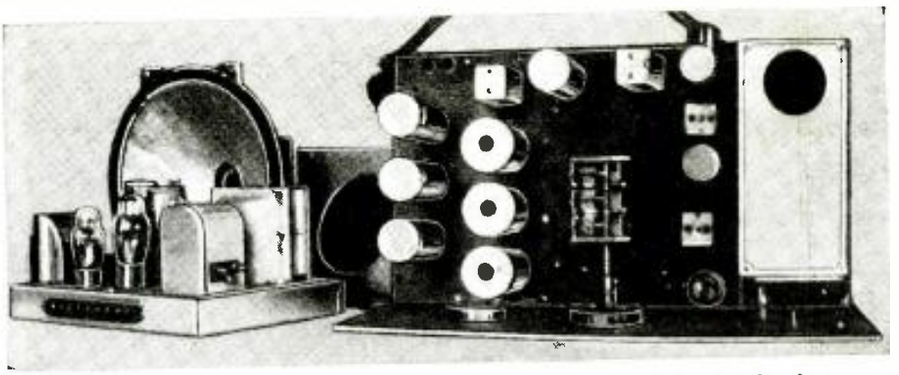
We are pleased to present this constructional article prepared for Short Wave Craft by Clarence O. Wahner, in which he describes in detail his 12-Tube superhetrodyne receiver. Many desirable features are incorporated in this set, such as 3 "IF." stages, uses separate detector and high-frequency oscillator, a C. W. beat oscillator, a frequency meter which aids in tuning, and band-spread. Visual tuning is provided through the use of a tuning meter. Many interesting angles on the superhet are brought out in this article; therefore, our readers should find it immensely interesting and valuable.

An Experimenter's Superheterodyne

By Clarence O. Wahner

● AFTER spending several years experimenting with different types of receiver circuits, all types of tubes and having passed through the stages of simple regenerative one tube sets, up to 16 tube hook-ups, the receiver herein described has finally been evolved. In its final form it is composed of 12 tubes, with the exception of one tube for the ultra-high frequencies which is operated only when receiving transmissions on these frequencies.

It is a most modern type of superheterodyne, very simple to operate, even though there seems to be quite a few panel controls. Each of these are quite necessary when extracting the utmost from a receiver. These controls always assure perfect *tracking* at all times.



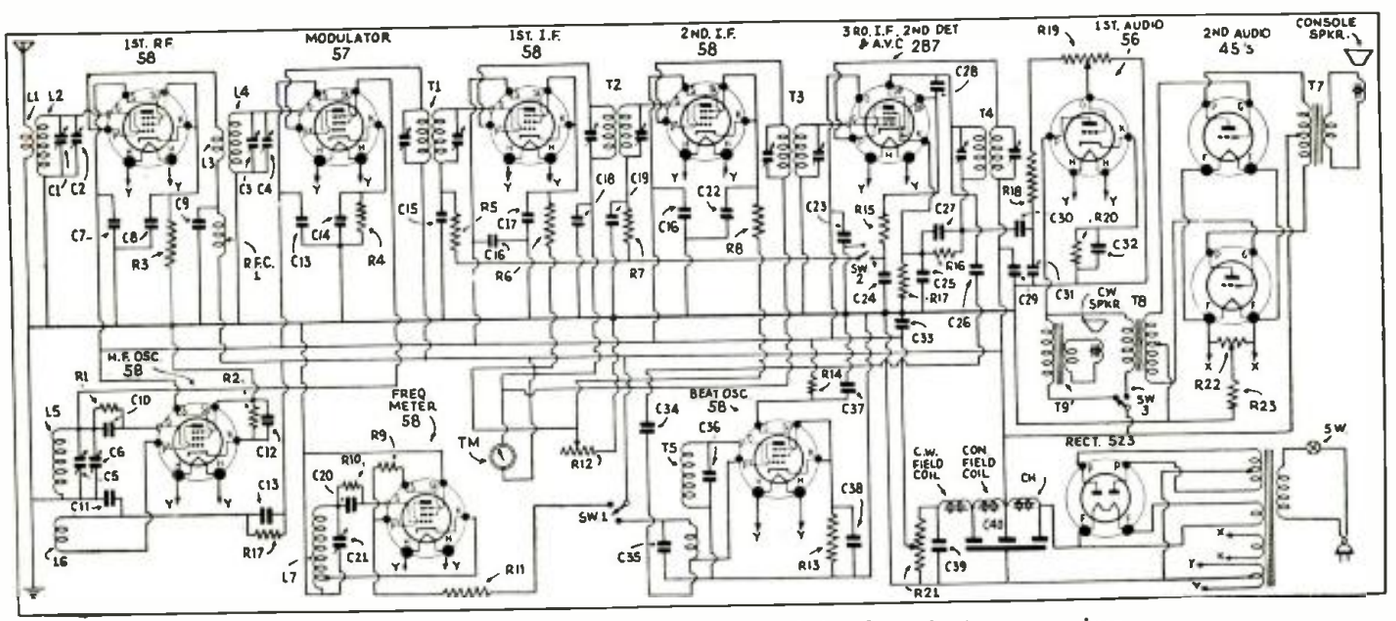
The parts are not a bit crowded in this receiver, as the photo clearly shows.

3 I.F. Stages Employed

An extra stage of intermediate amplification is incorporated in this receiver, bringing the total to three, even though ordinarily most sets have but two. The author believes in having an extra stage of intermediate amplification and running the total I.F. amplifier tubes with a slightly higher negative bias. This insures much quieter operation and less internal tube noise than if a smaller number of stages were used at their maximum efficiency. It also provides a great reserve of gain when "fishing" for those weak signals!

The *band-spread* feature incorporated provides tuning comfort. The *tuning meter* enables one to adjust the *band-setting* condensers at the proper point so that the ganged band-spread condenser will track over the dial.

(*Continued on page* 631)



Wiring diagram of Mr. Wahner's excellent superheterodyne short-wave receiver.

SHORT WAVES and Our Readers Forum. • • • LONG RAVES

R. S. Bailey, W8KQQ, Takes Prize This Month

Mr. Bailey surely has a neat station. Everything is shipshape.

Editor, SHORT WAVE CRAFT:

My transmitter uses the following—RK23 tritet *osc.* on 20 meters—RK20 first buffer; 242A—second buffer, and push-pull Eimac 150T's in the final amp., with 1000 watts input. The modulator is a pair of graphite plate 203A's in class B. RCA condenser microphone and usual speech equipment. The receiver is an RME—9DS with a Peak pre-selector. The antenna is a matched impedance type, the flat-top being 1½ waves long (99 feet) fed ¼ wave from one end with the Johnson "Q" feed bars. The "Q" section terminates in a "tuning box," which is in turn link-coupled by twisted pair cable to the transmitter tank. The transmitter operates on 14,245 kilocycles. and is held there by an "A" cut crystal mounted in an adjustable air-gap holder.

I have been a constant reader of your magazine since the very first copy (when they sold at 50c each) and have every copy from the first to the very last one published. I wish to congratulate you on this fine magazine. I note with interest how each copy seems to be just a little bit better than the one preceding it and hope you keep up the good work.

R. S. Bailey, W8KQQ
Centre Hall, Pa.

(A dandy 1k.w. phone transmitter, R.S.B. Congratulations O.M.—Editor.)

POCKET SET A PEACH!

Editor, SHORT WAVE CRAFT:

The super-regenerative Pocket Set circuit is a peach! I find it can be loaded on the aerial side and function well on the 160-meter band as a straight regenerative—by using 49M and a 3¼" outside diameter coil out of a broadcast receiver in series as aerial.

I copied all the airports from Albany, Chicago, Toledo, Cleveland, and Newark, while at Maplerest, N.Y.

Will you please tell all the Hams how to make a coil that can be tapped to switch points so as to function as a super below 49 meters and a straight regenerative up to 160 and 200 meters?

The data given in the Pocket Set functions well up to 49 meters; now if we could get a coil to go up from there it would be the gravy. Give us this in the next issue. This set will make a great transceiver on 5 meters.

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

Closing date for each contest—75 days preceding date of issue: Jan. 15 for April issue, etc. The editors will act as judges and their opinions will be final. In the event of a tie a subscription will be given to each contestant so tying.

I am planning one to hunt deer with in mountains of Pennsylvania this winter. One man in the group will be a licensed operator and direct the hunt.

L. S. HOOVER,
Boswell, Ind.

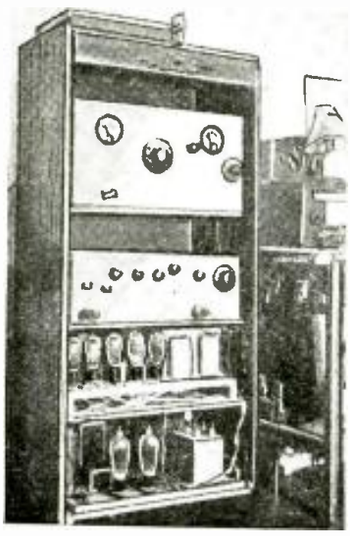
(You are right, O.M., about the "Pocket Set" being a "peach." By the number of letters we have received regarding the excellent performance of this receiver, it would seem to be the best 1-tube set that we have yet described. Regarding the coils for the longer wavelengths, it would be more practical to increase the size of the tuning condenser to 140 mmf. and use standard coil data, which, incidentally, can be found in practically every issue of SHORT WAVE CRAFT.

W2HJK Has Contacted 10 Countries

Editor, SHORT WAVE CRAFT:

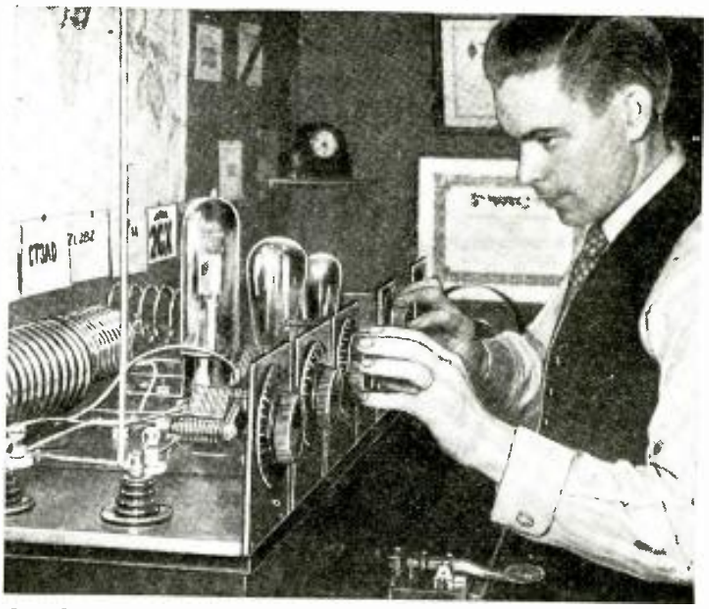
W2HJK has been on the air since July, 1934. In this time many different transmitters have been in use. The one shown on the enclosed photograph seems to satisfy me completely. On the bottom shelf is the main power pack giving 700 or 1400 volts. The next shelf contains the "keyer" tubes (for clickless keying), the bias power-pack and the power supply for the buffers. Going up to the next shelf one will find a 47 crystal oscillator, a 46 buffer or doubler, another 46 as a buffer, and then the "main buffer" which uses push-pull "tens." The final amplifier is a Western Electric 242A which runs either at 70 or 280 watts. This transmitter has been in contact with 10 countries in 3 continents. Australia and New Zealand are *worked regularly.* The receiver is a National FB7A. W2HJK is a member of the ARRL and is a ORS. Most of the work is carried

(Continued on page 619)



The complete transmitter of W2HJK

A Modern Danish "Ham" Station, OZ7CW



Our foreign brother, Aage Bau, OZ7CW, of Copenhagen, tuning up his modern Ham transmitter.

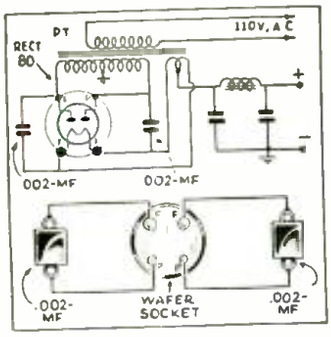
$5.00 FOR BEST SHORT-WAVE KINK

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

$5.00 Prize Winner

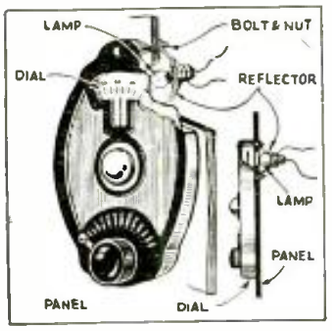
CURING TUNABLE HUM

When we climb to the ultra high frequencies of 28 or 56 mc. using regenerative type receivers powered from the 110



volt mains, a "tunable hum" often becomes very discouraging. Adding microfarads to the filter supply is of no avail, and it seems the higher we tune in frequency, the worse the effect becomes. The author of this kink hates using batteries when mains are available, so after a bit of experimentation, a way out of the trouble was found. The cure consists of connecting a .002 mf. fixed mica condenser between the plates and filament of the rectifier tube, as shown in the drawing. This was affected by inserting a wafer between tube-base and socket-bearing connections to the pins. These connections then went to the condensers externally, although if room is available, they can equally well be located under the chassis.—G. Merrin an.

▼ ▼ ▼



LIGHTING NATIONAL DIAL

Although few people realize it, the National dials are designed so that a light may be mounted behind the panel to illuminate the scale. In the drawing, I have endeavored to show clearly just how this is done. A hole should be cut in the panel in front of the bulb so that the light will shine into the dial. This aids considerably in tuning where the receiver is located in a part of the room which receives very little light.—Marty Analan.

▼ ▼ ▼

TAKING BETTER PICTURES

For those who are interested in taking photographs to be entered in **Short Wave Craft's** contest, I am submitting this kink: Remove the heater element from the usual electric heater and insert a large electric light bulb. This reflector will work very nicely and throw considerably more light on the pictures. Of course, the faithfulness of the photo will depend upon your ability in focusing the camera.—Leonard J. Wood.

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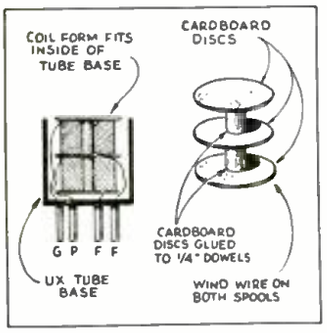
COIL CONSTRUCTION

Recently, when I constructed a 5-meter receiver which was a super-regenerator, I hit upon the following idea for constructing

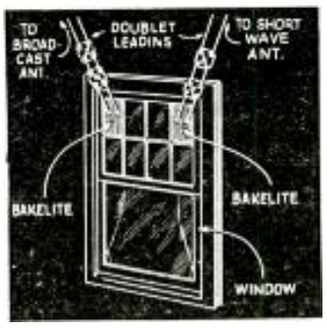


the low-frequency transformer. The constructional details of the forms are given in the drawing. The completed coil fits into a tube base; 1250 turns are used on one coil, and 750 on the other. This is simple to construct and will present a pleasing appearance.—Joe Horvath.

▼ ▼ ▼

LEAD-IN INSULATION

By removing the small glass panes from the top of a window and replacing them with bakelite panels, it is possible to bring the lead-ins through the unit without necessity of drilling holes through the glass. If better insulation than bakelite is needed, the now-popular Victron panels may be used. The panels are fastened into the window sash exactly the same as the glass panes were fastened.—Harold J. Clark.



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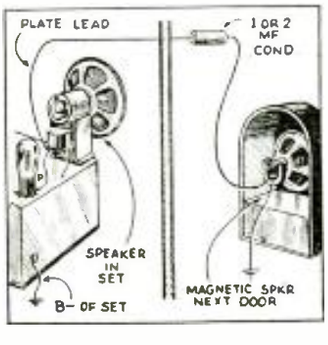
ADDING MAGNETIC SPEAKER

Many times short-wave "Fans" have felt the need of an additional loudspeaker, and in many cases it presents a real problem where manufactured radios are concerned. My problem was overcome simply by connecting a magnetic speaker, as shown in the diagram. One side of this speaker is connected to the chassis, while the other lead connects to the plate side of one of the amplifier tubes through a fixed condenser. This condenser should have a rating of at least 600 volts because, should it "short," considerable damage may be done to the receiver.—William O. Strath.



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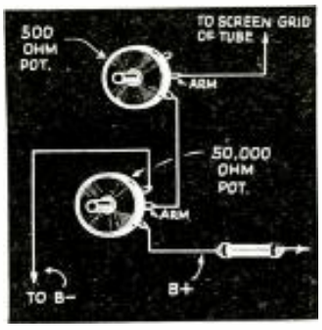
"BAND-SPREAD REGENERATION"

Doubtless, many of you have missed "fine catches" on account of a "jumpy" regeneration control. I have the following kink that I think will help give you perfectly balanced regeneration. I had an old 500-ohm potentiometer which I hooked together with the usual 50,000-ohm potentiometer, that gave perfect control. You can tune coarsely with the 50,000 ohm and use the 500 ohm for fine adjustment. This kink will be a great help in catching those stations (see diagram).—Webster Hayward.



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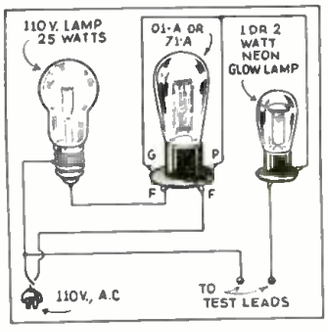
SIMPLE HOME-MADE TESTER

Here is a "kink" that has proved very valuable to me, and I hope will also benefit others. It is a simple "condenser analyzer" that can also be used for other purposes, such as continuity and tube leakage up to 10 megohms. In testing condensers, if the neon bulb flickers, it shows a good condenser; if it remains bright, the condenser is shorted; and if no light is seen, the condenser is open-circuited. Many other uses will probably be found.—Harland Whitcomb.



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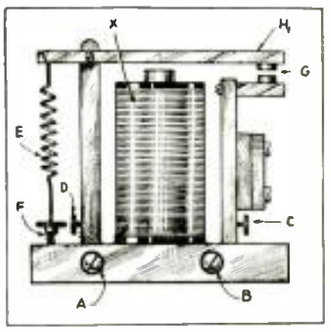
HOMEMADE RELAY

By rewinding a Ford generator cut-out with No. 28 D. C. wire, I made a very sensitive relay. The drawing clearly shows the general construction. "A" and "B" are the low current leads; "D" and "I" are the power leads used to make and break the desired circuit; "E" is a sensitivity spring; "F" is the sensitivity adjustment; "G" are the contacts; and "H" is the armature.

A relay of this type should find much favor among the Hams as it can be used as a keying relay on the more powerful transmitters where keying direct would be too dangerous. The coil can consist of a pole-piece of an ear-phone or loudspeaker unit. These will require some 10 to 15 volts to operate.—Merlyn C. Herrick.



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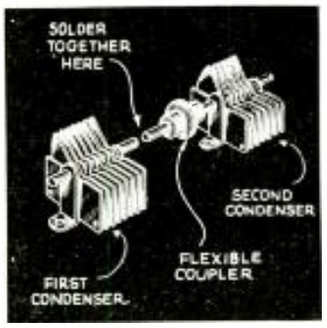
GANGING CONDENSERS

Here is a kink which may be useful to experimenters or set-builders who want to gang two condensers of the cheaper variety



which do not have the shafts extended at the rear for that purpose. The trick is to solder a short piece of brass rod of the right size on the rear end of the first condenser shaft. Be sure to make a solid joint where the brass rod is soldered on the shaft and use a flexible coupler to prevent strain on the rod in case it is not exactly in line. —Burl McFadden.

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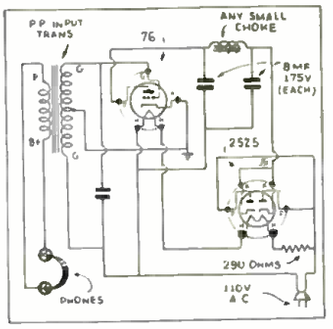
A.C.-D.C. CODE PRACTICE OSCILLATOR

Very often a prospective Ham wants an

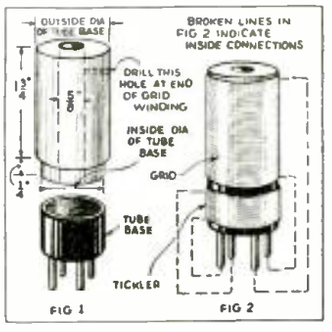


electrified code-practice oscillator. The circuit shown will satisfy this need in every respect. The usual A.C.-D.C. circuit was employed because of its simplicity and economy.—Nooman L. Chaffer.

▼ ▼ ▼

PLUG-IN COIL KINK

Many fans have found that the ordinary tube-base is entirely too small to accommodate 100- to 200-meter coils. The sketch clearly shows how a piece of round wood is fitted into the tube-base. The tickler is wound on the tube-base while the grid coil is wound on the wood form.—Harry W. Lewis.



SHORT WAVE SCOUTS

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

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

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

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

Honorable Mention Awards

Honorable Mention:
S. Clarkson,
Montreal, Quebec, Can.

Trophy Contest Entry Rules

● THE rules for entries in the SHORT WAVE SCOUT Trophy Contest have been amended and 50 per cent of your list of stations submitted must be "foreign." The trophy will be awarded to the SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during any 30 day period; (he must have at least 50 per cent "foreign" stations). This period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the September issue of this magazine.

In the event of a tie between two or more contestants, each logging the same number of stations (each accompanied by the required minimum of 50 per cent "foreigns") the judges will award a similar trophy to each contestant so tying. Each list of stations heard and submitted in the contest must be sworn to before a Notary Public and testify to the fact that the list of stations heard were "logged" over a given 30 day period, that reception was verified and that the contestant personally listened to the station announcements as given in the list.

Only commercial "phone" stations should be entered in your list, no "amateur transmitters" or "commercial code" stations. This contest will close every month on the first day of the month, by which time all entries must be in the editors' hands in New York City. Entries received after this date will be held over for the next month's contest. The next contest will close in New York City, January 31.

The winner each month will be the person sending in the greatest number of verifications. Unverified stations should not be sent in, as they will not count in the selection of the winner. At least 50 percent of the verifications sent in by each listener must be for stations located outside of the country in which he resides! In other words, if the contestant lives in the United States at least 50 percent of his "veries" must be from stations outside of the United States. Letters or cards which do not specifically verify reception, such as those sent by the Daventry stations and, also by commercial telephone stations, will not be accepted as verifications. Only letters or cards which "specifically" verify reception of a "given station," on a given wave length and on a given day, will be accepted! In other words it is useless to send in cards from commercial telephone stations or the Daventry stations, which state that specific verifications will not be given. Therefore do not put such stations on your list for entry in the trophy contest!

SHORT WAVE SCOUTS are allowed the use of any receiving set, from a one-tuber up to one of sixteen tubes or upwards, if they so desire.

When sending in entries, note the following few simple instructions: Type your list, or write in ink, pencilled matter is not allowed. Send verification cards, letters and the list all in one package, either by mail or by express prepaid; do not split up the package. Verification cards and letters will be returned, at the end of the contest, to their owners; the expense to be borne by SHORT WAVE CRAFT magazine.

In order to have uniformity of the entries, when writing or typing your list, observe the following routine: USE A SINGLE LINE FOR EACH STATION; type or write the entries IN THE FOLLOWING ORDER: Station call letters; frequency station transmits at; schedule of transmission, if known (all time should be reduced to Eastern Standard which is five hours behind Greenwich Meridian Time); name of station, city, country; identification signal if any. Sign your name at the bottom of the list and furthermore state the type of set used by you to receive these stations.

(Continued on page 630)

TWENTY-THIRD "TROPHY CUP"

Presented to

SHORT WAVE SCOUT

GLENN G. GODWIN

BINGHAMTON, N.Y.

For his contribution toward the advancement of the art of Radio

by

Magazine

23rd TROPHY WINNER

50 veries; 39 foreign

● THE 23rd Trophy goes, as a Christmas present, to Glenn G. Godwin of 5 Mildred Avenue, Binghamton, N.Y. Mr. Godwin had a total of 50 veris, all coming within the rules of the Contest. Mr. Godwin's receiver was the Alan "Ace," with a good many changes. He points out that he added a tuned radio frequency stage which increased the sensitivity and added considerably in bringing in the weak stations.

Mr. Godwin goes on in his report to say that he does not recommend A.C.-D.C. receivers, because the voltage delivered to the tubes is too low to give satisfactory amplification. The antenna used was just an ordinary single wire. No dimensions were given.

UNITED STATES STATIONS

W1XK—9,570 kc.—6 a.m.-12 mid., Boston.
W2XAD, 15,330 kc.—2-3 p.m., Schenectady.
W2XAF—9,530 kc.—5:30-11 p.m., Schenectady.
W3XAL—6,100 kc., M-W-Sat., 5-6 p.m., Bound Brook.
W3XAU—9,590 kc.—Noon-7:50 p.m., Philadelphia.
W8XAL—6,060 kc.—6:30-8 p.m., 11 p.m.-1 a.m., Cincinnati.
W8XK—15,210 kc.—9 a.m.-7 p.m., Pittsburgh.
W8XK—11,870 kc.—5-9 p.m., Pittsburgh.
W8XK—6,140 kc.—9 p.m.-1 a.m., Pittsburgh.
W9XBS—6,425 kc.—Irregular, Chicago.
W9XF—6,100 kc.—Chicago.

FOREIGN STATIONS

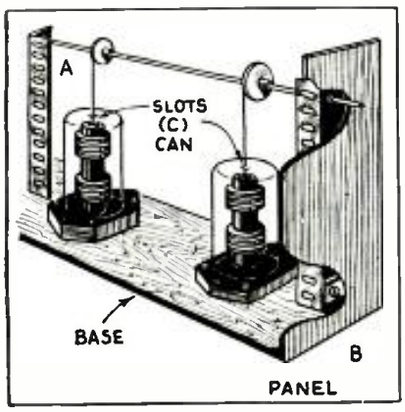
CRCX—6,090 kc.—Irreg. 6 p.m.-12 mid., Toronto, Canada.
CJRO—6,150 kc.—8 p.m.-12 mid., Winnipeg, Canada.
CJRX—11,720 kc.—8 p.m.-12 mid., Winnipeg, Canada.
EAQ—9,860 kc.—6:15-7:30 p.m., Madrid, Spain.
HAS3—15,370 kc.—Sun., 9-10 a.m., Budapest, Hungary.
HAT4—9,125 kc.—Sun., 6-7 p.m., Budapest, Hungary.
HBL—9,595 kc.—Sat., 5:30-6:15 p.m., Geneva, Switzerland.
HBP—7,797 kc.—Sat., 5:30-6:15 p.m., Geneva Switzerland.
PCJ—15,200 kc.—Irregular, Eindhoven, Holland
PHI—17,775 kc.—Off at present, Hilversum, Holland.
PHI—11,730 kc.—Irreg., 8:30-10:30 a.m., Hilversum, Holland.
2RO—11,810 kc.—Rome, Italy.
2RO—9,635 kc.—M.-W.-F., 6-7:30 p.m., Rome, Italy.
HVJ—15,121 kc.—10:30-10:45 a.m. (ex. Sun.), Vatican City, Italy.
ORK—10,330 kc.—1:30-3 p.m., Brussels, Belgium.
COCD—6,130 kc.—8 p.m.-12 mid., Havana, Cuba.
HI4D—6,482 kc.—Irreg. 5-8 p.m., Santo Domingo, D.R.
XEBT—6,000 kc.—8-1 a.m., Mexico City, Mexico.
HP5J—9,590 kc.—7:30-10 p.m., Panama City, Panama.
YV5RMO—5,650 kc.—5:30-10 p.m., Maracaibo, Venezuela.
YV6RV—6,520 kc.—6-10 p.m., Valencia, Venezuela.
YV2RC—6,112 kc.—(Now testing on 5800.)Caracas, Venezuela.
YVQ—6,672 kc.—Sat., 8-9 p.m., Maracay, Venezuela.
YV3RC—6,150 kc.—4-10 p.m., Caracas, Venezuela.

(Continued on page 630)

WORLD-WIDE SHORT-WAVE REVIEW

—Edited By C. W. PALMER

Variable I.F. Transformers



A simple variable selectivity device.

● THE latest issue of *Practical and Amateur Wireless* (London) contains an interesting method for obtaining variable coupling in existing I.F. transformers, in order to improve the fidelity of existing sets.

The sketch here shows how this is accomplished. A hole is cut in the top of the shield can and the coils are removed. One coil is worked free of the wax or other impregnating material and one or two turns are removed from the inside so that when the coil is set back on the form, it will slide freely up and down on it (these few turns can be easily compensated by turning the trimmer a little further down).

A cam arrangement is then made, as shown in the accompanying sketch, and linen strings are used to support the moveable coils. A knob on the panel completes the job—turning the knob then raises the coils and decreases the coupling—or in other words, increases selectivity.

The Renode—a New Tube

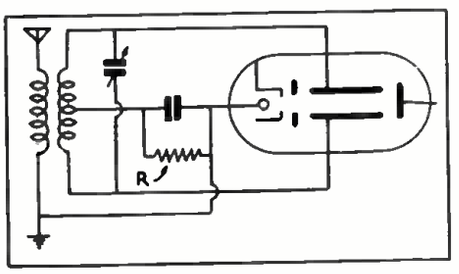
● A DANISH engineer, A. Schleimann Jensen, has just announced a new tube which will be manufactured in that country to compete with tubes which are imported from other countries at excessively high prices, according to an announcement in *Popular Radio*, (Copenhagen).

The new tube works on the principle of the *cathode ray tube*, having a cathode, concentrator plate, deflector plates and plate or anode. The tube is connected as shown in the diagram and is a push-pull type of circuit.

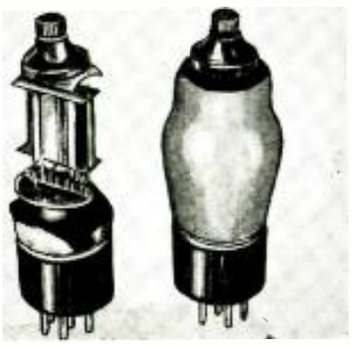
The action of the tube is briefly as follows: The cathode emits a steady stream of electrons which pass through slits in the shield and concentrator plate. The latter speeds up the stream of electrons which pass between the deflector plates to the anode, from which the signal is passed to the phones or A.F. amplifier.

The electron stream in passing between the deflector plates is affected by these plates. As the signal changes polarity, the cathode stream swings back and forth, being reflected by the plate which is negative and attracted to the one which is positive. This swinging back and forth caused an increase and decrease in the stream which reaches the anode.

Thus either a detecting or amplifying action takes place, depending on the circuit and potentials. This is accomplished without the use of grids of any type.

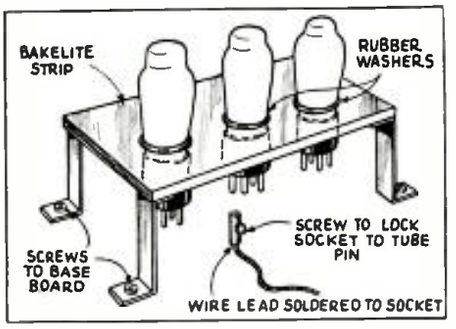


Push-pull "Renode" Hook-up for Detector Action.



Appearance of new "Renode" Tube.

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



Newest "Low-Loss" method of mounting tubes.

Ultra-Low-Loss Tube Mounting

● ONE English experimenter devised a novel tube mounting method, according to a recent issue of *Practical and Amateur Wireless* (London).

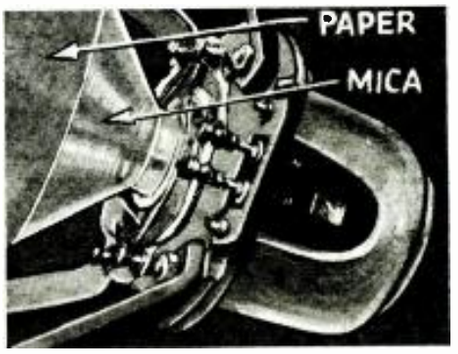
Working on the premise that most of the leakage and capacitative effects in tube connecting is found in the tube sockets, this experimenter made a shelf of the type shown here, having holes into which the tubes set. The connections to the tube prongs were made with small brass collars having set screws to fasten them securely to the prongs. Thus, no additional insulation is added than the tube itself has.

(An improvement of this idea would be to remove the bases of the tubes also, and make the contacts directly on the protruding leads!—Editor.)

New Speaker Cone Development

● THE cry for better fidelity in radio reception has been answered in many interesting and novel ways which have been described in past issues of this and other magazines.

Europe has not missed the demands, either, as recent issues of their magazines plainly shows. Announcement of a very interesting development in this line appeared in *Wireless World* (London) recently. This consisted in an explanation of



High-Fidelity speaker having mica-paper cone.

speaker response, especially concerning the *cone* or *driver*. The results of experiments with many different types of cones were given—with comments on their advantages and short-comings.

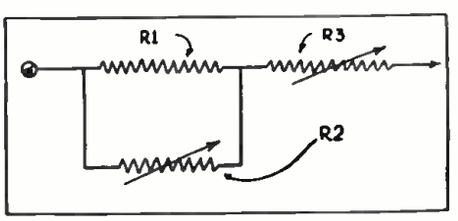
The final cone material chosen was *mica*, since it could be split very thin, yet remained rigid. Since the weight could thus be reduced to a very small fraction of the weight of the usual paper cone, high frequency response above 10,000 cycles, with very little attenuation, was found possible. This eliminated the need for tweeters or other artificial means of raising the "highs," with the result that less distortion entered the reproduction.

For economy, a *mica-paper* cone was advocated. This consisted of a mica cone 4 ins. in diameter cemented to a dry vellum frustrum forming a 10 in. cone driver. This is shown in the illustration here. The mica was split to .001 inch thick and the paper .005 inch.

Novel Regeneration Control

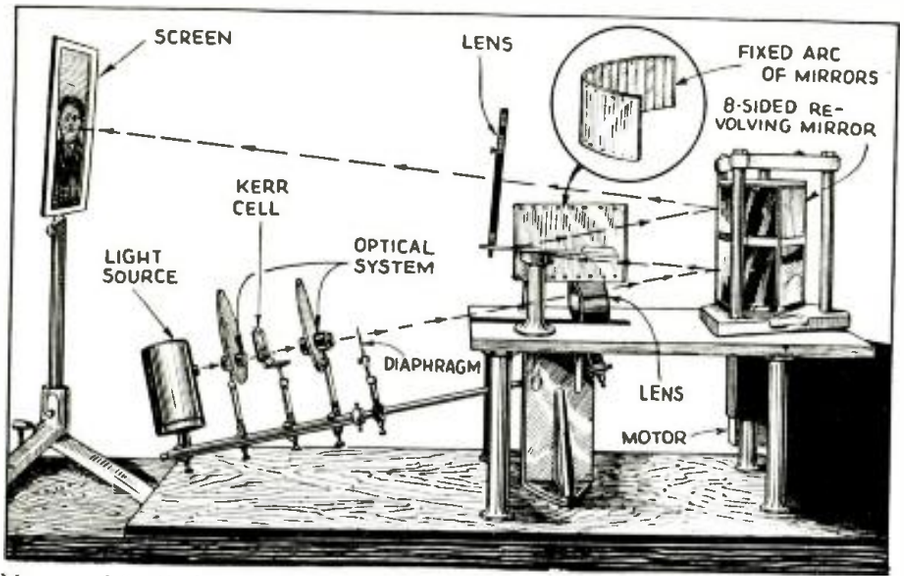
● FOR short-wave sets using a resistance to control regeneration, such as screen-grid potential control or tickler shunt-resistor, etc., a very handy vernier control of regeneration can be obtained by the method shown. This was described in the latest issue of *Ondes Courtes*—a supplement to *Le Haut-Parleur* (Paris).

(Continued on page 619)



Improved 2-unit Regeneration Control.

A New Television Scanning System



Line-up of "optical train" for television scanning by the new Mihaly-Traub optical-mechanical system.

● A NEW television scanning system, which has been attracting considerable attention in Europe, is that known as the Mihaly-Traub system, here illustrated. This scanning arrangement involves the use of a Kerr cell, through which a beam of light from a lamp passes; changes in the polarization in the Kerr cell, caused by the fluctuating television image currents, result in the cell acting as a *light-shutter* or valve, and thus modulates the light beam. The beam falls upon a revolving 8-sided mirror and is rapidly swept across the screen on which the image is built up. As will be seen, there is a ring of stationary mirrors arranged in front of the revolving mirror drum, which acts as part of the scanning system.

The 8-sided polygon has been found the best compromise in practice, together with a quarter of an arc of stationary mirrors. Generally speaking, we have here a multiplying effect due to the peculiar optical scanning arrangement, the number of lines on the screen being the product of the number of stationary mirrors and the number of faces on the polygon. A considerable saving in cost is effected in this way, as the number of actual mirrors, rotating or stationary, has only to be twice the square root of the number of lines. One of the secrets of success in the Mihaly-Traub system lies in the fact that the light from the stationary mirrors is reflected back onto the top ring of mirrors on the rotating polygon before it is projected onto the screen. This design results in a fourfold increase in light as the screen angle is doubled.

It may be, though, that such a mechanical-optical scanning system in

(*Continued on page* 616)

Marconi Infra-Red Light Beam Link

● SOME few years ago the Marconi Company demonstrated a form of telephone link in which a beam of visible light was modulated by the telephone signals. For these experiments both a sodium and a neon discharge lamp were adopted as a modulatable light source. These previous experiments were recently resuscitated and modified for demonstration at the Manchester Conference on Industrial Physics. The modification consisted of the introduction of an infra-red filter in the beam of light from the same neon crater lamp as used on the previous occasion.

