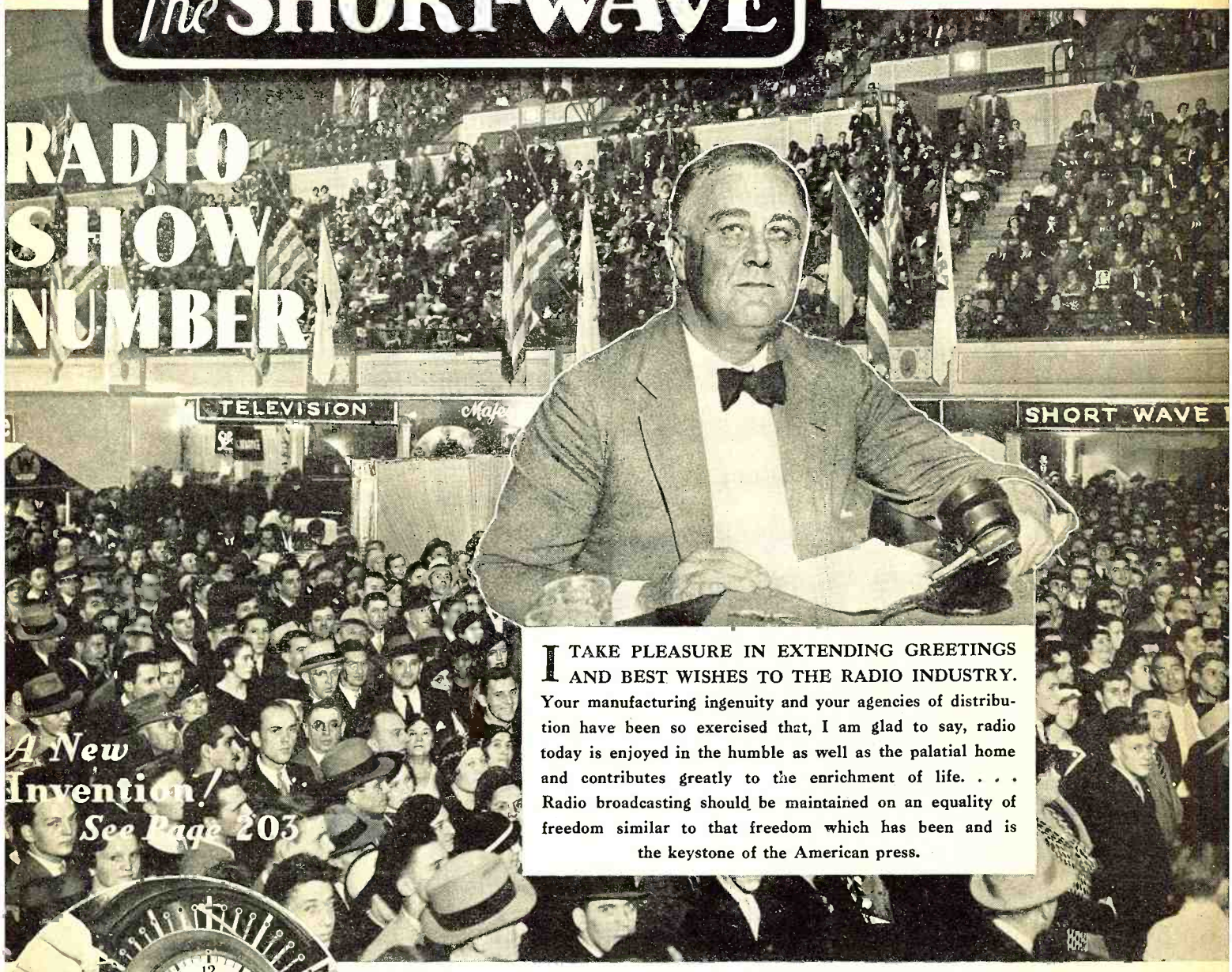
SHORT-WAVE STATION LIST

RADIO NEWS and The SHORT-WAVE

NRA CODE

OCTOBER, 25¢

RADIO SHOW NUMBER



I TAKE PLEASURE IN EXTENDING GREETINGS AND BEST WISHES TO THE RADIO INDUSTRY. Your manufacturing ingenuity and your agencies of distribution have been so exercised that, I am glad to say, radio today is enjoyed in the humble as well as the palatial home and contributes greatly to the enrichment of life. . . . Radio broadcasting should be maintained on an equality of freedom similar to that freedom which has been and is the keystone of the American press.

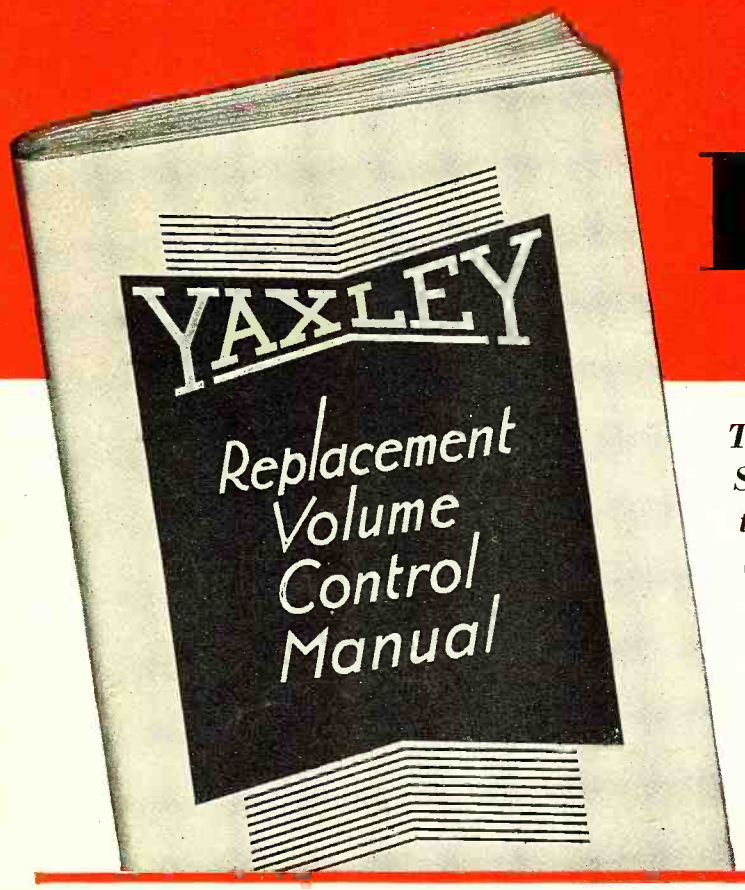
A New Invention!
See Page 203

DATA ON ANTENNAS

A Publication Devoted to Progress in Radio

Service Work	Set Building	Television
Engineering	Short Waves	Electronics
Experiments	DX Reception	Broadcasting
Measurements	Amateur Activity	Applications

You Can't Do Without It . . And It's FREE!



The most complete Manual for Service Men ever published... the first that is authoritatively accurate. There's nothing like it. You need it to simplify your work. You need it to make your work more profitable . . . and it's FREE! All you need do is send in this coupon.

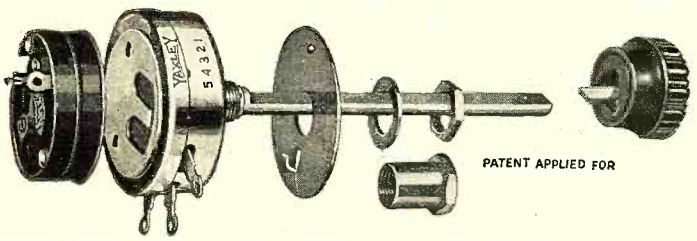
The publication of a complete manual of controls has been attempted often but never before accomplished. Now Yaxley meets the need with an illustrated book of more than 100 pages that is both complete and more definitely helpful than any authority. Along with other invaluable information it lists the 30 new Yaxley Replacement Volume Controls that will service 98% of the 3200 set models now in existence. It shows, for example, how 4 Yaxley controls will cover 1398 models—how a single control will service 618 different models. Mail the coupon now for this indispensable book.