The spectrum of the neon lamp is shown in Fig. 1. It will be seen that a fair amount of energy in the infra-red spectrum is liberated. In Fig. 2 we have the curve of an average infra-red filter, this particular one being a Wratten 87. This filter cuts off at 7,600 Angstrom units. It is possible, therefore, to detect a faint red glow in observing bright incandescent light

(*Continued on page* 616)

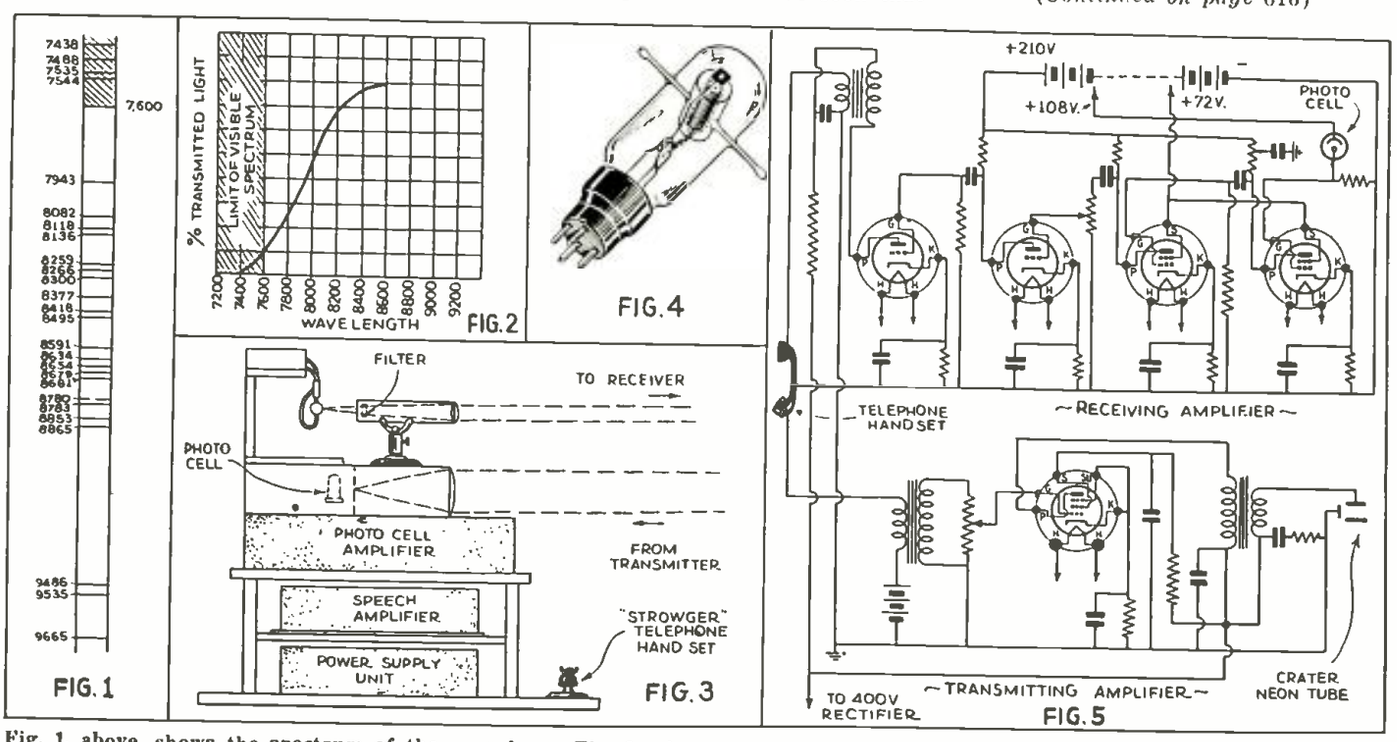
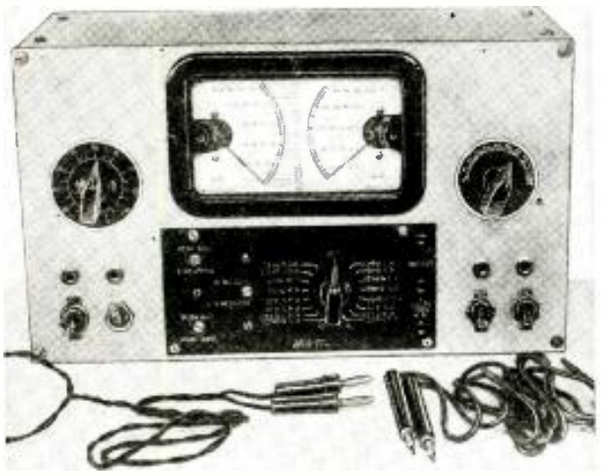


Fig. 1, above, shows the spectrum of the neon lamp. Fig. 2—shows percentage of light transmitted by infra-red filter. Fig. 3—Set-up of apparatus for talking by infra-red rays. Fig. 4—Water-cooled neon crater tube. Fig. 5—Transmitter and receiver circuits for infra-red system.

How to Build An All-Purpose Tester

By George W. Shuart, W2AMN

This "tester" measures A.C.-D.C. volts, ma., ohms, modulation percentage, and has an "oscillator" incorporated in it.



Front view of the compact "all-purpose" Tester.

● EVERY Experimenter and "Fan" needs some kind of testing equipment if his experiments are to be conducted in an accurate manner. The most important measurements to be made in any radio shack are voltage, current, and resistance. For this purpose a *universal* meter is necessary. Of course separate meters could be used but the cost would be many times that of a single *multi-purpose* meter. It is safe to say that there are experimenters who build sets and never know just how much voltage is being applied to the plates or screens of the tubes in the receiver. Likewise there are plenty of "Hams" who are operating transmitters without the knowledge of just how many volts are being applied to the various elements of the tubes in the transmitter.

It was with the above in mind that the writer set out to build a "general purpose" measuring instrument that would serve even the most critical experimenter and Ham. First an outline of the functions of the instrument were made, together with a list of parts. This called for a great number of resistors and two meters, also the switch and other accessories which go to make up a "universal" tester.

It was finally decided that a Triplett Model 1200 tester kit would be the best bet considering its simplicity and economy. Along with the A.C. and D.C. measurements we intended to include a vacuum tube voltmeter. This instrument is a very useful adjunct but to the average person it probably would not be worth its actual cost in labor. So we decided to use a vacuum tube rectifier in the usual V.T. voltmeter hook-up, but for relative measurements only.

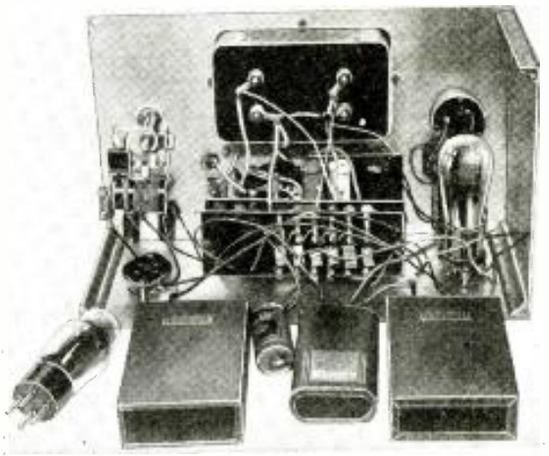
Oscillator Provided Also

Many times we have seen a "Ham" or "Fan" using an oscillating detector of a receiver to check coils or the tuning of another receiver. For this reason we decided to incorporate in this tester an *oscillator*. Not one that is a frequency meter calibrated exactly, but roughly calibrated either in frequency or wavelength, and tuning for instance from 50 to 100 meters. An oscillator that is roughly calibrated and always in "working order" is a very handy piece of apparatus.

The entire "tester" is built in a 7x12x5 inch aluminum box and is small and compact enough to fit anywhere in the Ham's workshop. As we said before it measures everything; voltage, A.C. and D.C. in five steps, 10- 50- 250- 500- and 1000. Resistance in three steps — 1500 ohms, 1.5 and 3 megohms. Current in milliamperes—1 ma., 10 ma., 50 ma., and 250 ma. The resistance scales are also used for continuity testing.

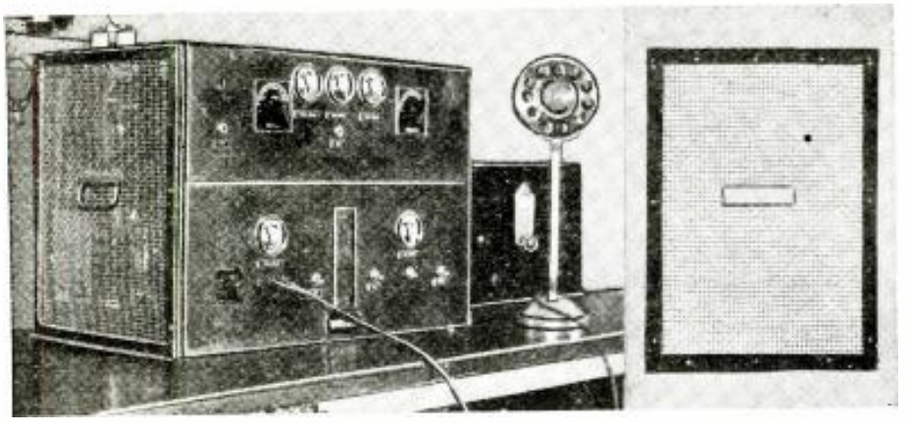
We have discussed the pur-

(*Continued on page* 621)



Rear view showing the "works" of the Ham "tester."

Novel Shielding Made of Wire Mesh



A real business-like appearance can be given to your transmitter by following Mr. Brown's suggestion of using ¼ inch mesh wire netting, and coating it with black paint. It may not keep the dust out, but it will keep your friends' hands away from that big bottle! Hi!

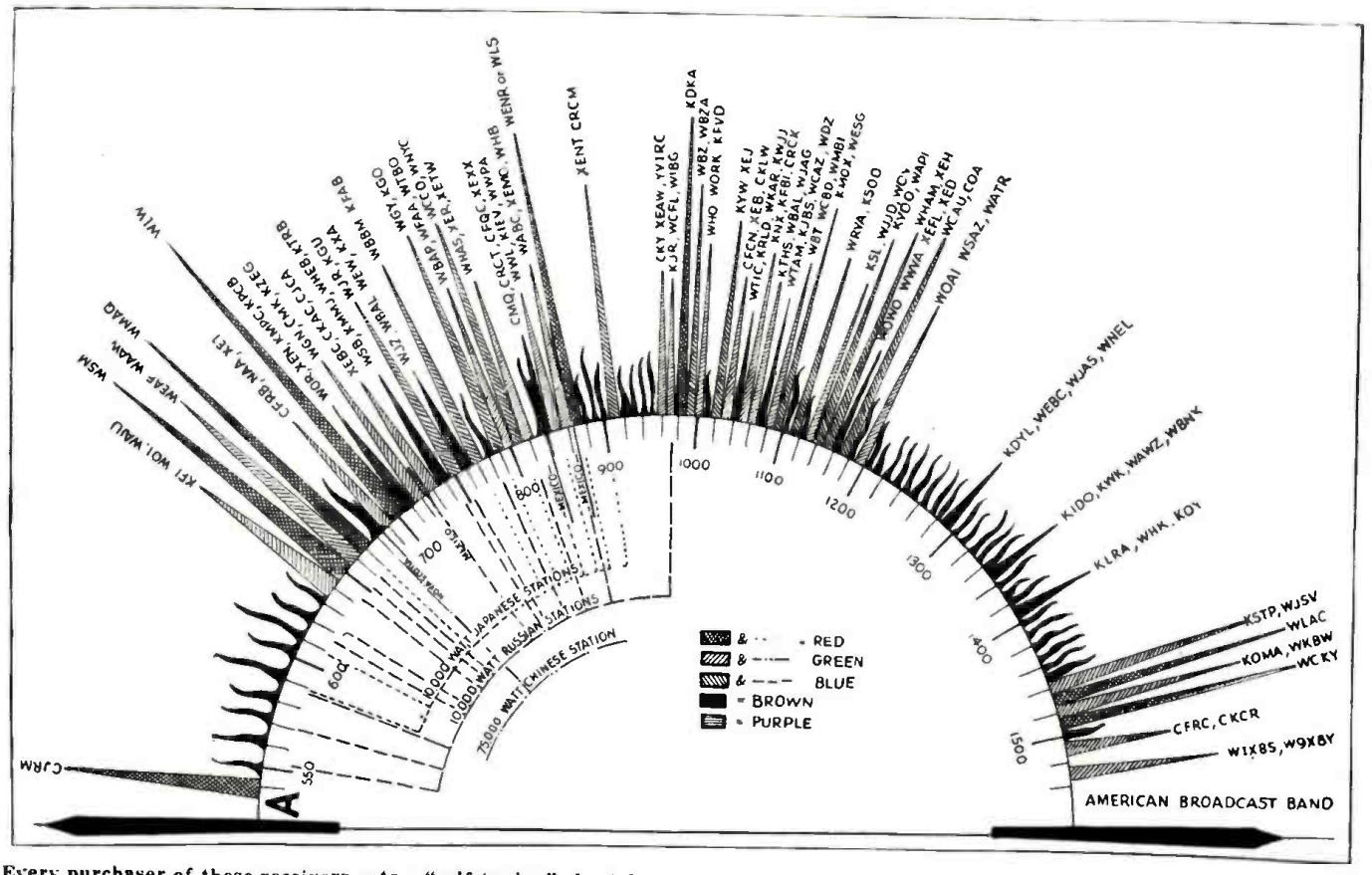
● I recently constructed a low-power portable transmitter and wished to shield the complete job.

Measure the surface to be covered and buy sufficient ¼" square mesh wire fence netting. It is easily cut to fit the sides and top of the transmitter.

Then take a 2" strip of light tin and cut to the length of the screen panel. Bend the tin in the center and press over the edge of the screen by clamping in your vise. Put one of these strips on each side of the screen, making a frame, and stick in place with solder. The tin can be drilled to fit the screws on the top and sides of the transmitter.

Cut a hole in the screen for the handle of the portable transmitter.

Paint the frame black and shellac the screen, and the result will be a neat looking job that will cost you about 40c at the most.—Wm. C. Brown.

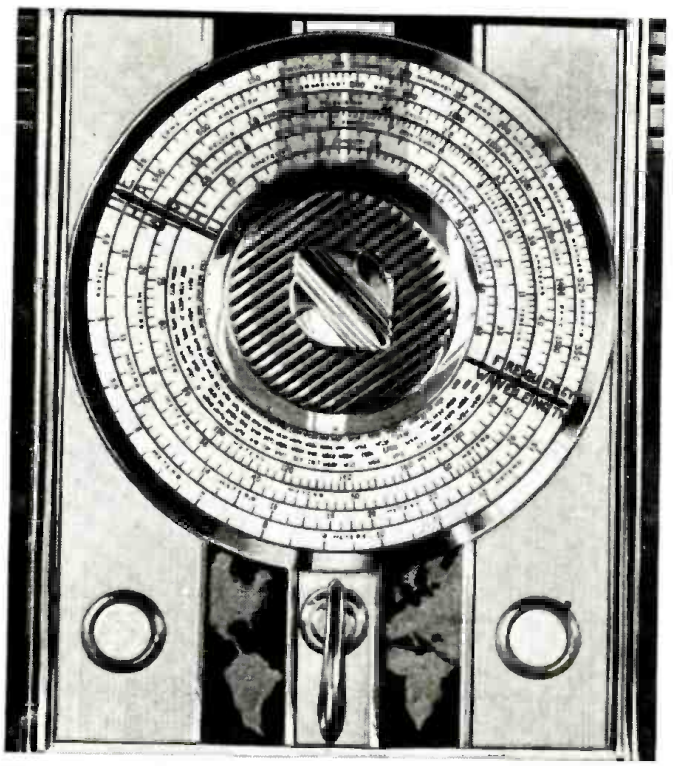


Every purchaser of these receivers gets a "self-tuning" chart for each of the six bands covered by the receiver. The short, wavy, black lines indicate that several stations are operated on the same wavelength and are useful only locally.

4½ to 2400 Meter "SELF-TUNING" GUIDE

Devised for Commercial Set

Elaborate colored charts enable the layman to quickly locate those elusive short, broadcast and long-wave stations with a minimum of time and effort.



Closeup view of the new tuning dial calibrated in kilocycles and wavelengths. Only the particular band in use is illuminated.

● ONE of the most elaborate *self-tuning* charts ever conceived, has been recently perfected for a well-known line of receivers. The accompanying drawing gives some idea of how easy it is for the average non-technical purchaser of one of these receivers to tune in *short-wave*, as well as broadcast stations, from points all over the world. These tuning charts are accurately printed in four colors. By consulting these charts, the owner of the set can easily and quickly pick out the stations he might like to hear. By glancing at these charts and also the elaborately calibrated dial furnished on the new model receivers, he can surely and positively trail that distant station to its lair.

The engineers who developed this new *self-tuning* chart system for these receivers, came to the conclusion that the usual method of thumbing through page after page of station calls in a Log Book was too tiresome, and they, therefore, worked out this much simpler direct-reading chart scheme. A colored chart for each one of the six bands, covering all the way from 4½ to 2400 meters, is supplied with each set. These charts have been prepared at a great expense, and were executed by engineers and artists with great precision, and one can actually see where each short wave or broadcast station comes in on the dial It is felt that they will provide the answer to the short-wave "Fan's" prayer for a simple, accurate and quick method of tuning in those many interesting stations from all parts of the world.

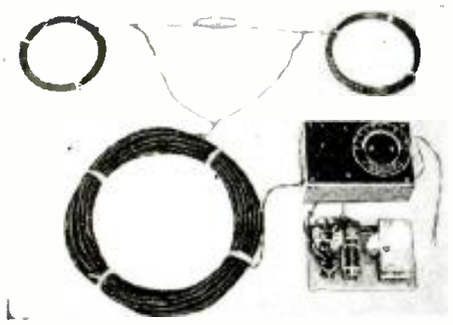
Index Marks Proportioned to Power of Station

The height of the triangles and "wiggles" indicates the power of the strongest station on that frequency, as follows: The height of the RED triangle is proportional to the logarithm through the base end of the power of that station. An arbitrary length was chosen for WLW, 500,000 watts, and the other lengths (*Continued on page* 617)

WHAT'S NEW In Short-Wave Apparatus

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

Tuned Aerial Gets More "DX"



Appearance of newest "Tuned Antenna." (No. 514)

● THE R9+ antenna consists of a doublet 50 ft. long (25 ft. per side), three special insulators, 131 ft. of weatherproof twisted pair noise rejecting transmission line leadin and the tuner and switch box, as illustrated herewith. It comes with all connections soldered and all insulators in place. To erect it, it is merely necessary to tie a rope to each of the two insulators at the ends of the 50 ft. flat top, uncoil the transmission line leadin and hoist the antenna on its supports, which may be poles on a house, eaves of a house, house and garage, house and tree, or two trees. The higher up it is, the better, and the further away from electrical apparatus, such as motors, and auto roads, the better also. The leadin is carried down to a window near the radio, the tuner box pulled in through the window, its leads fastened to the antenna binding posts of the set, and the job is done. If too much leadin is left over, it can be coiled and placed out of the way, or exactly 78 feet—no more, no less—can be cut off. If a longer leadin is needed, as many extra 78 ft. lengths of twisted pair as are required may be spliced into the original 131 ft. leadin.

Considering practical operation, the net benefits obtained have been measured against the best available competition—a widely used double doublet—and found to be as follows:

Kc.			Db. Gain
1,800—R9+	antenna	up	+15.6
4,200—R9+	antenna	up	+ 4.74
6,200—R9+	antenna	up	+12.0
7,300—R9+	antenna	up	+ 4.5
9,000—R9+	antenna	up	+10.9
12,000—R9+	antenna	up	+ 9.6
14,000—R9+	antenna	up	+ 6.6
15,000—R9+	antenna	up	+10.5
18,000—R9+	antenna	up	+ 3.5

These figures show three things—the non-uniformity of the simply semi-tuned double doublet against which the R9+ was compared and tested, its poor performance on the short wave broadcast bands for which it was presumably designed, and the outstanding superiority of the R9+ tuned antenna.

Gives Three to Six-Time Volume Gain

In practical reception, the R9+ gave apparent volume three to six times greater on short waves than that obtainable from the double-doublet against which it was compared. This audible increase in volume of three to six times on short wave broadcast and amateur bands results in reception of signals so weak as to be unheard on other antennae, and coupled with the noise elimination benefits of the low impedance noise rejecting leadin, plus ability to tune the antenna exactly to any wave length between 9 and 200 meters, is of inestimable value.

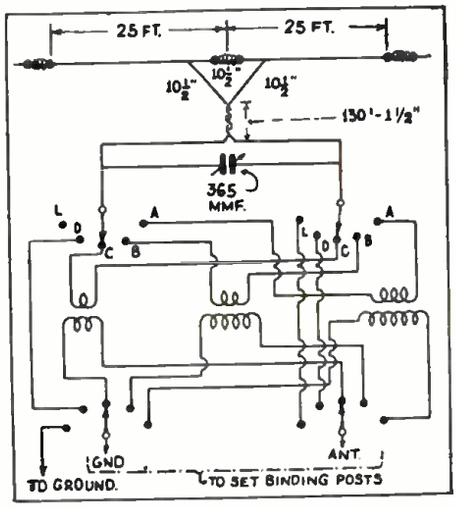
The direct noise elimination benefit of the R9+ tuned antenna is initially equal to that of competitive noise reducing antennae. In practical use it is much greater, due to the longer leadin of 131 ft. permitting antenna flat-top placement well outside local noise fields, to the selective noise rejection attendant upon its tuning, and finally to the 5 to 15 db. signal volume increase, which effectively drops local noise 5 to 15 db. below that obtainable with any other antenna available.

What's Inside the Tuner Box

The tuner box contains three balanced non-reactive coupling transformers, the antenna tuning condenser, and the five-position selector switch. Three positions of the switch select the three balanced coupling transformers for different wave lengths, the fourth feeds the balanced doublet transmission line directly through the tuning condenser to the receiver, and the fifth position gives a standard L antenna for broadcast reception.

This switching arrangement provides any desired type of antenna for broadcast band or short wave reception, from a fully tuned antenna to simply the usual noise reducing doublet, and finally, a simple L antenna. It is not tuned for broadcast band reception simply because physical dimensions would be excessive, and high power, relatively strong stations and little local noise on the broadcast band do not justify such extra complication and bulk.

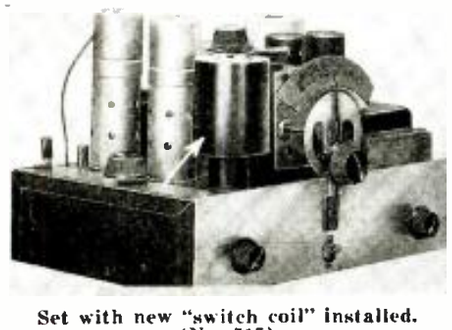
(*Continued on page* 628)



Hook-up of new "tuned aerial."

A New Multi-Band Switch-Coil

● FOR those who have tired of changing plug-in coils, this new switch-coil offers a solution to the problem, it is a completely self-contained unit which has five prongs similar to the conventional tube base, and plugs into the ordinary 5-prong socket. Inside of the casing of this coil is located four individual sets of windings corresponding to the wave range of conventional plug-in coils. By merely turning the knob at the top of the coil, the bands are switched. This coil is quite unlike the average switch-coil in that it is not a tapped coil arrangement, but connects individual coils into the circuit at each position. The coils are radially wound similar to the old style "pancake" coil, and are only a single layer in thickness. They are mounted inside the casing in pie fashion; one above the other. Very positive contacts are assured because behind the contact electrode is a spring forcing it forward for a very firm connection. In the drawing, we have endeavored to illustrate the complete coil. Four separate sets of coils, i.e., four secondaries with their associated *primaries* or *ticklers*. The secondary is always used as a grid coil and is tuned with a 140 mmf. condenser. However, if the coil is used in an R.F. stage, the primary will be the antenna coil, while in the detector this is usually the tickler. Modifications of this particular coil are being made wherein the secondary is tapped for the usual cathode feed-back for electron coupling. In this case, we presume that the primary is used to couple the R.F. stage to the regenerative detector. Superheterodynes, as well as regenerative receivers, can make use of these new coils. This article has been prepared from data supplied by courtesy of Uno All-Wave Coil Co.



Set with new "switch coil" installed. (No. 515)

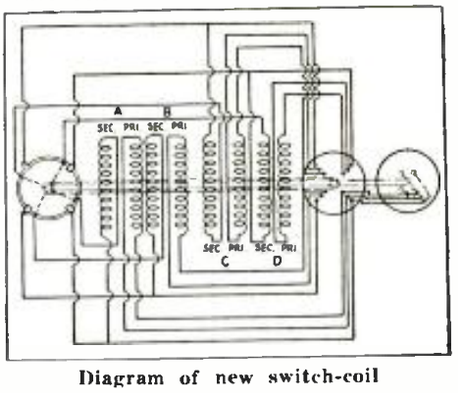


Diagram of new switch-coil

Names and addresses of manufacturers of apparatus described on this and following pages furnished upon receipt of 3-cent stamp; mention No. of article.

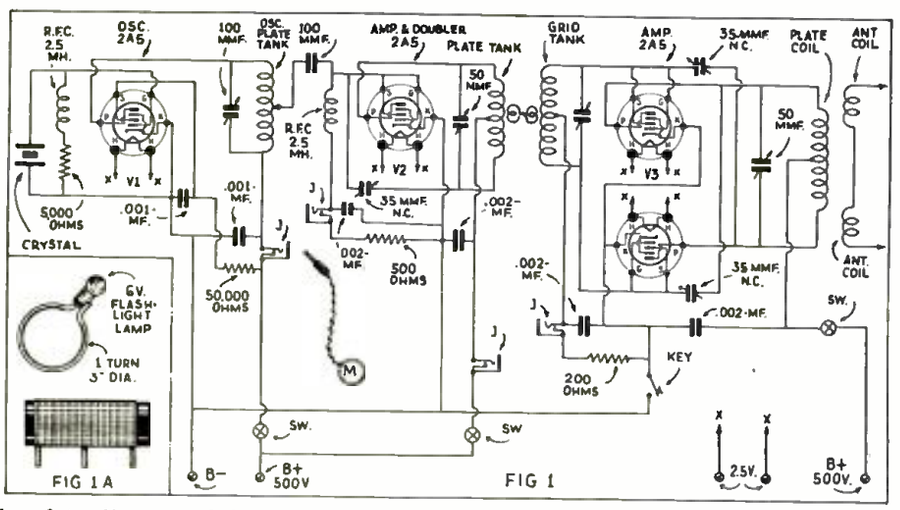
THE RADIO AMATEUR

Conducted by Geo. W. Shuart

Radio Amateur Course

6th Lesson—Explanation of M.O.P.A.—Master Oscillator—Power Amplifier

● AS announced previously, this sixth lesson of our Amateur Radio Course will cover the M.O.P.A. (master oscillator-power amplifier) transmitter using crystal-control, frequency-multiplication, buffers, etc.



Complete diagram of 3-stage crystal-controlled M.O.P.A. (Master Oscillator—Power Amplifier) transmitter with details of the tuning light and plug-in coil suggestion (1A).

Amateur Radio has advanced to the point where multi-tube transmitters are almost a necessity, although single-tube crystal-controlled transmitters, such as the "*Wizard*", described in one of our past issues, is not to be "sneezed" at insofar as *stability* and *power output* is concerned. On the other hand, for greatest flexibility and efficiency, an M.O.P.A., comprising at least three stages, is necessary if real efficiency is desired along with three or four band operation.

Today, the Ham does not need to spend a fortune in constructing a modern multi-stage transmitter with a fairly respectable power output, because in nearly all cases, receiving tubes may be used.

In Figure 1, we have a crystal-controlled transmitter built entirely around 2A5 tubes. Although few Hams realize it, this tube is ideally suited to low-power transmitters or in the oscillator, buffer and frequency multiplier stages. In this transmitter, we use a 2A5 connected as a pentode crystal oscillator, another 2A5 as a neutralized amplifier or frequency doubler, and in the third stage, 2—2A5's in push-pull, as amplifiers. When using the 2A5 as an amplifier or doubler, the control grid and screen grid should be tied together.

Pentode Oscillator

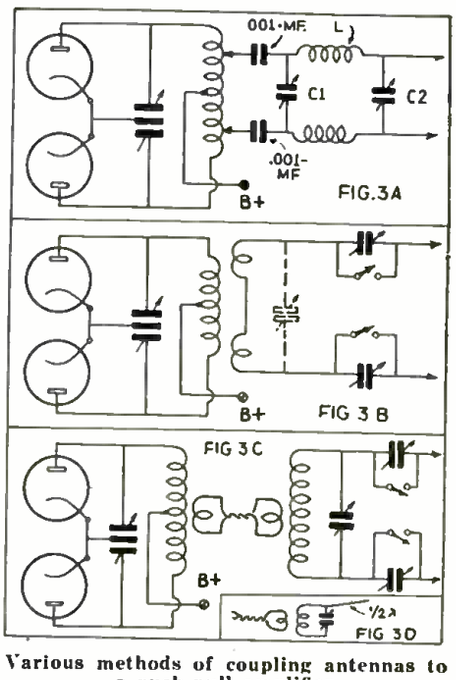
In the *pentode-oscillator* circuit of Figure 1, we have condenser coupling to the first amplifier. Experience has proven that the excitation tap on the plate coil should be connected between one-half and three quarters the length of the entire coil, from the B plus side. If this tap were connected directly to the plate end of the coil, considerable instability in the oscillator circuit would result, and in many cases, the oscillator may fail to start oscillating when the transmitter is turned on.

With the two grids of the 2A5 connected together, this tube represents a high-mu triode similar to the 46, and no separate bias is necessary, although a small resistor, around 500 ohms, in series with the grid return, increases the second harmonic output when doubling. Many who have used the 46 will recall that the plate current tends to *creep up* if the circuit is detuned or if too much excitation is applied. This trouble is entirely eliminated in the 2A5, no doubt due to the suppressor which is connected directly to the cathode inside the tube. We might also mention here that those having trouble with the 46 will do well to change to the 47, because this tube exhibits the same characteristics as the 2A5, and requires no change in circuits formerly using the 46, other than a reduction in the value of the grid bias resistor; 500 ohms seems to be the optimum value.

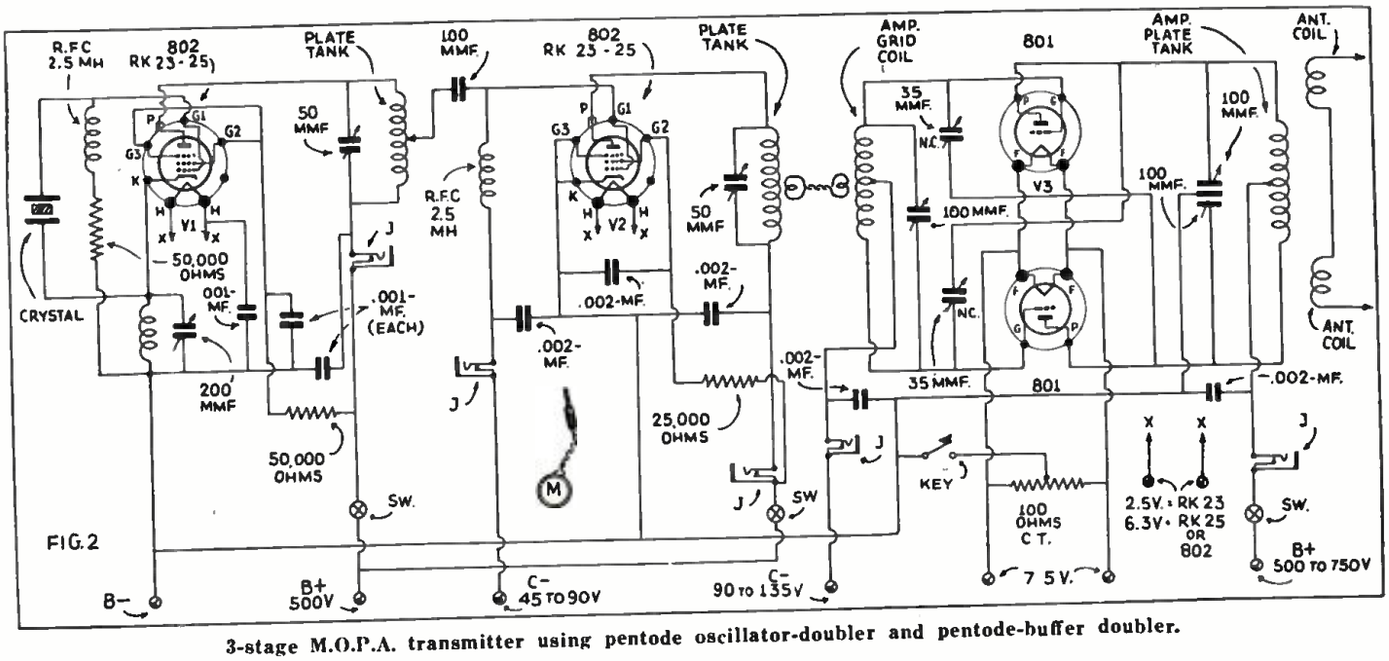
Advantages of Link Coupling

The final amplifier or push-pull stage of this transmitter (Fig. 1), is *link-coupled* to the first amplifier. Experiments have long ago proven, where a "single-ended" driver is used in conjunction with a push-pull stage, that inductive coupling is far more efficient than any other method of coupling. Each coil of this link circuit should consist of two turns in each coil, coupled fairly close to the center of both the first amplifier plate coil and the push-pull amplifier grid coil. Both grid and plate circuits of the push-pull amplifier are tuned to the same frequency, and, therefore, neutralization is necessary. For a more thorough discussion of neutralized amplifiers, we refer you to the fifth lesson.

All values of resistors and condensers are given. However, coil data is omitted because this will depend upon the particular band in which the transmitter is to be operated. A transmitter of this type should have an output of from 30 to 40 watts on 80 and 40 meters, and possibly slightly less on 20.



Various methods of coupling antennas to a push-pull amplifier.



3-stage M.O.P.A. transmitter using pentode oscillator-doubler and pentode-buffer doubler.

Tuning Procedure

The tuning procedure for this transmitter is as follows: With all the B-plus voltages disconnected, the filaments or heaters should be turned on and the tubes allowed to heat up for at least two or three minutes. Then the plate and screen voltages should be applied to the oscillator with the excitation tap of the first amplifier removed from the oscillator plate coil. Then with a flash-light bulb connected to a single turn of wire, coupled rather closely to the plate coil in the oscillator, swing the plate condenser back and forth until a point is reached where the light glows the brightest. Back the pick-up coil away from the plate coil, and retune for a peak in brilliancy of the lamp. The excitation tap should now be connected to the oscillator somewhere around two-thirds the distance from the B-plus end of the coil. The plate milliammeter could have been used for tuning the oscillator. However, the maximum output does not come about with either a maximum or minimum reading on this plate meter but somewhere between the two. Now, when the excitation tap is connected to the oscillator-plate coil, the plate current will increase, as shown on the meter. With the neutralized condenser "nc" set at zero capacity, and the flash-light bulb coupled to the first amplifier (V2) plate coil, swing the plate condenser of this stage back and forth until the bulb lights. Now, if we are operating this amplifier at the same frequency as the oscillator, it must be neutralized. Increasing the capacity of the neutralized condenser gradually, and swinging the plate condenser back and forth through resonance, will eventually result in a setting of the neutralizing condenser where the flash-light bulb will not glow. A more accurate method of neutralizing can be used by plugging a zero to 50 ma. meter in the grid circuit of the amplifier. You will notice that rectified grid current will be present even though no plate voltage is applied to the tube. As the plate condenser is swung back and forth, you will also notice, if the amplifier is not perfectly neutralized, a slight "bump" in the grid current when the amplifier condenser swings through the resonant point. A further adjustment of the neutralizing condenser will eliminate this. After this stage is thoroughly neutralized, the plate voltage can be applied.

Tuning of the Push-Pull Amplifier

Our next job is to "tune up" the push-pull amplifier. Couple the flash-light bulb to the grid-coil of the amplifier and tune the grid condenser for maximum brilliancy. The neutralizing condensers of this stage should be at minimum capacity; then couple the flash-light bulb to the plate coil of the push-pull amplifier, and adjust the plate condenser for maximum brilliancy of the bulb. This stage is then neutralized the same as the first amplifier, except that both neutralizing condensers are adjusted simultaneously, and a point will be reached in the setting of these condensers where the flash-light bulb will not glow, and the grid current meter when plugged into this circuit, will not jump.

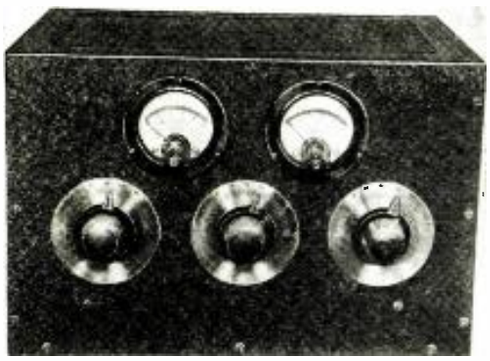
A word of warning about push-pull amplifiers!—unless a push-pull amplifier is perfectly symmetrical, i. e., the two grid leads of *identical length*, and the tap on the grid coil in the *exact electrical center;* the *plate leads identical*, and the B-plus tap on the plate coil at the *exact electrical center*, it cannot be neutralized. Also, identical makes of tubes should be used. In a perfectly symmetrical amplifier, the neutralizing condensers will be set at exactly the same capacity. The leads to these condensers should also be symmetrical; they should be mounted so that the grid leads to them are identical, and the plate leads both of the same dimensions. Many experimenters have given up push-pull amplification because they could not neutralize the amplifier, and this, undoubtedly, was due to *lack of symmetry.* If plug-in coils are used in the push-pull amplifier, do not use the usual plug-in receiver type coil with the pins in the base. The coils should be of the flat mounting type, such as shown in the drawing 1A. The other type of plug-in coil form will make the leads uneven in length.

The push-pull amplifier in this transmitter is keyed in the cathode circuit, and the biasing resistor should be from 100 to 200 ohms. In the plate and grid circuits of the push-pull amplifier and the plate circuit of the first amplifier, single section condensers are used. This makes both ends of the condenser "hot" and an insulating shaft should be used for coupling to the knob or dial. For those who have split-stator condensers, or can afford their usage, they are highly recommended. This transmitter when used with an 80-meter crystal, can be used on the 80 and 40 meter bands. For 80 meters, all three stages are tuned to the crystal frequency; on 40 meters, the first amplifier (V2) is a doubler, and the second amplifier tuned to 40 meters. This is with an 80 meter crystal. With a 40 meter crystal, all three stages can be tuned to 40, or we can operate on 20 by tuning the first amplifier (V2) and final (V3) to that band. All the power amplifier circuits are tuned the same whether they are frequency multiplier stages or not. After they have been neutralized, that is, if they require it, the plate voltage should be applied and the plate tuning condenser *immediately* adjusted for minimum reading on the plate milliammeter—this always indicates resonance.

The next Lesson in the Radio Amateur Course will deal with the construction and operation of "Antennas"—a most important subject of interest to every student of Short-Wave Technique.

Three-Stage Transmitter Using 2 S. G. Tubes

In Fig. 2, we have another 3-stage transmitter using two screen-grid tubes and two 801's (*Continued on page* 620)



Front view of new 5-meter M. O. P. A.

5 Meter M.O.P.A. Uses Receiving Tubes

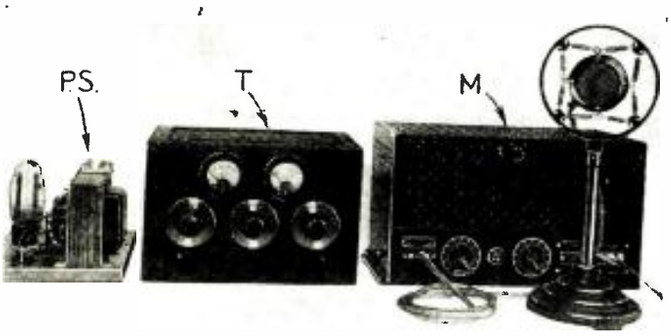
By George W. Shuart, W2AMN

Here is a real *up-to-the-minute* 5-meter transmitter using the M. O. P. A. (master-oscillator power amplifier) circuit. Perfect frequency stability and quality are obtainable with this circuit. It uses all receiving parts, and 3 type 89 tubes. Over 60 miles distance has been covered with this transmitter.

● FOR the past five years the *five-meter* band has been steadily increasing in popularity. And it has finally come to the point where the band is really "overcrowded." This is not so much due to the great number of stations operating on five meters, but due to the type of equipment used. The present-day receiver is quite satisfactory. Our super-regenerator has been improved to the point where not only is the "superregen" now very sensitive but it is as *selective* as the popular five-meter superheterodyne.

What is an M. O. P. A.?

For the benefit of the uninitiated, an M. O. P. A. (master-oscillator, power-amplifier) is a circuit in which a separate tube is used as a frequency generator or oscillator, and is followed by one or more non-oscillating amplifiers. This is really necessary in a phone transmitter if the frequency is not to be disturbed during modulation. Modulation is usually applied to the amplifier, allowing the oscillator to be free from all effects of the modulator.—Editor.



The entire station—power supply, transmitter, modulator and "mike."

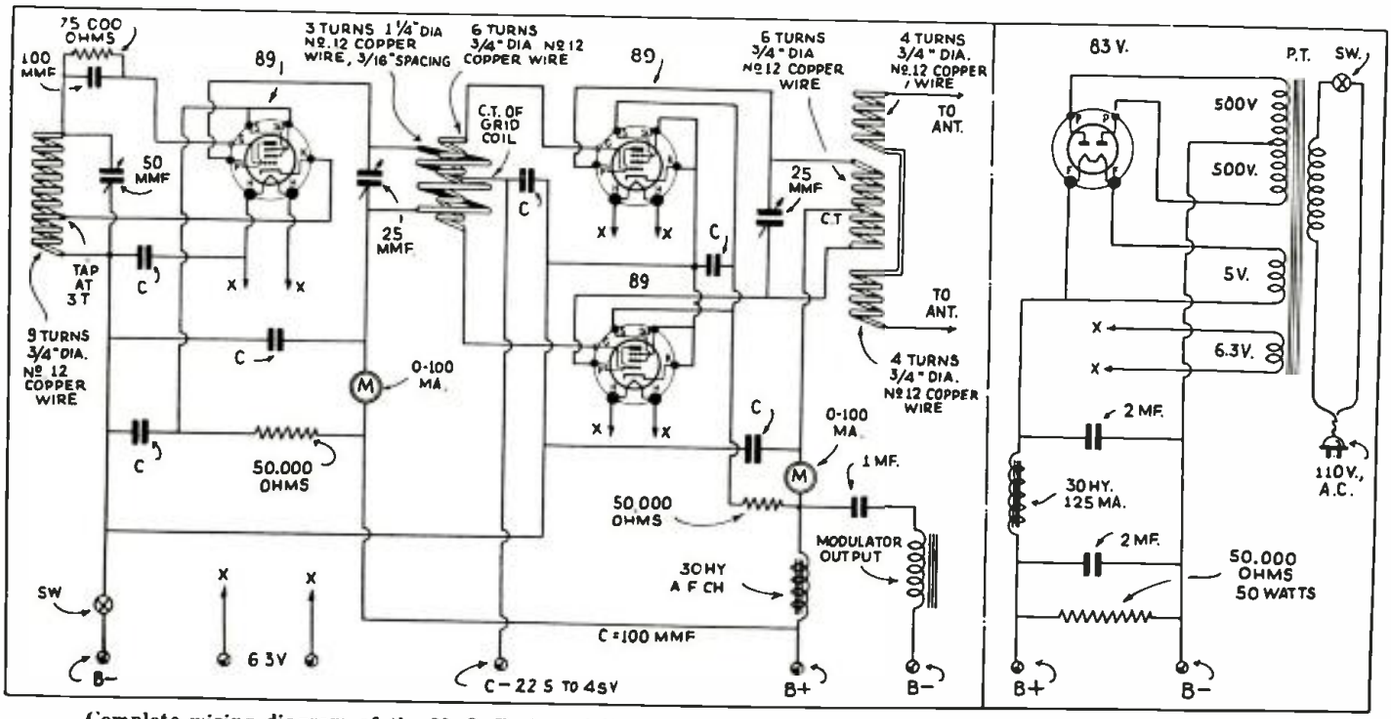
The 'long-lines," or so-called *long-lines* oscillator is unquestionably the best of the modulated oscillators in so far as *frequency stability* and efficiency are concerned. However it is high time we use the better type of transmitter.

Rear view showing how the parts are placed for shortest connecting leads.

Type 89 Tubes Used

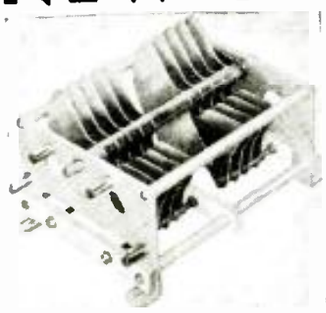
Last month the writer described a transmitter using the type 89 tubes. An exact duplicate of this transmitter was also constructed for operation on the five-meter band; of course crystal

(*Continued on page* 629)



Complete wiring diagram of the M. O. P. A. and its power supply. Also showing how the modulator is connected.

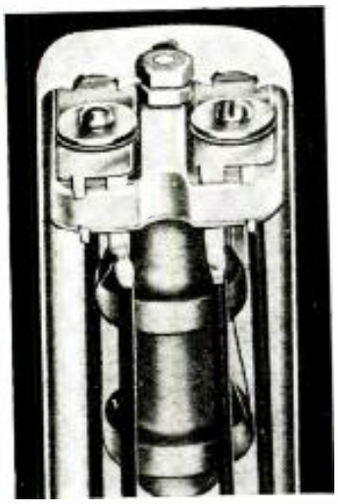
NEW APPARATUS FOR THE HAM



New National high-voltage transmitting condenser H30.

New National Condensers—H30

A new line of transmitting condensers has just been announced by the National Company. Among the features are low cost, rigidity, and extremely high-voltage insulation. These are especially designed for the amateurs. Condensers of this type have only been hitherto available in expensive commercial types such as used in commercial transmitters and by the U. S. Navy.



Miller Iron core I.F. transformer, H31.

Miller Iron Core I.F. Transformers—H31

Iron core transformers have recently become very popular because of their very high gain and inherent selectivity. These Miller transformers measure 1½x1½x3½ inches and have a core which consists of a finely divided magnesium alloy embedded in a ceramic body. The manufacturers claim that a *single* stage with the new transformer will provide as much gain and selectivity as the older type transformers in *two stages*, with one-half the usual amplifier noise. The material used in the core is known by the trade name "Crolite Magicore." The coils are wound with Litz wire, and are impregnated in a special low-loss compound preventing moisture absorption.

U. L. F. Transmitting Condenser—H32

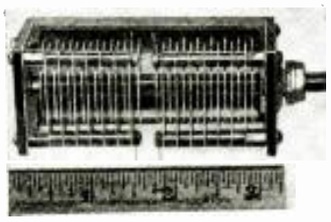
Here's a split-stator transmitting condenser designed especially for ultra high-frequency transmitters. Each section has a maximum capacity of 26 mmf. The plates are double spaced and suitable for use in fairly high-power transmitters. The end pieces are constructed of micalex for highest efficiency.

Insulated Metallized Resistor—H33

The International Resistance Co., makers of the well-known I. R. C. resistors, have recently developed a new insulated metallized resistor. These type B resistors, as shown in the photograph, are thoroughly insulated so that should one come in contact with other parts or the chassis of a receiver, there would be no danger of a short circuit. The insulation is molded completely around the metallized resistance element, and seals it against moisture or damage.

Compact Transmitting Condenser—H-34

In the photograph, we have a partial view of the new Cornell-Dubilier "Dykanal" insulated condenser. The use of this new special oil for insulating purposes makes the new condenser much smaller than the ordinary wax-impregnated, wax-filled condensers. As an example the 1,000 volt 2 mf. condenser measures only 4 inches high, 1-13/16 inches wide, and 1-1/16 inches thick. These are ideally suitable for "Ham" filters and power-supply where space is usually at a premium.



U. L. F. split-stator condenser, H32.

I.R.C. insulated metallized resistors, H33.

New Cornell-Duhilier "Dykanal" insulated condenser, H-34.

EFFICIENT 5-METER ANTENNAS

By ARTHUR H. LYNCH

Details Covering The Design And Construction Of Various Types Of Simple and Complex Antennas Used In Conjunction With Low Impedance Transmission Lines.

● VARIOUS TYPES of antennas, for operation in the 56-60 megacycle band—five meters—have been given very thorough "workouts" in the New York area, where more than one thousand "five-meter" stations are now on the air. In almost every case, a particular type of antenna is found to be most suitable at a given location, and its choice is very much more a matter of mechanical expediency than electrical performance.

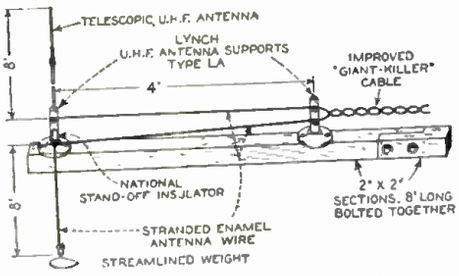


Fig. 2—The antenna used at W2DKJ, portable, Forty Wall St., New York City. With fifty watts input to the oscillator signals from this antenna have been reported R8, at Baltimore, Maryland, two hundred twenty-five miles away.

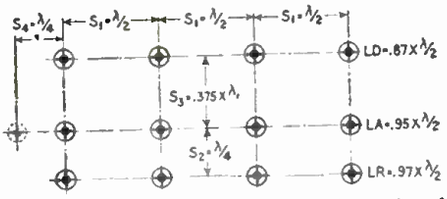


Fig. 3—Top view giving the dimensional layout for any type of vertical beam array.

The simple matched-impedance arrangement with open-wire transmission line, illustrated in Fig. 1, has been the most popular type of antenna used, because it has been comparatively simple to erect and easy to adjust. The open type of transmission line is used with this antenna and three different types of lines are illustrated. While the antenna is shown in a horizontal plane, it is actually mounted vertically when in use and the transmission line is carried for at least four feet at *right-angles* to the vertical radiator.

Aerials Tested at 900 Ft. Elevation!

Various types of simple and rather complex antennas have been in use at the author's five-meter stations, located at Garden City, Long Island, on the roof of the Hotel New Yorker and, more recently, in the tower of the Forty Wall Street Building, where our station is located more than nine hundred feet above the street!

The station, itself, is located in the observation tower and no means are provided for the erection of beam antennas and for that reason we have had to resort to the use of simple units. The arrangement shown in Fig. 2, is the re- *(Continued on page 623)*

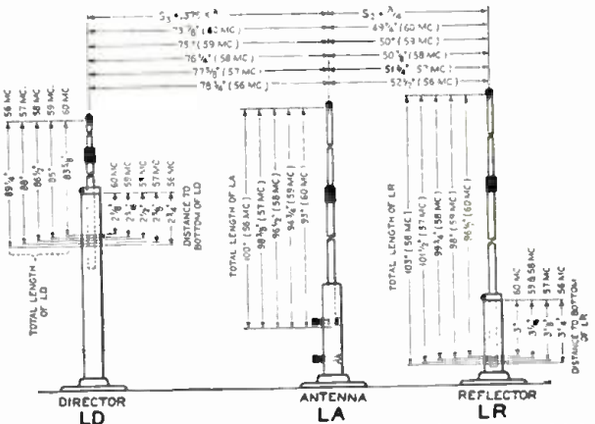
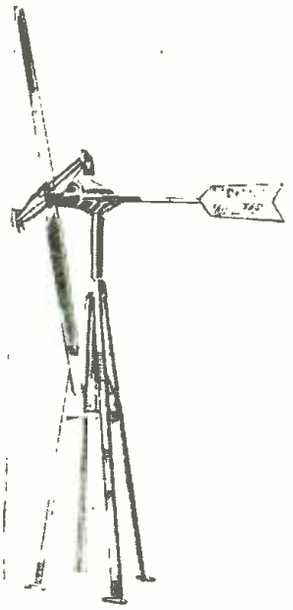


Fig. 4—Complete dimensions for the elements which compose beam arrays. This layout should be used in conjunction with the layout in Fig. 3 and it has been derived from the legend which appears in the article.



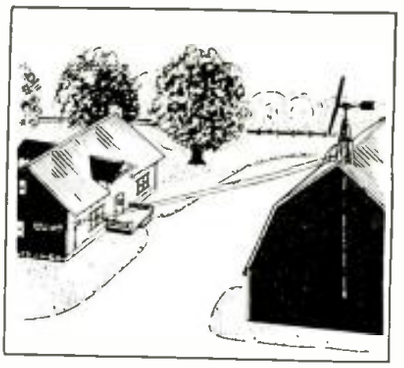
Now Wind Charges Battery

● FOR many years those living in isolated sections where regular electric service is not available, have been forced to carry their batteries to and from the charging station. However, it is now possible for the average person to purchase a completely built and ready-to-install battery charger deriving its power from the wind. This instrument requires no motor devices and is, of course, economical to operate because, so far, the wind has not been taxed and costs nothing. The manufacturers claim that the only operating cost is the distilled water used in the battery, which amounts to less than 50c a year. According to specifications, one particular model begins operation and starts charging a battery with a 7¾ mile an hour wind.

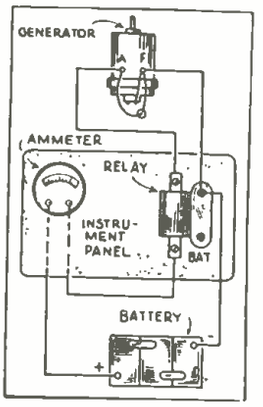
Quite a novel arrangement is incorporated in this charger wherein if it fails to start due to congealed oil or stiffness due to its being new, a certain connection can be made and the generator will become a motor and start itself off. The de luxe model has a specially designed Albers airfoil propeller, patented air-brake governor, turn-table, vane and mounting, a 5½ foot rigid angle iron tower for mounting either on a flat or gable roof structure (and is designed so that an extension pipe may be used), cut-out, ammeter, and short lead-in wire. It costs less than 1c a week to operate, according to the manufacturers. This model has a condenser on the generator which eliminates electrical interference. At 350 R.P.M., this generator will have an output of from 16 to 18 amperes. In the various diagrams shown, we have endeavored to reveal the most interesting features, and we have also shown a typical layout for a system of this type. It is important to have a charger of this type installed where the winds from four directions will not be hindered by any hills or other obstructions, such as buildings, trees, etc., and it should be mounted not less than 20 feet above the ground, building, trees, etc.

Our Information Bureau will gladly supply manufacturers names and addresses of any items mentioned in Short Wave Craft. Please enclose stamped return envelope.

●



How the wind-charger is wired and mounted.



The complete wind-charger.

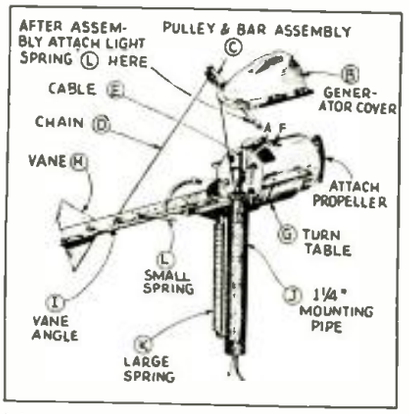


Diagram showing how the dynamo is mounted.

4 Tube Set Works Like 6 Tuber

By Guy Stokely, E. E.

Front view of the "4 tubes equal 6" set.

● THIS receiver utilizes the latest in hi-gain tubes and is one of the most powerful short wave receivers of its kind available. In it are incorporated those features which will fulfill the requirements of the most exacting short wave fan, i.e., operation entirely from 110 volt A.C. or D.C. lighting system, hum-free power supply, built-in high quality loud-speaker, headphone jack permitting the use of phones when desired, BAND-SPREAD tuning, smooth regeneration control, illuminated airplane type vernier tuning control, and 6 tube performance obtained by the use of the multi-element variety of tubes.

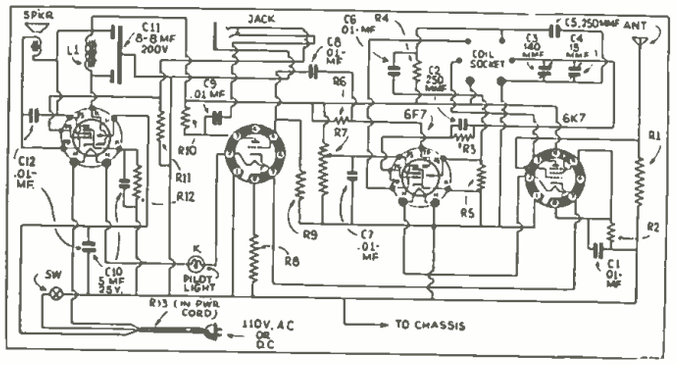
The complete schematic circuit diagram employed is given in Fig. 1. Inspection of this diagram reveals the use of the following tubes: 6D6 (or 6K7 metal)—6F7 (twin, 2 in 1 tube)—76 (or 6C5 metal)—12A7 (twin 2 in 1 tube). The 6D6, or its metal counterpart the 6K7, is used as an aperiodic R.F. amplifier. This stage is very effective in isolating the detector stage from the antenna system and eliminates the usual bothersome antenna series condenser as well as providing considerable R.F. amplification. This extra gain is of considerable advantage when fishing for those elusive "far-off" DX stations.

The 6F7 tube is used as a high-gain, screen-grid regenerative detector and first audio amplifier stage. The R.F. pentode section of the 6F7 type of tube is ideally suited for this purpose. Regeneration is controlled by means of the screen voltage potentiometer R7 having a maximum value of 100,000 ohms and having a special resistance tapered curve which provides an extremely smooth regeneration control. Three winding plug-in coils are used for their high electrical efficiency and the excellent selectivity obtainable from their use. The primary winding is interwoven with that of the secondary in order to provide high energy transfer from the R.F. stage to the detector section. The number of turns on each tickler coil is so proportioned as to permit regeneration in that range of screen-grid voltages where sensitivity is maximum. Ignorance of this fact accounts for the poor sensitivity of many present-day short wave receivers.

The output of the detector section of the 6F7 tube is resistance-capacity coupled into the triode section of the same tube which acts as the first stage of a powerful audio frequency amplifier. The output of this stage is in turn fed into the grid circuit of the second audio stage which uses the type 76 tube (or

(Continued on page 628)

View of the chassis.



Wiring diagram of Mr. Stokely's receiver.

CORRECTED AND REVISED Monthly

Short-Wave Stations of the World

Complete List of Broadcast, Police and Television Stations

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

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

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

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

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

Around-the-Clock Listening Guide

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

From daybreak till 3 p.m. and particularly during bright daylight, listen between 13 and 19 meters (21540 to 15800 kc.).

To the east of the listener, from about 1 p.m.-8 p.m., the 25-35 meter will be found very productive. To the west of the listener this same band is generally found best from about 8 p.m. until 9 a.m. (After dark, results above 35 meters are usually much better than during daylight.) These general rules hold for any location in the Northern Hemisphere.

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

NOTE: To convert kc. to megacycles (mc.) shift decimal point 3 places to left: Thus, read 21540 kc. as 21.540 mc.

21540 kc. W8XK
-B- 13.93 meters
WESTINGHOUSE ELECTRIC
PITTSBURGH, PA.
7-9 a.m.; relays KDKA

21520 kc. W2XE
-B- 13.94 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.
Irregular 8 a.m.-12 n.

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

21080 kc. PSA
-C- 14.23 meters
RIO DE JANEIRO, BRAZIL
Works WKK Daytime

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

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

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

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

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

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

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

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

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

19345 kc. PMA
-B.C- 15.51 meters
BANDOENG, JAVA
Calls Holland early a.m.
Broadcasts Tues., Thur., Sat., 10:00-10:30 a.m.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

17790 kc. GSG
-B- 16.86 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6.8:45 a.m.

17780 kc ★W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ. Daily exc. Sun. 9 a.m.-1 p.m.

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

17760 kc. W2XE
-B- 16.89 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.
Irregular 11 a.m.-3 p.m.

17760 kc. DJE
-B- 16.89 meters
BROADCASTING HOUSE
BERLIN, GERMANY
6.11:30 a.m.

17760 kc. IAC
-C- 16:89 meters
PISA, ITALY
Calls ships, 6:30-7:30 a. m.

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

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

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

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

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

16240 kc. KTO
-C- 18.47 meters
MANILLA, P. I.
Calls Cal., Tokio and ships
8-11:30 a.m.

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

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

15810 kc. LSL
-C- 18.96 meters
HURLINGHAM, ARGENTINA
Calls
Brazil and Europe, daytime

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

15660 kc. JVE
-C- 19.16 meters
NAZAKI, JAPAN
Phones Java 3-5 a.m.

15620 kc. JVF
-C- 19.2 meters
NAZAKI, JAPAN
Phones U.S., 5 a.m. & 4 p.m.

15415 kc. KWO
-C- 19.46 meters
DIXON, CAL.
Phones Hawaii 2-7 p.m.

15370 kc. ★HAS3
-B- 19.52 meters
BUDAPEST, HUNGARY
Broadcasts Sundays, 9-10 a.m.

15355 kc. KWU
-C- 19.53 meters
DIXON, CAL.
Phones Pacific Isles and Japan

15330kc.★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays
WGY daily, 2-3 p.m.
Sun. 10:30 a.m.-4 p.m.

15310 kc. GSP
-B- 19.6 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular

15280 kc. DJQ
-B- 19.63 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-2 a.m.

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
485 Madison Av., N.Y.C.
Relays
WABC daily, 11 a.m.-6 p.m.

15260 kc. GSI
-B- 19.66 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-2:15 p.m.

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

15245 kc. ★
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
103 Rue de Grenelle, Paris
7-11 a.m.

15220 kc. ★PCJ
-B- 19.71 meters
N.V. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Sun. 8-11 a.m.
Also Tues. 3-6 a.m.,
Wed. 7-11 a.m.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
9 a.m.-7 p.m.
Relays KDKA

15200 kc. ★DJB
-B- 19.74 meters
BROADCASTING HOUSE
BERLIN, GERMANY
3:45-7:15 a.m., 8-11:30 a.m.

15180 kc. GSO
-B- 19.76 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular

15140 kc. ★GSF
-B- 19.82 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
3:30-5:30, 6-8:45 a.m.

15120 kc. ★HVJ
-B- 19.83 meters
VATICAN CITY
ROME, ITALY
10:30 to 10:45 a.m., except Sunday
Sat. 10-10:45 a.m.

15090 kc. RKI
-C- 19.88 meters
MOSCOW, U.S.S.R.
Phones Tashkent near 7 a.m. and relays RNE on Sundays irregularly

15070 kc. PSD
-C- 19.91 meters
RIO DE JANEIRO, BRAZIL
Calls N.Y., Buenos Aires and Europe, daytime

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

(All Schedules Eastern Standard Time)

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

14950 kc. HJB
-C- 20.07 meters
BOGOTA, COL.
Calls WNC, daytime

14600 kc. JVH
-B,C- 20.55 meters.
NAZAKI, JAPAN
Phones Europe 4-6 a.m.

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

14535 kc. HBJ
-B- 20.64 meters
RADIO NATIONS,
GENEVA, SWITZERLAND
Broadcasts irregularly

14530 kc. LSN
-C- 20.65 meters
HURLINGHAM, ARGENTINA
Calls N.Y.C. afternoons

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls Rio and Europe daytime

14485 kc. TIR
-C- 20.71 metere
CARTAGO, COSTA RICA
Phones Cen. Amer. & U.S.A.
Daytime

14485 kc. HPF
-C- 20.71 metere
PANAMA CITY, PAN.
Phones WNC daytime

14485 kc. TGF
-C- 20.71 meters
GUATEMALA CITY, GUAT.
Phones WNC daytime

14485 kc. YNA
-C- 20.71 meters
MANAGUA, NICARAGUA
Phones WNC daytime

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

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

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

13635 kc. SPW
-B- 22 meters
WARSAW, POLAND
Sundays 11:30 a.m.-12:30 p.m.

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

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

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

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

13345 kc. YVC
-C- 22.48 meters
MARACAY, VENEZUELA
Calls Hialeah daytime

13075 kc. VPD
-X- 22.94 meters
SUVA, FIJI ISLANDS
Daily exc. Sun. 12:30-1:30 a.m.

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

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

12800 kc. IAC
-C- 23.45 meters
PISA, ITALY
Calls Italian ships, mornings

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

12396 kc. CT1GO
-B- 24.2 meters
PAREDE, PORTUGAL
Sun. 10-11:30 a.m., Tues., Thur., Fri. 1:00-2:15 p.m.

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

12235 kc. TFJ
-B.C- 24.52 meters
REYKJAVIK, ICELAND
Phones England mornings,
Broadcasts Sun. 1:40-2 p.m.

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

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sun. 6-9, 10-11 a.m., Daily 12:30-1:30 p.m., Wed. 5-6 a.m.

11991 kc. FZS2
-C- 25.02 meters
SAIGON, INDO-CHINA
Phones Paris, morning

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

11940 kc. FTA
-C- 25.13 meters
STE. ASSISE, FRANCE
Phones CNR morning,
Hurlingham, Arge., nights

11890 kc. ★
-B- 25.23 meters
"RADIO COLONIAL"
PARIS, FRANCE
11:50 a.m.-6 p.m.
3-4 a.m.

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
5-9 p.m.
Fri. till 12 m
Relays KDKA

11860 kc. GSE
-B- 25.29 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
9 a.m.-12 n.

11830 kc. W2XE
-B- 25.38 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC 6-8 p.m.

11820 kc. GSN
-B- 25.38 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE.
LONDON, ENGLAND
Irregular

11810 kc. ★2RO
-B- 25.4 meters
E.I.A.R.
Via Montello 5
ROME, ITALY
8:15-9 a.m., 9:15-11 a.m., 11:30 a.m.-12:15 p.m.

11800 kc. CO9WR
-X- 25.42 meters
P. O. Box 85
SANCTI SPIRITUS, CUBA
Testing in early evening and 9 a.m.-12 n.

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Sun. 5-7 p.m.

11770 kc. DJD
-B- 25.49 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
12-4:30 p.m.

11750 kc. ★GSD
-B- 25.53 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
3:30-5:30 a.m., 12:15-4 p.m.

11730 kc. PHI
-B- 25.57 meters
HUIZEN, HOLLAND
Daily exc. Tues. and Wed. 8-10 a.m., Sat. and Sun. 8-11 a.m.

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

11715 kc.
-B- 25.61 meters
"RADIO COLONIAL"
PARIS, FRANCE
7-10:10 p.m.
11 p.m.-1 a. m.

11710 kc. ★HJ4ABA
-B- 25.62 meters
P. O. BOX 50,
MEDELLIN, COLOMBIA
11:30 a.m.-1 p.m., 6:30-10:30 p.m.

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

11560 kc. VIZ3
-X- 25.95 meters
AMALGAMATED WIRELESS OF AUSTRALASIA
FISKVILLE, AUSTRALIA
Calls Canada evening and early a.m.

11413 kc. CJA4
-C- 26.28 meters
DRUMMONDVILLE,
QUE., CAN.
Tests with Australia irregularly in evening

11200 kc. XDJQ
-B- 26.79 meters
BOX 2825,
MEXICO CITY, MEX.
Daily 5:30-6:30 p.m., 10 p.m.-12 m. Relays XEW.

11050 kc. ZLT4
-C- 27.15 meters
WELLINGTON, N. ZEALAND
Phones Australia and England early a.m. Also broadcasts irregularly on Sunday, 9-10 a.m.

11000 kc. PLP
-B-C- 27.27 meters
BANDOENG, JAVA
Relays NIROM programs 5:30-11 a.m. irregular on Sundays

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

10740 kc. ★JVM
-B,C- 27.93 meters
NAZAKI, JAPAN
Daily 12 m.-1 a.m., Tues. and Fri. 2-3 p.m., Daily 4-5 p.m.

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

10670 kc. ★CEC
-C- 28.12 meters
SANTIAGO, CHILE
Broadcasts Thurs., Sun. 8:30-9 p.m., Daily 7-7:15 p.m.

10660 kc. JVN
-C- 28.14 meters
NAZAKI, JAPAN
Phones Europe 3-8 a.m.

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

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

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

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

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

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

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

10330 kc. ★ORK
-B-C- 29.04 meters
RUYSSELEDE, BELGIUM
Broadcasts 2:30-4 p.m.

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

10290 kc. DIQ
-X- 29.16 meters
KONIGSWUSTERHAUSEN, GERMANY
Broadcasts irregularly

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

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

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

10140 kc. OPM
-C- 29.59 meters
LEOPOLDVILLE, BELGIAN CONGO
Phones around 3 a.m.

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

10042 kc. DJJ
-C- 29.87 meters
KONIGSWUSTERHAUSEN, GERMANY.
Works with Africa and broadcasts irregularly 2-4 p.m.

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

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

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

9860 kc. ★EAQ
-B- 30.43 meters
P. O. Box 951
MADRID, SPAIN
Daily 5:15-9:30 p.m.;
Saturday also 12 n.-2 p.m.

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

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

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

9760 kc. VLJ-VLZ2
-C- 30.74 meters
AMALGAMATED WIRELESS OF AUSTRALIA
SYDNEY, AUSTRALIA
Phones Java and N. Zealand early a.m.

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

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

9675 kc. DJI
-C- 31.01 meters
KONIGSWUSTERHAUSEN, GERMANY.
Works with Central America and broadcasts irregularly 5-7 p.m.

9635 kc. ★2RO
-B- 31.13 meters
E.I.A.R.,
ROME, ITALY
M., W., F. 7:45-9:15 p.m.
Daily 2-5:15 p.m.

9625 kc. ★CT1AA
-B- 31.17 meters
LISBON, PORTUGAL
Tues., Thurs., Sat. 4:30-7 p.m.

9600 kc. XEFT
-B- 31.25 meters
AVE. INDEPENDENCIA, 28,
VERA CRUZ, MEXICO
Daily 11 a.m.-4 p.m., 7:30 p.m.-12 m., Sat. 11 a.m.-4 p.m., 6:30 p.m.-12 m., Sun. 11 a.m.-4 p.m., 9 p.m.-12 m.
Relays XETF.

9595 kc. ★HBL
-B- 31.27 meters
LEAGUE OF NATIONS
GENEVA, SWITZERLAND
Saturdays, 5:30-6:15 p. m.
Mon. at 1:45 a.m.

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.
SYDNEY, AUSTRALIA
Sun. 1-3, 5-11 a.m.

9590 kc. HP5J
-B- 31.28 meters
APARTADO 867
PANAMA CITY, PANAMA
11:45 a.m.-1 p.m., 7:30-10 p.m.

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

9580 kc. ★GSC
-B- 31.32 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8, 10-11 p.m.

9580 kc. ★VK3LR
-B- 31.32 meters
Research Section,
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
3-7:30 a.m. except Sun.
also Fri. 10:30 p.m.-2 a.m.

9570 kc. ★W1XK
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
SPRINGFIELD, MASS.
Relays WBZ, 7 a.m.-1 a.m.
Sun. 8 a.m.-1 a.m.

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

9560 kc. ★DJA
-B- 31.38 meters
BROADCASTING HOUSE,
BERLIN
5:00-9:15 p.m.
12:30-2 a.m.
8-11:30 a.m.

9540 kc. ★DJN
-B- 31.45 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-2 a.m.
3:45-7:15 a.m.
8-11:30 a.m.
5:00-10:45 p.m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY 4 p.m.-12 m.
Sun. 4:15 p.m.-12 m.
Sat. 12 n.-12 m.

9525 kc. LKJ1
-B- 31.49 meters
JELOY, NORWAY
5-8 a.m., 11 a.m.-6 p.m.

9518 kc. ★VK3ME
-B- 31.54 meters
AMALGAMATED WIRELESS, Ltd.
G. P. O. Box 1272L,
MELBOURNE, AUSTRALIA
Daily exc. Sun. 4-7 a.m.

9510 kc. ★GSB
-B- 31.55 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
3:30-5:30 a.m., 9 a.m.-12 n. 12:15-4, 4:15-5:45 p.m.

9501 kc. ★PRF5
-B- 31.58 meters
RIO DE JANEIRO, BRAZIL
Irregularly 4:45-5:45 p.m.

9428 kc. ★COCH
-B- 31.8 meters
2 B ST., VEDADO,
HAVANA, CUBA
10 a.m.-12 n., 4-6:30, 8-10 p.m.
also 11 a.m.-12 N. Thurs.

9415 kc. ★PLV
-C- 31.87 meters
BANDOENG, JAVA
Phones Holland around 9:45 a.m.
Broadcasts Tues. and Thurs., Sat. 10-10:30 a.m.

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

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

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

(All Schedules Eastern Standard Time)

9125 kc. ★HAT4
-B- 32.88 meters
"RADIOLABOR," GYALI-uT. 22
BUDAPEST, HUNGARY
Sunday 6-7 a.m.

9060 kc. TFK
-C- 33.11 meters
REYKJAVIK, ICELAND
Phones London afternoons.
Broadcasts irregularly.

9020 kc. GCS
-C- 33.26 meters
RUGBY, ENGLAND
Calls N.Y.C., evenings

9010 kc. KEJ
-C- 33.3 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

8795 kc. HKV
-B- 34.09 meters
BOGOTA, COLOMBIA
Irregular; 6:30 p.m.-12 m.

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

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

8730 kc. GCI
-C- 34.36 meters
RUGBY, ENGLAND
Calls India, 6 a. m.

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

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

8380 kc. IAC
-C- 35.8 meters
Pisa, Italy

8220 kc. ZP10
-B- 36.4 meters
ASUNCION, PARAGUAY
7-9 p.m.

8214 kc. HCJB
-B- 36.5 meters
QUITO, ECUADOR
7-11 p.m., except Monday
Sun. 11 a.m.-12 n.; 4-10 p.m.

8185 kc. PSK
-C- 36.65 meters
RIO DE JANEIRO, BRAZIL
Irregularly

8170 kc. CO9JQ
-X- 36.72 meters
CAMAGUEY, CUBA
Broadcast 8-9 p.m. daily except Sat. and Sun.

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

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

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

7854 kc. HC2JSB
-B- 38.2 meters
GUAYAQUIL, ECUADOR
8:15-11:15 p.m.

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

7715 kc. KEE
-C- 38.89 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

7630 kc. ZHJ
-B- 39.32 meters
PENANG, MALAYA
Daily 7-9 a.m.
also Sat. 11 p.m.-1 A.M. (Sun.)

7510 kc. ★JVP
-B,C- 39.95 meters
NAZAKI, JAPAN
4-5 p.m.

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

7380 kc. XECR
-B- 40.65 meters
FOREIGN OFFICE, MEXICO CITY, MEX.
Sun. 6-7 p.m.

7281 kc. HJ1ABD
-B- 41.04 meters
CARTAGENA, COLO.
Irregularly, evenings

7100 kc. HKE
-B- 42.25 meters
BOGOTA, COL., S. A.
Tue. and Sat. 8-9 p. m.; Mon. & Thurs. 6:30-7 p. m.

7080 kc. VP3MR
-B- 42.68 meters
GEORGETOWN, BRI. GUIANA, S.A.
Sun. 7:45-10:15 a.m.
Mon. 3:45-4:45, 6:45-7:45 p.m.
Wed. 6:45-7:45 p.m.
Thur. 5-6:45 p.m.
Sat. 6:45-7:45 p.m.

7030 kc. HRP1
-B- 42.67 meters
SAN PEDRO SULA, HONDURAS
Reported on this and other waves irregularly in evening

7000 kc. HJ1ABK
-B- 42 meters
CALLE, BOLIVIA, PROGROSO-IGUALOAD
BARRANQUILLA, COLOMBIA
Testing in evening

6996 kc. PZH
-B- 42.88 meters
P. O. BOX 18.
PARAMIRABO, DUTCH GUIANA
Sun. 9:36-11:36 a.m.
Mon. and Fri. 5:36-9:36 p.m.
Tues. and Thur. 8:36-10:36 a.m.. 2:36-4:36 p.m.
Wed. 3:36-4:36, 5:36-9:36 p.m.
Sat. 2:36-4:36 p.m.