YAXLEY MANUFACTURING CO., Incorporated

Division of P. R. Mallory & Company, Incorporated

Indianapolis : : : Indiana

Cable address: Pelmallo



You want to know about this new Yaxley Replacement Volume Control. It's the greatest advance ever made . . . the biggest boon to service men ever developed.

Detailed information is included in the complete Yaxley Replacement Volume Control Manual.

YAXLEY MANUFACTURING CO., INCORPORATED
Division of P. R. Mallory & Co., Incorporated
Indianapolis, Indiana

Gentlemen: Please send me—absolutely free—a copy of the complete Yaxley Volume Control Manual.

*Name*_____

*Address*_____

*My Jobber's name is*_____

J. E. Smith, President National Radio Institute

I WILL HELP YOU

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

HERE ARE A FEW EXAMPLES OF THE KIND OF MONEY I TRAIN MY MEN TO MAKE

Clears $4500 in 18 Months

"Before taking your Radio Course I was making $18 a week. I came here three years ago. In about 18 months I made about $4500 in Radio. I cannot say too much for the wonderful help I have received from N. R. I."

Noel W. Ray,
619 Broad St.,
Gadsden, Alabama.

Spare Time Work Pays $18 a Week

"I only do spare time Radio work and average $18 a week. People who in good times would buy a new Radio, now have the old one fixed."

Stephen J. Drapchaty,
407 Wunderlich Avenue,
Barberton, Ohio.

Now Owns Own Business

"If I had not taken your Course I would be digging ditches instead of running my own business. One week I made $75 on repairing alone, and this doesn't count sales. If a fellow wants to get into Radio, N. R. I. is the starting point."

R. S. Lewis,
Modern Radio Service,
Pittsfield, Ill.

You Get PRACTICAL EXPERIENCE with Radio Equipment I Give You

My Course is not all theory. I'll show you how to use my special Radio equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R.C.A., Victor, Majestic, and others. You work out with your own hands many of the things you read in our lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work, how to make them work.

Free Book Tells How Mail Coupon!

The world-wide use of Radio sets for home entertainment has made many opportunities for you to have a spare time or full time Radio business of your own. I give you instructions early in your Training for doing 28 Radio jobs common in almost every neighborhood. Many N. R. I. men make $5, $10, $15 a week extra in spare time while learning. I show you how to install and service all types of receiving sets. I give you Radio equipment and instructions for conducting experiments, for building circuits and testing equipment, and for making tests that will give you broad, practical Radio experience. Clip the coupon below and get my free 64-page book, "Rich Rewards in Radio"—it gives you a full story of the success of N. R. I. students and graduates, and tells how to start a spare time or full time Radio business on money made in spare time while learning.

Many N. R. I. Men Make $5, $10, $15 a Week Extra in Spare Time While Learning

Many of the seventeen million sets now in use are less than 50% efficient. I will show you how to cash in on this condition. I will show you the plans and ideas that have enabled many others to make $5, $10, $15 a week in spare time while learning. Ford R. Leary, 1633 Davison Road, Flint, Mich., wrote: "My part-time earnings while taking the N. R. I. Course were $651."

Get Ready Now for a Radio Business of Your Own and for Jobs Like These

Broadcasting stations use engineers, operators, station managers, and pay up to $5,000 a year. Radio manufacturers use testers, inspectors, foremen, engineers, servicemen and buyers, and pay up to $6,000 a year. Radio dealers and jobbers employ hundreds of servicemen, salesmen, managers, and pay up to $5,000 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. My book tells you of the opportunities in these fields, also in Aviation Radio, Television, Police Radio, Short Wave Radio, Automobile Radio and other new branches of this fast growing industry. Get it.

I Train You at Home in Your Spare Time

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

You Must Be Satisfied

I will give you an agreement to refund every penny of your money if you are not satisfied with my Lesson and Instruction Service when you complete my Training. And I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also Advanced Specialized Training in the type of Radio work you choose.

Get My Free Book of Facts

Mail the coupon for "Rich Rewards in Radio." It's free to any ambitious fellow over 15 years old. It tells you about Radio's spare time and full time opportunities; about my training; what others who have taken it are doing and making. Mail coupon now in an envelope, or paste it on a 1c post card.

J. E. SMITH, Pres.
Dept. 4KR
National Radio Institute,
Washington, D. C.

FREE: Radio Servicing Tips

Let me PROVE that my Course is clear, easy to understand and fascinating to study. Send the coupon for a free lesson, "Trouble Shooting in D. C., A.C., and Battery Sets." This interesting lessons gives 132 ways to correct common Radio troubles. I am willing to send this book to prove that you too can master Radio—just as thousands of other fellows have done. Many of them, without even a grammar school education, and no Radio or technical experience, have become Radio experts and now earn two or three times their former pay. Mail the coupon now.

Find out about the World Famous Course that Pays for Itself

This Coupon is Good For One FREE COPY OF MY NEW BOOK

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

NRA MEMBER U.S. WE DO OUR PART

Dear Mr. Smith: Without obligation, send me the Service Manual and your free book about spare time and full time Radio opportunities, and how I can train for them at home in spare time. (Please print plainly.)

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

Address .....

City .....*State*.... "M"

Vol. XVI
No. 4

RADIO NEWS

October, 1934

Edited by LAURENCE M. COCKADAY

S. GORDON TAYLOR
Managing Editor

WILLIAM C. DORF
Associate Tech. Editor

JOHN M. BORST
Technical Editor

SAMUEL KAUFMAN
Broadcast Editor

HOWARD S. PEARSE
Associate Editor

JOSEPH F. ODENBACH
Art Editor

THIS MONTH—

New Developments

●

Technical Data

●

Amateur News

●

Short Waves

●

Service Data

●

NEXT MONTH—

The November issue will contain important information on the Short Waves and Aviation. A complete story on the Stratosphere balloon flight and the part radio played in it. Also data on direction finders in aviation. Do not miss this issue!

For the DX Fan: The DX Corners grow in interest and bring you World Time Schedules you can get nowhere else.

For the Technician: Data on building a high quality amplifier and other important information.

Published Monthly by Teck Publications, Inc., *Washington and South Avenues, Dunellen, N. J.*

EDITORIAL AND EXECUTIVE OFFICES
222 WEST 39th STREET, NEW YORK CITY, N. Y.

Lee Ellmaker
President and Treas.
Abner Germann
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Advertising Management

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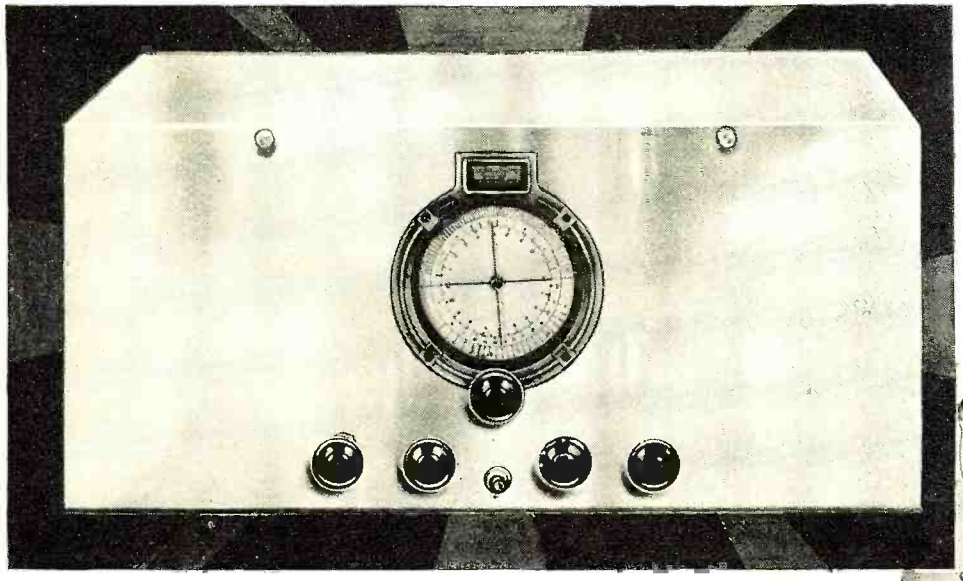
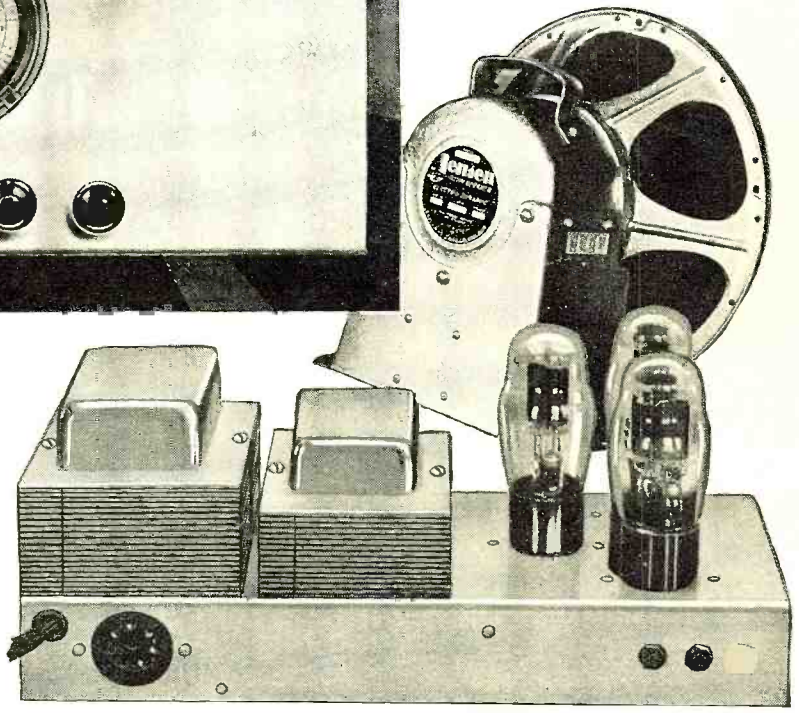
25c a Copy, $2.50 a year, $3.00 in Canada, $3.50 in Foreign Countries. Subscribers are notified that change of address must reach us five weeks in advance of the next date of issue.

McMURDO SILVER  now presents

his MASTERPIECE III

The famous Masterpiece II, choice of Admiral Byrd, has been re-designed into Masterpiece III, and chosen by Paramount Engineers for Use by Bing Crosby and Richard Arlen in the Hollywood International DX Contest.





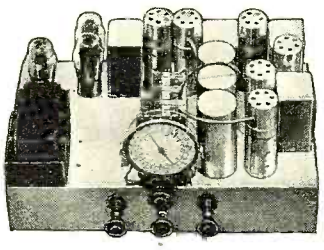
Masterpiece III, by any standard of measurement, by any kind of competitive tests, and in the opinon of everyone who has seen it in action, we believe, is the most complete, the most capable, the most outstanding all-wave radio receiver ever engineered. It will not only out-perform anything else, in laboratory demonstrations, but is positively and unconditionally guaranteed to outperform any other radio receiver in existence ... right *in your own home!*

Greatest Foreign Reception Ever Heard

Masterpiece III yields a volume and a quality of tone on transoceanic reception under average conditions, unbelievable excepting to those who have heard it. It brings in with unmistakable identity those small, low-powered foreigners that you have always worked so hard to get, but never did hear.

Band Spread Tuning With New Watch Dial

Simply pull out the tuning knob and the second dial pointer spreads out the crowded short wave band over the full 180 degree scale! Masterpiece III provides actual band-spread tuning over all four wave bands.



The WORLD-WIDE NINE

Here is a custom-built all-wave receiver that is guaranteed to be the performance-superior of anything in the field excepting only the Masterpiece III—yet it costs no more than the "production" jobs that can't approach it in any way. Actually, the World-Wide Nine is twice as much radio as has ever been given for the money before. Check the coupon and mail it at once for full details.

10 DAY TRIAL

Paramount Engineers heard Masterpiece III, tested it in competition, then selected it for Bing Crosby and Richard Arlen in the Hollywood DX contest. Columbia Broadcasting System heard it, tested it, then installed it as *official* studio receiver in Chicago. *You* can put Masterpiece III to the same tests, under your own reception conditions . . . without risking one cent of your money. You can try it 10 full days, then send it back if you want to. It's just as simple as that. Check the coupon and mail it at once, for particulars and full details of Masterpiece III's most amazing specifications.

McMURDO SILVER, INC.

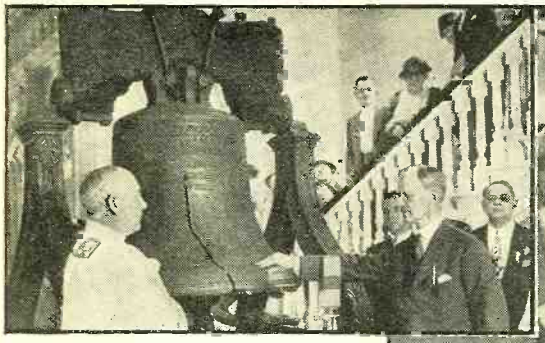
3352 N. Paulina Street **Chicago, U. S. A.**

McMURDO SILVER, Inc.,
3352 N. Paulina St., Chicago, U. S. A.
Send me full particulars and specifications of
[ ] MASTERPIECE III [ ] WORLD-WIDE NINE

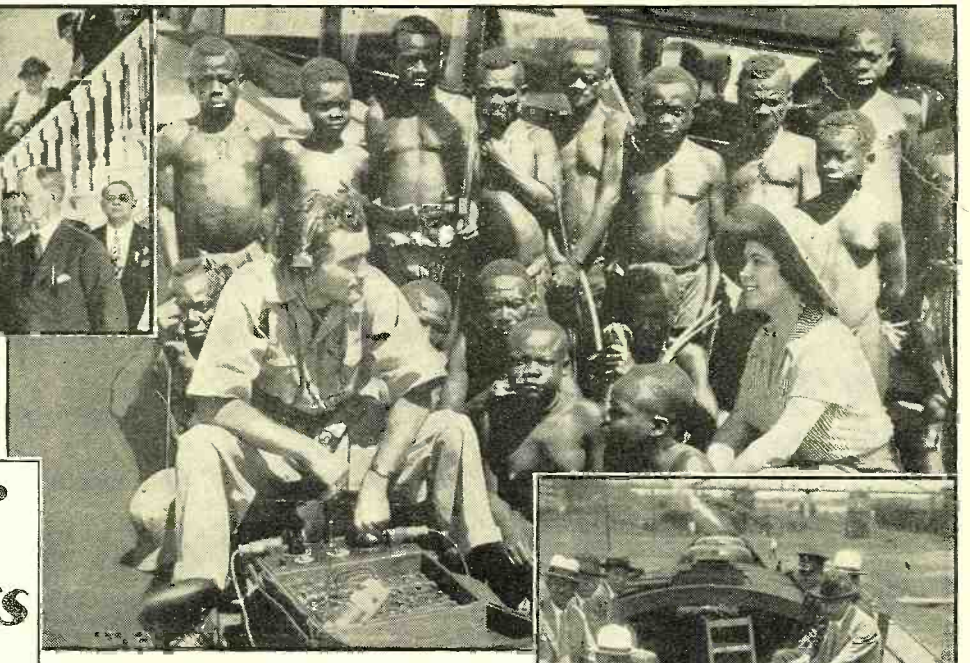
Name _____

Street _____

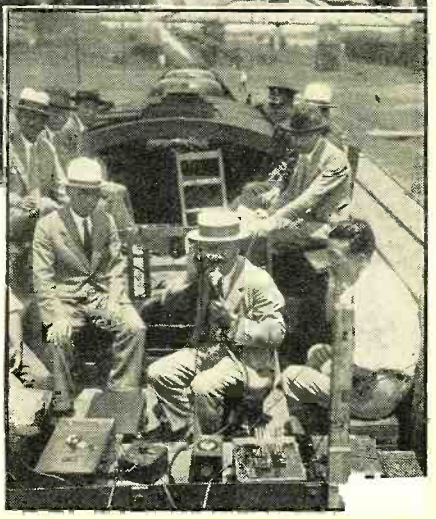
Town _____ State _____



ECHOES FROM ANTARCTIC
An electrical impulse, transmitted from Byrd's base in Antarctica, recently rang the Liberty Bell