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

6860 kc. KEL
-X- 43.70 meters
BOLINAS, CALIF.
Tests irregularly
11 a. m.-12 n.; 6-9 p. m.

6814 kc. HIH
-B- 44.03 meters
SAN PEORO de MACORIS DOMINICAN REP.
12:10-1:40 p.m., 7:30-9 p.m.,
Sun. 3-4 a.m. 4:15-6 p.m.

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

6750 kc. ★JVT
-B.C- 44.44 meters
NAZAKI, JAPAN
KOKUSAI-DENWA KAISHA, LTD., TOKIO
Broadcasts 12 m.-1 a.m., 4-8 a.m.

6710 kc. ★TIEP
-B- 44.71 meters
LA-VOZ DEL TROPICO
SAN JOSE, COSTA RICA
APARTADO 257, Daily 7-10 p.m.

6672 kc. YVQ
-C- 44.95 meters
MARACAY, VENEZUELA
Broadcasts Sat. 8-9 p.m.

6660 kc. ★HC2RL
-B- 45.05 meters
P. O. BOX 759, GUAYAQUIL, ECUADOR, S. A.
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

6650 kc. IAC
-C- 45.11 meters
PISA, ITALY
Calls ships, evenings

6620 kc. ★PRADO
-B- 45.30 meters
RIOBAMBA, ECUADOR
Thurs. 9-11:45 p.m.

6611 kc. RV72
-B- 45.38 meters
MOSCOW, U. S. S. R.
1-6 p. m.

6600 kc. YV5AM
-B- 45.45 meters
"ECOS de LLANO"
SAN JUAN de LOS MORROS, VENEZUELA
Testing in evening

6550 kc. TIRCC
-B- 45.77 meters
RADIOEMISORA CATOLICA COSTARRICENSE
SAN JOSE, COSTA RICA
Sun. 12:45-2:30, 6-7, 8-9 p.m.

6528 kc. HIL
-B- 45.95 meters
SANTO DOMINGO, D.R.
Sat., 8-10 p.m.

6520 kc. ★YV6RV
-B- 46.01 meters
VALENCIA, VENEZUELA
12 n.-1 p.m., 6-10 p.m.

6500 kc. HJ5ABD
-B- 46.15 meters
MANIZALES, COL.
12-1:30 p. m., 7-10 p. m.

6482 kc. HI4D
-B- 46.28 meters
SANTO DOMINGO, DOMINICAN REPUBLIC
Except Sun. 11:55 a.m.-1:40 p.m.; 4:40-7:40 p.m.

6450 kc. HJ4ABJ
-B- 46.51 meters
"LA VOZ de CAMBEBE," IBAQUE, COLOMBIA
6-9 p.m.

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

6425 kc. W9XBS
-X- 46.7 meters
NATL. BROAD. CO.
CHICAGO, ILL.
Relays WMAQ, irregular

6410 kc. TIPG
-B- 46.8 meters
APARTADO 225,
SAN JOSE, COSTA RICA
"LA VOZ DE LA VICTOR"
12 n.-2 p.m., 6-10 p.m.

6375 kc. YV4RC
-B- 47.06 meters
CARACAS VENEZUELA
4:30-10:30 p.m.

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

6230 kc. OAX4G
-B- 48 meters
Apartado 1242
LIMA, PERU
Wed. 7-11:30 p.m.

6198 kc. CT1GO
-B- 48.4 meters
Portuguese Radio Club.
PAREDE, PORTUGAL
Sun. 11:30 a.m.-1 p.m.
Daily exc. Tues. 7:20-8:30 p.m.

6185 kc. HI1A
-B- 48.5 meters
P. O. BOX 423, SANTIAGO, DOMINICAN REP.
11:40 a. m.-1:40 p. m.
7:40-9:40 p. m.

6175 kc. HJ2ABA
-B- 48.58 meters
TUNJA, COLOMBIA
1-2; 7:30-9:30 p.m.

6170 kc. HJ3ABF
-B- 48.62 meters
BOGOTA, COLOMBIA
6-11 p.m.

6160 kc. ★YV3RC
-B- 48.7 meters
CARACAS, VENEZUELA
11 a.m.-2 p.m., 4-10:30 p.m.

6155 kc. CO9GC
-B- 48.74 meters
GRAU & CAMENEROS LABS., BOX 137, SANTIAGO, CUBA
9-10 a.m., 11:30 a.m.-1:30 p.m., 3-4:30 p.m., 10-11 p.m., 12 m.-2 a.m.

6150 kc. CSL
-B- 48.78 meters
LISBON, PORTUGAL
7-8:30 a.m., 2-7 p.m.

6150 kc. ★CJRO
-B- 48.78 meters
WINNIPEG, MAN., CANADA
8 p. m.-12 m.
Sun. 3-10:30 p. m.

6150 kc. HJ5ABC
-B- 48.78 meters
CALI, COLOMBIA
M., W., F., 7-10 p.m.

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

6130 kc. COCD
-B- 48.92 meters
"La Voz del Aire"
CALLE G y 25, VEDADO, HAVANA, CUBA
Relays CMCD 8 p.m.-12 m.

6130 kc. HJ1ABE
-B- 48.92 meters
CARTAGENA, COL.
P. O. Box 31
Daily 11:15 a. m.-1 p. m.; Sun. 9-11 a.m.; Mon. 10 p.m.-12 m. Wed. 8-11 p.m.

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

6120 kc. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC, 8-11 p.m.

6120 kc. XEFT
-B- 49.02 meters
VERA CRUZ, MEX.
11 a.m.-4 p.m., 7:30 p.m.-12 m.
Sat. also 6:30-7:30 p.m.
Sun. 11 a.m.-4 p.m., 9 p.m.-12 m.
Relays XETF

6110 kc. ★CHNX
-B- 49.1 meters
P.O. BOX 998
HALIFAX, N.S., CANADA
Daily 9 a.m.-12:30 p.m., 4-10 p.m.

6110 kc. ★GSL
-B- 49.10 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
2:30-4, 10-11 p.m.

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

6105 kc. HJ4ABB
-B- 49.14 meters
MANIZALES, COL., S. A.
P. O. Box 175
Mon. to Fri. 12:15-1 p. m.; Tues. & Fri. 7:30-10 p. m.; Sun. 2:30-5 p. m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ
Monday, Wednesday, Saturday, 5-6 p.m., Sun. 12 m-1 a.m.

6100 kc. ★W9XF
-B- 49.18 meters
Natl. Broad. Co.
Relays WENR, Chicago

6097 kc. ZTJ
-B- 49.2 meters
AFRICAN BROADCASTING CO.
JOHANNESBURG, SOUTH AFRICA.
Sun.-Fri. 11:45 p.m. (12:30 a.m. (next day)
Mon.-Sat. 3:30-7 a.m.
9 a.m.-4 p.m.
Sun. 8.10:15 a.m.; 12:30-3 p.m.

6090 kc. ★CRCX
-B- 49.26 meters
TORONTO, CANADA
Daily 6 p.m.-12 m., Sun. 12 n -12m

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

6085 kc. 2RO
-B- 49.3 meters
E.I.A.R.
ROME, ITALY
Mon., Wed., Fri. 6:15-7:30 p.m.
Daily 6-6:15 p.m.

6083 kc. VQ7LO
-B- 49.31 meters
NAIROBI, KENYA, AFRICA
Mon.-Fri. 5:45-6:15 a.m., 11:30 a.m.-2:30 p.m. Also 8:30-9:30 a.m. on Tues. and Thurs. Sat. 11:30 a.m.-3:30 p.m. Sun. 11 a.m.-2 p.m.

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

6080 kc. HP5F
-B- 49.34 meters
COLON, PANAMA
Testing in evening.

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

6079 kc. DJM
-X- 49.34 meters
BROADCASTING HOUSE
BERLIN
Tests 3-5 p.m.

6072 kc. OER2
-B- 49.41 meters
VIENNA, AUSTRIA
9 a.m.-5 p.m.

6070 kc. HJ4ABC
-B- 49.42 meters
PERIERA, COL.
9:30-11:30 a.m., 7-8 or 9 p.m.

6070 kc. VE9CS
-B- 49.42 meters
VANCOUVER, B. C., CANADA
Sun. 1:45-9 p. m., 10:30 p. m.-1 a. m.; Tues. 6-7:30 p. m., 11:30 p. m.-1:30 a. m. Daily 6-7:30 p. m.

6065 kc. HJ4ABL
-B- 49.46 meters
MANIZALES, COL.
Daily 11 a.m.-12 n., 5:30-7:30 p.m. Sat. 10:30-11:30 p.m.

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
6:30 a.m.-8 p.m.; 11 a.m.-1 a.m.
Relays WLW

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

6050 kc. ★GSA
-B- 49.59 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
10:45 a.m.-12 n.- 4-5:45 p.m., 6-8 p.m.

6045 kc. HJ3ABI
-B- 49.63 meters
BOGOTA, COLO.
Irregular in evening

6042 kc. HJ1ABG
-B- 49.65 meters
BARRANQUILLA, COLO.
12 n.-1 p.m., 6-10 p.m.
Sun. 1-6 p.m.

6040 kc. W4XB
-B- 49.67 meters
MIAMI BEACH, FLA.
Relays WIOD 12 n.-2 p.m., 5:30 p.m.-12 m.

6040 kc. PRA8
-B- 49.67 meters
RADIO CLUB OF PERNAMBUCO
PERNAMBUCO, BRAZIL
1-3 p.m., 4-7:30 p.m. daily

6040 kc. ★W1XAL
-B- 49.67 meters
BOSTON, MASS.
Tues., Thurs. 7:15-9:15 p.m.
Sun 5-7 p.m.

6040 kc. YDA
-B- 49.67 meters
N.I.R.O.M.
TANJONGPRIOK, JAVA
5:45-6:45 p.m., 10:30 p.m.-1:30 a.m.

6030 kc. ★HP5B
-B- 49.75 meters
P. O. BOX 910
PANAMA CITY, PAN.
12 N.-1 p.m., 8-10:30 p.m.

6030 kc. VE9CA
-B- 49.75 meters
CALGARY, ALBERTA, CAN.
Thurs. 9 a.m.-2 a.m. (Fri.); Sun. 12 n.-12 m.
Irregularly on other days from 9 a.m.-12 m.

6020 kc. CQN
-B- 49.83 meters
MACAO, CHINA
Mon. and Fri. 3-5 a.m.

6020 kc. ★DJC
-B- 49.83 meters
BROADCASTING HOUSE, BERLIN
12 n.-4:30 p.m., 5-10:45 p.m.

6020 kc. HJ3ABH
-B- 49.83 meters
BOGOTA, COLO.
APARTADO 565
7-11 p.m.

(All Schedules Eastern Standard Time)

6018 kc. ZHI
-B- 49.9 meters
RADIO SERVICE CO., 20 ORCHARD RD., SINGAPORE, MALAYA
Mon., Wed. and Thurs 5:40-8:10 a.m. Sat. 10:40 p.m.-1:10 a.m. (Sun.) Every other Sunday 5:10-6:40 a.m.

6010 kc. ★COCO
-B- 49.92 meters
P.O. BOX 98
HAVANA, CUBA
Daily 9:30-11 a.m., 4-7 p.m. and 8-10 p.m.
Sat. also 11:30 p.m.-1:30 a.m.

6005 kc. VE9DN
-B- 49.96 meters
CANADIAN MARCONI CO., MONTREAL, QUE., CANADA
Saturdays at 11:30 p.m.

6000 kc. TGWA
-B- 50 meters
GUATEMALA CITY, GUAT.
12 n-1 p.m., 6:30-7:30 p.m. 10-11 p.m. Sat. also from 12 m.-6 a.m. (Sun.)

6000 kc. RV59
-B- 50 meters
MOSCOW, U. S. S. R.
Daily 3-6 p.m.

5990 kc. ★XEBT
-B- 50.08 meters
MEXICO CITY, MEX.
P. O. Box 79-44
8 a.m.-1 a.m.

5985 kc. HJ2ABC
-B- 50.13 meters
CUCUTA, COLOMBIA
Irreg. in evening

5980 kc. XECW
-B- 50.17 meters
CALLE del BAJIO 120
MEXICO CITY, MEX.
4-4:30 p.m., 10:30 p.m.-12 m.

5980 kc. HIX
-B- 50.17 meters
SANTO DOMINGO, DOMINICAN REP.
Sun. 7:10 a.m.; Tues. and Fri. 11:10 a.m., 4:40 and 8:10 p.m.; Mon., Wed., Thurs. and Sat. 11:10 a.m. and 4:40 p.m.

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

5950 kc. HJ1ABJ
-B- 50.42 meters
SANTA MARTA, COLO.
11 a.m.-1 p.m., 7-9 p.m.

5950 kc. HJ4ABE
-B- 50.42 meters
MEDELLIN, COLO.
Daily 11 a.m.-12 n., 6-10:30 p.m.

5940 kc. TG2X
-B- 50.5 meters
GUATEMALA CITY, GUAT.
4-6, 9-11 p.m.

5880 kc. YV8RB
-B- 51.02 meters
"LA VOZ de LARA"
BARQUISIMETO, VENEZUELA
6-10 p.m.

5875 kc. HRN
-B- 51.06 meters
TEGUCIGALPA, HONDURAS
7-9 p.m.

5853 kc. WOB
-C- 51.26 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, nights

5850 kc. ★YV5RMO
-B- 51.28 meters
CALLE REGISTRO, LAS DELICIAS APARTADO de CORRES 214
MARACAIBO, VENEZUELA
11 a.m.-1 p.m., 5:30-10 p.m.

5825 kc. TIGPH
-B- 51.5 meters
SAN JOSE, COSTA RICA
6:15-11 p.m.

5800 kc. ★YV2RC
-B- 51.72 meters
BROADCASTING CARACAS
CARACAS, VENEZUELA
Sun. 8:30 a.m.-10:30 p.m.
Daily 11 a.m.-1:30 p.m., 4-9:30 p.m.

5790 kc. JVU
-C- 51.81 meters
NAZAKI, JAPAN
Broadcasts 2-7:45 a.m.

5780 kc. HI1J
-B- 51.9 meters
SAN PEDRO de MACORIS, DOM. REP.
7-9:30 p.m.

5780 kc. OAX4D
-B- 51.9 meters
P.O. Box 853
LIMA, PERU
Mon., Wed. & Sat. 9-11:30 p.m.

5720 kc. YV10RSC
-B- 52.45 meters
"LA VOZ de TACHIRA,"
SAN CRISTOBAL, VENEZUELA
Testing near 12 m.

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

5713 kc. TGS
-B- 52.51 meters
GAUTEMALA CITY, GUAT.
Tues., Thurs., and Sun. 6-8 p.m.

5500 kc. TI5HH
-B- 54.55 meters
SAN RAMON, COSTA RICA
Irregularly around 9:45 p.m.

5410 kc. ZCK
-B- 55.45 meters
HONGKONG, CHINA
Relays ZBW
Daily 11:30 p.m.-1:15 a.m.
Mon. and Thurs. 3-7 p.m.
Tues., Wed., Fri. 6-10 a.m.
Sat. 6-11 a.m.

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

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

5000 kc. TFL
-C- 60 meters
REYKJAVIK, ICELAND
Calls London at night.
Also broadcasts irregularly

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

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

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

4600 kc. HC2ET
-B- 65.22 meters
Apartado 249
GUAYAQUIL, ECUADOR
Wed., Sat. 9-11:30 p.m.

4470 kc. YDB
-B- 67.11 meters
N.I.R.O.M.
SOERABAJA, JAVA
10:30 p.m.-1:30 a.m., 5:30-11 a.m., 5:45-6:45 p.m.

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

4273 kc. RV15
-B- 70.20 meters
KHABAROVSK, SIBERIA, U. S. S. R.
Daily, 3-9 a.m.

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

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

4002 kc. CT2AJ
-B- 74.95 meters
PONTA DELGADA, SAO MIGUEL, AZORES
Wed. and Sat. 5-7 p. m.

3543 kc. CR7AA
-B- 84.67 meters
P. O. BOX 594
LOURENCO MARQUES, MOZAMBIQUE, E. AFRICA
1:30-3:30 p.m., Mon., Thurs., and Sat.

3490 kc. YDH3
-B- 85.96 meters
BANDOENG, JAVA
Daily except Fri., 4:30-5:30 a. m.

3040 kc. YDA
-B- 98.68 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
5:30-11 a.m.

(All Schedules Eastern Standard Time)

Police Radio Alarm Stations

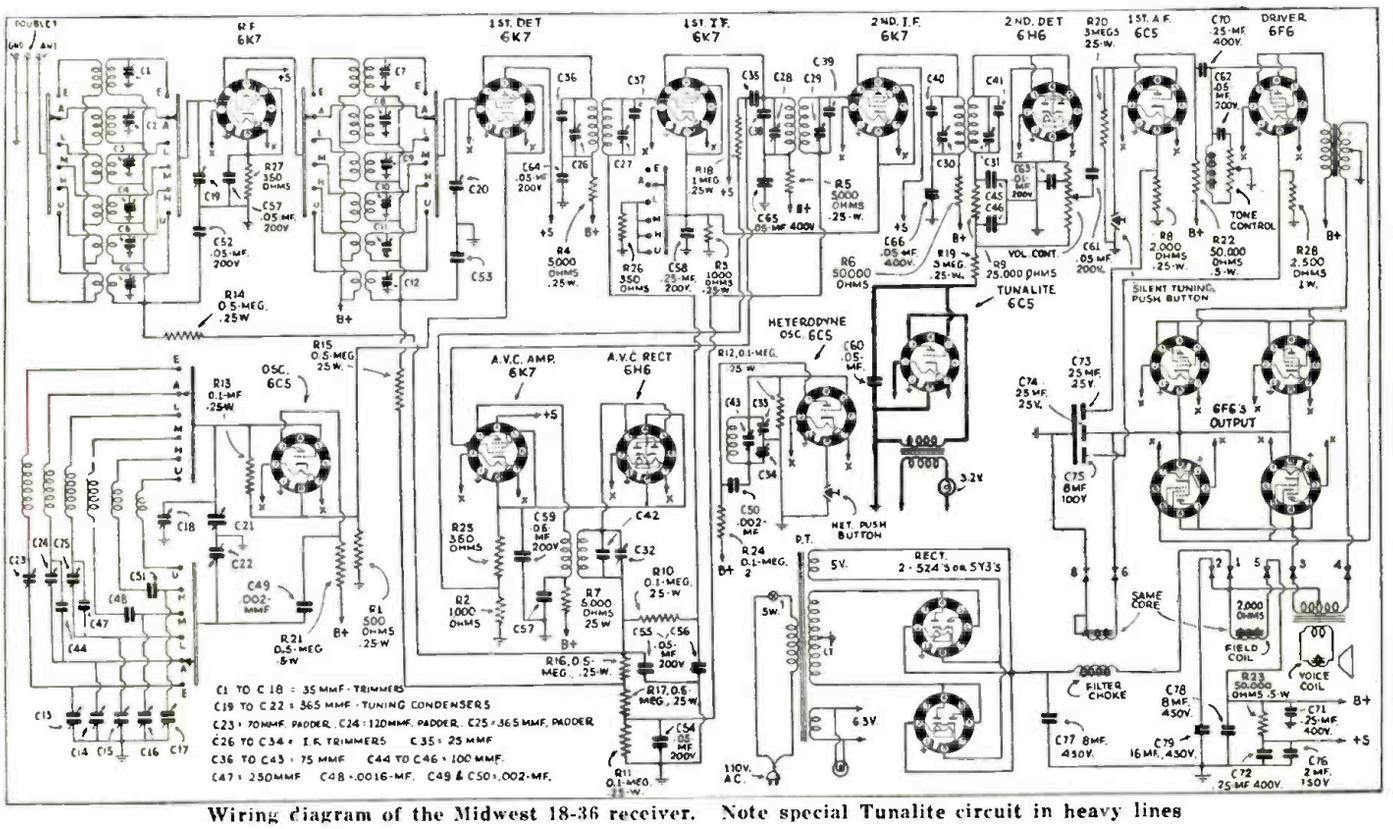
CGZ	Vancouver, B.C.	2342 kc
CJW	St. Johns, N.B.	2390 kc.
CJZ	Verdeen, Que.	2390 kc.
KGHA, KGHB, KGHC	Portable-Mobile In State of Wash.	2490 kc.
KGHG	Las Vegas, Nev.	2474 kc.
KGHK	Palo Alto, Cal.	1674 kc.
KGHM	Reno, Nev.	2474 kc.
KGHN	Hutchinson, Kans.	2450 kc.
KGHO	Des Moines, Iowa	1682 kc.
KGHP	Lawton, Okla.	2466 kc.
KGHQ	Chinook Pass, W.	2490 kc.
KGHR	(Mobile) in Wash.	2490 kc.
KGHS	Spokane, Wash.	2414 kc.
KGHT	Brownsville, Tex.	2382 kc.
KGHU	Austin, Tex.	2442 kc.
KGHV	Corpus Christi, Tex.	2382 kc.
KGHW	Centralia, Wash.	2414 kc.
KGHX	Santa Ana, Cal.	2490 kc.
KGHY	Whittier, Cal.	1712 kc.
KGHZ	Little Rock, Ark.	2406 kc.
KGJX	Pasadena, Cal.	1712 kc.
KGLX	Albuq uerque, N.M.	2414 kc.
KGOZ	Cedar Rapids, Iowa	2466 kc.
KGPA	Seattle, Wash.	2414 kc.
KGPB	Minneapolis, Minn.	2430 kc.
KGPC	St. Louis, Mo.	1706 kc.
KGPD	San Francisco, Cal.	2466 kc.
KGPE	Kansas City, Mo.	2422 kc.
KGPF	Santa Fe, N.Mex.	2414 kc.
KGPG	Vallejo, Cal.	2422 kc.
KGPH	Oklahoma City, Okla.	2450 kc.
KGPI	Omaha, Neb.	2466 kc.
KGPJ	Beaumont, Tex.	1712 kc.
KGPK	Sioux City, Iowa	2466 kc.
KGPL	Los Angeles, Cal.	1712 kc.
KGPM	San Jose, Cal.	2466 kc.
KGPN	Davenport, Iowa	2466 kc.
KGPO	Tulsa, Okla.	2450 kc.
KGPP	Portland, Ore.	2442 kc.
KGPQ	Honolulu, T.H.	1712 kc.
KGPR	Minneapolis, Minn.	2430 kc.
KGPS	Bakersfield, Cal.	2414 kc.
KGPW	Salt Lake City, Utah	2406 kc.
KGPX	Denver, Colo	2442 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZA	Fresno, Cal.	2414 kc.
KGZB	Houston, Tex.	1712 kc.
KGZC	Topeka, Kans.	2422 kc.
KGZD	San Diego, Cal.	2490 kc.
KGZE	San Antonio, Tex.	2482 kc.
KGZF	Chanute, Kans.	2450 kc.
KGZG	Des Moines, Iowa	2466 kc.
KGZH	Klamath Falls, Ore.	2442 kc.
KGZI	Wichita Falls, Tex.	2458 kc.
KGZJ	Phoenix, Ariz.	2430 kc.
KGZM	El Paso, Tex.	2414 kc.
KGZN	Taconia, Wash.	2414 kc.
KGZO	Santa Barbara, Cal.	2414 kc.
KGZP	Coffeyville, Kans.	2450 kc.
KGZQ	Waco, Tex.	1712 kc.
KGZR	Salem, Ore.	2442 kc.
KGZT	Santa Cruz, Cal.	1674 kc.
KGZU	Lincoln, Neb.	2490 kc.
KGZV	Aberdeen, Wash.	2414 kc.
KGZW	Lubbock, Tex.	2458 kc.
KGZX	Albuquerque, N.Mex.	2414 kc.
KGZY	San Bernardino, Cal.	1712 kc.
KIUK	Jefferson City, Mo.	1674 kc.
KNFA	Clovis, N.Mex.	2414 kc.
KNFB	Idaho Falls, Idaho	2458 kc.
KNFC	SS Gov. Stevens, (Wash.)	2490 kc.
KNFD	SS Gov. J Rogers, (Wash.)	2490 kc.
KNFE	Duluth, Minn.	2382 kc.
KNFF	Leavenworth, Kans.	2422 kc.
KNFG	Olympia, Wash.	2490 kc
KNFH	Garden City, Kans.	2474 kc.
KNFI	Mt. Vernon, Wash.	2414 kc.
KNFJ	Pomona, Cal.	1712 kc.
KNFK	Bellingham, Wash.	2490 kc.
KNFL	Shuksan, Wash.	2490 kc.
KNFM	Compton, Cal.	2490 kc.
KNFN	Waterloo, Iowa	1682 kc.
KNFO	Storm Lake, Iowa	1682 kc.
KNFP	Everett, Wash.	2414 kc.
KNFQ	Skykomish, Wash.	2490 kc.
KNFR, KNFS, KNFT, KNFU, KNFV, KNFW	Mobile in State of Wash.	2490 kc.
KNFX	Alpowa Camp, Wash.	2490 kc.
KNFY	Ilwaco, Wash.	2490 kc.
KNFZ	Hells Crossing Camp, Wash.	2490 kc.
KNGA	Satus Pass Camp, Wash.	2490 kc.
KNGB	Yakima, Wash.	2490 kc.
KNGC	Vancouver, Wash.	2490 kc.
KNGD	Walla Walla, Wash.	2490 kc.
KNGE	Cleburne, Tex.	1712 kc.
KNGF	Sacramento, Cal.	2422 kc.
KNGH	Dodge City, Kans.	2474 kc.
KNGJ	El Centro, Cal.	2490 kc.
KNGK	Duncan, Okla.	2450 kc.
KNGM	Rapid City, S. Dak.	2450 kc.
KNGN	Norfolk, Nebr.	2490 kc.
KNGO	Portable, Okla.	2450 kc.
KNGP	Shreveport, Pa.	2430 kc.
KNGQ	Wenatchee, Wash	2490 kc.
KNGR	Spokane, Wash.	2490 kc.
KNGT	Muskogee, Okla.	2450 kc.
KNGU	Yakima, Wash.	2414 kc.
KNGV	Salina, Kans.	2422 kc.
KNGW	Brownwood, Tex.	2458 kc.
KNGX	Portable, Los Angeles	1712 kc.
KNGY	Lodi, Calif.	2414 kc.
KNGZ	Ephrata, Wash.	2490 kc.
KNHA	Mobile, Wash.	2490 kc.
KNHB	Green Bay, Wis.	2382 kc.
KNHC	Ada, Okla.	2450 kc.
KNHD	Redwood Falls, Minn.	1658 kc.
KNHE	Fort Smith, Ark.	2406 kc.
KNHF	Denton, Tex.	1712 kc.
KNHG	Prescott, Ark.	2430 kc.
KNHM	Fargo, N. Dak.	2442 kc.
KSW	Berkeley, Cal.	1658 kc.
KVP	Dallas, Tex.	1712 kc.
VDM	Halifax, N.S.	1690 kc.
VYR	Montreal, Can.	1706 kc.
VYW	Winnipeg, Man.	2396 kc.
WCK	Belle Island, Mich.	2414 kc.
WEY	Boston, Mass.	1630 kc.
WKDT	Detroit, Mich.	1630 kc.
WKDU	Cincinnati, Ohio	1706 kc.
WMDZ	Indianapolis, Ind.	2442 kc.
WMJ	Buffalo, N.Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1666 kc.
WNFP	Niagara Falls, N.Y.	2422 kc.
WPDA	Tulare, Cal.	2414 kc.
WPDB	Chicago, Ill.	1712 kc.
WPDC	Chicago, Ill.	1712 kc.
WPDD	Chicago, Ill.	1712 kc.
WPDE	Louisville, Ky.	2442 kc.
WPDF	Flint, Mich.	2466 kc.
WPDG	Youngstown, Ohio	2458 kc.
WPDH	Richmond, Ind.	2442 kc.
WPDI	Columbus, Ohio	2430 kc.
WPDK	Milwaukee, Wis.	2450 kc.
WPDL	Lansing, Mich.	2442 kc.
WPDM	Dayton, Ohio	2430 kc.
WPDN	Auburn, N.Y.	2382 kc.
WPDO	Akron, Ohio	2458 kc.
WPDP	Philadelphia, Pa.	2474 kc.
WPDR	Rochester, N.Y.	2422 kc.
WPDS	St. Paul, Minn.	2430 kc.
WPDT	Kokomo, Ind.	2490 kc.
WPDU	Pittsburgh, Pa.	1712 kc.
WPDV	Charlotte, N.C.	2458 kc.
WPDW	Washington, D.C.	2422 kc.
WPDX	Detroit, Mich.	2414 kc.
WPDY	Atlanta, Ga.	2414 kc.
WPDZ	Fort Wayne, Ind.	2490 kc.
WPEA	Syracuse, N.Y.	2382 kc.
WPEB	Grand Rapids, Mich.	2442 kc.
WPEC	Memphis, Tenn.	2466 kc.
WPED	Arlington, Mass.	1712 kc.
WPEE	New York, N.Y.	2450 kc.
WPEF	New York, N.Y.	2450 kc.
WPEG	New York, N.Y.	2450 kc.
WPEH	Somerville, Mass.	1712 kc.
WPEI	E. Providence, R.I.	1712 kc.
WPEK	New Orleans, La.	2430 kc.
WPEL	W. Bridgewater, Mass.	1666 kc
WPEM	Woonsocket, R.I.	2466 kc.
WPEP	Kenosha, Wis.	2450 kc.
WPES	Saginaw, Mich.	2442 kc.
WPET	Lexington, Ky.	1706 kc.
WPEV	Portable (in Mass.)	1666 kc.
WPEW	Northampton, Mass.	1666 kc.
WPFA	Newton, Mass.	1712 kc.
WPFC	Muskegon, Mich.	2442 kc.
WPFE	Reading, Pa.	2442 kc.
WPFG	Jacksonville, Fla.	2442 kc.
WPFH	Baltimore, Md.	2414 kc.
WPFI	Columbus, Ga.	2414 kc.
WPFJ	Hammond, Ind.	1712 kc.
WPFK	Hackensack, N.J.	2430 kc.

"WHEN TO LISTEN IN" Appears on page 622

(Continued on Page 632)

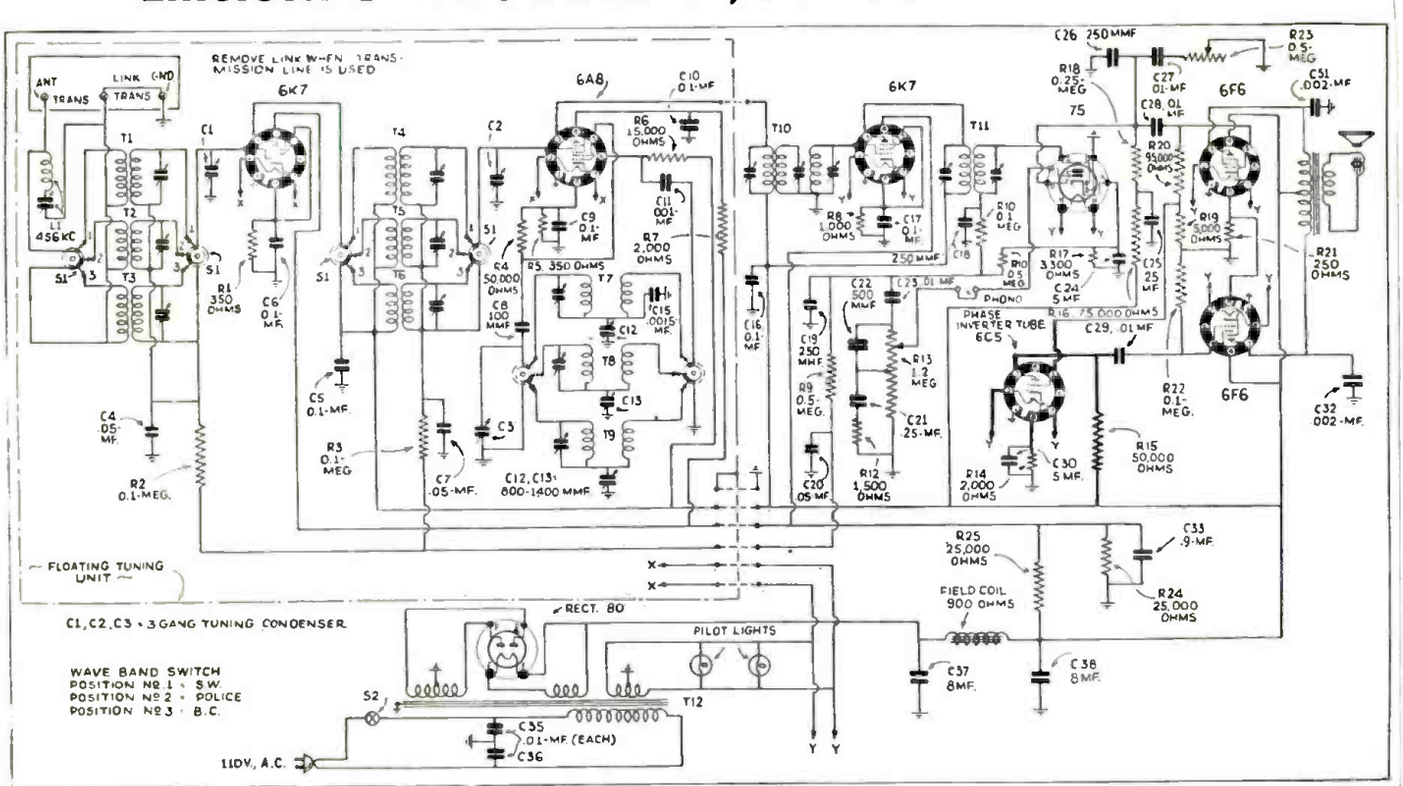
Diagrams of S-W Commercial Receivers

Midwest 18-Tube Receiver, Model 18-36



Wiring diagram of the Midwest 18-36 receiver. Note special Tunalite circuit in heavy lines

Emerson 8-Tube Receiver, Models 102 and 104



Wiring diagram of the Emerson receiver. Note Phase Inverter Tube Circuit in heavy line.

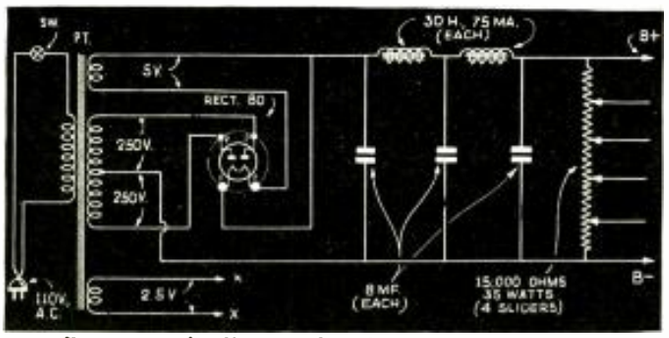
• • Short Wave

POWER SUPPLY DIAGRAM

Albert Anderson, Brooklyn, N.Y.

(Q) Kindly print a diagram of a power-pack delivering the following voltages: 45, 67½, 90 and 135 volts B, and 2½ volts for filaments.

(A) The diagram of a power-supply for a short-wave receiver is given herewith. The output voltages are taken from a 15,000 ohm, 35-watt resistor with 4 sliders. These should be adjusted to give the proper voltage and each tap should be by-passed with a condenser having from ½ to 1 mf. capacity.



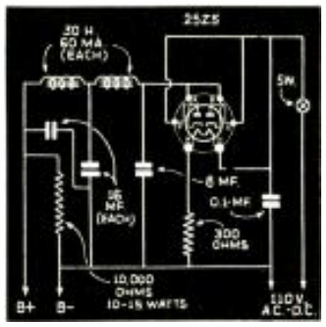
Power supply diagram for short wave receivers.

A.C.-D.C. POWER SUPPLY

Peter Zantos, Chicago, Ill.

(Q) I would be pleased if you would print a diagram of an A.C.-D.C. power supply using a 25Z5 tube.

(A) The power supply shown will deliver from 110 to 125 volts D.C., depending on the line voltage.



A.C.-D.C. power supply diagram.

No direct ground should be attached to the B negative circuit.

3-TUBE REGENERATOR

Carl Neyers, Johnstown, Pa.

(Q) I would be very grateful to you if you would publish a diagram of a receiver using a 56 regenerative detector, transformer coupled to a 56 audio amplifier, which in turn should be transformer-coupled to a 2A5 pentode audio amplifier.

(A) The diagram you request is printed here. In order to eliminate serious "feed-back," we suggest that you use low-ratio transformers; no greater than 3 to 1, and preferably lower. Regeneration is controlled in the detector stage with a .00014 mf. variable condenser. An earphone jack is also shown in the output of the first audio amplifier.

25-CYCLE SETS

Joe Sullivan, Timmins, Ont., Can.

(Q) Are your power-packs all suitable for 25 A.C. operation? I remember reading a statement in your *Question Box* to the effect that fellows with 25 cycle "mains" should keep away from A.C.-D.C. sets. Please throw some light on the subject.

(A) The diagrams of conventional A.C. power packs, printed in *Short Wave Craft*, are all suitable for 25 cycles, providing a 25-cycle transformer is used. The filter condenser should have about twice to three times the capacity of those used on 60 cycles. With a half-wave rectifier, as used in most A.C.-D.C. sets, we believe it just about impossible to eliminate hum on 25 cycle supply, because we have seen very few A.C.-D.C. sets that did not hum on 60-cycles supplies, so our warning still stands. If you have 25-cycle power supply lines, keep away from A.C.-D.C. sets.

3 TUBES EQUAL 4

Jack Derney, Marshfield, Ore.

(Q) I would like to have a short-wave set, battery operated, using a 34 untuned R.F. stage and 19 super-regenerative detector and audio amplifier with a 33 power amplifier. Will you be kind enough to print the diagram.