RECORDING AFRICAN VOICES
Bob Moreno, sound expert of the Martin Johnson expedition, filming the speech of African Pygmies. At right: Japanese experts making a successful trial of radio communication to and from moving trains



DOTS • • • • • and — — — DASHES

Short but Interesting Items from the Month's Radio News the World Over

The Radio Industry Today

NEW YORK—Interest in radio has reached its highest pitch in several years. Retailers describe current demand as measuring up to the interest shown way back in 1924; instead of the usual summer low, the radio sales have continued steadily upward. Wholesale and retail volume reached up to 50% and 75% above the level during comparative months in 1933. Some distributors increased as much as 100% and 150%. "This substantial gain is not attributed to the stimulus of low prices," says Dun and Bradstreet, "but almost entirely to the widening popularity of radio and the constant improvement in bringing short-wave sets within the reach of the average buyer." Sales for 1934 are conservatively estimated to reach a peak of 4,550,000 sets. Automobile sets alone are expected to run 75,000 units. In the metropolitan area it has been reported that 85% of the set sales have been on all-wave or short-wave receivers.

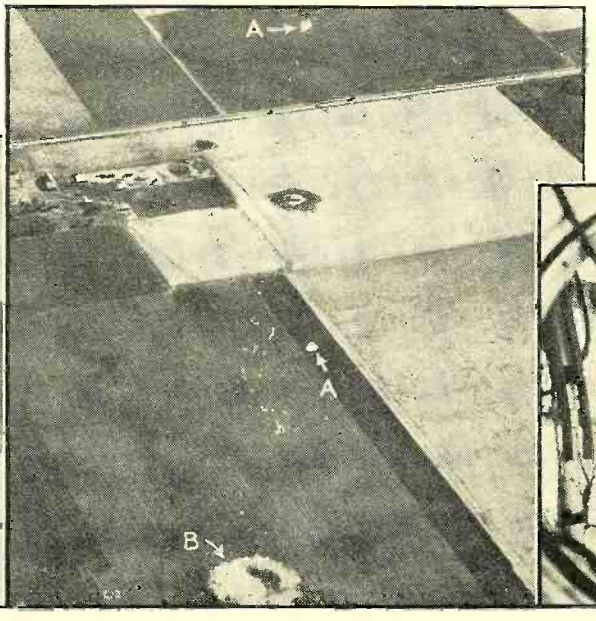
David Sarnoff, head of R.C.A., returning from a business trip abroad, announces completion of several contracts with radio companies in Holland, France, Italy, Hungary and England, permitting these companies the use of RCA patents in return for substantial royalties. "Of all European countries, England is the soundest economically and politically." He said that he found France extremely dull, with a noticeable lack of tourist trade and that the trouble with countries remaining on the gold standard was high prices, prohibitive tariffs and quotas.

Radio and the Stratosphere Flight

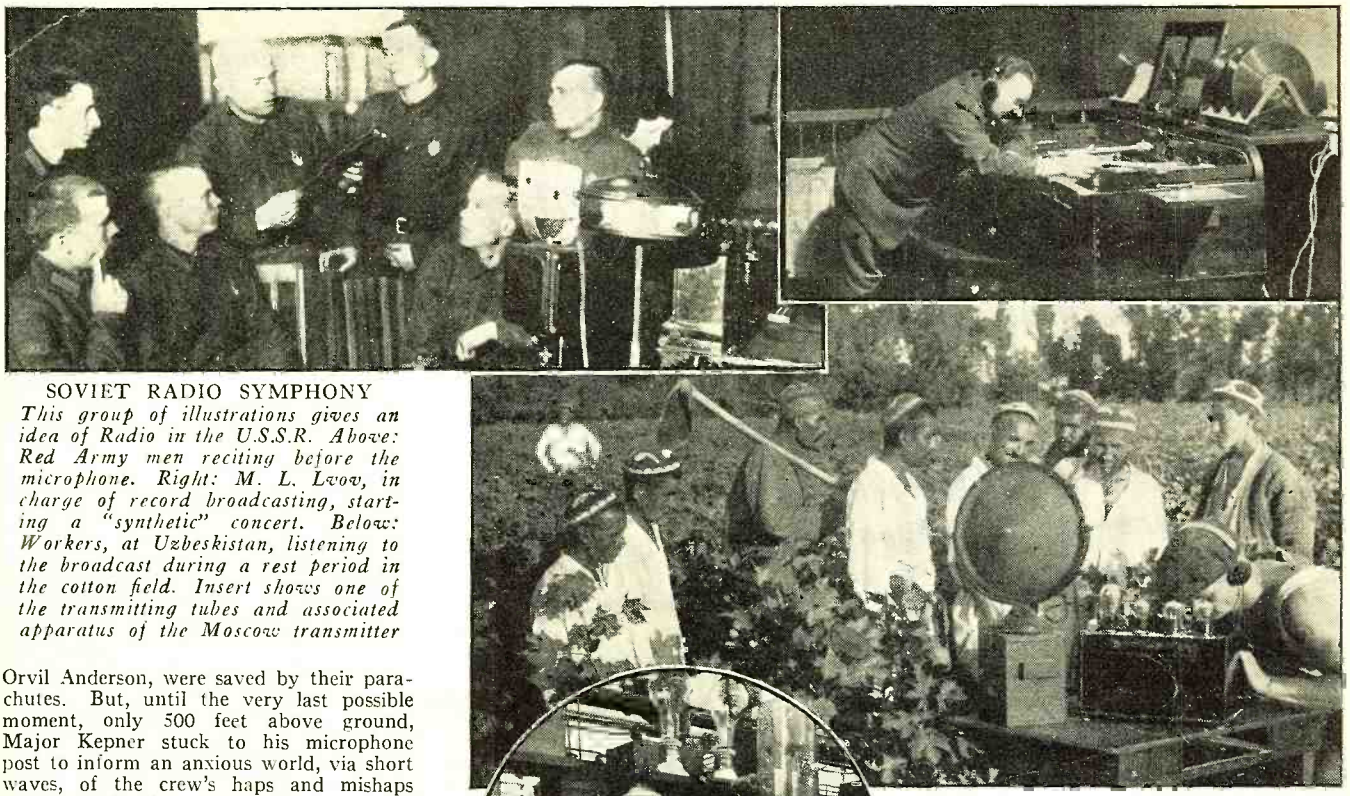
LOOMIS, NEB.—Radio's rôle in the thrilling air drama of the National Geographic Society-U. S. Army Air Corps stratosphere flight was conceded to be one of the most successful phases of the recent ascent above atmospheric levels. The most pretentious scientific preparations for any stratosphere flight in history were made for the trip of "The Explorer," which left the strato camp near Rapid City, S. D., at dawn on July 28, soared to an approximate height of 60,000 feet (above sea level) and, bag torn, crashed into Reuben Johnson's cornfield here.

Major William E. Kepner, pilot, and his two aides, Captains Albert W. Stevens and

CUTS OUT ANNOUNCEMENTS!
Floyd Gaskey, with the device he invented for cutting out announcer's talk, in between musical programs



RADIO "UPS AND DOWNS"
End of the recent Stratosphere flight. The white specks, at A, are the parachutes of Major Kepner and Captain Stevens amid debris, with the balloon smashing on the ground at B. Below: Fliers inside gondola



SOVIET RADIO SYMPHONY

This group of illustrations gives an idea of Radio in the U.S.S.R. Above: Red Army men reciting before the microphone. Right: M. L. Lvov, in charge of record broadcasting, starting a "synthetic" concert. Below: Workers, at Uzbeskistan, listening to the broadcast during a rest period in the cotton field. Insert shows one of the transmitting tubes and associated apparatus of the Moscow transmitter

Orvil Anderson, were saved by their parachutes. But, until the very last possible moment, only 500 feet above ground, Major Kepner stuck to his microphone post to inform an anxious world, via short waves, of the crew's haps and mishaps during the flight.

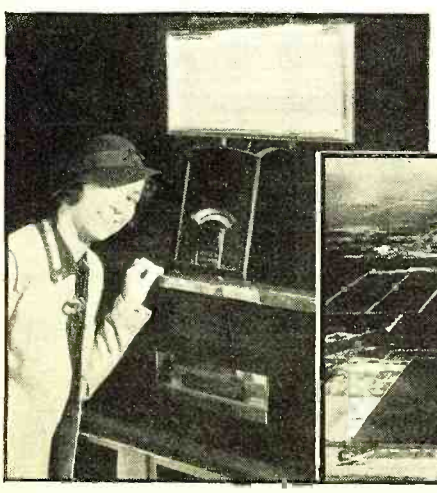
The balloon's transmitter, W10XCW, and receiver, both installed by NBC engineers, functioned efficiently and maintained constant two-way communication between the gondola and land stations. The bulk of the continuous intercommunication was of a private and official nature between the fliers, army officials, scientists and others, but many interesting snatches of the conversations were relayed to the entire nation by the NBC combined networks.

Short-wave listeners throughout the land had the opportunity of tuning in the gondola directly. A total of thirty-five RADIO NEWS Official Listening Posts in twenty States picked up the signals throughout the day of the flight.

The fliers were grounded for more than a month while waiting for satisfactory weather before penetrating the stratosphere. (*Due to this long delay, the special stratosphere radio feature story previously announced for this issue of* RADIO NEWS *will appear in the November number.*

HOW STRONG ARE YOU?

Anyone can bend a railroad rail but it takes ultra-sensitive electronic apparatus to measure its deflection



Position Finders for British Aircraft

LONDON—Radio stations for noting positions of airplanes and prepared to indicate *to* the machines their exact positions, will be set up around the coast of the United Kingdom, the Air Ministry announced recently.

Chinese to Use Radio Telephones

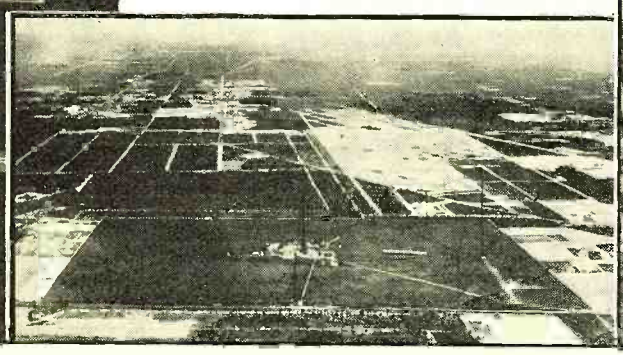
HONG KONG—The Chinese interior will be connected by a series of long-distance telephone radio stations for communication, instead of wire lines. Radio stations will be erected for commercial telephony in the provincial capitals.

Marconi and Micro-Waves

GENOA, ITALY—Marconi thinks it necessary again to lift a tip of the mysterious veil which covers the knowledge of the properties of micro-waves. In the presence of press representatives aboard his yacht "Elettra," he explained the great advantages of ultra-short-waves from fifty to sixty centimeters, over those of several thousand meters. The Marchese claimed further that he has succeeded in bringing distances of approximately 380 kilometers, which is nine times further than the limits imposed by the curvature of the earth. He still hopes to transmit over still larger distances. It is reported that the Marchese has intentions of staging a demonstration before representatives of the War Department and commercial steamship lines,

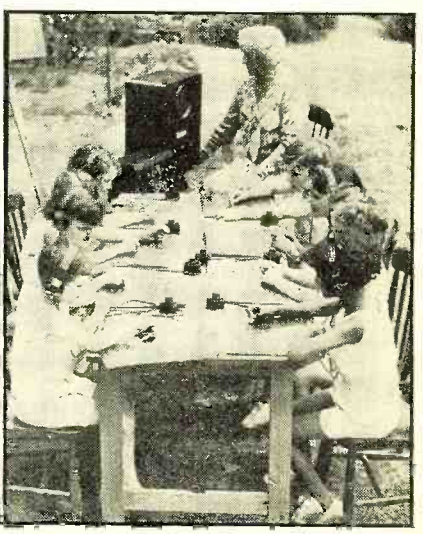
SAYVILLE SHUTS DOWN

Famous radio station used by the Mackay Radio system which is being returned to the Navy department. Mackay Radio is now constructing a short-wave center near Brentwood, Long Island



RADIO AIDS DEAF CHILDREN

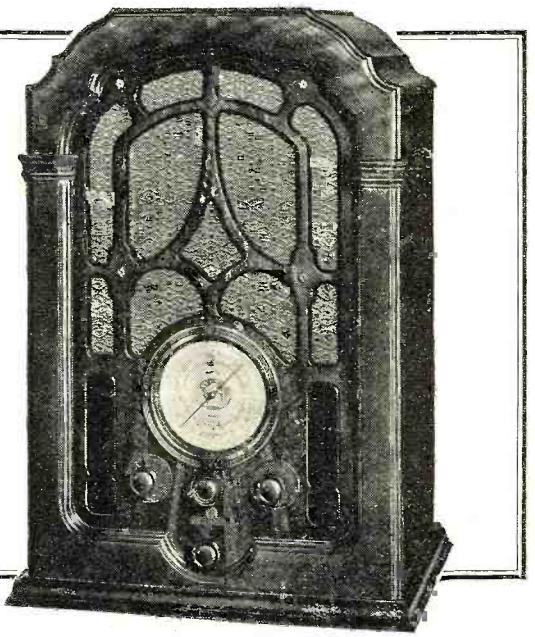
England installs radio apparatus for the instruction of children who are hard-of-hearing



Simplicity can be overdone

THE SIMPLEST SHORT-WAVE SUPERHETERODYNE

Would have plug-in coils
would have multiple tuning control
would lack a speaker
would have a separate powerpack
would have a limited tuning range
would be *without pre-selection*.
It would be easy to make but—
would tend to be noisy
would be helpless against image interference.



THE GENERAL ELECTRIC K-80 ALL-PURPOSE RECEIVER IS NOT SO SIMPLE

IT HAS 2 *integral* stages of *inductively* coupled pre-selecting amplification to erase noises and images. YOU HEAR STATIONS UNOBSCURED BY THE USUAL IMAGES. Admittedly, this requires a 4-section tuning condenser.

It has a single tuning control.

It has a noiseless 1-stage i. f. system and every other modern provision for noise-suppression, such as doublet-antenna facilities and complete shielding.

It has a wide-range automatic volume control. Input changes of 50,000 to 1 change the output very little. The absence of images, and low noise, permit full a. v. c. operation.

It has a high-gain audio system, supplying up to 6 watts to an *integral* dynamic speaker.

It has super-fine tuning over a continuous range of from 550 kc. to 18,000 kc.

C. W.? Of course! See the coupon.

GENERAL ELECTRIC RADIO

GENERAL ELECTRIC COMPANY
Radio Sales Section, R-8810, Bridgeport, Conn.