(A) We are printing the diagram you request. However, we do not recommend the super-regenerative detector. For a set having more than 1 tube and operated on the general short-wave bands, the super-regenerative detector is not recommended.

A.C.-D.C. MONITOR

R. Willoughby, Salinas, Calif.

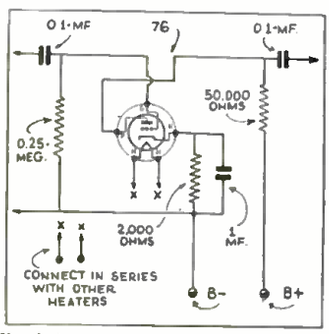
(Q) Kindly publish a diagram of a Monitor and frequency meter using a 12A7 tube as the rectifier and oscillator. This is to be a self-powered instrument.

(A) The 12A7, used as a Monitor in a frequency meter, presents a very compact instrument. Remember, though, that there is liable to be some modulation due to the hum, and also fluctuations in line voltage may cause changes in the calibration.

AMPLIFIER FOR UDAR

Francis Saunders, Springfield, Ill.

(Q) I have built a 2-tube UDAR



Resistance - coupled amplifier for "UDAR" receiver.

as described in the May issue. It is a wonderful set. I would like to add an audio stage using a 76 tube. Please print the diagram.

(A) The 76 tube is resistance-coupled between the 6F7 and 12A7. The heaters will be connected in series and the line cord should have 20 ohms less resistance.

1-TUBE ALL-WAVE'ER

H. D. Booker, Muskogee, Okla.

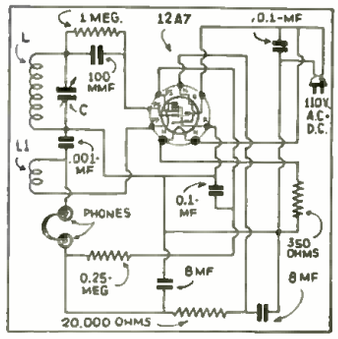
(Q) Will you kindly explain through the aid of a diagram in the *Question Box*, how to build a 1-tube "all-wave" receiver using a type 30 tube. I want to operate this on a 6 volt storage battery.

(A) The diagram you request is shown on this page. Plug-in coils are used and the data for them can be found in last month's *Short Wave Craft*. When operating on a 6-volt battery, use only one 2-volt cell at a time.

SIMPLEST PHONE TRANSMITTER

A. L. Hulburt, Mt. Vernon, Ill.

(Q) Regarding the "*Simplest Phone Transmitter*" in the July issue, which condenser is a neutralizing condenser, and which is used to tune the amplifier. Also, can another R.F. amplifier, using 2—10's, be added to this set?



A.C.-D.C. Monitor using 12A7

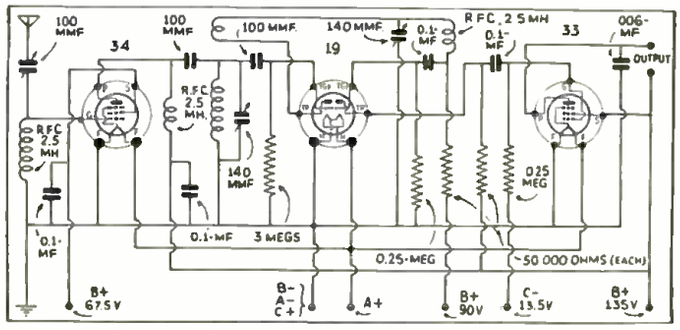
(A) The two 175 mmf. condensers are used for tuning. This should be a split-stator condenser. The 50 mmf. condenser is used for neutralizing. If additional amplification is used with this transmitter, modulation should be applied to the final amplifier instead of the 46's. The same modulation method can be used.

T.R.F. AMPLIFIER

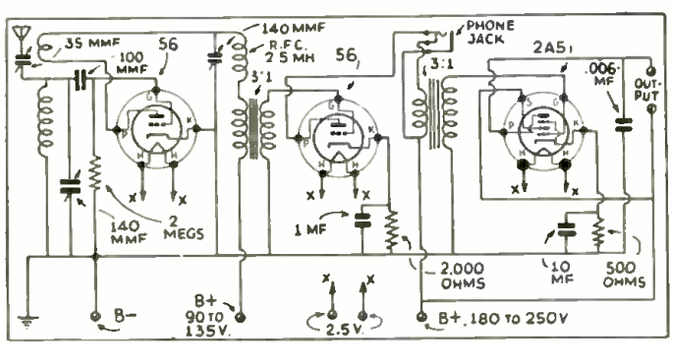
Arthur Lombarde, Derby, Conn.

(Q) Kindly print a diagram of an R.F. amplifier which may be added to the 2-tube "band-spread" Doerle receiver.

(A) The 58 R.F. amplifier diagram shown, should increase the signal strength tremendously on the Doerle receiver. The output of the amplifier connects directly to the an-



3 tubes equal 4 in this battery-operated receiver.



Short wave receiver using 56 regenerative detector, 56 audio and 2A5 second audio amplifier.

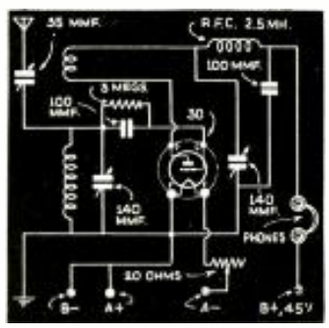


Diagram of 1-tube all-wave set.

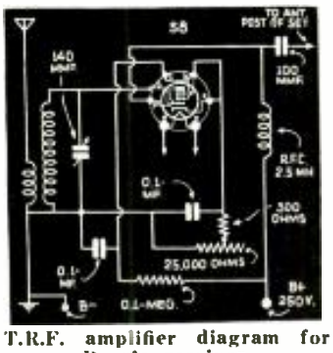
EDITED BY GEORGE W. SHUART, W2AMN

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

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

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

QUESTION BOX



T.R.F. amplifier diagram for Doerle receiver.

tenna post. The present antenna-coupling condenser may be used to vary the coupling between the R.F. stage and the detector.

ADDING AUDIO AMPLIFIER

Rudolph Surych, Jersey City, N.J.

(Q) I am using a regenerative set with a 37 and a 6F7. Please show a diagram of an amplifier which will match this receiver.

(A) We are showing a diagram of the 37 which should be transformer-coupled to the receiver. If it is an A.C.-D.C. set, the heaters should all be connected in series. Reduce the line cord resistor 20 ohms to allow for the added tube.

3-TUBE BATTERY SET

Bruce T. McCaun, New York City.

(Q) Kindly print a diagram of the Doerle receiver which uses a 34 T.R.F. amplifier, a 30 regenerative detector and 30 audio amplifier.

(A) We are pleased to print the diagram for you, Bruce. This is a well-known combination, and a very easy one to "get going." Three winding coils are used in the detector circuit, while the original Doerle only had two winding coils.

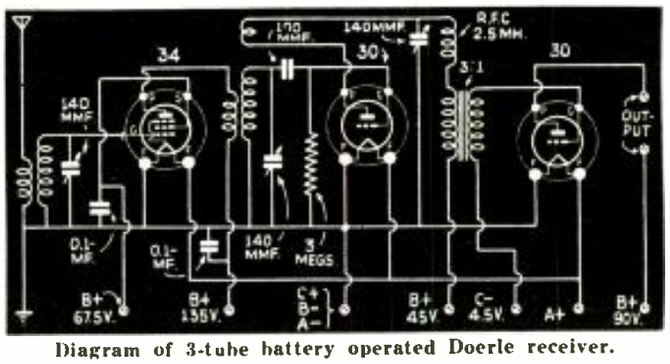


Diagram of 3-tube battery operated Doerle receiver.

CODE-PRACTICE OSCILLATOR

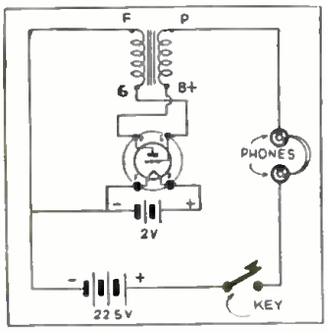
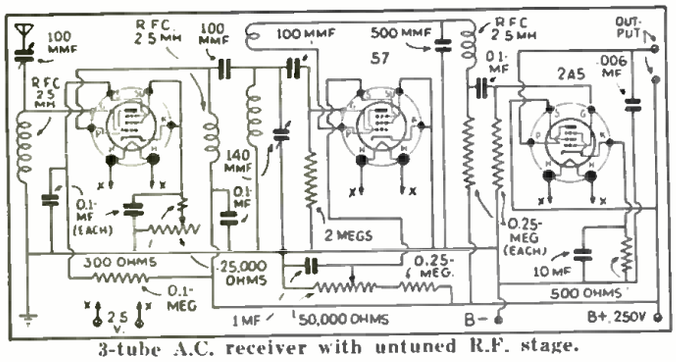


Diagram of 1-tube code practice oscillator.

Clarence Brown, Kansas City, Kans.

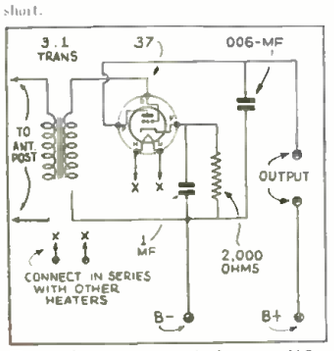
(Q) Please publish a circuit diagram of a simple code-practice oscillator using a type 30 tube and a minimum of batteries.

(A) We have shown the circuit diagram requested. This uses a 30 and an ordinary audio transformer. Make sure the transformer is connected as shown. Otherwise, no tone will be obtained.



3-tube A.C. receiver with untuned R.F. stage.

Wherever A.D.-D.C. receivers are used, no ground wire should be attached directly to the B negative. Wherever a ground is used on .1 mf. condenser should be connected in series with it to prevent a direct short.



Transformer-coupled amplifier for 2-tube set.

5-TUBE RECEIVER

K. Krebs, Los Angeles, Calif.

(Q) Please print in your *Question Box*, a diagram of a 5-tube receiver using the following tubes: A 58 T.R.F. amplifier, 57 regenerative detector, a 56 first audio, and a 2A5 second audio, all resistance-coupled. The rectifier should be an 80 in a well-filtered power supply.

(A) This 5-tube T.R.F. receiver should give wonderful results on distant short-wave stations. Full speaker volume can be expected on the majority of them, and the set should be very simple to operate.

WANTS A.C. RECEIVER

Bob E. White, Vancouver, Wash.

(Q) Please print in your *Question Box* a diagram of a 4-tube set using a 6C6, 37, 2A6 and a 2A5 or 58. I would like this set to operate on A.C. and use 140 mmf. condensers with a potentiometer for regeneration control.

(A) The tube combination that you mention, would not be a good one. We refer you to the diagram using 57, 58, 56 and 2A5. For 6-volt operation, this would use a 6C7, 6D6, 76 and a 41 or 42. The power supply should deliver 6.3 volts instead of 2.5.

3-TUBE A.C. RECEIVER

Richard Owen, Dover, N.J.

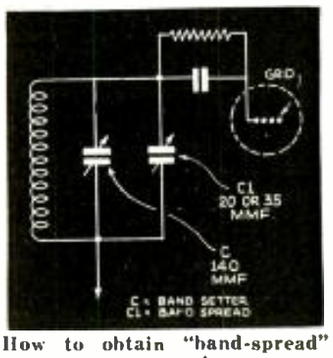
(Q) Would you be kind enough to publish a diagram of a short-wave receiver using a 58 as an untuned R.F. amplifier, a 57 as a regenerative detector, and a 2A5 pentode audio amplifier.

(A) This 3-tube set should work very smooth and pull in all of the short-wave stations. Only on the stronger stations will speaker operation be possible, because there is practically no gain in the untuned stage, and only one stage of audio is used. For earphone, this set would be hard to beat.

BAND-SPREAD TUNING

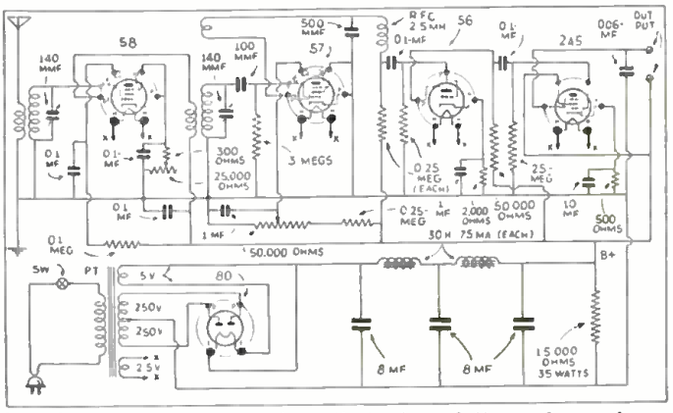
Arthur Lewis, Freeport, L.I.

(Q) I have built a number of sets described in *Short Wave Craft* and had excellent results with them. My present receiver consists of a regenerative detector and audio amplifier using plug-in coils with a 140 mmf. tuning condenser. I would like to know how *band-spread* could be incorporated in this receiver.



How to obtain "band-spread" on any receiver.

(A) Probably the simplest and most effective method of obtaining band-spread is the parallel condenser system. Connect a 20 or 35 mmf. condenser in parallel with the 140. Use the small condenser for *band-spread* tuning.



Complete 5-tube A.C. receiver that gives full speaker volume.

SHORT WAVE LEAGUE

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Baron Manfred von Ardenne
Hugo Gernsback

Executive Secretary

SHORT WAVE SCOUT NEWS

Dr. Smith Reports from Vermont

● NEW stations heard here in the past month include:

YV8RB, 5870 kc., heard every evening with good volume.

OCJ-2, 14845 kc., heard once in afternoon, with special program broadcast of Eucharistic Congress. Located at Lima.

DFB, Nauen, 17520 kc., heard calling Maracay early in day.

HJ2ABD, of Bucaramanga, owned by Hector McCormick has been heard several times on 5980 kc.. late in evening.

YV-10-RSC, San Cristobal, on 5718 kc., is heard every evening with broadcast programs, and occasionally calling other Venezuelan stations late in evening.

ETB, Addis Ababa, on 11945 kc., heard one Wednesday at 4:55 to 5:14 P.M., with program for Columbia B.C. System.

JVN, on 10660 kc., located at Nazaki, has been heard three afternoons, Monday and Thursday, from 4 to 5 P.M., with excellent volume, announcing that they were using JVN and JVM. JVM was not heard.

W-10-XFH, the radio of the stratosphere balloon, was heard with fair volume, on 13055 kc.

HJN, Radiodifusora Nacional, at Bogota was heard several times on 5960 kc., in evening.

HP5F, La Voz de Colon, Panama, on 6080 kc., heard testing several evenings late.

HJ4ABC, at Ibague. Colombia, has the same call letters as HJ4-ABC at Pereira. The station at Ibague has a frequency of 6451 kc. I have heard them and have written for verification, asking them to please tell me why they have same call letters as Pereira.

XEXA on 6180 kc., located at Mexico, D.F., was heard once. They announced as "XEXX and short wave XEXA."

DJI, on 9675 kc., is a new German broadcast S.-W. station. They announce in German, French, English and Spanish, and say they are on the air every day from 5 to 7 P.M. E.S.T.

HH2S at Port-au-Prince, Haiti, is being heard every evening on a frequency of 6178 kc. They announce in French and English.

YV-12-RM at Maracay, was heard once testing on a frequency of approximately 6300 kc.. late in eve.

PRA8 at Pernambuco, Brazil, was heard with fair volume on 6040 kc. one Sunday afternoon from 5 to 5:30 P.M., announcing in Port.

Verifications received include:

HBH, HBJ. YNVA (8590 kc. at Managua), PLE, TI5HH, OPM, YVQ, DIQ, DJA, DJB, DJC, DJD, DJE. DJN.

Alan E. Smith, M.D.
Box 228, Chester, Vt.

Cloquell's Listening Post Report from Porto Rico

● THE autumn season is very good down here in Puerto Rico for short wave reception.

W3XAL-17.7 is coming in very good daily, while DJE has faded completely out and GSC regular.

HAS3—Radio Colonial—W8XK—PCJ—GSF are coming in very good in the 19 meter band. W2XAD has always been very badly heard in this frequency. I do not understand how this is. HVJ has disappeared also.

Although late at night, VPD has been coming in quite satisfactorily.

RNE has not been heard for the past month on 12 mc. and they were coming in R8 during summer months.

On the 25 meter band all of them are good. The same may be said about the 31 meter band.

Guayaquil, Ecuador, HC2CW, is a newcomer around 8.6 mc. on the side of YNVA. Several British West Indies amateur stations on the 40 meter band have appeared and a new station, PZH, in 6.9 mc. from Paramaribo, D.G. It broadcasts musical programs three times a week. They announce in Dutch, English and Spanish. On the crowded 49 meter band we have new stations as follows:

HJ4ABD—Voz Castilla—Medellin, Colombia. 6070 kc.

HP5H—Voz de Colon—Colon, Panama. 6060 kc.

HJ1ABD—Voz del CHOCO—Chibdo, Int. de Choco, Colombia, 6040 kc.

YV1ORSC—Voz de Tachira—San Cristobal—Venezuela. 5720 kc., is on the air now every night regularly.

HI4V—Voz de la Marina—Box 771—Santo Domingo. 6450 kc. Also a newcomer just inaugurated daily programs.

OER2 has been heard several times during the month also.

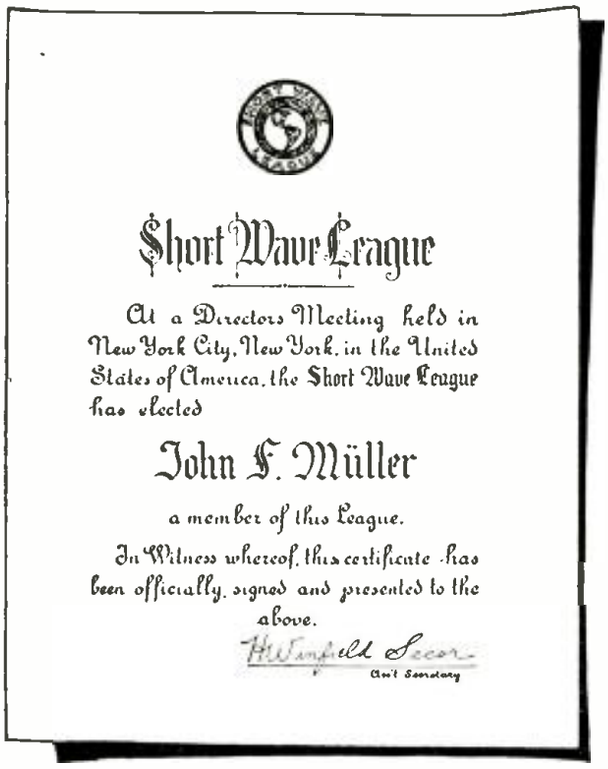
Besides that I may say that CEC on 10670 kc. broadcasts only on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays from 7:05 to 7:30 E.S.T. P.M.

The new Mexican XBJQ, which was heard R9 in their test, is not heard regularly and when heard is in very bad condition now.

From Puerto Rico we have some good news. Very soon we will have a powerful short-wave station which will work telephony between New York and Puerto Rico on 13410 kc. as announced today by Gov. Winship. This station is owned by the Radio Corp. of Puerto Rico and we hope that also musical programs from WKAQ will be rebroadcast. I know that the power house and transmitting houses are already built at Hato Rey, P.R.

Well, friends, from every land, and especially the U.S., "so long, until . . . next issue."

Juan Cloquell Storer,
Box 194,
Arecibo, Puerto Rico.



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

See page 634 how to obtain certificate.

S.-W. News from Portland, Ore.

● HERE is my report on conditions on the short wave. In the Northwest last month.

PLV 9.45 mc., after being the "best bet" for distant reception here in the last several months seems to have discontinued their Tues. and Thurs. morning programs.

Latin-American stations are now coming in fine; the best bets are—

(*Continued on page* 633)

The Octode "Metal Tube 3"

(*Continued from page* 590)

receiver. The use of a good vernier dial in conjunction with the 140 mmf. tuning condenser spreads all the short-wave "broadcast" bands sufficiently to make tuning, even in the most congested 49 meter band, relatively simple.

The tickler windings on the plug-in coils should have several turns removed. The 3 smallest coils should not have more than 2 turns on the ticklers. It should also be noted that the connections to the ticklers are in *reverse*. Try one way and then reverse the connections. One way should permit regeneration, the other way not.

Audio Stage Employs 6C5 Tube

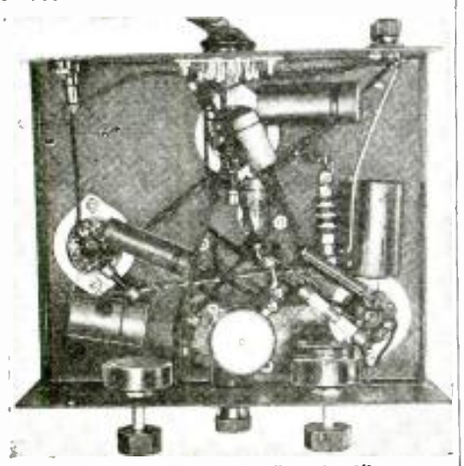
The audio stage makes use of a 6C5 tube. This is a general purpose triode similar to the 76 tube. It has an amplification factor of 20. Since this tube draws about 8 to 9 ma. it may be advisable with some types of headphones to incorporate a plate coupling filter to prevent current from flowing through the phones and thus damaging them. This is particularly true with *crystal* type headphones. These will surely be damaged if connected directly to the output of the receiver.

It is essential if a power supply unit is used with this receiver that it have a well filtered "B" supply, devoid of "buzzing bees."

The operation of the set is perfectly simple. The sensitivity control should be advanced to maximum and the regeneration control adjusted so that the set just regenerates; the main tuning dial should then be turned till a signal is picked up. After the regeneration control has been readjusted the sensitivity control should be adjusted for desired volume. Following this a slight readjustment of the regeneration control will be necessary.

Parts List

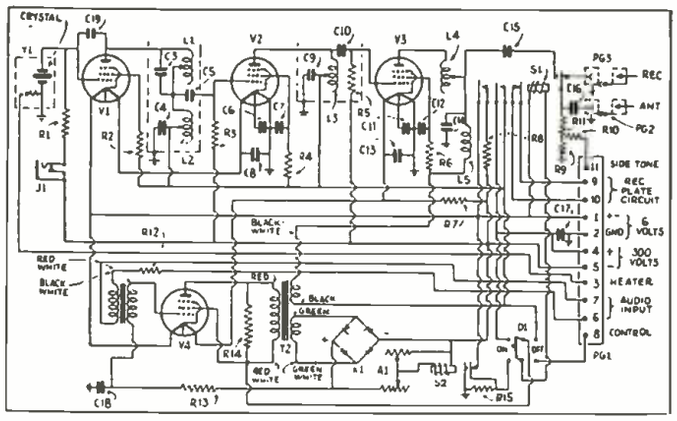
2—.5 meg. fixed resistors ½ watt (I.R.C.).
3—.25 meg. fixed resistors ½ watt (I.R.C.).
2—1. meg. fixed resistors ½ watt (I.R.C.).
1—500 ohm fixed resistor ½ watt (I.R.C.).
1—1000 ohm fixed resistor ½ watt (I.R.C.).
4—.1 mf non-inductive paper condensers (Cornell-Dubilier).
2—1. mf. non-inductive paper condensers (Cornell-Dubilier).
1—.00005 mf. mica condenser (Cornell-Dubilier).
1—.0001 mf. mica condenser (Cornell-Dubilier).
1—25. mf. electrolytic condenser, 25 volt (Cornell-Dubilier).
2—2.5 mh. r.f. chokes (Hammarlund).
1—140 mmf. midget tuning condenser (Hammarlund).
2—50,000 ohm potentiometers (Electrad).
3—octal type sockets (Alden).
1—6 prong wafer socket (Alden).
1—tuning dial (I.C.A.).
1—chassis.
1—phones connecting block (Na-Ald).
1—Ant.-Gnd. terminal strip (Na-Ald).
2—miniature grid clips.
1—Set of 4, 6-prong, 3-winding plug-in coils (14-200 meters) (Na-Ald).
1—6L7 tube.
1—6J7 tube.
1—6C5 tube.



Bottom View of "Octode 3"

Short Waves Help Welcome "Jimmy" Walker

(Continued from page 586)



Schematic circuit of the model 18 radio transmitter.

mitter and receiver aboard ship were erected at the highest point available and likewise at the land pick-up station in New York. The apparatus and antenna for the 7 to 8 meter transmission and reception was set up in a tall building along the waterfront.

Not only were speeches of welcome carried over the ultra short-wave system provided by the WOR engineers, but the tiny transmitter and receiver also greatly aided newspaper men in making reports to their various papers from the ship, newsmen on the ship having been enabled to relay phone reports direct to the city editors' desks.

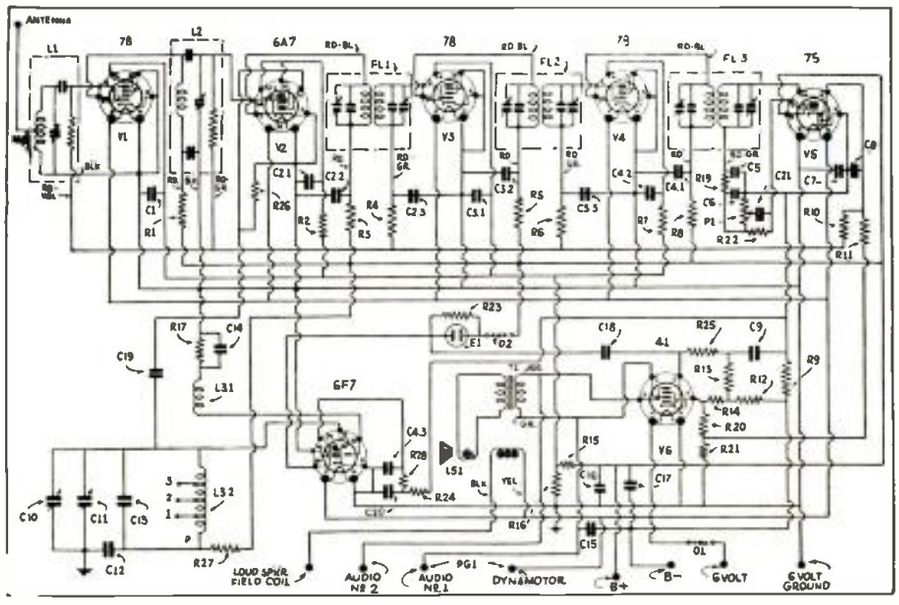
The shore point was also connected by special telephone lines to the master control room in the New York branch studios of WOR, at 1440, Broadway, and thence by *high-quality* telephone circuits to the WOR transmitting Station at Carteret, New Jersey, and also to the American Telephone and Telegraph Company's wire lines which connect to the other Mutual Broadcasting System stations: WLW—Cincinnati, WGN — Chicago, CKLW — Windsor, Ontario, WGAR—Cleveland, and WCAE—Pittsburgh.

5-Watt Transmitter Details

The ultra-high frequency equipment was entirely standard portable equipment. The transmitters are the No. 18 type capable of delivering 5 watts of radio energy into the antenna and are designed to operate within the band between 30 and 42 megacycles. The transmitter and receiver take their power from one six volt storage battery. The frequency is maintained by a quartz plate. The transmitter is suitable for either *mobile* or *fixed* station operation; the filament power is supplied directly from the battery and plate power from a 300 volt dynamotor, which also operates from the six volt battery. The transmitter is approximately eleven inches wide, 7 inches high and six and one-half inches deep. The four tuning controls are accessible on the front panel. Electrical connections to the unit are all made by detachable plugs.

The chassis carrying the apparatus is integral with the front panel and may be easily removed from the steel housing for inspection.

The transmitter employs four Western Electric 306A vacuum tubes which are designed especially for ultra-high frequency, mobile service. They perform the functions of oscillator, harmonic generator, modulating amplifier and audio amplifier, respectively.



Circuit of the model 18 ultra short-wave receiver which uses 7 tubes. It is a "super-het," extremely light-weight and battery-operated, the plate voltage being supplied from a dynamotor delivering 230 volts D.C. A dynamic loudspeaker is built into the receiver and terminals for connecting an external loudspeaker are supplied.

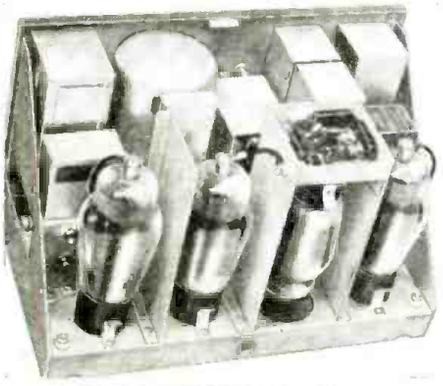
Details of Receiver

The receivers are also of the No. 18 type, which are light, compact units for fixed frequency communication work in the thirty to forty-two megacycle band. These receivers are of the superheterodyne type, combining a high degree of sensitivity and adequate selectivity. The oscillator circuit of this type receiver is a conventional self-excited or electric oscillator. A vernier oscillator tuning condenser is provided to compensate for small variations in oscillator frequency. The control for this vernier tuning condenser may be either on the front panel of the receiver or in a remote control unit. The No. 18 type radio receiver is a very compact mechanical unit being only 6x9x7" in size.

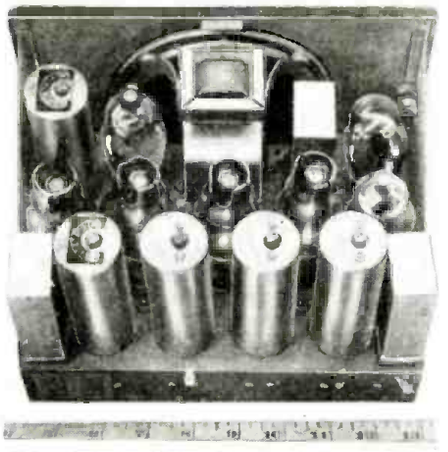
The filaments are operated directly from the six volt battery, and the plate power is from a battery driven dynamotor which delivers 230 volts D.C. A dynamic loudspeaker is incorporated in the receiver unit and provisions are also made for using an external loudspeaker if desired.

The receiver uses seven vacuum tubes. One tube is used as a radio frequency amplifier, one as an oscillator, two as intermediate frequency amplifiers, one as a modulator, one as a detector and audio frequency amplifier and the output tube is a power pentode vacuum tube.

Our Information Bureau will gladly supply manufacturers' names and addresses of any item mentioned in Short Wave Craft. Please enclose stamped return envelope.



Rear of "18A" transmitter.



Rear View of "18B" portable receiver.

Radio Weather Balloon

(*Continued from page* 587)

ment was made possible by special research carried on with high frequency (5 meter, etc.) signals, transmitted and received between the weather observatory atop Mount Washington, 6,000 feet high, and the Blue Hill Observatory. Recent tests have shown that reliable transmissions on the 5-meter wavelength from the upper air can be picked up at distances up to fifty miles or more. The signals recorded at the receiving station on the revolving chronograph drum are converted into regular meteorological data by those familiar with the radio signals automatically transmitted from the balloon. The transmitter weighs but three pounds.

ITALY

2RO at Rome operates on 11,810 kc. daily from 8:15-9, 9:15-11 a.m. and from 11:30 a.m.-12:15 p.m. 2RO is on 9635 kc. from 2-5:15 p.m. daily. On either 9635 or 6085 kc. a news bulletin in English is broadcast daily at 6 p.m. for American listeners. On Monday, Wednesday and Friday from 6:15-7:30 p.m. the "American Hour" is broadcast in English on 6085 kc.

U. S. A.

W2XE at New York is now testing two new frequencies during the daylight hours. They are 21,520 kc. and 17,760 kc. W2XAF, Schenectady, comes on the air at noon on Saturdays and stays on right through till 12 m. W2XAD also comes in early on Saturdays (around 1 p.m.) and stays on till 5 p.m.

New Television Scanning System

(*Continued from page* 596)

comparison to the new high-speed cathode ray scanners is only useful for rather coarse images of say 40 to 80 lines, etc., and it will probably come as a surprise to know that the Mihaly-Traub model illustrated is for 120-line scanning; 180-line models are about ready, and a new model, designs for which are complete, will take care of 240-line scanning and yield a brilliant image at least 12"x16". This system is also capable of being used for much higher definition than 240 lines, and the beauty of this design is that by using a powerful lamp as a source of light, and suitable lenses, big screen images can be produced, suitable for home or even theater use, and a design has recently been perfected for a 240-line screen projector for producing images 8 by 10 feet.

This system is also well adapted for use as a television transmitter. Some such system as this will undoubtedly be developed or adapted for use on the American television market later on, when the ultra short-wave television transmitters are put into operation, as for a given size of image, the Mihaly-Traub apparatus can be built more cheaply, it would appear, than the equivalent cathode-ray system. —*Television and Short-Wave World, London.*

Marconi Infra-red

(*Continued from page* 596)

through it. An R. W. Wood filter, which was actually used in the demonstration, cuts off a little higher, so that very little visible light even from the sun can be seen.

In Fig. 3 we have the general layout for the combined transmitter and receiver at one end of the link. Exactly the same apparatus is used at the other end. A water-cooled crater-neon lamp, a drawing of which is given in Fig. 4. is modulated by a Strowger hand-set microphone, the signal from which is amplified by an MPT4 pentode.

The electrical circuit can be seen from Fig. 5, which shows the amplifying scheme for both transmitter and receiver.

The light from the crater of the neon is collimated and sent out to the receiver station in the form of a narrow pencil. At the receiver station this parallel beam is incident on a large uncorrected lens which brings an image of the transmitting collimator in the plane of an aperture of about 3 mm. diameter. In this manner the light from the transmitter is allowed to pass through an aperture and to reach the sensitive surface of a CMG8 photo cell. The presence of the aperture is needed to eliminate all light other than from the transmitter. This helps considerably to reduce the noise level of the receiving amplifier.

When the whole of the light from the crater-neon is modulated to give the signal, about 30 dB. amplification for a range of 50 yards is necessary to bring the signal on the photo cell to sufficient intensity for passing through the hand-set earphone. When the infra-red filter is introduced, however, the signal must he increased roughly tenfold. For short distances up to 100 yards the second valve in the photo-cell amplifier can be dispensed with.

At the Manchester Exhibition, the distance over which telephonic communication was established was about 30 yards, this being the longest distance allowed hy the confines of the building in which the exhibition was held. The signal strength was adequate and well above noise level.

A commercial model of the appartus described above is in course of production, and it is hoped to give a brief report of this at a later date.

4½ to 2400 Meter "Self-Tuning" Guide

(*Continued from page* 598)

are determined by the logarithmic scale. The logarithmic scale was chosen because it gives a more accurate picture of how a modern radio receiver, with automatic volume control action, reacts to the signals of various lengths. Similarly, an arbitrary height was chosen for the highest-powered station in each color plan, and the height of the line for the rest of the stations in that plan are proportional to the logarithm of the power of the most powerful station at that frequency, drawn in proportion to the arbitrarily chosen height for the most powerful station in that plan. Thus, whether the chart is drawn in color or in black and white, the height of the line (triangles or "wiggles") will be proportional to the possibility of one receiving a station at that frequency, which is free from interference from other stations which are operating on the same frequency. Thus, if one has a black and white diagram, he will find that reception is best at frequencies indicated by the highest triangles on the chart. Good reception becomes improbable, and chiefly a matter of his location with respect to the station, as he tries frequencies indicated by shorter and shorter triangles.

What "Wiggly" Marks Indicate

In the area marked by the "wiggles," good reception can be obtained only from *local*, or *semi-local* stations. For example, there are forty-five small stations (about 100 watts) assigned to 1,210 kilocycles; 1,310 kilocycles and 1,500 kilocycles are a little better. One may very easily be located in a locality where he will receive four or five of these stations at the same time. The only chance to get satisfactory reception here, as said before, is only on *local* stations.

If one has a color chart before him, the interpretation is still more simple. Frequencies marked with red triangles are the best, and the probability decreases in the following color sequence: Blue, green, brown and black. In making this chart, strong Canadian, Mexican and Cuban stations were also taken into consideration, as a glance at the station call letters marked on the chart will indicate. The call letters are given at the frequency on which the station broadcasts, and where more than one station is given, the most powerful one is given first. It is most probable that the station being received is the first one listed, unless one is much nearer one of the other stations.

For the interest of fans who thrill to getting the unusual (and who don't mind trying at unusual hours), the points are indicated where the more powerful Japanese, Russian and Chinese stations come in on our American broadcast band. It will usually be impossible to get these stations while American stations are operating; but after they have closed down, after about 1:00 a.m., it is possible to get some of these stations because it will be early in the evening in those countries when it is 1:00 a.m. here. The engineers have also indicated a station in Nova Scotia and several in Mexico which operate on frequencies lying between our assigned frequencies, and which may cause interference in some locations.

The American "E" Band, extends from 125 kilocycles to 350 kilocycles. There are many United States weather stations which give weather information at stated intervals, which is intended especially to aid aircraft navigation. Note that several stations are assigned to the same frequencies. However, stations on the same frequency are many miles apart, and since they are of low power, they do not interfere with each other. From 125 kilocycles to 225 kilocycles has been reserved mainly for Army and Navy Morse code stations. There are many aircraft marker stations on the band which never transmit, sending their calls in Morse code. All marker beacons answer aircraft in distress on 278 kilocycles. There are many European sta-

tions on this band, but they are not received in the United States because a prohibitively long antenna would be required, and aircraft stations would cause much interference. (Note that local weather is given at thirty minutes past the hour.) The location of the stations shown on the chart, is given in an appended list.