Kindly send me, without charge, full technical details of the K-80 receiver. My special interests are checked below.

☐ New Receiver antenna data ☐ Using the K-80 for C. W.
☐ I do radio service work

Name.....

Street.....

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

Radio News

October, 1934

The Return of the

RADIO SHOW

(The Editor—To You)

As an indication of the general upturn in the radio business, radio shows are being held this Fall in many countries throughout the world. Readers will be interested in the data given herewith and in the fact that RADIO NEWS presents, in this Show Number, descriptions of new apparatus that will be featured for the 1935 Season

THE NATIONAL RADIO SHOW is coming back into prominence as an exhibition that everyone wants to visit. Radio Shows in general are being held this Fall, in greater numbers throughout the world, indicating that conditions are improving and that people have a great interest in Radio itself.

The National Electrical and Radio Exposition will be held, this year, at the Madison Square Garden in New York City and will run from September 19th to September 29th. Also, the new Century of Progress at Chicago contains a permanent radio exposition that is very popular with business. During the month of August there was held the great English radio exposition, the Olympia, in London, at which it is claimed all records of attendance were broken. The Scottish radio exposition, at Glasgow, ran from August 31st to about the date this issue appears on the newsstands. During the month of September will be held the Bristol Radio Exposition, Bristol, England; the Manchester Exposition at Manchester, England; the Dublin Radio Exposition at Dublin, Ireland, and the Nottingham Radio Exposition, Nottingham, England, running into October 3rd. During the month of October, from the 12th to the 22nd, the Scottish National Radio Exposition will be held at Edinburgh. In October, also, will be held the Belfast Radio Exhibition at Kings Hall, Balmoral, Ireland. Also there will be held at Helsingfors, Finland, from September 29th to October 2nd, the International Radio, Electrical and Lighting Exposition, which is to be the radio show for the Northern Continental (*Continued on page 247*)

TELEVISION STILL A LEADING FEATURE OF ALL RADIO SHOWS

Crowds have stood for hours before a television demonstration at radio shows to catch a glimpse of the televised images of one of their number and to hear him speak at the same time. This year Television and the Short Waves are expected to share honors at radio shows the world over

"OUR OWN" RADIO SHOW

Previews and short items on new radio instruments soon to be announced for the 1935 season

Inside information and technical details on the new models gathered by our technical staff

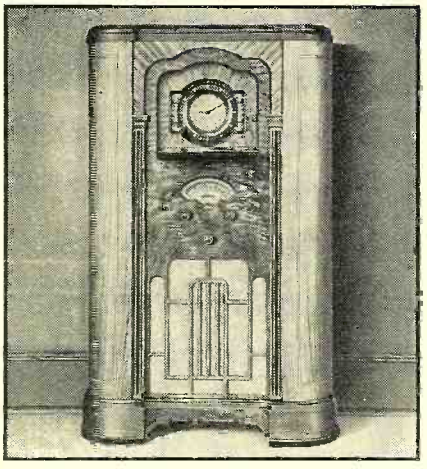
New Multi-Wave Receiver

Attractive console and table models of multi-wave, all-wave and dual-wave design are announced for the new General Electric 1935 line of radio receivers. The multi-wave sets have five wavebands as follows: 140 to 410 kilocycles for the long waves, 540 to 1800 kc. for the broadcast band, 1800 to 18000 kc. for the short wavelengths and an additional high-frequency band of 18,000 to 36,000 kc. which translated into meters is 16½ meters to approximately 8½ meters covering the 13 meter short-wave broadcasting, the 10 meter amateur transmission and the ultra high-frequency police calls. The new line

of receivers is headed by the model M-129 shown in the accompanying illustration. This is a twelve-tube multi-wave radio-phonograph combination equipped for home recording. The tube equipment comprises four 6D6's, one 6A7, three 76's, one 85, two 42's, and one 5Z3 type rectifier. The set has a power output of 16 watts. The cabinet dimensions are: 43 inches high by 33½ inches wide by 19 inches deep.

Self-Tuning Receiver

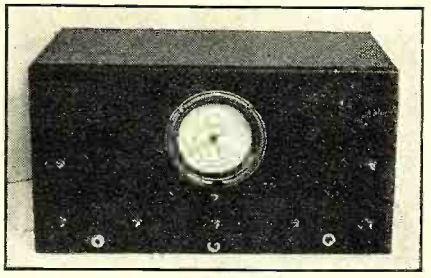
Outstanding in the new line of Atwater Kent receivers is the model 511-W, an eleven-tube dual-wave console with the new Tune-O-matic development. Here is a receiver that turns itself on and off and can tune itself to any of 14 different pre-selected programs for any predetermined time. The set can always be operated as a regular receiver as a simple switch cuts out the automatic circuit. The assembly incorporates a 4-inch electric clock which, in addition to its function in the automatic circuit, is ornamental and of course is of general utility. The set uses the following type tubes: three –58's, one 2A7, one 2B7, three –56's, two 2A3's, and one



5Z3 rectifier. In addition to the Tune-O-matic features the set is equipped with silent tuning control and shadow tuning.

Commercial Type Short-Wave Receiver

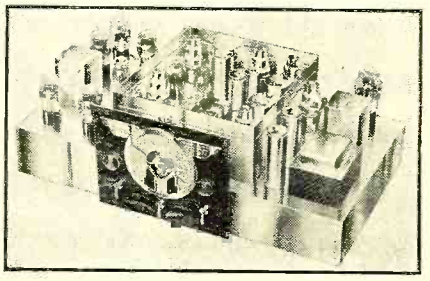
Supplementing the new line of McMurdo Silver nine-tube World Wide model receivers and the Masterpiece III 12-tube model receiver, is the model 5C professional single-signal superheterodyne set which is illustrated herewith. One of the outstanding features of this set is the accurately calibrated large airplane watch type dial which has one indicating pointer for the main three-gang tuning condensers and a second pointer on a 0-100 division scale for the three-gang band-spread condensers. The manufacturer advises that the crystal circuit employed, sacrifices no signal volume for its extreme selectivity. The set has automatic volume control, air tuned i.f. amplifier, 3 watts power output and all the parts used are processed for tropical climatic conditions. It is equipped



with an audio beat oscillator for c.w. reception.

Latest All-Wave Receiver

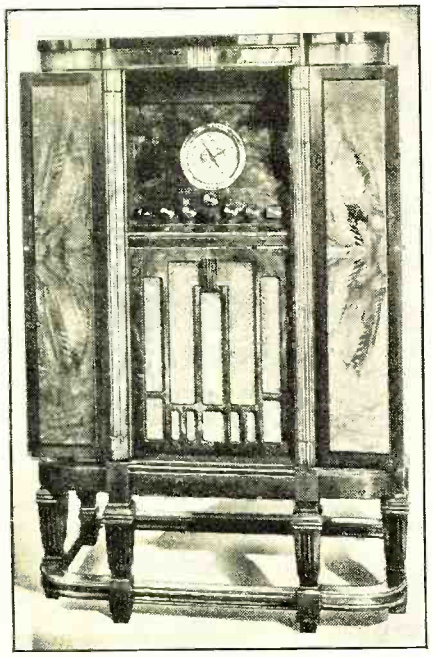
The new Midwest 16-tube radio receiver with a wavelength range of 9 to 2400 meters features a unique and convenient tuning dial made with four distinct different calibrations. There are the popular kilocycle and megacycle calibrations for the various short-wave, broadcast and long-wave bands and for convenience in short wave tuning the calibrations for low wavelength ranges from 9 to 200 meters are shown in meters and as a further convenience the short-wave bands are shown in group locations for the different bands, for instance, amateurs, foreign, airplanes, etc. Augmenting all



these designations is the printing of the call letters on the dial for the principal American broadcast stations. This call letter dial scale is removable for future regrouping of broadcast stations. Additional new developments incorporated in this set include "Spot-o-Lite" and "Line-o-Lite" tuning, "Fidel-O-Trol" tone blender and doublet or counterpoise antenna provision.

A Five-Band Multi-Wave Receiver

Representative of the new RCA-Victor 1935 line, comprising fourteen different model receivers, is the De Luxe Globe Trotter, a twelve-tube superheterodyne with a wavelength coverage from 140 to 36,000 kilocycles. The outstanding features of this set are automatic tone compensation, double vernier tuning and an airplane dial with secondary pointer and band indicator. The console cabinet, neo-

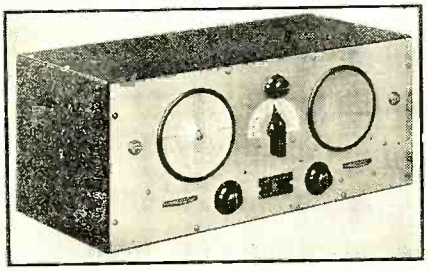


classic in style, measures 43 inches high by 29 1/16 inches wide.

New Receiver Line

An announcement has just been received on the new Hallicrafters 1935 line, comprising three new receivers; namely, the standard Skyrider; a 5-tube tuned r.f. set; the Super Skyrider, a seven-tube superheterodyne short-wave set for the amateur and the De Luxe all-wave superheterodyne with a tuning range from 13 to

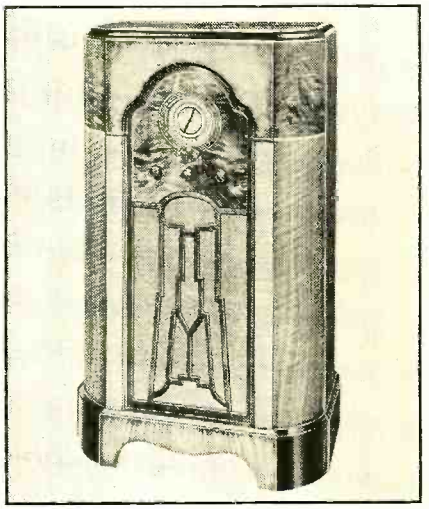
2000 meters. The photograph shows the standard Skyrider 5-tube short-wave receiver which features a new large-size tuning dial with four calibrated divisions marked off with the principal short-wave broadcast, commercial and amateur bands. It is a.c.-operated, has a built-in electrodynamic type speaker and is equipped with continuous band spreading. It employs two 6D6's, one 6C6, one -42, one -80 rec-



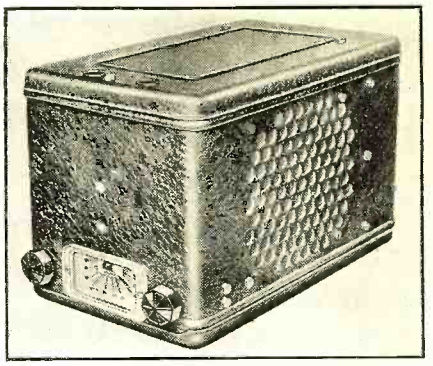
tifier. Its wavelength range is from 12 to 200 meters. The cabinet measures 17 inches by 7½ inches and its shipping weight is 24 pounds.

New Receivers

The Crosley Radio Corporation makes the announcement that smartness and attractive appearance in cabinet design and high standards in performance are to characterize the 1935 line of Crosley radio receiving sets. To meet all requirements, the new series includes all-wave, dual-wave, standard broadcast band, automobile and aviation type receiving sets, designed for a.c., battery and universal a.c.-d.c. operation. The first illustration shows the model 80, a low-boy console, eight-tube, all-wave superheterodyne, equipped with the new airplane type tuning dial. It uses two 42 type tubes in the push-pull power output stage. The front panel and the ends of the cabinet are of walnut veneer. The dimensions of the cabinet are 38½ inches by 23 inches by 11¾ inches. The



second photograph illustrates the Crosley Roamio model 4A1 automobile receiver. This is a single-unit set with the chassis, speaker and power supply all housed within the one metal contaner. The tube equipment for this set comprises one 6F7, one



6D6, one 6B7 and one type 42 tube for the output power stage.

Complete New Line of Receivers

An interesting announcement was recently made that the new 1935 line of Philco receivers is to comprise forty-nine different models consisting of five universal compact style sets, seven lowboys, six highboys, twelve baby-grand models, eight inclined-sounding-board sets, three remote-control models and six radio-phonograph combinations, designed in dual-wave, all-wave and standard broadcast models and available for battery, a.c. or d.c. operation

"FAIR AND FINE" FOR THE RADIO INDUSTRY

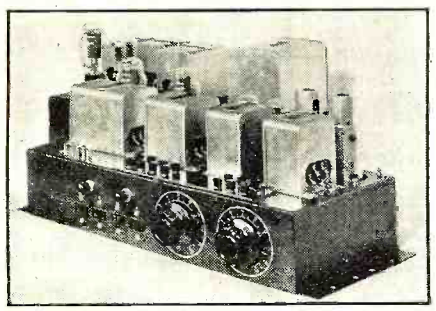
So said Willis R. Gregg, Chief of the United States Weather Bureau, in a recent radio speech at the Century of Progress. Standing at his side is Rufus C. Dawes

and for use on 32-volt farm-lighting systems. Typical of the new line in smart console cabinet design is the model 16L receiver shown below. This all-wave set has five different wave bands, covering a wavelength range from 3 to 555 meters. It

employs eleven tubes and features shadow tuning, interstation noise suppression and 15 watts of power output.

Sound Reproducing System

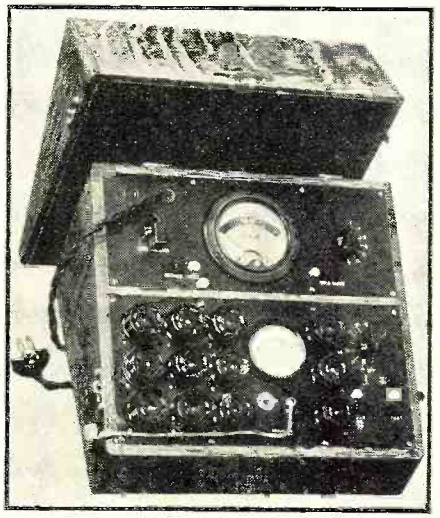
The new Kenyon eight-tube public-address system illustrated below is capable of delivering 18 watts output power. This job uses a pair of 77 type tubes in a push-pull impedance-coupling circuit, feeding a pair of push-pull 76 type tubes which are coupled to two 45 tubes in a Class AB push-pull power stage. By a unique type



of chassis construction it is possible to change this amplifier from an 18-watt job to a 36-watt amplifier by employing four 45 type tubes in a class AB push-pull parallel circuit and adding two transformers and a filter reactor. Also, the mechanical construction of the chassis permits the installation of the amplifier either as a rack-and-panel unit or as a table amplifier. The overall gain is 80 db. Microphonic noises which might otherwise be transmitted through the amplifier by the 77 or 76 tubes are eliminated by mounting the voltage amplifier tubes in a phosphorus bronze spring suspension. The amplifier is particularly adapted to sound-truck installation.

Tube Testers

Two new tube checkers were recently introduced by the Readrite Meter Works. The model 421 is a counter tube checker and model 422 is a portable tester. These instruments incorporate a Triplett 3½-inch meter which has a shaded two-color scale



to indicate whether the tube is good or poor and an a.c. meter with a line voltage control, also provisions for testing cathode, grid leakage and shorts. A push-button arrangement provides two plate current readings for determining the worth and conductance of all types of tubes. The portable model shown here is 10¾ inches wide by 9⅜ inches deep by 6½ inches high.