The American "A" Band is the popular "broadcast" band. The range of this band is from 540 kilocycles to 1,540 kilocycles. Each American broadcast station is assigned to a definite frequency, and is allowed to cover a band of ten kilocycles, i.e., five kilocycles on each side of the assigned frequency. Hence, there is room for 1,540 minus 540—the difference divided by ten, equals 100 stations on the American broadcast band. However, there are several hundred American stations on the American broadcast band, without considering the Canadian and Mexican stations on the same band. Hence, several American stations must be assigned to the same frequency. An attempt has been made to assign to the same frequency stations that are separated by as great a distance as is possible, in order to avoid interference between them, i.e., both stations would be received at the same time in a perfect radio set because they broadcast on exactly the same frequency. The attempt to eliminate the interference by wide separation of the stations operating on the same frequency often fails, especially if the radio receiver is located midway between them.

The complexity of the problem increases as the number of stations assigned to a given frequency is increased. This is shown in the chart. RED triangles indicate frequencies to which only one station has been assigned. The BLUE triangles indicate that two stations are assigned to that frequency. The GREEN indicate that three stations, and the BROWN that four stations have been assigned to the same frequency. The BLACK "wiggles" indicate that more than four stations have been assigned to that frequency, and that there is little chance of receiving these stations unless there is a *local* one at this frequency.

Foreign Station Band—4.1 to 12 mc.

The "M" Band is marked "No. 4" on the chart. The range is from 4.1 megacycles to 12.0 megacycles. This band is one of the most interesting ones of the six. It is on this band that one receives most of the *foreign* short-wave reception. Nearly every country in the world is represented. Colors in this band can mean nothing. The colored copy of this band is not drawn to the same scale as the rest of the band. This scale has been discarded in favor of the smaller one. The actual point of reception of *foreign* and domestic short wave stations has been indicated in the chart. The length of the line, drawn for any station, is proportional to the number of Midwest listeners who have reported reception of that station the past year. Hence, the chart is doubly valuable. It not only rapidly shows you exactly where on the dial a particular station comes in, but tells you at a glance the probability of your being able to receive that station. These reports have been received from all over the world, so that it represents an average experience of many listeners in many localities. It may not fit your experience exactly, but it will be surprisingly close. When you have this chart, you are in possession of information about short-wave reception that would take you several years to accumulate by yourself.

There are several "day" *airplane* bands, and they are indicated in the same manner as they were on the "L" band. "Chart No. 3." There is some amateur code on this band, as there is also on the "L" and the "H" band, "Chart No. 3 and No. 5," but they have been omitted because only a few listeners have the training required to read Morse code, and hence, it is utterly uninteresting to the vast majority of S-W listeners, besides giving the call letters of each station, the point on the band where different countries may be heard has been indicated.

Due to the concentration of stations at approximately 6, 9.5 and 11.7 megacycles, very slow tuning is required in these regions in order not to skip over several stations. They are the "hot spots" on this band, and should be tuned for with care and precision.

Regarding the dial itself, only the band in use at the time is illuminated; also the strength of the light varies as the station is tuned into resonance the pilot light dims down, acting as a tuning meter. The super-vernier control gives slow and fast speeds for the dial indicator.

This article has been prepared from data supplied by courtesy of the Midwest Radio Corporation.

Short Waves and Long Raves

(Continued from page 592)

out on 7,010 kc.

Incidentally *Short Wave Craft* started me off in radio about three years ago.

Yours truly,
Ben G. Lewis, W2HJK,
14 Gates Ave., Brooklyn, N.Y.

(A peach of a S-W Amateur Station, Ben, and your station sure has "stepped out and gone places."—Editor.)

BUILT SEVERAL OF OUR SETS SUCCESSFULLY

Editor, SHORT WAVE CRAFT:

I have read SHORT WAVE CRAFT since December, 1932, and think it is by far the best magazine available on short waves.

I have built several sets such as the "Doerle," the "Binneweg," and the "Oscillodyne" 1-tuber; and now am using the "Reliable" 2-tube set described in August, 1932, issue of SHORT WAVE CRAFT, described by Edward G. Ingram.

JIM PHILLIPPE,
1619 Paris Road,
Columbia, Mo.

(Hats off to you, Jim, for having successfully built such a number of "S.W.C." receivers. We trust that you find the succeeding issues of SHORT WAVE CRAFT *an improvement over past issues, as the editors are constantly striving to incorporate new features in the magazine right along. —Editor)*

World-Wide Short-Wave Review

(Continued from page 595)

As shown, it consists of three resistors, R1, R2 and R3. R1 is a fixed resistance of 1,000 or 2,000 ohms, shunted by R2 which is a variable resistor of 10,000 to 50,000 ohms. Resistor R3 also has a value of 10,000 to 50,000 ohms, depending on the total resistance required for the regeneration control.

Resistor R3 is the rough control and is handled just as any regeneration control in a short-wave set. Resistor R2 is left at about the center of its scale, and then when a station is tuned in, the last "ounce" of signal strength can be obtained by the vernier action of the regeneration control R2. This will materially help in tuning in those weak foreign stations.

Correction

In the December issue, on page 471, "New Apparatus for the Ham," the "Ultra High-frequency tube H23," should have been designated RK34 instead of RK24.

80 Meter DX—Europe!

On Saturday, November 30th last, at 10:22 p.m., E.S.T., W2AMN held a successful QSO with PAOASD of Amsterdam, Holland. PAOASD's signals were QSA5-R6, XPDC on approximately 3755 kc. W2AMN's report was T9X QSA5R5 and the transmitter was the "RK23-31" described in the October issue, operated on 3770 kc. 80 meter DX should be FB this winter and we should watch for those "weak" signals.

RADIO INSTRUCTION

Radio Amateur Course

(*Continued from page* 601)

in the final amplifier. Tuning the first amplifier and the final amplifier will be identical to the transmitter shown in Figure 1, except that the first amplifier (V2) need not be neutralized because a screen-grid tube is used. The oscillator here is quite different. Because we are using a screen-grid tube which will serve not only as an *oscillator*, but as a *frequency-multiplier*. With this transmitter and an 80-meter crystal, we can work on either 80, 40 or 20 meters without changing crystals. This is the well-known *Tritet* oscillator circuit, where a cathode coil is used to bring about oscillation of the crystal independent of the plate tuning circuit. This plate circuit can be tuned to either 80 or 40 meters. When operating on 80 meters all circuits will be tuned to that band. On 40 meters, the plate circuit of the oscillator, as well as other two stages, will be tuned to 40 meters. For 20-meter operation, we have the plate circuit of the oscillator tuned to 40, the first amplifier, V2, tuned to 20, and the final amplifier, V3, tuned to 20 meters. In this transmitter, external bias is needed for the amplifier stages. This can be supplied by conventional B batteries or of an especially designed low-voltage power supply.

Method of Coupling Antenna

In Figure 3, we have shown the various methods of coupling an antenna to a push-pull amplifier. In Figure 3A, we have the *impedance-matching* network used with two-wire feed systems. In adjusting this type, the amplifier plate circuit is adjusted for minimum plate current without the network attached to the amplifier coil; then the two feed wires are attached to the plate tank coil and Condenser C1 *immediately* adjusted for a minimum plate current in the amplifier. If a dip in the plate current cannot be obtained, C2 should be changed from minimum to maximum, or vice versa. If a minimum setting of C2 will not allow a dip in plate current when C1 is adjusted, then the maximum setting will. C1 and C2 should then be adjusted until the plate current of the amplifier rises to normal value for *full-load* conditions, always setting C1 to a point giving *minimum plate-current*. The plate tuning condenser should never be touched after it first has been adjusted without the feeders connected. In Figure 3B, we have the usual inductive coupling where either series or parallel tuning of the feeder system is employed. *Link-coupling* can also be used between the final amplifier and the antenna circuit, as shown in Figure 3C. In Figure 3D, we have *link-coupling* to a single wire antenna with a tuned circuit connected to one end of the antenna. In this case, the total antenna length from the tuned circuit to its farthest end should be slightly less than one-half wavelength. Full details regarding the construction and operation of various types of antennas will be given in the Seventh Lesson, which will appear in the next issue of *Short Wave Craft*.

$20.00 Prize Monthly for Best Set

● **THE editors are looking for "new" receiving circuits—from 1 to 5 tubes preferably. A $20.00 monthly prize will be awarded to the best short-wave receiver submitted. The closing date for each contest is 75 days preceding date of issue (Jan. 15 for the April issue, etc.). In the event of a tie, an equal prize will be given to each contestant so tieing. Address all entries to: Editor, SHORT WAVE CRAFT, 99 Hudson St., New York City.**

How to Build An All-Purpose Tester

(*Continued from page* 597)

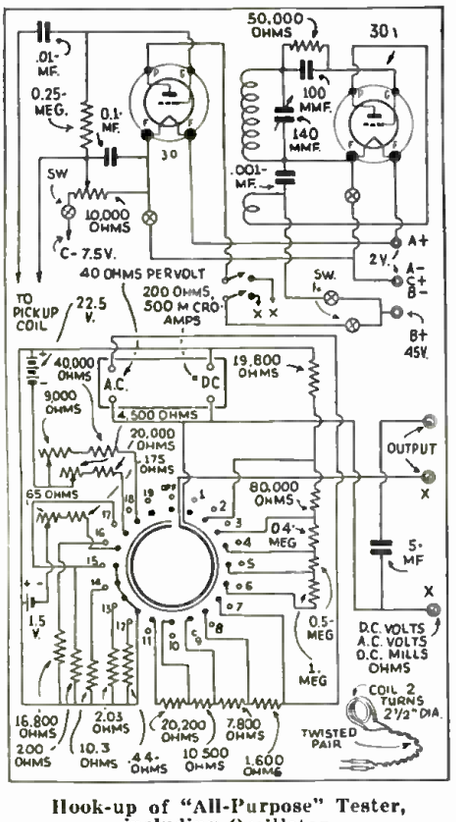
pose of the oscillator and now let us describe the use and operation of the v.t. rectifier.

Its use in the Ham's shack is undoubtedly the most valuable. It can be used in tuning up and neutralizing a CW transmitter and for measuring the percentage of modulation of a phone "rig." In the photo and drawing we see a 2-turn coil on the end of a length of twisted wire. This loop is used as the pick-up coil.

The rectifier consists of a type 30 tube connected in the usual triode circuit. Forty-five volts are applied to the plate and the grid bias is varied with a potentiometer connected across the "C" battery. In the plate circuit is a double-pole single-throw switch, which connects the terminals of the tester in series with the plate of the tube. When the meter switch is in the ma. position the plate current of the tube shows on the meter. The 1 mill (milliampere) scale is used for most measurements. For operation put the bias potentiometer at full bias position and turn on the plate and filament switches of the rectifier. The switch is, of course, on the 1 ma. position. The bias can now be adjusted to give a plate current reading of from .2 to over one milliampere. For tuning and neutralizing a transmitter, set the bias for lowest plate current on the meter and then place the pick-up coil near the circuit to be tuned, taking care not to get it so close that the plate current of the rectifier drives the meter *off scale*. Now as the power in the transmitting circuit is increased or decreased the rectifier plate current will increase or decrease, which ever the case may be. This will show accurately just what is going on in the transmitter.

Measuring Modulation

For measuring modulation the bias on the rectifier is adjusted so that the meter reads .5 ma. and the pickup placed near the plate coil of the modulated amplifier or near the antenna feeder. The pickup coil is placed only near enough to cause the plate current of the rectifier rise to .6 ma.



Hook-up of "All-Purpose" Tester, including Oscillator.

When the amplifier is modulated the meter will show an increase. The increase will be rather slight even for 100 percent modulation. The original reading of .5 on the meter should be considered as *zero carrier*.

The difference between .5 and .6 which is .1, is considered the carrier with no modulation. Now the meter only shows average increase in amplitude and for 100 percent modulation the meter will read 1.226 times the normal carrier as represented by .1 or .1226. This is then 22.6% greater than the normal unmodulated carrier, the same as read on a thermal ammeter. The advantage of this type of modulation indicator is that there is no lag or sluggishness as in the thermal meter. Remember 100% modulation is not 22.6% greater than the entire meter reading; the *no-carrier* reading (.5) is considered as zero.

With the No. 1200 meter "kit" there comes complete instructions in both schematic and pictorial form. Each connection is numbered and all one has to do is connect connection 1 to 1, 2 to 2, 3 to 3, etc. For the benefit of those interested in seeing just what the tester consists of, we have printed the schematic diagram along with the diagrams of the rectifier and the oscillator.

If you are interested in experimenting in the "light" rather than in the darkness, you will find this multi-purpose tester to fill every practical need around the radio "work-shop."

Parts List for "Tester"

1—No. 1200 Triplett tester.
1—aluminum box 7 x 12 x 5 inches.
1—.01 mf. condenser, Cornell-Dubilier.
1—.1 mf. condenser. Cornell-Dubilier.
1—.0001 mf. mica condenser. Aerovox.
1—140 mmf. variable condenser. Bud.
1—.001 mf. mica condenser. Aerovox.
1—¼ meg. ½ watt resistor. I. R. C.
1—50,000 ohm ½ watt resistor. I. R. C.
1—10,000 ohm potentiometer with switch. Electrad.
2—4-prong wafer sockets. Na-Ald.
4—"On-off" switches.
1—double-pole single-throw toggle switch.
2—engraved dials with knobs, Bud.
2—type 30 tubes. Arco.
1—midget 7½ volt "C" battery.
1—midget 22½ battery.
1—midget 45 volt battery.
1—midget 3-volt "A" battery.
1—1½ volt flash-light cell.

Coil Data.

Grid coil, 32 turns, No. 28 D.S.C.
Tickler, 10 turns, No. 28 D.S.C.
Wound on 1 inch diameter form.

HAMS!!!

Next issue will be special "Ham" number—Don't miss it!

When To Listen In

by M. HARVEY GERNSBACK

(All Schedules Eastern Standard Time)

DAVENTRY

● THE English station has added several additional frequencies to its string. They are GSN 11,820 kc. (25.38 m.), GSO 15,180 kc. (19.76 m.), and GSP 15,310 kc. (19.6 mc.). None are in use so far.

The schedule for January is as follows: Trans. 1 3:30-5:30 a.m. on either GSF, GSD or GSB (any two). Trans. 2. 6-8:45 a.m. (Sun. 6:30-8:45 a.m.) on GSF and either GSG or GSE. Trans. 3 9-10:15 a.m. on GSE and either GSF or GSB; 10:15 a.m.-12 n. on GSB and either GSE or GSA. Trans. 4 12:15-2:15 p.m. on GSD, GSB and GSI; 2:15-4 p.m. on GSD, GSB and GSL; 4:15-5:45 p.m. on GSB and either GSC or GSA. Trans. 5 6-8 p.m. on GSC and GSA. Trans. 6 10-11 p.m. on GSL and GSC.

GERMANY

Two new German stations have been making a big stir recently. They are commercial phone and telegraph transmitters of the German P.O. Department. These transmitters were only recently completed and prior to being placed in regular commercial phone service they have been tested for a considerable time by relaying the various programs of the Berlin short-wave broadcaster. The best heard stations are DJJ on 10042 kc. and DJI on 9,675 kc., both located at Konigswusterhausen, a suburb of Berlin. DJI has been broadcasting from 2-4 p.m. daily and DJJ from 5-7 p.m. DJJ will be used for service to South Africa and DJI for Central American service. DJM, 6079 kc. is also testing from 3-5 p.m.

DJB 152,000 kc., Berlin, will be on the air daily from 8-11:30 a.m., with a N. America beam aerial during December and January. Other schedules remain the same as before.

JAPAN

The Nazaki stations are extending their overseas broadcasting service. At present there is a program for Europe from 2-3 p.m. on Wednesday and Friday sent out on JVM and JVP or JVT. This will be made a daily program if reports warrant it. On Monday and Thursday from 4-5 p.m. there is a program for the eastern U.S.A. and Canada. This is broadcast on JVM and JVP ordinarily. This transmission is being well heard in the east and will shortly be made a daily feature. Daily from 12 m.-1 a.m. JVM and JVT send out a program for the western U.S.A. and Canada.

In addition a regular daily service for Manchuria (mostly in Japanese) is sent out on JVM, JVT or JVU from 4-8 a.m.

ICELAND

TFJ the Phone station at Reykjavik operating on 12,175 kc. will broadcast on Sundays from 1:40-2 p.m. This service will be extended later.

MEXICO

There are several new Mexicans about which very little information is available. Exact schedules are not known but here they are: Mexico City, XECI, 5980 kc. on till 3 a.m. and XEXA 6190 kc. on till 11:15 p.m. In Vera Cruz there is XEUW on 6025 or 6125 kc. This one stays on till 3 a.m. also.

JAVA

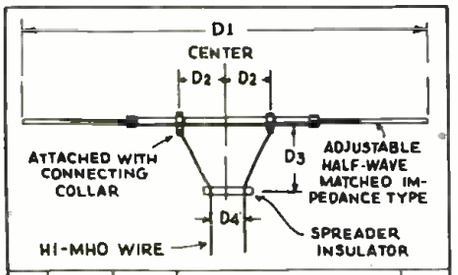
YDA at Tandjongpriok is now on the air again and a puzzle has been cleared up. This station operates on one wave during daylight hours and on another at night. YDA on 6040 kc. is on from 5:45-6:45 p.m. and from 10:30 p.m. to 1:30 a.m. YDA on 3040 kc. is on from 5:30-11 a.m. On Sundays PLP at Bandoeng, 11,000 kc. sends the same program as YDA.

AUSTRALIA

VK3ME at Melbourne is now on daily except Sunday from 4-7 a.m. This station is on 9518 kc. VK2ME at Sydney on 9590 kc. is on Sundays from 1-3 and 5-11 a.m. It also operates irregularly on Mondays during the early a.m.

Efficient 5-Meter Antennas

(*Continued from page 603*)



FR MC.	W.L MET	D1	D2			D3
			430	440	475	
56	5.357	8'3"	13 068	13.167	13.8	29.7
57	5.263	8'0"	12.67	12 768	13.54	28.8
58	5 172	7' 11"	12 54	12 635	13.3	28 5
59	5.085	7' 10"	12 418	12 5	13.16	28.2
60	5.0	7'8½"	12 21	12 3	12 95	27.75

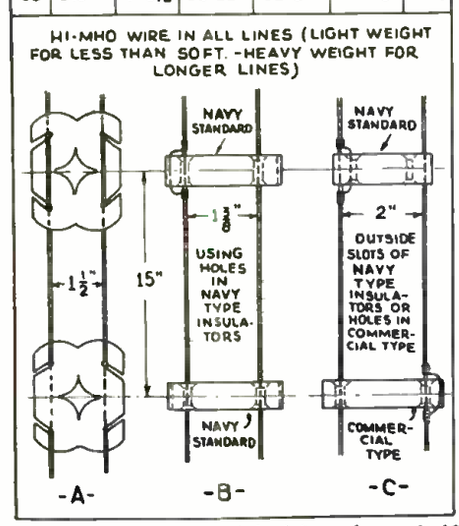


Fig. 1—A typical matched-impedance half wave radiator with three different types of transmission lines and table of constants.

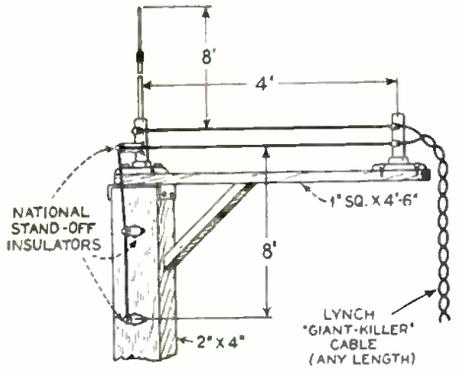


Fig. 5—Is a vertical assembly which is identical electrically to the assembly shown in Fig. 2.

Fig. 6
A newly designed metal support for attaching any type of mast to a parapet or chimney.

sult of a great many experiments, and it has proved to be the most reliable of all the antennas we have used. Where simplicity is desirable, it is recommended for use at amateur stations. Its superior performance for transmitting will be best understood by a study of the other illustrations.

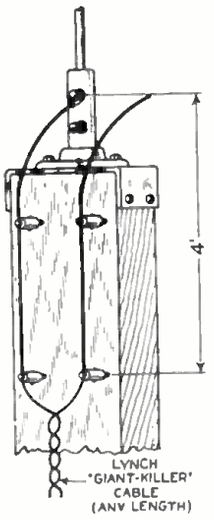


Fig. 7
A simplified type of "J" antenna derived from the formulae in the accompanying article. The feed and matching systems form a practical simplification of the methods formerly in use.

It will be observed that in Fig. 2, we have provided ourselves with an antenna which may be stuck out the window. Of course, the vertical radiator which projects above the 2"x2" boom is made of rigid aluminum tubing and it must be withdrawn from the mounting socket each time the antenna assembly is taken down. The lower portion of the antenna is made by the simple expedient of using heavy grade Hi Mho wire with a streamline weight at the end. Two specially designed insulators, detailed in the sketch, are used to support the wire which provides a suitable impedance-matching arrangement, so that low impedance Giant Killer Cable may be used for the transmission line.

It will be observed, that the dimensions for this antenna are indicated as being eight feet for each of the vertical radiators and four feet for the impedance-matching section. The length of the Giant Killer Cable transmission line is unimportant. In order to prevent the wire, which forms the lower half of the antenna, from striking the metal support for the insulator, a National type GS2 standoff insulator is used.

The actual dimensions for a given antenna are not those supplied on the figure but should conform, as a general rule, to the following legend, and this legend applies to any type of antenna, whether for use on the five meter band or otherwise. It will be seen that these figures cover not only the antennas themselves, but also the dimensions for reflectors and directors when they are used in connection with the antennas for the making of various types of arrays.

Here is the formula for making any of these antennas and this formula is shown in its practical layout form in Figures 3 and 4.

S1 = Antenna to Antenna = $\lambda/2$
S2 = Antenna to Reflector = $\lambda/4$
S3 = Antenna to Director = .375 x λ
S4 = Matching Section = $\lambda/4$
LR = Reflector Length = .97 x $\lambda/2$
LA = Antenna Length = .95 x $\lambda/2$
LD = Director Length = .87 x $\lambda/2$
Where λ = Wave length, in meters.

Reference to Fig. 3 will indicate that any number of elements may be used for the construction of a beam type of antenna and the dimensions for any such beam are indicated in the drawing.

Reference to Fig. 4 will give the actual dimensions in inches for the reflectors, antennas and directors, as well as the distance in inches between them for any group of units in any part of the 56-60 megacycle band.

The antenna shown in Fig. 2 is actually a full wave di-pole and if it were fed directly at the center, we would be feeding at a point of high impedance and to utilize a low-impedance transmission line for such feeding would be out of the question. Therefore, the impedance-matching section is introduced and the antenna then becomes two half wave radiators in

phase, and the whole system becomes a current fed system, with the point of contact between the impedance-matching section and the low-impedance cable approximately a perfect impedance match.

There are a great many locations where the use of an antenna of this nature would be out of the question because it would be impossible to have the antenna extend far enough away from surrounding objects. For situations of this nature, the antenna shown in Fig. 5 is suggested. We believe this type of antenna will become very much more popular with amateurs because of its simplicity, as well as extraordinarily high efficiency. It will be observed that no electrical details are changed, but we have brought about a mechanical situation which is entirely different from the arrangement shown in Fig. 2. This type of antenna lends itself admirably to installation of masts which may be attached to the side of the house with lag bolts, or which may be extended above the chimney or parapet, by using the newly developed parapet mast support, shown in Fig. 6.

In Figure 7 a simplified method for making a so-called "J" antenna is shown.

The impedance-matching section in all of these antennas except Fig. 7 is made of ordinary antenna wire and the two wires which form this section are approximately two inches apart. The distance they are apart is not at all critical. Because the right hand end of this matching section in Fig. 7 must be fairly rigid and self-supporting at the top, No. 10 solid copper wire is suggested. All these aerials have been designed for use with a 70 ohm line and the new 70 ohm coaxial conductor, which is making its appearance on the market, can be used in place of the twisted pair, shown in the diagrams, without any other alterations in the circuits.

Flying the Radio Beam

(*Continued from page* 583)

sending into each quadrant a continuous stream of signals: letter N (dash-dot) to the north and south, or northwest and southeast; and letter A (dot-dash) to the east and west, or northeast and southwest. The automatic transmitter at the beacon station is so arranged that the dots and dashes of one signal correspond to the silent spaces *between* the dashes and dots of the other signal. When the pilot flies along the borderline between the two quadrants, he hears both signals equally as one continuous note, interrupted by the beacon call letters. Should he stray from this narrow lane, he will still hear the blended signals, but one will sound louder than the other, telling him that he is off his course, and in which direction.

These four narrow zones where the signals blend are called the beams. They show the pilot the true direction of the beacon station, and at a few strategic points along each beam, low-powered non-directional beacons superimpose their call letters on the course signals, telling the pilot his exact location. Every half hour, the signals are interrupted, and a brief weather broadcast, by voice, informs the pilot of the weather conditions.

Since we took off from New Orleans at one o'clock this afternoon, eight such beacons guided us on our way. We passed over the Camden beacon fifteen minutes ago, and are now about to leave its *northern beam*. We are no longer climbing. There is no point now in trying to get over the snow with the home port so near; gently, imperceptibly, we are coming down. A turn of the dial, and a new note sounds in the earphones, interrupted every few seconds by the new code signal: four dots in succession. Beacon WWU, at Elizabeth, now leads us into Newark.

Shifting Course by Radio Beacon

There is no marker beacon here, but a few kilocycles away, the WWIB beam from Martins Creek joins our course from the

west. The pilot tunes it in and listens to the letter N in its southeastern quadrant gradually become lost in the steady note as we reach the beam. The Martins Creek identifying call — dash-dot-dot — sings in the earphones. Trenton lies below, lost in the swirling snow. Time to call Newark and get clearance for landing. He nods to his copilot.

The generator whines into action, and the copilot switches on the short-wave receiver; the pilot continues listening to the beacon on the long wave, keeping the ship on her course.

From the slender strand of antenna wire above the fuselage the copilot's voice spans the darkness. "Trip 12 to Newark. Over Trenton at six thousand seven hundred. What is your surface wind and Kollsman?" (barometric pressure.)

Promptly comes the answer of the radio operator on watch in the air line's radio room thirty miles away: "Newark to Trip 12. O.K., six thousand seven hundred over Trenton. Surface wind southwest eighteen, Kollsman thirty-ten—three-zero-one-zero; snowing."

An eighteen-mile wind, and the barometer dropped quite a bit since we left Washington. The copilot sets the sensitive Kollsman altimeter to the new reading—a difference of almost two hundred feet. This delicate instrument indicates altitude within ten feet, and since it operates on the aneroid barometer principle, it must be corrected for the atmospheric pressure.

Again the high-pitched whine of the generator, and the copilot acknowledges the message, word for word.

Coming down . . . Suddenly, the snowflakes whirl away, and through a hole in the clouds we see a cobweb of lights six thousand feet below, clinging to the dark curved shadow of the Delaware River. Trenton slips by under the port wing! Three seconds—and we plunge anew into the swirling snow, the brief glimpse of lights just a fanciful vision in a dream.

"We Land in Ten Minutes"

Coming down . . . In the cabin a sign discreetly flashes next to the pilots' door: "Please fasten seat belts." The copilot walks down the aisle, touches a sleeping passenger's shoulder: "We land in ten minutes." The copilot goes back to his post. A busy ten minutes ahead.

At his fingertips are the radio controls, the eyes, ears and voice of the great air liner.

The eyes—the long-wave receiving set for course signals from radio range beacons and marker beacons, and later, landing instructions from the airport's control tower. The half-hourly Federal weather forecasts are given on range beacon frequencies where the pilot is sure not to miss them.

The ears—the *short-wave* receiver, with his air line's frequencies prominently marked for quick tuning. Every fifteen minutes it brings him the voices of his air line's ground stations, or messages on altitude and position from other ships flying in his vicinity.

The voice—the transmitter, with three pre-tuned frequencies: two of these are the day and night frequencies assigned by his air line for this run. The third frequency is held in reserve; on private airplanes, having no ground system, this is tuned to 3105 kilocycles, the distress frequency, and at every Bureau of Air Commerce station from coast to coast, there is a receiver tuned in, day and night, always standing by for the call.

In addition, a third receiver is carried in reserve. This can operate either from the airplane's electric system, as the others, or in an emergency, from its own dry cells.

"Ground" S-W Equipment

On the ground, the system is even more elaborate. Powerful *short-wave* transmitters at every stop knit the air line into one complete whole. Ten frequencies are usually assigned to an air line; a flip of the dial is all that is needed to change from one frequency to another. A battery of receivers brings voices from everywhere: airport speaks to airport, airport to ship, and ship to ship. There are twenty men on the ground for each pilot in the air, and the radio operator is the only contact between the pilot in the vastness of the storm and these men on whom he must depend.

The beacon is suddenly silent. The signals, strong and clear a moment ago, now ceased entirely. We are in the "cone of silence" directly over the beacon's transmitting antennas, where no signals penetrate from below. Newark airport is a mile and a half to the northeast. Ten o'clock.

For the last ten minutes our copilot spoke to the control tower at the airport. Another air liner came in from the West just ahead of us, and we stayed high above him until he landed. Now comes the message from the control tower: "WREE to Trip 12. O.K. to land. Wind is now south, twelve. Use north-south runway."

The ship passed over the invisible beacon below, and the signals are clear again. The pilot pulls back the throttles, and through the gray void which has neither *up* nor *down*, gently spirals earthward, his eyes on the spinning dials, the alternating A and N quadrant signals singing in his ears as he circles the beacon station.

We Break Through the Clouds!

We break through the clouds at five hundred feet. The snow-clad airport welcames us, gay with yellow, green and red lights. Dazzling floodlights reach across the snow, illuminating for us our path. Engines softly purring, we slip down over the yellow boundary lights, and roll without a sound over the white carpet of snow. The little girl in seat number four is still fast asleep . . .

The flight is ended. The lights from the terminal windows reveal a row of motor cars to take us on to the city. Under the long canopy, we file from the ship to the waiting room. Porters scurry for luggage. Shivering reporters carefully scrutinize the faces, looking for celebrities. A gay little crowd inside to welcome the travellers. "What about supper?"

As the cars start for New York, we see a lighted window through the swirling snow. Bending over his transmitter, a lone radio operator is standing watch, talking to the winged ships in the night.

Awards in $200 "Cover Title" Contest

(*Continued from page* 588)

Conn.

"An 18 Tube Radio from an 18 Karat Wife. Let's Go," by Emory E. Phelps, Rockville, Ct.

"Wifey sacrifices Hair Waves for Air Waves," by E. M. Frykman, Gibson City, Ill.

$50.00 Cash Prize Contest

(*Continued from page* 588)

the answers must be short and each answer not containing more than 50 words.

7.—All entries should be sent in either flat or folded, *not rolled.*

8.—The prizes will be awarded to those who, in the minds of the judges, give the best and concise reasons on the subjects listed. The 1st prize going to the best set of answers; the 2nd prize to the next best one, etc.

9.—The judges of this contest will be the editorial staff of *Short Wave Craft* and their findings will be final.

10.—This contest closes 12 P.M. Midnight. March 31, 1936, and all entries postmarked later than this date will be disqualified.

11.—The results of the contest will be published in the July 1936 issue of *Short Wave Craft.* In the event of a "tie" an equal prize will be awarded to each contestant so tying.

12.—Address all entries to "Prize Question" Editor, % *Short Wave Craft,* 99 Hudson Street, New York City.

"Modern" Aerials Invented 34 Years Ago By Dr. Lee de Forest

(*Continued from page* 589)

"Concentric" Transmission Line Is Not New!

We hear much nowadays regarding the *concentric* transmission line, especially for use in ultra high-frequency transmitters and television transmission, which involve the use of a wire or rod supported in the center of a concentric metal tube by means of insulators spaced along the wire. Dr. de Forest was there first, as witness Fig. 4. Stabilizing bridges C, may be connected at the location of the electro-static nodes as pointed out in the patent. The receiving device is indicated at R in Fig. 4.

Figures 8, 9, 10 and 11 show systems for exciting the Lecher-wire transmission line with a transmitting apparatus. In Fig. 8 a "static" method of charging is shown, to quote the patent. The parallel or Lecher wires are shown as of only half wavelength; inserted in the bridge across their ends is a condenser K. In shunt around this condenser is a spark gap S (vacumn tube transmitters were unknown at that time), and the secondary coil T of a transformer T1. When this condenser is charged to the break-down point of the spark-gap S, there is a discharge at this point, and this serves as a *connecting-bridge* between the parallel wires, and these wires are set in vibration as a Lecher system. Part of the energy is reflected back at O and O1, forming stationary waves with nodes at O and O1. A part goes into the upright conductor or antenna A and is radiated outward into space.

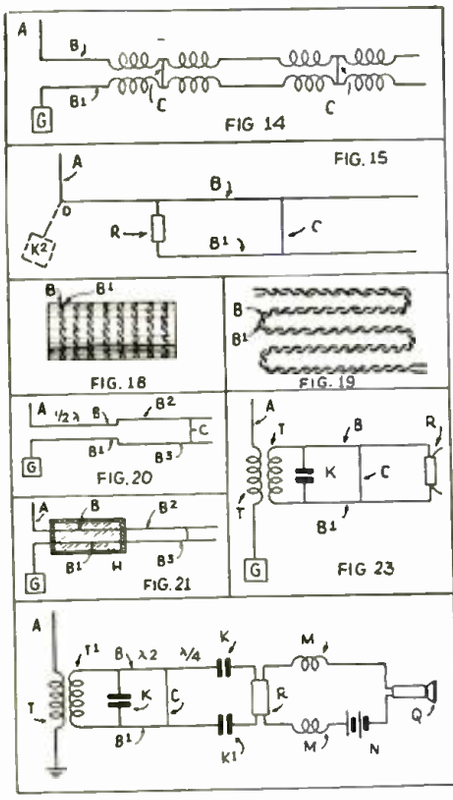
Inductive Coupling Too

In Figs. 9, 10, and 11 the Lecher system is charged *inductively*—that is, the secondary T1 of the transformer is in the circuit of the Lecher system and oscillates therewith, while in Fig. 8 it is not in such circuit and does not enter directly in its oscillations. In fact, in Fig. 8 the transformer may be replaced by any source of electrical energy giving the requisite potential.

In Fig. 9 the parallel wires are shown as equal to *one-quarter* wave length, and the coil T1, forming the secondary of the transformer, is equivalent to one-half wavelength. The primary coil T of this transformer is connected in series with condensers K1 and spark-gap S. This primary system is charged from any suitable source of energy I. It is necessary that the self-induction of the primary coil T and the capacities K1 be so chosen that the natural period of oscillation of this primary system is equal to that of the adjoining Lecher system.

Fig. 10 shows a system essentially the same as that shown in Fig. 9, except that a condenser K is connected to the Lecher wires at the static loop. A condenser so located is the equivalent of a certain length of parallel wires, so that a system containing the condenser vibrates with a period of one having longer wires, or reduces the length of wire necessary for a system of a given period. The effective capacity of such a condenser depends somewhat upon its location in the stationary wave, it being most effective when located at a static loop—viz., at a point where the potential difference across its terminals is maximum.

Fig. 11 shows the Lecher wires cut at a static loop and a condenser inserted in such cut between the Lecher wires and the secondary terminals of the transformer. Here also the armatures (plates) of the condenser behave as the equivalent of a certain length of wire, this relation depending upon the amount of surface in the condensers and the distance between the armatures (plates), states the patent. This affords a ready means of attuning the system by changing the distance between the armatures (plate members) of the condensers. Since the maximum potential of



Various other "transmission line" ideas covered in Dr. de Forest's early patent.

opposite sign occurs at the terminals of the secondary T1 of the transformer, the middle point of the coil must be one of zero potential and may therefore be grounded, as shown at G, without interrupting the action of the system.

If the devices shown in Figs. 10 or 11 are used as *receivers*, the transformer coils T and T1 should be reversed in arrangement, as shown in Fig. 12, the low-potential coil T being connected with the Lecher wires, and the receiving instrument or responder R may be substituted for the spark-gap S. The same necessity arises in this case as in the sender for tuning alike the two circuits shown.

In Fig. 14 is shown a method of reducing the actual length of wires required to form the equivalent of the proper wavelength, which consists in inserting coils L L1 in the wires of the Lecher system. These coils should be inserted at loops of current, where their inductive or impedance effect will be maximum. If the Lecher wires are to be bridged, these bridges should connect the middle points of two corresponding coils, as shown at C.

It is not always necessary that the two parallel or Lecher wires be of the *same* length, Dr. de Forest pointed out in his patent. Fig. 15 shows an arrangement in which the responder R is located at a static loop of the wires and one-quarter wavelength removed from the base of the upright wire. At this point in the lower wire we have a static loop formed by open-end reflection. The node at O may be connected to earth or to a capacity K2.

In Fig. 17 is shown a convenient form of using the Lecher wires. Here the two wires, which are insulated, are twisted together, forming a *twisted pair*,* the distance between them being regulated by the thickness of the insulation. It is desirable that the pitch of the twist be not too steep. The *twisted pair* is well adapted to use upon a spool or *coiled* in any other manner which may be desirable to economize space or to secure portability. If the two simple parallel wires untwisted were coiled upon a spool; with convolutions parallel and near together, interference by induction between adjacent convolutions would arise; but when closely twisted such adjacent convolutions of the coil, if not too close together, will not interfere with one another. In any considerable length of the convolution, one wire will first lie adjacent to another carrying current of *opposite* sign, so that for any considerable length of wire, the inductive effects from the two wires in the convolutions adjoining will be *neutralized*. In practice I have successfully used such wires, twisted with a pitch equal to three turns to the inch, wound upon a spool about three inches in diameter with successive turns separated about an eighth of an inch. Their use is not, however, limited to even a near approximation to the above proportions, which are given only to show what has been found successful without any intention of limiting myself thereto. (Imagine! All this in 1902 and really before that of course, while Dr. de Forest was developing the idea.—Ed.)

Wherever in the accompanying drawings or description straight Lecher wires are shown or described, it is to be understood that the *twisted pair*, as above described, may be substituted, either coiled (as shown in Fig. 18) or disposed in any suitable way—for instance, as in Fig. 19.

As shown in Fig. 17, the responder or detector is placed across the open end of a loop and one-quarter wavelength distant from the responder, and one-half wavelength distant from the upright A, a bridge C may be placed.

Fig. 20 shows how the potential may be raised in a second section of the Lecher wire system B2 B3 by changing the spacing between the wires. The mutual induction of the Lecher wires decrease as the two parallel wires are brought closer together, becoming zero for the wires in actual contact, and the capacity of the system is increased as the wires are brought closer together. Thus if we have one system of such parallel wires B B1, Fig. 20, of length equivalent to one-half the wavelength transmitted, connected or added to a second system B2 B3, having the same period of electrical vibration, but having its two parallel wires farther apart, then this second system B2 B3 may take up the impulse transmitted from the first system, unaffected as to its period of vibration, yet transformed to a wave of higher potential, but of correspondingly diminished magnetic energy or current.

In Fig. 21 such a system is shown, and here the wires B B1 are parallel throughout their length, but the first half wavelength from the upright or aerial is enclosed in a casing H, containing oil, which changes the capacity between the wires so immersed. Such combinations as these thus afford a step-up or step-down device, *differing entirely* from the well known "transformer-coils," and Dr. de Forest, in his letter to the editor, mentions this idea particularly, and the possibility of using this scheme in place of the usual step-up or step-down transformers—an idea which he says has never been used thus far, to the best of his knowledge.

A scheme for inductively coupling the antenna system proper to the Lecher wire system is shown in Fig. 23, R being the responder.

The diagram in Fig. 26 shows an antenna directly connected with the ground G, and *inductively* coupled with the resonant Lecher system by the coils T T1. The system is coupled to the detector or responder at R, by means of coupling condensers K1.

A study of these early patents granted to Dr. de Forest proves that old adage—"there is but little new under the sun."

*Plenty of 1936 S-W aerials are featured with such "twisted" lead-in or transmission lines sections. Who said "new"?

"Fans" and "Hams"

will both be interested in the "communications" Type 4-Tube Receiver to be described, with full constructional details, in the March number by George W. Shuart, W2AMN.

4 Tube Set Works Like 6 Tuber

(Continued from page 604)

its metal counterpart, the 6C5 if preferred). Its output in turn works into the pentode section of the 12A7 tube resulting in a strong 3-stage audio frequency amplifier which gives ample volume for the built-in loudspeaker. Many similar receivers have only two audio stage operating under very low plate voltages and are not capable of driving a speaker except on the powerful stations. Eilen 6A overcomes this difficulty by using *three* resistance-capacity coupled stages. This method of amplification produces remarkably good quality of reproduction. Distortion is entirely negligible in the receiver. Automatic bias is used on the 12A7 tube, the biasing resistor being by-passed by the 10 mf. capacity C10. The loudspeaker is connected in the plate circuit of this tube. An automatic headphone jack is connected in the plate circuit of the preceeding stage and when the phones are inserted the speaker is automatically disconnected.

The entire receiver is built upon a heavy, black shrivel finished metal chassis which fits snugly into a similar metal cabinet. Switch regeneration control, and band-spread condenser are adjustable from the front of the cabinet, the phone jack being located in the rear of the chassis. Four coils cover the wavelength range of approximately 9½ meters to 200 meters. An additional broadcast band coil is available for the use on the regular broadcast band if desired. Any single wire, antenna having an overall length of from 25 to 90 feet will give excellent results; a doublet may be also used if desired.

When operated properly this receiver is capable of producing loudspeaker volume on practically all of the "foreign" S-W stations under fair conditions. There are no adjustments to get out of order, and the tuning procedure is so simple that even a beginner can obtain excellent results with it.

This article has been prepared from data supplied by Eilen Radio Laboratories.

Tuned Aerial Gets More "DX"

(Continued from page 599)

Looking at the basic circuit we see that the total length of both flat tops is 25+25 ft.=50 ft. total. By the usual formula of flat-top length in feet divided by 1.56 equals lowest resonant wave length, the flat-top is found to resonate at 32.5 meters, or 9,200 kc. approximately. To effect an impedance match between antenna flat-top and transmission line at this natural resonant frequency or wave length of the flat-top, the two wires of the latter are formed into a triangle 10½" on a side, and connected to the flat-top center 10½" apart, which separation gives an impedance match between flat-top and transmission line productive of maximum energy transfer to the line, and hence to the receiver, at 9,200 kc., without external tuning.

At all other wave lengths the two wire transmission line may be considered as a part of the resonant antenna system as a whole. In such a case the total antenna length is 50 feet in the flat-top, plus twice the transmission line length of 131 feet. This total of 312 feet divided by 1.56 gives 200 meters as the longest wave length at which it will resonate as a one-half wave antenna.

But it will also resonate in effect at certain fractions of this wave length, such as 100 meters, which equals a full wave antenna, 75 meters equals 3/2 waves, 50 meters equals 2 waves, 37.5 meters equals 5/2 waves, 25 meters equals 3 waves, and 16.7 meters equals 7/2 waves.

Our Information Bureau will gladly supply manufacturers names and addresses of any items mentioned in *Short Wave Craft*. Please enclose stamped return envelope.

5-Meter M.O.P.A. Uses Receiving Tubes

(*Continued from page 602*)

control was not employed. Extensive experiment proved that perfect or near-perfect frequency stability was possible under complete modulation, providing the transmitter was *properly tuned.*

The reason the modulated oscillator has been used so long is because of its simplicity and low cost, and this was carefully considered during the development of the transmitter about to be described. The requirements of an up-to-date transmitter are simplicity and low cost to cope with the modulated oscillator, frequency stability that will permit the use of advanced receivers which are quite selective and of sufficient output to enable the operator to communicate over distances as great as those covered with the average modulated oscillator.

Transmitter Easy to Build

This transmitter is very simple to build and operate; its constructional cost is very low because receiving parts and tubes are used throughout. Simplicity in operation results from the use of screen-grid tubes. The power output may be a little lower than some of the modulated oscillator oscillators but is *not* "flea power" by any means. It is possible to obtain over *twelve watts of power output* from the two 89's in pushpull, with 25 to 30 watts input. Twelve watts of power will, under ordinary conditions, cover the average distances negotiated by any transmitter. This is peculiar of the five-meter band—low power can do great things!

The usual master-oscillator power-amplifier transmitter used on five meters has the oscillator operating at the same frequency as the modulated amplifier. *For good "frequency stability" the oscillator should never be operated in this manner,* even with a *buffer* stage connected between the oscillator and the final amplifier.

In this transmitter we use a *tritet* master-oscillator, which serves as the frequency generator and driver stage as well as a frequency doubler. When the oscillator is operated in this fashion there is little likelihood of the modulation affecting the frequency. In this stage we use an 89 with the screen-grid and the suppressor tied together. The suppressor should *not* be grounded in this stage! The first 89 really serves as a M.O.P.A. in itself. The grid coil has 9 turns ¾ inch in diameter and is tuned with a 50 mmf. National midget condenser. The cathode is tapped onto this coil three turns from the grounded side. We have the conventional grid condenser and leaks; 75,000 ohms proved to be the best value for obtaining the greatest second harmonic output of the oscillator. It also lowered the plate current considerably and increased the overall efficiency of this stage. It was found that the plate voltage to the oscillator had to be the same as that fed to the final amplifier, in order to provide enough excitation for the modulated amplifier. Screen-grid voltage is obtained through the use of a dropping resistor of 50,000 ohms. The screen is by-passed with a .0001 mf. mica condenser, on the under side of the chassis, as near to the tube as possible.

The grid circuit is tuned to 10 meters and the plate circuit is tuned to five.

In the plate circuit we have three turns for the coil 1¼ inches in diameter. This coil, as are all others, is wound with No. 12 tinned copper wire, and has its turns spaced about ⅛ of an inch apart and is tuned with a 25 mmf. condenser, of the same type used in the oscillator grid circuit. A .0001 mf. condenser is used to by-pass the one side of the coil to the B-minus.

Inductive Coupling Used

The grid circuit of the power amplifier is inductively coupled to the oscillator by placing the grid coil inside of oscillator plate coil. With the coupling so close the grid coil does not have to be tuned. It is of the proper size to be resonant in the five-meter band and the plate circuit of the oscillator pulls it into resonance with the oscillator second harmonic. This coil is center-tapped for feeding the bias to the grids, and it is also by-passed with a .0001 mf. condenser. Six turns are used and the diameter is ¾ inch. The plate coil of the amplifier is identical to the grid coil and the center tap is by-passed with a .0001 mf. condenser. No. R.F. chokes were found necessary in any of the circuits, but there is no law against using them of course. Tuning in the plate circuit is accomplished with a 25 mmf. double spaced condenser identical to the oscillator plate condenser. All of the condensers are mounted back from the panel and tuned with a bakelite shaft and coupling to eliminate body capacity effects.

As in the oscillator the screen voltage is obtained with a potential dropping resistor of 50,000 ohms resistance; both screens are connected together. The antenna circuit consists of two four turn coils and the coupling and tuning depend on the type of antenna and feeder system used.

450 to 550 Volts on Plates

The diagram shows the proper connections when 450 to 550 volts are used on the plates; however if a lower voltage (300 to 400) is used the suppressors of the amplifier should be connected to the screens, the same as in the oscillator. Bias for the amplifier was obtained from batteries; between 22.5 and 45 volts, depending on the plate voltage. Under normal operating conditions the plate current readings, with the antenna load on the amplifier, are as follows: oscillator 30 to 40 ma.; amplifier 50 to 60 ma. and the grid current of the amplifier will be between 5 and 10 ma.

The modulator shown is a Lafayette 15 watt amplifier and serves its purpose very nicely. No less than 15 watts should be used because the plates and screen grids are modulated together and this requires all of 15 watts for around 100 percent modulation.

The signal emitted from this little "rig" is perfect in quality and stability. Not only is this a swell transmitter, but it will drive a pair of 801's or a pair of 800's, if higher power is desired.

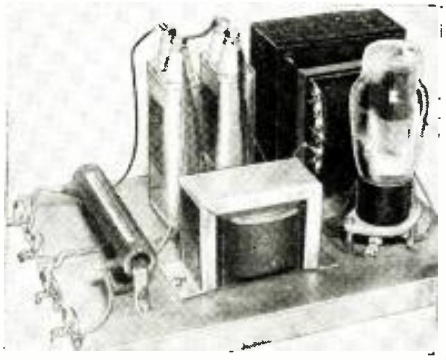
Just as we go to press, some very interesting things took place. A perfect two-way QSL was held with W1AIY in Wolcott, Conn., a distance of around 60 miles, and believe it or not, the signals from this little M.O.P.A. were reported a solid QSA5 R6. Many other stations from 30 to 50 miles distant were contacted from W2AMN's "shack" in New Jersey. The antenna used was a single 8 ft. vertical copper rod with a matched impedance feeder system, using the "Y" method. The modulator system consisted of a 15 watt Lafayette high-fidelity amplifier and a crystal microphone. Everyone who has heard this transmitter noted its superiority in quality, and requested information on constructing a similar transmitter, so by the time this appears in print, there will probably be a good many of these transmitters in operation.

Parts for 5-Meter M.O.P.A.

7—.001 mf. 1,000 volt mica condensers, Aerovox.
1—50 mmf. type UM50 condenser, National.
2—25 mmf. type UMA25 condenser, National.
3—6-prong isolantite sockets, National.
3 small standoff insulators, National.
2—50,000 ohm, 20 watt resistor, Aerovox.
1—75,000 ohm resistor 5 or 10 watts, Aerovox.
1 chassis and cabinet, Wholesale Radio.
1—0-50 ma. meter Triplett.
1—0-100 ma. meter Triplett.
3 type 89 tubes.

Power Supply Parts

1 transformer 500-0-500, 5 volts, 6.3 volts, 125 ma.
1—30 H. 125 ma. filter choke.
2—2 mf. 1,000 volt filter condensers, Cornell-Dubilier.
1—50,000 ohm 50 watt resistor, I. R. C.
1—83 "V" rectifier tube.
1 complete modulator and speech amplifier 15 watts output with 8,000 ohm output impedance, the one shown in the photograph is manufactured by Wholesale Radio.
Modulator coupling to amplifier consists of a 30 henry choke and a 1 mf. 1,000 volt Cornell-Dubilier condenser.



View of Mopa Power Supply

Short Wave Scouts

(*Continued from page* 594)

HJ4ABA—11,710 kc.—6:30-10:30 p.m., Medellin, Colombia.
HJ3ABD—7.400 kc.—Irregular, Bogota, Colombia.
HJ4ABE—5,950 kc.—6-10:30 p.m., Medellin, Colombia.
HJ5ABE—14,000 kc.—Off at present, Cali, Colombia.
HJ1ABD—7.281 kc.—Irregular, Cartagena, Colombia.
HC2RL—6,660 kc.—Please see card, Guayaquil, Ecuador.
OAX4D—5.780 kc.—M.-W.-Sat., 9-11:30 p.m., Lima. Peru.
VK2ME—9,590 kc.—Sunday a.m., Sydney, Australia.
VK3LR—9.580 kc.—3-7:30 a.m. (ex. Sun.), Melbourne, Australia.
DJA—9,560 kc., 5-9:15 p.m., Berlin, Germany.
DJB—15,200 kc.—8-11:30 a.m., Berlin, Germany.
DJC—6,020 kc.—5-10:45 p.m., Berlin, Germany.
DJD—11,770 kc.—12-4:30 p.m., Berlin, Germany.
DJN—9,540 kc.—5-10:45 p.m.. Berlin, Germany.
DIQ—10,290 kc.—Irregular, Berlin. Germany.

TROPHY CONTEST RULES

(*Continued from page* 594)

The judges of the contest will be the editors of SHORT WAVE CRAFT, and their findings will be final. Trophy awards will be made every month, at which time the trophy will be sent to the winner. Names of the contesting SCOUTS not winning a trophy will be listed in Honorable Mention each month. From this contest are excluded all employees and their families of SHORT WAVE CRAFT magazine. Address all entries to SHORT WAVE SCOUT AWARD, 99-101 Hudson St., New York City.

NEXT ISSUE!

A BIG "HAM" NUMBER!

Don't miss the special constructor articles on S.-W. Transmitters and other apparatus so dear to the heart of the "Ham".

An Experimenter's Superheterodyne

(Continued from page 591)

Has Pre-Selector Stage

The *Pre-Selector Stage* raises the signal-to-noise ratio considerably and using the variable mu type 58 tube in this position affords a great deal of amplification on the higher frequencies.

The Modulator Stage uses a type 57 tube, and with the proper apportioning of voltages, which by the way is quite important, makes a very good mixer tube. I have found from my experience, that by using separate tubes for the oscillator and mixer circuits better results are attained. Using the composite type of tube, such as the 2A7, several bad features show up, which more than over-ride the advantages gained by using this tube; almost as much conversion gain can be obtained in a type 57 or 58 tube when the proper voltages are applied. The composite type of tube has a bad fault of not oscillating on the lower frequencies of each set of coils and still another habit of "pulling" on the frequencies above 25 meg. By injecting the voltage from the oscillator to the mixer through the suppressor grid, a good mixing action is obtained and produces a good signal for the intermediate stages.

The *Oscillator* is a 58 type tube, noted for its stability and "sure fire" oscillation on the high frequencies.

Details of I.F. Stages

The *Intermediate Amplifier* operates on a frequency of 456 kilocycles, which is high enough to prevent such "bogys" as *repeat spots*. The transformers are all double-tuned, making for high selectivity. The first two intermediate stages have automatic volume control. The third stage is set with the proper bias to prevent it from being overloaded by strong signals. The second detector and third intermediate stages use the 2B7 type of tube, which also provides the high A.V.C. voltage necessary to properly control the high mu 58 tubes, which require as high as 35 or 40 volts negative. This A.V.C. voltage is very slightly delayed, not quite as much however as is ordinarily done in commercial types of all way receivers. It is only delayed enough to prevent the loud blast, usually heard in a speaker when a powerful signal is tuned across in an ordinary A.V.C. circuit, due to the fact that the sensitivity jumps to its highest peak when the incoming signal is removed from the I.F. amplifier. The delay amounts to only a small fraction of a second. This delay is taken care of by using the proper size resistor in the cathode leg of the 2B7 tube. The A.V.C. is cut out by turning a small switch located on the panel, automatically cutting in the manual gain control, which is always used when receiving C.W. signals.

Audio Stages

The First Audio stage uses a type 56 tube, which provides plenty of amplification to drive a small five-inch dynamic speaker. This speaker is used mainly for C.W. and *amateur phone* reception. Usually we do not want five or ten watts of output when receiving signals from the amateur bands, as most of us find the rest of the household is not interested in hearing a great deal of heterodyning squeals, whistles and "beep beeps". The C.W. signals provide a nice musical note when coming from this small speaker. When listening to foreign and local programs, however, then the class "A" push-pull type 45's are thrown into the circuit, which feeds a 10 inch dynamic console speaker, providing very good fidelity.

Frequency Meter Built In

Due to the fact that when using constant band-spread for all frequencies, the stations are more or less shifting to slightly different points on the dial, some type of separate calibration for the receiver must be provided. This is taken care of by building in this receiver an electron-coupled *frequency meter*. After this frequency meter has been calibrated it is merely necessary to throw the switch that controls it, turn the dial until the tuning meter shows a major deflection. This point on the dial will represent the frequency to which the receiver is tuned. The calibration of this meter will be described later in this article.

Beat Oscillator Provided

A Beat Oscillator is incorporated in the receiver to provide audible reception of C.W. signals. This beat oscillator uses an intermediate transformer of the same frequency as the amplifiers in the receiver.

List of Parts

Resistors

R1	50,000 ohms	
R2	5,000 ohms	
R3	300 ohms	
R4	5,000 ohms	
R5	250,000 ohms	
R6	300 ohms	
R7	250,000 ohms	
R8	300 ohms	
R9	20,000 ohms	
R10	1 megohm	
R11	500,000 ohms	
R12	10,000 ohms	Variable
R13	2,000 ohms	
R14	20,000 ohms	
R15	250,000 ohms	
R16	500,000 ohms	
R17	500 ohms	
R18	1,000,000 ohms	
R19	500,000 ohms	
R20	2,000 ohms	
R21	12,000	Tapped Divider
R22	50	Center-tap
R23	750 ohms	

Condensers

C2, C4, C6, is a three-gang variable condenser, formerly .00035 mf. per section with all but one rotor plate removed from each section.
C21, C1, C3, C5, .0001 mf. variable (Hammarlund)
C7, C8, C9, .01 mf.
C12, C30, .01 mf.
C13, C14, C15, C16, C17, C18, C19, C22, C23, C24, C25, C29, C35, C37, C38, 0.1 mf.
C10, C20, .0025 mf.
C11, .0005 mf.
C31, .0001 mf.
C26, described in text.
C27, C28, .001 mf.
C32, C33, C39, 1.0 mf.
C34, .00007 mf.
C36, intermediate tuning condenser in can.
C40, 3-8 mf. condensers in a single can.

Miscellaneous

L1, 2, 3, 4, 5, 6, see text for coil data.
T1, 2, 3, 4, 5, 456 kc.'s intermediate transformers.
T6, power transformer, 350 volts. 5 volts. 2½ and 2½ volts, all center-tapped.
T7, output push-pull transformer.
T8, input push-pull transformer.
T9, output transformer from single 56 to 5 inch speaker.
Choke, filter choke 30 henries. Low D.C. resistance.

Coil Data

METERS R.F. MIXER OSCILLATOR

	P. L1	S. L2	P. L3	S. L4	Plate L6	Grid L5	
10- 22	4	4	4	4	5	4	Spaced own diameter
19- 35	5	6	5	6	5	5	Close wound
29- 65	7	12	9	12	8	10½	Close wound
60-110	14	23	19	23	10	21	Close wound
100-220	20	48	36	48	15	43	Close wound
220-550	30	140	75	140	25	70	Close wound

For the 10-22 and 19-35 meter coils No. 20 wire should be used for the secondary. Primaries are not critical.

All other coils, except broadcast band, use No. 26 wire. Broadcast coils No. 30 or No. 32. All wire double silk covered.

Diameter of coils 1¼ inches.

All coils are of the plug-in type.

Frequency Meter Coils L7

METERS	TURNS	TAPPED AT
150-200	55	4th turn
70-150	28	2nd turn
30- 75	11	1st turn
20- 35	5½	½ turn
9- 21	3½	½ turn
9- 21	coil space wound.	Space equal to wire diameter.

(Continued on page 639)

Police Radio Alarm Stations

(*Continued from page* 608)

WPFL	Gary, Ind.	2470 kc.
WPFM	Birmingham, Ala.	2382 kc.
WPFN	New Bedford Mass.	1712 kc.
WPFO	Knoxville, Tenn.	2474 kc.
WPFP	Clarksburg, W.Va.	2490 kc.
WPFQ	Swarthmore, Pa.	2474 kc.
WPFR	Johnson City, Tenn.	2470 kc.
WPFS	Asheville, N.C.	2474 kc.
WPFT	Lakeland, Fla.	2442 kc.
WPFU	Portland, Me.	2422 kc.
WPFV	Pawtucket, R.I.	2466 kc.
WPFW	Bridgeport, Conn.	2466 kc.
WPFX	Palm Beach, Fla.	2442 kc.
WPFY	Yonkers, N.Y.	2442 kc.
WPFZ	Miami, Fla.	2442 kc.
WPGA	Bay City, Mich.	2466 kc.
WPGB	Port Huron, Mich.	2466 kc.
WPGC	S. Schenectady, N.Y.	1658 kc.
WPGD	Rockford, Ill.	2458 kc
WPGF	Providence, R.I.	1712 kc.
WPGG	Findlay, Ohio	1596 kc.
WPGH	Albany, N.Y.	2414 kc.
WPGI	Portsmouth, Ohio	2430 kc.
WPGJ	Utica, N.Y.	2414 kc.
WPGK	Cranston, R.I.	2466 kc.
WPGL	Binghamton, N.Y.	2442 kc.
WPGN	South Bend, Ind.	2490 kc.
WPGO	Huntington, N.Y.	2490 kc.
WPGP	Muncie, Ind.	2442 kc.
WPGQ	Columbus, Ohio	1596 kc.
WPGS	Mineola, N.Y.	2490 kc.
WPGT	New Castle, Pa.	2482 kc.
WPGU	Cohasset, Mass.	1712 kc.
WPGV	Boston, Mass.	1712 kc.
WPGW	Mobile, Ala.	2382 kc.
WPGX	Worcester, Mass.	2466 kc.
WPGZ	Johnson City, Tenn.	2474 kc.
WPHA	Fitchburg, Mass.	2466 kc.
WPHB	Nashua, N.H.	2422 kc.
WPHC	Massillon, Ohio	1596 kc.
WPHD	Steubenville, Ohio	2458 kc.
WPHE	Culver, Ind.	1634 kc.
WPHF	Richmond, Va.	2450 kc.
WPHG	Medford, Mass.	1712 kc.
WPHI	Charleston, W.Va.	2490 kc.
WPHJ	Fairmont, W.Va.	2490 kc.
WPHK	Wilmington, Ohio	1596 kc.
WPHL	Portable in Ohio	1682 kc.
WPHM	Orlando, Fla.	2442 kc.
WPHN	Tampa, Fla.	2466 kc.
WPHO	Zanesville, Ohio	2430 kc.
WPHP	Jackson, Mich.	2466 kc.
WPHQ	Parkersburg, W.Va.	2490 kc.
WPHS	Culver, Ind.	1634 kc.
WPHT	Cambridge, Ohio	1596 kc.
WPHU	Jasper, Ind.	1634 kc.
WPHV	Bristol, Va.	2450 kc.
WPHY	Elizabethton, Tenn.	2474 kc.
WPHZ	Oil City, Pa.	2482 kc.
WPSP	Harrisburg, Pa.	1674 kc.
WQFA	New Haven, Conn.	2466 kc.
WQFB	Macon, Ga.	2414 kc.
WQFC	Gainesville, Fla.	2466 kc.
WQFD	Columbia City, Ind.	1534 kc.
WQFE	Seymour, Ind.	1634 kc.
WQFF	Monessen, Pa.	2482 kc.
WQFG	Roanoke, Va.	2450 kc.
WQFH	Lynchburg, Va.	2450 kc.
WQFI	Petersburg, Va.	2450 kc.
WQFJ	Oneonta, N. Y.	2414 kc.
WQFK	Clearwater, Fla.	2466 kc.
WQFM	Wilkes-Barre, Pa.	2442 kc.
WQFN	Winter Haven, Fla.	2442 kc.
WQFO	Lancaster, Ohio	2430 kc.
WQFP	Springfield, Ill.	1610 kc.
WQFQ	Lafayette, Ind.	2442 kc.
WQFR	Portable, N. Y.	1658 kc.
WQFS	Hibbing, Minn.	2382 kc.
WQFT	Portable, Ohio	1596 kc.
WQFU	Sharon, Pa.	2482 kc.
WQFV	Augusta, Ga.	2414 kc.
WRBH	Cleveland, Ohio	2458 kc.
WRDQ	Toledo, Ohio	2474 kc.
WRDR	Grosse Pt. Village, Mich.	2414 kc.
WRDS	E. Lansing, Mich.	1642 kc.
W1XAO	Boston, Mass.	1712 kc.

Television Stations

	2000-2100 kc.
VE9AU	London, Ont., Can.
VE9DS	Montreal, Que.
W2XDR	Long Island City, N.Y.
W8XAN	Jackson, Mich.
W9XK	Iowa City, Iowa
W9XAK	Manhattan, Kans.
W9XAO	Chicago, Ill.
W6XAH	Bakersfield, Calif.
	2750-2850 kc.
W3XAK	Portable
W9XAP	Chicago, Ill.
W2XBS	Bellmore, N.Y.
W9XAL	Kansas City, Mo.
W9XG	W. Lafayette, Ind.
W2XAB	New York, N.Y.
VE9AR	Saskatoon, Sask., Can.
VE9ED	Mt. Joli, Que., Can.
	42000-56000, 60000-86000 kc.
W2XAX	New York, N.Y.
W6XAO	Los Angeles, Calif.
W9XD	Milwaukee, Wis.
W2XBT	Portable
W2XF	New York, N.Y.
W3XE	Philadelphia, Pa.
W3XAD	Camden, N.J.
W10XX	Portable & Mobile (Vicinity of Camden)
W2XDR	Long Island City, N.Y.
W8XAN	Jackson, Mich.
W9XAT	Portable
W2XD	New York, N.Y.
W2XAG	Portable
W1XG	Boston, Mass.
W9XK	Iowa City, Iowa
VE9BZ	Vancouver, B.C., Can.
VE9DS	Montreal, Que., Can.
VE9AU	London, Ont., Can.
VE9RC	Quebec, Que., Can.
VE9AG	Walkerville, Ont., Can.

S-W Scout News

(Continued from page 612)

YV2RC, YV5RMO, XEBT, XEJQ, HJ1ABE, HJ4ABE, HJ3ABH, TG2X, TIEP, COCO, COCH, COCD. There are also a few new stations testing on the 49 meter band coming in fine around 7 to 9 P.M., P.S.T.

Europeans are improving, the 19, 25, and 31 meter bands being very good at present.

Nov. 15, a German Transmission came in here R9 on about 9.65 mc. Program was similar to DJ-stations. Time was 2 to after 3:45 P.M., P.S.T. It came in stronger than any European I have ever received.

Of the other Europeans GSC, GSL, GSI, PCJ, DJB, DJN, HBL, I2RO, and Radio Coloniale have been the most consistent.

JVF & JVH are the most consistent Japanese stations, though JVN, JVE, JVM, and JVT have all been received with good volume.

JVF on occasion has come through about R9.

KKH, Kahuku Hawaii, 7.52 mc., is on at 9:30 P.M., P.S.T. with a program for C.B.S., Mondays, called Hawaii. Heard testing before and after said program with KKQ.

LSX, 10.35 mc., and W2XAF have been having some fine experimental broadcasts this month. Eg., Nov. 13, at 3 P.M., P.S.T.

All Canadian and Americans have been consistently strong.

KER, KKR, and JVM were heard testing for a program for N.B.C. international Junior Red Cross Oct. 28, 29, and 30 between 10 and 11:30 A.M., P.S.T., but on the 30th conditions were too poor for program transmission at 11.

JVF this same afternoon came through with a wallop. (Wow!)

Armistice day program for C.B.S. came through fine from KWU and JVF, at 12 noon.

KAY was heard at 4:15 P.M. on Sunday, Nov. 10.

RV15, Khabarovsk, Siberia, is an early morning "reliable."

The "Aussies" (Australians) are all coming in fine at present.

Sincerely yours,
James Boland,
Portland, Oregon.

Here's Your Button

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

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

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

Joe Ficere, Long Beach, Calif., Reports

FIRST of all I want to report on France and its new Radio-Coloniale transmitters, which, according to the English announcer over Radio-Coloniale on Sunday, November 17, are to go on the air before the end of November. It is believed the frequencies to be used are: 17.77, 15.29, 11.84 and 9.58 megacycles. According to the announcer, the tests have been conducted, and have been a success.

In regards to the German stations received here, DJN-A-B have been received the best, and DJC won't pull out of the heterodyne. The others have been tried for time and again, but so far no luck, as they are beamed away from North America, and can't even hear their carrier.

The South American stations are reaching their peak out here now and one can sit down almost any night, and get practically any country in South America. A new station in Maracaibo, Venezuela, heard testing on about 6,300 kc, is believed to be called YV2RS, also one

(Continued on page 635)

• • • SHORT WAVE ESSENTIALS

FOR MEMBERS OF THE SHORT WAVE LEAGUE • • •

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE 2-36
99-101 Hudson Street, New York, N. Y.

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

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

I own the following radio equipment:

Transmitting .....

Call Letters.....

Receiving .....

Name .....

Address .....

City and State.....

Country .....

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

A FEW WORDS AS TO THE PURPOSE OF THE LEAGUE

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

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

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

FREE MEMBERSHIP CERTIFICATE

As soon as you are enrolled as a member, a beautiful certificate with the LEAGUE'S seal will be sent to you, providing 10c in stamps or coin is sent for mailing charges.

Members are entitled to preferential discounts when buying radio merchandise from numerous firms who have agreed to allow lower prices to all SHORT WAVE LEAGUE members.

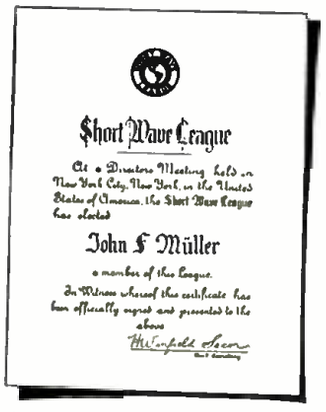


Illustration of engraved free membership certificate

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

They cannot be bought by anyone unless he has already enrolled as one of the members of the SHORT WAVE LEAGUE or signs the blank on this page (which automatically enrolls him as a member, always provided that he is a short wave experimenter, a short wave fan, radio engineer, radio student, etc.).

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

SHORT WAVE LEAGUE LETTERHEADS

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

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

A—50c per 100

OFFICIAL SHORT WAVE LISTENER MAGAZINE

The finest magazine of its kind ever published—totally different in get-up and contents from any other. Contains the largest listing of short wave stations in the world, up-to-the-minute, including "Police," "Television" and short-wave stations, as well as a special list of the star short-wave stations with their frequencies and call letters. Also contains photos and descriptions of short-wave broadcasting stations in various parts of the world with photos of short wave studio artists—How to locate "weak" distance stations, and other hints for the "short-wave listener"—Question and Answer Department for the "Listener"—Silver Cup Trophy for best photo of readers' listening "Posts," etc

B—Official Short Wave Listener Magazine.....Prepaid **15c**

B—15c per copy

RADIO MAP OF THE WORLD AND STATION FINDER

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

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

GLOBE OF THE WORLD AND MAGNETIC COMPASS

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

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

SHORT WAVE LEAGUE LAPEL BUTTON

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

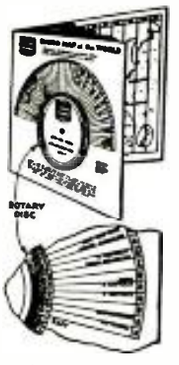
E—SHORT WAVE LEAGUE lapel button.....Prepaid **35c**

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

SHORT WAVE LEAGUE SEALS

These seals or stickers are executed in three colors and measure 1¼ in. in diameter, and are gummed on one side. They are used by members to affix to stationery, letterheads, envelopes, postal cards and the like. The seal signifies that you are a member of the SHORT WAVE LEAGUE. Sold in 25 lots or multiples only.

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



C—25c each

SHORT WAVE MAP OF THE WORLD

This beautiful map, measuring 18x26 in. and printed in 18 colors is indispensable when hung in sight or placed "under the glass" on the table or wall of the short wave enthusiast. It contains a wealth of information such as distances to all parts of the world, political nature of the country in which a broadcast station is located, etc., and from the manner in which the map is blocked off gives the time in different parts of the world at a glance.

F—SHORT WAVE Map of the World.....Prepaid **25c**

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

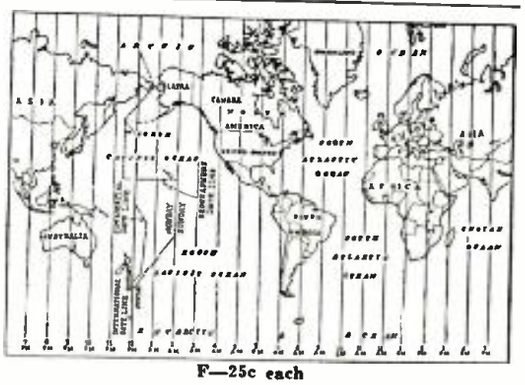
Send all orders for short wave essentials to SHORT WAVE LEAGUE, 99-101 Hudson Street, New York City.

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

SHORT WAVE LEAGUE 99-101 Hudson St., New York, N. Y.

D—$1.25 each

G—15c for 25



F—25c each

E—35c each

SHORT WAVE LEAGUE, 99-101 Hudson Street, New York, N. Y.
Gentlemen:
I am already an enrolled member in the SHORT WAVE LEAGUE ☐
I am a new member and attach my application to this coupon ☐
Please send me the following short wave essentials as listed in this advertisement

.....

.....

.....

.....

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

2-36

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

S-W Scout News

(*Continued from page 633*)

heard testing sending out musical recordings on about 6,135 kc. No call letters given on this one to my knowledge. Testing late P.M.

There are Mexican stations popping up from everywhere, and this post has received no less than four in the last few nights. They are: XECI, 5,980 kc. up till 12 P.M., P.S.T., XEUW, 6 025 kc. up till 12 P.M., P.S.T., XEFT, 6,120 up till 11 or 12 P.M., P.S.T., and XEXA, 6,190 kc. up to 8:15 P.M., P.S.T. XEUW and XEFT are situated in Vera Cruz, and the others in Mexico City. XBJQ, 11,000 kc., Mexico City, tests in early afternoon, and broadcasts up to 6 or 7 P.M., P.S.T. Very loud signals.

KIO and KKP, Kahuku, Hawaii, transmitting music on a test, in the early evenings. Also GAU, Rugby, heard early mornings calling WKN, then switching to inverted speech. WEA, 8,080 kc., heard re-broadcasting a program over N.B.C. from Poland, in honor of the monument dedicated there to Marshal Pilsudski, on November 18.

Heard here from Japan are: JVT very good, JVU very good, JVH fair, JVN very good also JZC, 5.83 meg. Kanjoshi, Manchukuo, and JDZ, Darien, Manchukuo, 5.71 meg., all heard almost any early morning.

PHI and PCJ continue to come in good out here on the days of their transmissions. 2RO heard well on both its frequencies. EAQ also heard fairly well, at least good enough to enjoy. HVJ, Vatican City, heard very well any morning. HAS3 also hangs in here on Sunday mornings, but HAT not heard from yet, though am still trying. Neither PLE or PMA heard from yet, but only tried one morning, and as the other Java stations come in here very good, I expect they will too, in time.

On Monday, November 11, I heard the "Stratosphere Balloon" talking to the China-Clipper Ship, while the balloon was 33,000 feet over Nebraska on its way down, after establishing a new mark, and the China-Clipper Ship was enroute to San Francisco. The frequency was 13,050. I held the stratosphere transmitter until 2:12 P.M., P.S.T., but they only talked to the China-Clipper about ten minutes.

C.N.R., Rabat, Morocco, transmitting a musical program of popular jazz on Sunday, November 17, between the times of 10:15 to 10:32 when they signed off the air. Time is P.M., P.S.T.

(*Continued on page 637*)

Brecksville, Ohio, O. L. P. Short Wave Log—Time Is E.S.T.

Date 1935	Time	Call	K.C.	Location	Remarks
Oct.	p.m.				
23	7:20	KKP	16,030	Hawaii...	Very, very loud
23	7:45	FYA	11,705	France...	Just understandable
23	7:55	EAQ	9,860	Spain....	Loud, but choppy
23	8:30	HJ4ABE	5,950	Colombia	Very loud and steady
26	7:15	CJRX	11,720	Canada..	Loud, but distorted
26	8:05	XEJQ*	11,000	Mexico...	Very loud, relays XEW
26	8:50	YVQ	6,672	Venezuela	Very loud, clear and steady
27	8:15	YV6RV	6,520	Venezuela	Clear and loud
27	8:40	COC	6,130	Cuba....	Very loud
Nov.					
1	7:10	EAQ	9,860	Spain....	Very loud
1	7:15	2RO	9,635	Italy....	Very loud
4	7:00	LSX	10,350	Argentina	Very fine. Musical program
4	7:30	GSA	6,050	England..	Very loud and clear
4	8:00	HJ4ABE	5,950	Colombia	Very loud
7	7:10	KKP	16,030	Hawaii...	Very, very loud
7	7:45	HJ4ABA	11,700	Colombia	Loud, but faded
7	7:55	XEJQ	11,000	Mexico...	Very, very loud and clear
8	10:50	GSL	6,110	England..	Very loud, some noise
	a.m.				
10	9:15	HAS3	15,370	Hungary	Fair, but faded
10	9:45	WNC	15,055	U. S.....	Loud, working HPF
10	10:20	DJB	15,200	Germany	Fair
	p.m.				
11	6:55	KKP	16,030	Hawaii...	Very, very loud
15	7:20	EAQ	9,860	Spain....	Very fine
15	7:30	2RO	9,635	Italy....	Very clear and loud
15	7:40	GSC	9,580	England.	Very, very loud
15	7:45	DJN	9,540	Germany	Fair
15	7:50	COH	9,428	Cuba....	Very loud and clear
15	7:55	FYA	11,705	France...	Fine
15	8:20	DJC	6,020	Germany	Very loud
16	7:50	YVQ	6,672	Venezuela	Very, very loud
17	6:20	WEA	10,610	U. S.....	Calling DIQ
17	10:50	GSL	6,110	England.	Very loud, some fading
18	7:15	KKP	16,030	Hawaii...	Loud
18	7:40	LSX	10,350	Argentina	Loud, but very choppy
18	8:10	WOA	6,755	U. S.....	Very, very loud

*New Station.

EDWARD M. HEISER,
Route 2, Box 124, Brecksville, Ohio.

S-W Scout News

(*Continued from page* 635)

Report from Richmond, Va.

Enclosed herewith please find official listening post report.

Oct. 13, TFJ, Reykjavik, Iceland, 12295 kc. Good.

Oct. 13, GBU, Rugby, England, 12,290 kc. Fair.

Oct. 14, EAQ, Madrid, Spain, 9,860 kc. Good.

Oct. 14, HBL, Geneva, Switzerland, 9,565 kc. Weak.

Oct. 14, HBP, Geneva, Switzerland, 7,799 kc. Good.

Oct. 14, RNE, Moscow, Russia, 12,000 kc. Good.

Oct. 14, 2RO, Rome, Italy, 9,635 kc. Good.

Oct. 14, YV4RC, Caracas, Venezuela, 6,375 kc. Very good.

Oct. 14, CT1AA, Lisbon, Portugal, 9,625 kc. Weak.

Oct. 14, TIGPH, San Jose, Costa Rica, 5,825 kc. Fair.

Oct. 20, ZHJ, Penang, Malaya, 7,630 kc. Weak.

Oct. 20, HAT4, Budapest, Hungary, 9,-125 kc. Fair.

Oct. 20, RV72, Moscow, Russia, 6,611 kc. Very weak.

Oct. 20, XECR, Mexico City, Mexico, 7,380 kc. Very good.

Oct. 20, HCJB, Quito, Ecuador, 2,214 kc. Fair.

Nov. 1, VK3ME, Melbourne, Australia, 9,518 kc. Fair.

Nov. 3, CT1GO, Parede, Portugal, 12,396 kc. Fair.

Nov. 11, W10XFN, Rapid City, S.D., 6,-350 kc. Very good. This station held from 7 a.m. to 6 p.m. E.S.T.

Nov. 23, LSX, Monte Grane, Argentina, 10,350 kc. Good.

A. B. RICE,
3432 Hanover Ave., Richmond, Va.

Listening in at Freeport, Pa.

● DGU, Nauen, Germany, 9.67 meg. has been relaying the programs of DJA, DJN and DJC after 5:05 p.m.

When special programs are sent from Germany DIQ, 10.29 meg. is generally put in use with one of the standard waves.

WEA, 10.68 meg. and WQV, 16.80 meg., are generally used to work Germany and Russia on special broadcasts.

HAS-3 on 15.37 meg. and HAT-4 on 9.12 meg. are being heard very well.

2RO, Rome, Italy, has a new schedule. They are on 11.81 meg. at 8:15 to 10:15 a.m.; then from 11:45 a.m. to 2:30 p.m. On 9.64 meg. from 2:30 p.m. till 5:30 p.m. On 9:64 meg. every evening except Sundays, at 6 p.m. with the "News Bulletin." On 9.64 meg. Mondays, Wednesdays and Fridays 6:15 to 7:30 p.m. with the "American Hour."

CT1AA, Lisbon, Portugal, has been on 9.63 and 9.64 meg. of late instead of 9.59 meg.

RKI 15.04 meg. and RIM 15.25 meg. can be heard almost daily phoning each other at times until 9:45 a.m.

HVJ on 15.11 meg. comes on at 10 a.m., Saturdays, then again at 10:30 a.m. as they do daily.

YVR, 18.30 meg. phones DFB 17.52 meg. at 10 a.m. almost every day.

PCJ on 15.22 meg. has been on daily, although they should be on only several times each week.

HJN, Bogota, Colombia, S.A., is now on about 6.82 meg.

YV8RB, Barquisimeto, Venezuela, S.A., is on 5.88 meg., 6 to 10 p.m.

HI1A on 6.19 meg. is being heard about every night a good signal.

Radio Coloniale on 15.25 meg. is now coming in very well.

XEFT on 6.12 meg. is heard at times but with poor modulation and signal strength.

The Addis Ababa, Ethiopia, station ETA operates on 11.93, 7.62 and 16.42 meg.

SPW, Warsaw, Poland, is on 13.63 meg. at 11:30 a.m. daily.

ANGELO CENTANINO,
Box 516, Freeport, Pa.

CLASSIFIED

Advertisements are inserted at 5c per word to strictly amateurs, or 10c a word to manufacturers or dealers. Each word in a name and address is counted. Cash should accompany all orders. Copy for the March issue should reach us not later than January 6th.

BOOKS

ARMY-NAVY GIVES FREE radio operators' training for service on aircraft, ships. Salary, expenses paid. Information pamphlet, how to apply, 20c. Continental, Box 344, Dept. 4, Indianapolis, Ind.

GENERATORS

TWENTY PRACTICAL AND LOW cost changes converting old generators into new generators and motors 100-500 watt capacity, d c or a c current, with 6 to 400 volts, for radio operation, power, light, or welding. Also instructions for rewinding armatures. 350 definitions of electrical terms, etc. All in new, revised book with simplified instructions and illustrations. Endorsed by thousands. Only $1.00 postpaid. Autopower, 414 S. Hoyne Ave., Chicago.

"HAM" OFFERS AND WANTS

MOTOR GENERATOR BARGAIN. Bodine Electric Two unit coupled 110 D.C. to 110A.C. 60 cycles. 300 Watts output. Complete with line noise filter, regulator, long extension cord plug. Bargain $25. Also Westinghouse 1/6H.P. 110D.C. motor, compound winding $7.50. Write, Phone L. Meuler, 563 West 184th Street, New York.

SALE TRADE MIDWEST DE-Luxe Sixteen All-wave Receiver, Large Pam Amplifier, Perlman Station Finder Oscillator, Small Hand Press. Want Silver Hallicrafter Skyrider similar bandspread receiver. Glenn Watt, Chanute, Kas.

ATTENTION—HAMS, $50 TAKES —75 watt xtal xmtr, SW-3, power supplys, monitor, key, all in a neat cabinet. For details, send stamped envelope. W9IPQF-H, Button, Aberdeen, So. Dak.

USED NATIONAL SW3s ALL models with tubes and any three sets of coils $15.00. National FB7s $22.00, other receivers. W9ARA, Butler, Mo.

NATIONAL ACSW5, 5 SETS coils, tubes $18.00. 210 Amplifier $3.50. Humless B. eliminator $3.50. J. Tate, 205 Simpson, Ardmore, Pa.

FOR SALE: COMPLETE PILOT A.C. Super Wasp. Works O.K. $10.00. Also converter $7.50. Glen G. Miller, 905 Choctaw, Alva, Okla.

SKYRIDERS CHEAP—SELL OR trade—Can use cameras, lenses, binoculars, etc. Wells-Smith Radio Corp., 26 N. Wells St., Chicago.

HAWK THREE TUBE CHEAP seventeen to one hundred sixty meters. Hal. P. Rea, Carrollton, Mo.

INSTRUCTION

RADIO ENGINEERING, BROADcasting, aviation and police radio. Servicing. Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Colt St., Valparaiso, Ind.

PACKMAN RADIO ENGINEERing School, Valparaiso, Indiana, offers complete radio training and employment service. Free prospectus.

MISCELLANEOUS

OHM'S LAW CALCULATOR— Lightning Slide Rule; solves all problems of Voltage, Current and Resistance, Power, Wire Sizes, etc. Range: 1 micro-amp. to 1000 amps.; 1 micro-volt to 10,000 volts; 1 micro-ohm to 10 megohms; 1 micro-watt to 10 megawatts; wire sizes 0 to 36 B. & S. gauge. Introductory price $1.00 prepaid. The Dataprint Co., Box 322, Ramsey, N.J.

CALLBOOKS, HANDBOOKS, QSLs SWL Cards. Write for prices. W8DED, Holland, Michigan.

PATENTS & INVENTIONS

HAVE YOU A SOUND, PRACTIcal invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 92, Washington, D.C.

PATENTS, REASONABLE TERMS. Book and advice free. L. F. Randolph, Dept. 714, Washington, D. C.

QSL—CARDS—SWL

TROPHY CUP WINNER TYPE QSL, SWL cards. Reply Getters. Samples? (Stamps). W-8-E-8-N, 1827 Cone, Toledo, Ohio.

QSL CARDS, NEAT, ATTRACtive, reasonably priced, samples free. Miller, Printer, Ambler, Pa.

RADIO ENGINEERING

CUSTOMBUILDERS OFFERS YOU a new service. Any radio equipment built to your specifications. Write for details—no obligation. Custombuilders, Dept. A, 113 West 57th, New York City.

SHORT WAVE COMPONENTS

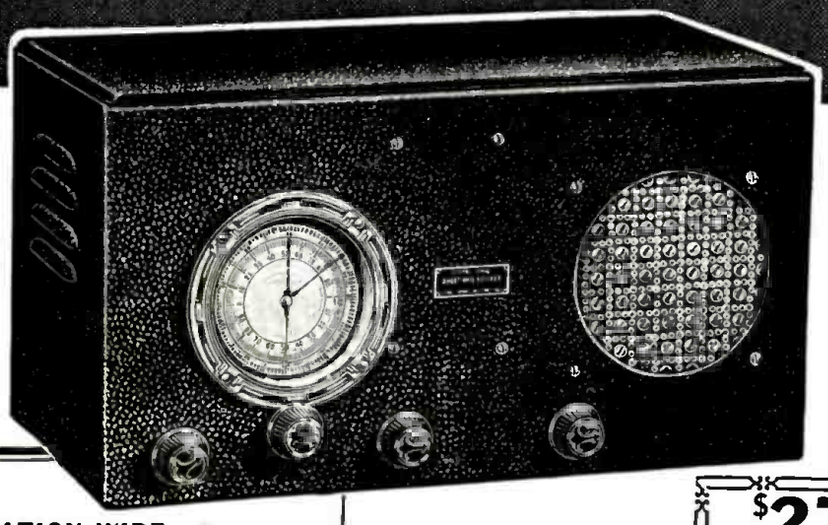
4 BAKELITE PLUG-IN COILS, wound on tube bases .30, tall forms .50, six prong .75. Noel, 728 Birch, Scranton, Pa.

SHORT WAVE RECEIVERS

IMMEDIATE DELIVERY—SHIPped Prepaid: S9 Super Skyriders $79.50, Breting 12s $93.00, PR-16s $95.70, Silver 5Ds $109.80. Super-Sevens $49.50. All National, Hammarlund RCA, Collins receivers and transmitters at lowest prices. Code machines rented. Write, Henry Radio Shop, Butler, Mo.

"RADIO BUILDER"—25c YEAR. 36 Crystal Sets; Shortwave; Ideas; Blueprints. Sample Free. Laboratories, 151-A Liberty, San Francisco.

The DOERLE 5-TUBE DELUXE A.C. SHORT-WAVE RECEIVER Features CONTINUOUS BANDSPREAD on All Bands!



- ★ USES DOUBLET OR STANDARD ANTENNA.
- ★ 8 LOW-LOSS PLUG-IN COILS.
- ★ RANGE 15 to 200 METERS.
- ★ MICROMASTER BANDSPREAD DIAL.
- ★ MAGNAVOX DYNAMIC SPEAKER.
- ★ BEAUTIFUL CRACKLE CABINET
- ★ HEADPHONE RECEPTION IF DESIRED.
- ★ SENSITIVE REGENERATIVE CIRCUIT.
- ★ TONE CONTROL.

NATION-WIDE TESTIMONIALS PRAISE THIS SET!

Dear Sirs:

Just a line or so to give you an idea of what my Doerle A.C. 5 hauled in during a 2 weeks listening test. All of the G and D stations were received also TIEP, W9SF, PRADO, HJ1ABE, W8XAL, W2XE, W8XK, CJRO, YV2RC, CJRX, COC, HJ4ABB, HJ1ABB, VY5RMO, YP3RC, WCRCT, CT1AA, WIXAL, W9XAA, W1XAZ, EAQ, WE9GW, HC2RL, HI3ABD, KEJ, HJB, HP5B, HJ1ABD, WNB, YV1RC, HJZ, JYK, FYA, YU4RC, OA4AD, RNE, PHI, RKL, WNC, YBA, COH, PRF5, WON, XERT, W2XAF, LSL, I2RO, DRM, JYS, UK3LR. All stations come in with strong carriers with a QSA1-5—R9 plus.

FRANCES KMETZ.
213 Linden St., Allentown, Pa.

Gentlemen:

Here is a list of Short-Wave stations I have received in a short time with my "Doerle AC5," with a very poor aerial for short-wave work. EAQ—MADRID, SPAIN; WIXAZ Springfield, Mass.; W2XAF—Schenectady, N.Y.; COH—Havana, Cuba; COC—Havana, Cuba; VE9GW—Bowmanville, Ontario, Canada; CT1AA—Lisbon, Portugal; PRF5—Rio De Janeiro, Brazil; HJ1ABB Barranquilla, Col., S.A.; PRADO—Riobamba, Ecuador, S.A.; DJC—Berlin, Germany; XERT—Mexico City, Mexico; YV5RMO—Maracaibo, Venezuela, S.A.; CJRO—Winnipeg, Canada; W2XE—New York, N.Y.; W8XK—Pittsburgh, Pa.; HI5B—Panama City, Panama; FYA—Paris, France; GSC-GSL—Daventry, England.

EAQ—Madrid, Spain, and COD—Havana, Cuba, come in every night on the loud speaker regardless of weather conditions. This is the third and best receiver I have owned in the short time I have been interested in Short Waves.

EMERALD H. DELBRUGGE.
Rose-Mary Dahlia Gardens.
Martins Ferry, Ohio.

Original Letters Plus Others May Be Seen At Our Office

$27.54 READY TO OPERATE
Less 2 B'cast. coils—$1.75 extra

EVERYBODY'S talking about the new *5-Tube Doerle De-Luxe Short-Wave Receiver*. If you are interested in short-waves, avail yourself of this opportunity to listen to this remarkable set with no obligation to buy it unless you are absolutely satisfied with its performance. Use the coupon below for fast service.

USES ANY TYPE AERIAL

Regardless of what type aerial you have, this receiver makes provisions for using it. Either the standard inverted-L type or noise-free doublet type may be utilized. This means that this receiver can be used in ALL localities.

SENSITIVE REGENERATIVE CIRCUIT

Two tuned stages, regenerative detector, three A.F. stages with powerful '41 pentode output and perfectly matched dynamic speaker—all these features contribute to the great power and fine performance of this receiver. A special antenna-trimming scheme permits perfect alignment of both antenna and detector tuning circuits without affecting the setting of the tuning dial.

CONTINUOUS BAND-SPREAD

Continuous bandspread on the entire range from 15 to 200 meters is obtained through the use of a very ingenious dial having a ratio of 125 to 1 and two pointers. Furthermore, two knobs are provided, making possible fast and slow tuning. No longer are the foreign broadcast stations crowded on two or three scale divisions of the dial. They are now spread out over a goodly portion of the dial thereby greatly simplifying tuning.

8-LOW-LOSS PLUG-IN COILS

The use of plug-in coils is still the most efficient method of changing from one band to another. That is why they are used in this Doerle receiver. 8 coils are provided to cover the range of from 15 to 200 meters in 4 bands, viz: 20, 40, 80 and 160 meter bands. These coils are of the 3-winding 6-prong type and are used 2 at a time. Wound on ribbed bakelite forms and designed especially for the Doerle receiver, they are highly efficient.

EXQUISITE WORKMANSHIP

All parts are mounted on a single, cadmium-plated chassis and contained in a large, handsomely-finished black crackle cabinet. The dial and speaker grill are practically the same diameter and are symetrically centered on the front panel of the cabinet thereby presenting a professional and dignified appearance.

Provisions are made for using headphones if desired with switch to cut out the dynamic speaker. A tone control is provided which not only varies the tone but helps materially to reduce back ground hiss.

FAMOUS FOR DX RECEPTION

Hundreds of testimonials in our files attest to the superlative performance of this world-famous receiver. Several of these testimonials are printed on this page. Set measures 17¼"x8"x8¾" high. Net weight 23 lbs., shipping weight 35 lbs. Designed for 110-120 volt, 50-60 cycle, A.C. operation.

No. 5000—Doerle 5-Tube DeLuxe A.C. Short-Wave Receiver complete with 5 matched tubes and 8 coils. Completely wired and tested (NOT SOLD IN KIT FORM).
Your price..... **$27.54**
Set of 2 broadcast coils $1.75 additional. Add $2.50 for 110 volt 25 cycle model or 220 volt 60 cycle model.

Send COUPON TODAY

FREE 5-DAY FREE TRIAL

64 page Buying Guide for the Radio Serviceman, Dealer and Experimenter. Contains thousands of well illustrated items; and a wealth of radio information formulas, tables, short-wave hints, radio suggestion contest and other useful data.

DO NOT DELAY WRITE TODAY
Enclose 2c in letter for postage. Buying Guide sent by return mail. It's Free.

RADIO TRADING CO., 101A HUDSON ST., NEW YORK

Gentlemen: 2-36

I enclose ..... dollars ..... cents, for your new Doerle 5-tube DeLuxe Short-Wave receiver on a five day free trial basis. If, at the end of five days after receipt of radio, I am not perfectly satisfied, I will write you for return shipping instructions. Upon receipt of the radio, you will refund me the full purchase price. I agree to pay express charges one way, and you the other.

C.O.D. SHIPMENT. I enclose ..... dollars ..... cents deposit, balance of ..... dollars ..... cents C.O.D.

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

RADIO TRADING CO., 101A Hudson St., New York City

• Index to Advertisers •

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

An Experimenter's Super.

(*Continued from page* 631)

Layout of Parts Important

By placing, first, a transformer, then a tube, a transformer, etc., in a row, feed-back due to inter-action of leads from transformers and tubes, was reduced to an absolute minimum. It was not found necessary to shield any of the plate or grid-leaks in the I.F. amplifier circuits. The R.F. gain is controlled manually by a variable resistor in the cathodes of the first two I.F. tubes. Automatic volume control is also taken care of by voltage furnished by the 2B7 tube to these tube stages. The third stage uses the pentode portion of the 2B7 tube. This pentode section is biased by a suitable resistor in the cathode leg. This resistor ordinarily must be found by experimentation, due to the fact that this stage can be very easily overloaded. The bias voltage should be so adjusted as to prevent such overloading to occur. The I.F. frequency does not necessarily have to be the same as the author used, but it is advisable to use an I.F. frequency that is fairly high, thereby decreasing repeat points on the tuning dial. Remember that if the I.F. frequency is different from the one used in this receiver, the oscillator turning coil must be altered accordingly.

The 2B7 supplies the necessary high voltage for the A.V.C. action.

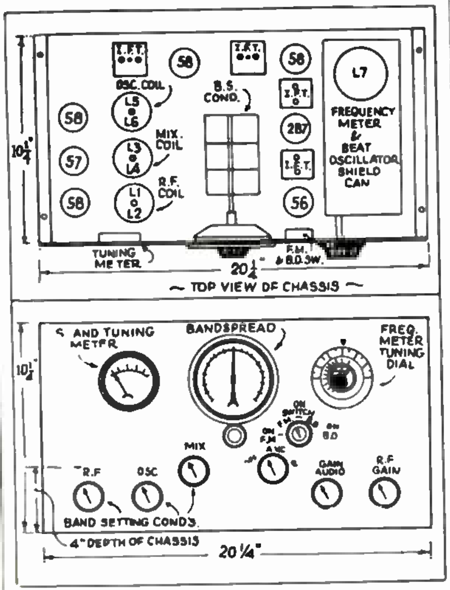
The beat oscillator is constructed around an identical I.F. transformer. It is a straightforward oscillator circuit. It should be thoroughly shielded, including the lead to the diode. The coupling condenser used in this lead is made up of two pieces of push-back wire twisted together until the proper coupling is achieved.

The frequency meter is an electron-coupled circuit of high stability and must be built in a very sturdy and rugged manner. It must be totally shielded, with the exception of a small length of wire, determined by experimentation to obtain the proper signal strength. Calibration for the meter is obtained by beating this signal against the incoming carrier of known frequency. After a few of these points on the dial are found, a suitable curve can be plotted on graph paper. This frequency meter is equipped with five plug-in coils, covering the range of 10 to 200 meters.

The tuning meter must be by-passed.

The beat oscillator can be used for aligning I.F. stages. Let the beat oscillator and all tubes thoroughly warm up, then adjust all the I.F. trimmers for minimum reading on the tuning meter. This is indeed the most simple way of aligning these transformers. After the I.F. stages are all in adjustment and the receiver has been tuned to a signal, readjust the beat oscillator for the most pleasing sound, ordinarily about 1 kc. off the I.F. frequency.

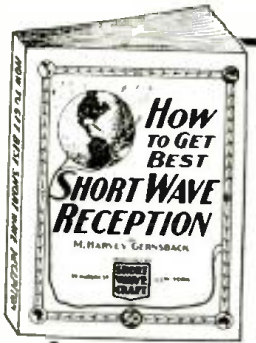
The high frequency end of the set should not cause any trouble whatsoever. Merely tune in any signal, be it C.W. or otherwise, with the three band-setting condensers and then use the band-spread condenser for all tuning in that particular band.



Top and front views.

Here are the Six BEST SHORT-WAVE RADIO BOOKS!

Without doubt you will have to go a long way to buy better books on short waves than you find on this page. Each book is written by a well-known authority on short waves . . . each book has been carefully illustrated with photographs and diagrams to make the study of this field of radio much simpler. The volumes on this page are the finest books on short-waves which are published anywhere today. Order one or more copies today . . . find out for yourself how fine they are. Prices are postpaid.



How to Get Best Short-Wave Reception

By M. HARVEY GERNSBACK

This book tells you everything you ever wanted to know about short-wave receiving.

The author, a professional radio listener and radio fan for many years, gives you his long experience in radio reception and all that goes with it.

Why is one radio listener enabled to pull in stations from all over the globe, even small 100 watters, 10,000 miles away, and why is it that the next fellow with a much better and more expensive equipment, can only pull in the powerful stations that any child can get without much ado?

The reason is intimate knowledge of short waves and how they behave. Here are the chapters of this new book:

1. What are Short Waves and what can the listener hear on a short-wave receiver or converter?
2. How to tune and when to listen in on the short waves.
3. How to identify short-wave stations.
4. Seasonal changes in short-wave reception.
5. Types of receivers for short-wave reception.
6. Aerial systems for short wave receivers.
7. Verifications from short wave stations.

The book makes excellent reading matter. There are many tricks in short-wave reception that even some of the "old-timers" do not know. Be sure to get it.

40 Illustrations, 72 Pages. Stiff, flexible covers **50c**

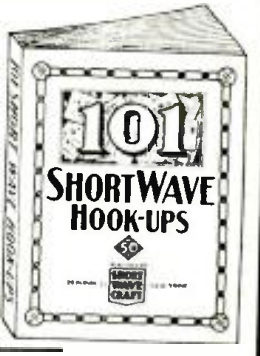
101 SHORT-WAVE HOOKUPS

Compiled by the Editors of SHORT WAVE CRAFT

EACH and every hook-up and diagram illustrated is also accompanied by a thorough explanation of what this particular hook-up accomplishes, what parts are required, coil-winding information, values of resistors, etc., in fact, everything you want to know in order to build the set or to look up the data required.

To be sure, all of the important sets which have appeared in print during the past five years are in this valuable book. Sets such as the Doerle, Dinsmore, the "19" Twinplex, Oscillodyne, Denton "Stand-by," Mega-lyne Triplex 2-Globe-Trotter," 2-Tube Superhet, Minidyne, "Loop" Receiver, "Doerle" 2-tube Battery, "Doerle" 3-tube Battery, "Doerle" 2-tube A.C., "Doerle" 3-tube A.C. Doerle "Signal Gripper," Duo R.F. 4-tube Receiver, The Sargent 9-33 Tapped Coil Receiver, Globe-Girdler 7, The 2-Tube "Champ"—2 Tubes Equal 2, Ham-Band "2-Tube Pee-Wee" Wyeth All-Way 6, Denton Economy 3, 2-Tube "Regenerative-Oscillodyne" will be found here, with full descriptions. In many cases, we have also included a picture hook-up for those who do not wish to follow the regular symbolic hook-up, but wish to have a regular wiring diagram.

This is a very handy volume, especially for those "fans" who wish to study the best sets in the short-wave art, from one tube up to ten tubes.



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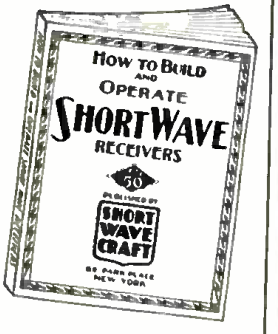
HOW TO BUILD AND OPERATE SHORT-WAVE RECEIVERS

THIS is the best and most up-to-date book on the subject. It is edited and prepared by the editors of SHORT WAVE CRAFT, and contains a wealth of material on the building and operation, not only of typical short-wave receivers, but short-wave converters as well. Dozens of short-waves sets are found in this book, which contains hundreds of illustrations; actual photographs of sets built, hookups and diagrams galore.

This book is sold only at a ridiculously low price because it is our aim to put this valuable work into the hands of every short-wave enthusiast.

We know that if you are at all interested in short waves you will not wish to do without this book. It is a most important and timely radio publication.



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HOW TO BECOME AN AMATEUR RADIO OPERATOR

WE chose Lieut. Myron F. Eddy to write this book because his experience in the amateur field has made him pre-eminent in this line. For many years he was instructor of radio telegraphy at the R.C.A. Institute. He is a member of the I.R.E. (Institute of Radio Engineers), also the Veteran Wireless Operators' Association.

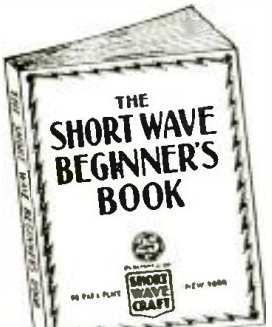
If you intend to become a licensed code operator, if you wish to take up phone work eventually—this is the book you must get.

Partial List of Contents

Ways of learning the code. A system of sending and receiving with necessary drill words is supplied so that you may work with approved methods. Concise, authoritative definitions of radio terms, units and laws, brief descriptions of commonly used pieces of radio equipment. This chapter gives the working terminology of the radio operator. Graphic symbols are used to indicate the various parts of radio circuits. General radio theory particularly as it applies to the beginner. The electron theory is briefly given, then waves—their creation, propagation and reception. Fundamental laws of electric circuits, particularly those used in radio are explained next and typical basic circuits are analysed. Descriptions of modern receivers that are being used with success by amateurs. You are told how to build and operate these sets. Amateur transmitters. Diagrams with specifications are furnished so construction is made easy. Power equipment that may be used with transmitters and receivers, rectifiers, filters, batteries, etc. Regulations that apply to amateur operators. Appendix which contains the International "Q" signals, conversion tables for reference purposes, etc.

50c **150 Illustrations, 72 Pages, Stiff, flexible covers**

THE SHORT-WAVE BEGINNER'S BOOK



HERE is a book that solves your short wave problems—leading you in easy stages from the simplest fundamentals to the present stage of the art as it is known today. It is the only low priced reference book on short waves for the beginner.

The book is profusely illustrated—it is not "technical." It has no mathematics and no technical jargon.

It also gives you a tremendous amount of important information, such as time conversion tables, all about aerials, noise elimination, all about radio tubes, data on coil winding and other subjects.

Partial List of Contents

Getting Started in Short Waves—the fundamentals of electricity. Symbols, the Short Hand of Radio—how to read schematic diagrams. Short Wave Coils—various types and kinds in making them.

Short Wave Aerials, the points that determine a good aerial from an inefficient one.

The Transposed Lead in for reducing Static.

The Beginner's Short-Wave Receiver—a simple one tube set that anyone can build.

How to Tune the Short-Wave Set—telling the important points to get good results.

Audio Amplifiers for S-W Receivers.

Learning the Code—for greater enjoyment with the S-W set.

Wave Length to Kilocycle Chart.

Wire Chart—to assist in the construction of coils.

25c **75 Illustrations, 40 Pages. Stiff, flexible covers**

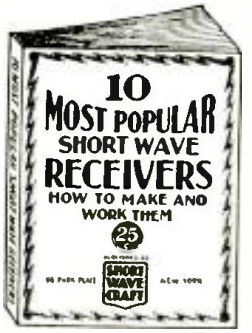
TEN MOST POPULAR SHORT-WAVE RECEIVERS

—HOW TO MAKE AND WORK THEM

THE editors of SHORT WAVE CRAFT have selected ten outstanding short-wave receivers and these are described in the new volume. Each receiver is fully illustrated with a complete layout, pictorial representation, photographs of the set complete, hookup and all worthwhile specifications. Everything from the simplest one-tube set to a 5-tube T. R. F. receiver is presented. Complete lists of parts are given to make each set complete. You are shown how to operate the receiver to its maximum efficiency.

CONTENTS

The Doerle 2-Tube Receiver That Reaches the 12,500 Mile Mark, by Walter C. Doerle.
S.W.F. Pentode S-W Receiver having two stages of Tuned Radio Frequency, by Clifford E. Denton and H. W. Secor.
My de Luxe S-W Receiver, by Edward G. Ingram.
The Binneweg 2-Tube 12,000 Mile DX Receiver, by A. Binneweg, Jr.
Build a Short-Wave Receiver in your "Brief-Case," by Hugo Gernsback and Clifford E. Denton.
The Denton 2-Tube All-Wave Receiver, by Clifford E. Denton.
The Denton "Stand-By" by Clifford E. Denton.
The "Stand-By" Electrified.
A COAT POCKET Short-Wave Receiver, by Hugo Gernsback and Clifford E. Denton.
The S-W PENTODE 4 by H. G. Cisin, M.E.
Lynn Martin's Idea of A GOOD S-W RECEIVER, by Lynn Martin.



75 Illustrations, 40 Pages, Stiff, flexible covers **25c**

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99-101 Hudson Street, New York, N. Y.

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( ) How to Get Best Short-Wave Reception .....50c each
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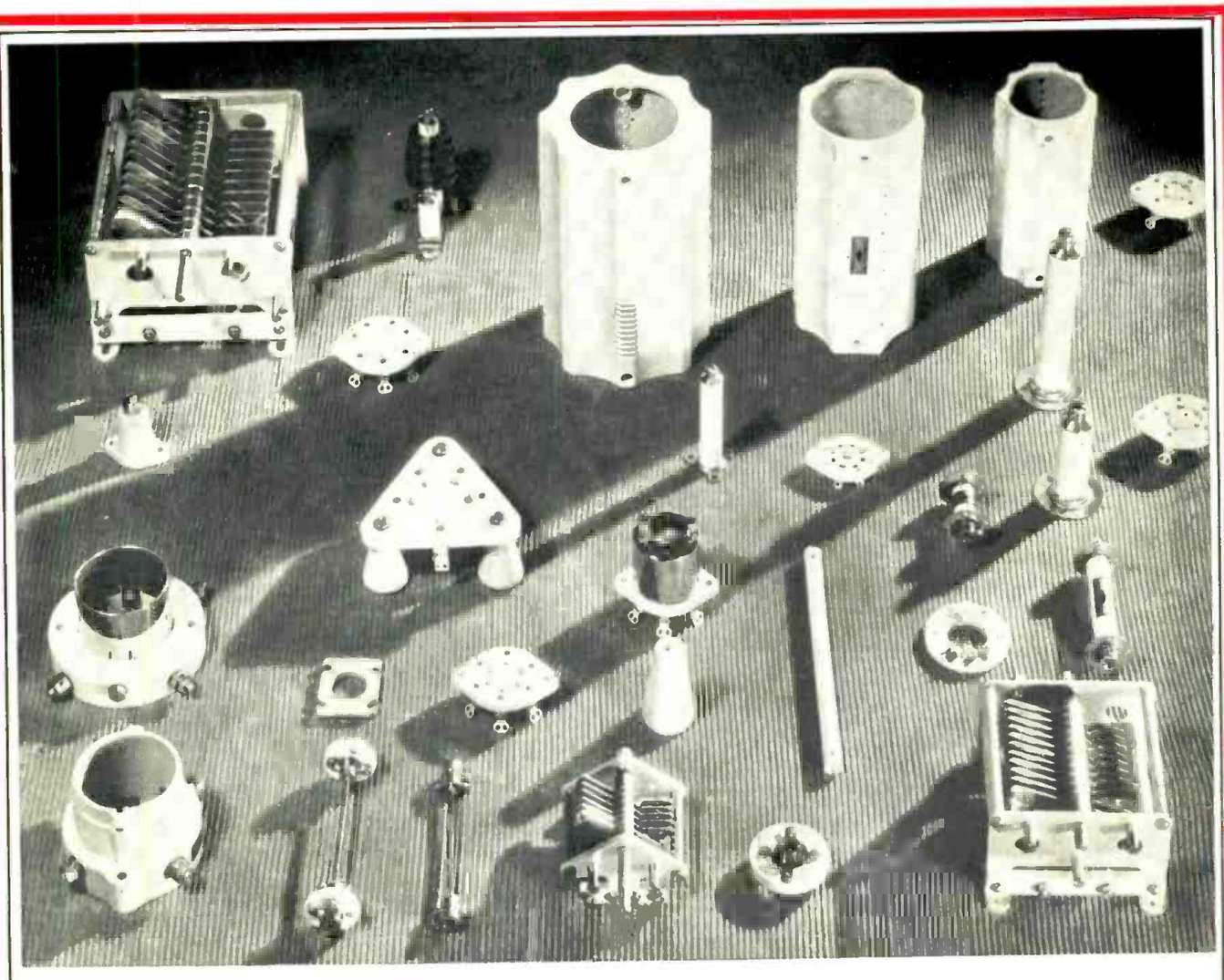

National offers a thoroughly engineered part for nearly every radio purpose. The entire line cannot be compressed into our twenty-page catalogue, much less a single page. But look over the group above. Transmitting condensers from the little 1000 volt TMS in the foreground to the 12,000 volt TMA at the rear. Low loss ceramic coil forms for every amateur band. Low loss sockets for nearly every tube type, from acorns to power pentodes. Flexible couplings from the little TX-12, which will work around a corner, to the big fellows for heavy condensers, high voltages, and low-losses. Strain insulators, spreaders, lead-ins for the antenna: stand-offs, chokes, dials for the rig. National has what it takes.

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MALDEN, MASS.

QUALITY INSIDE AS WELL AS OUTSIDE... *That's the Secret of Midwest's Leadership*

Only Radio with Six Wave Bands Covering 4½ to 2,400 METERS!

18 Tubes

·METAL OR GLASS·

6 WAVE BANDS

80 Advanced Features

18 Tubes and 6 wave bands are but two of the 80 advanced features that include every worthwhile advantage, that even the most critical radio technician and enthusiast could ask for. Some of the other exclusive features are: Station Finder Button, enabling "hams" to secure CW—Silencer Button, which silences the set between stations—38 Tuned Circuits give Maximum Selectivity—4 Gang Condensors—Reinforced Capacitors and Pre-aged Intermediate Frequency Transformers prevent drift, etc. The balance of the 80 features are described in detail on pages 12 to 21 inclusive, of the new FREE 40-page catalog.

Before you buy any radio, write for the free 40-page 1936 catalog, and learn about the successful Midwest Laboratory - To - You policy that saves you 30% to 50%, that gives you 30 days free trial in your own home. No middlemen's profits to pay. You buy at wholesale price, direct from Laboratories ... making your radio dollar go twice as far. You can order your 1936 Midwest radio from the new 40-page catalog with as much certainty of satisfaction as if you were to come yourself to our great laboratories.

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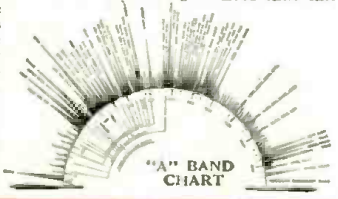
Midwest is the only radio in the world that positively covers every possible and useful wave band. Accurately made, precisely assembled, rigidly tested, this 18-tube Super De Luxe radio assures the brilliant super performance that radio "hams" and enthusiasts demand. The 18 tubes permit of advanced circuits making it possible to use the tremendous reserve power, and to exert the sustained maximum output of the powerful new tubes. These sets are vibration tested, many times, until "creeping screws" and other means of adjustment are locked permanently in position. It is interesting to note that this is the only home receiver that is "aged." All shrinkage and drift are completely eliminated by the use of such features as reinforced capacitors, pre-aged intermediate frequency transformers, as well as elaborate pre-aging tests and processes.



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$77.45 COMPLETE *with 18 Tubes and* GIANT THEATRE-SONIC SPEAKER

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The Midwest "A" band chart, illustrated at left, shows how the perfect reception of the Midwest equalizes the widely varying powers assigned to those fortunate stations enjoying cleared channel and semi-cleared channel broadcasting. These stations come in clearly and with equal volume. The short wavering lines indicate that many stations are operating on the same wave length. These stations are useful only when one of them is located close to your set. Charts, illustrating the stations that can be secured on the five additional bands, are pictured on pages 20 and 21 of the Midwest catalog.

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User-Agents Make Easy Extra Money

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