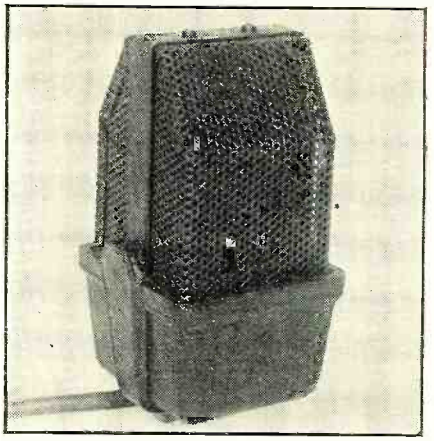
Multi-Range Table Type Set

The new Hetro six-tube a.c.-d.c. superheterodyne receiver is a triple-range set covering the wave bands from 17 to 60 meters, 195 to 555 meters and 800 to 2200 meters. It employs 12 tuned circuits with high gain, highly selective i.f. transformers both plate and grid tuned, and using an intermediate frequency of 456 kilocycles. All the parts used in this set are processed for tropical climatic conditions. The two-toned walnut cabinet measures 14 inches by 10¼ inches and the net weight is 16

pounds. The new series of Hetro receivers comprise all-wave, multi-wave and broadcast sets in console, midget and table models. This company also makes five-, six- and seven-tube motor-car receivers.

New Ribbon Type Microphone

The electrical characteristics of the new Amperite model RA1 velocity or ribbon type microphone are given by the manufacturer as follows: frequency response 42 to 10,000 cycles, output 90 decibels



down and an output impedance 50 and 200 ohms (from built-in transformer). It uses cobalt steel magnets and the ribbon is made of specially treated aluminum alloy which the manufacturer states cannot be stretched or permanently distorted and it is not affected by temperature, pressure or humidity. The bronze and steel case enclosing this microphone provides the necessary shielding. This model is made especially for public-address work. The model RAE velocity microphone, made for studio use, has a greater frequency range and a slightly higher output.

Dual-Wave Set

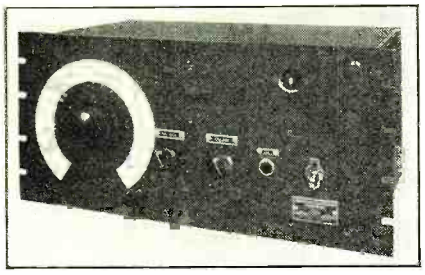
An International Kadette table type receiver with a short-wave band of 18 to 55 meters in addition to the regular broadcast waveband of 555 to 200 meters. It operates from 110 volt either a.c. or d.c. supply and the five tube superheterodyne circuit uses one 6A7, one 6D6, one 6B7, one 43 and one 25Z5 voltage doubler rectifier tube. The dial is marked to indicate the position of the most prominent foreign

short-wave broadcast stations and is illuminated in two colors indicating the short-wave and regular broadcast bands. The walnut cabinet measures 15 inches

high by 11½ inches wide by 8 inches deep, and the shipping weight is 14 pounds.

Beat Frequency Oscillator

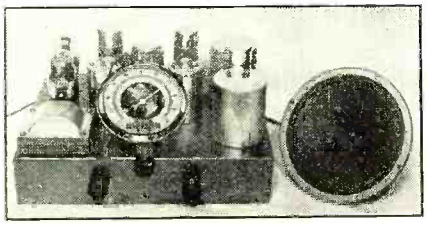
Here is an announcement of the RCA-Victor type TMV-52-E beat-frequency oscillator which has a range from 20 to 17,000 cycles. It features stability, constant output, high output level, calibration adjustment and universal design. Laboratory, broadcast studio and manufacturing sound engineers should be interested in an instrument of this kind. It



is available in either rack mounting or portable types.

All-Wave Kit

This Try-Mo Powertone 6-tube superheterodyne receiver employing plug-in coils covers a wavelength range from 14 to 550 meters. The manufacturer calls attention to the automatic regeneration control which is a material aid in tuning in weak signals. The set is equipped with an attractive airplane type tuning dial. The tubes utilized are as follows: one 2A7, two



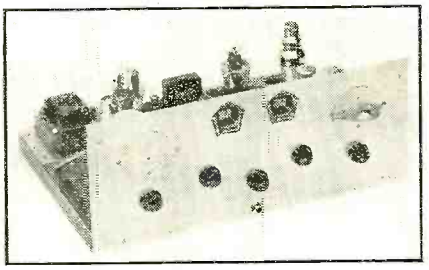
–58's, one –55, one 2A5 and one –80 type rectifier. The set is available either in kit form or completely wired and tested ready for operation.

Short-Wave Kits

The Insuline Corporation of America announce five new Mascot Short-wave kits. There is the one-tube beginners kit, the advanced battery two-tube set, a three-tube a.c. receiver and a four-tube a.c. job. Kit number five is the Universal Mascot five tube job. The tube equipment for this set is as follows: one 78 as an r.f.

"D'YOU NEED NEW TUBES"?—HOW ABOUT THESE?
New 100,000-watt tubes for WLW; too large for your set and anyway—the girls don't go with them!

amplifier, one 37 as a regenerative detector, which is resistance coupled to a 77 type tube in the first audio stage, followed by a 42 in the output power stage. The 80



type tube is used for rectification. The coils plug-in from the front panel into specially shielded compartments. Band spreading is provided. Complete constructional details with picture and schematic

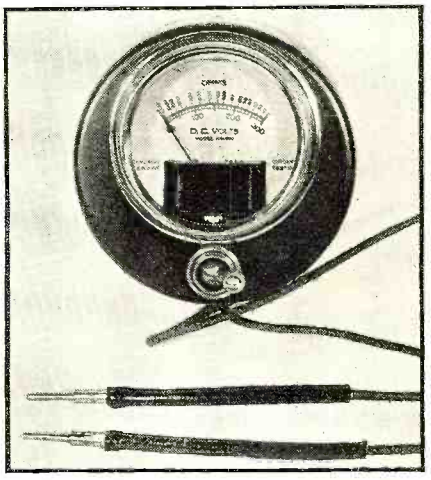
A NEW AND IMPORTANT RADIO INVENTION

Mr. A. Atwater Kent's latest radio receiver tunes itself to various stations, according to a pre-selected schedule. Mr. Kent explains that it will select a full evening's entertainment, doing away with constant searching up and down the dials

wiring diagrams are furnished with each kit of parts.

A Compact Volt-Ohmmeter

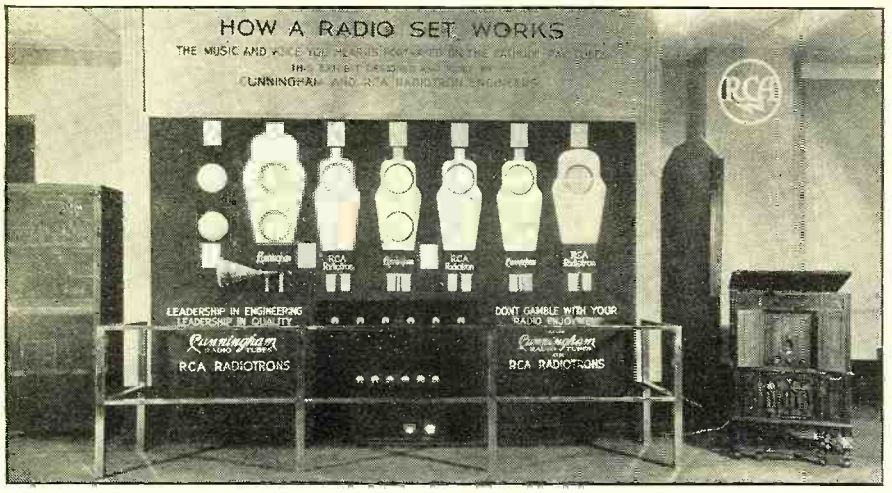
The Chicago Service Station Company recently announced a small pocket size volt-ohmmeter. The change from voltage to resistance readings is accomplished by the small toggle switch mounted on the front of the instrument. In position "O" the meter is set for the ohmmeter and in



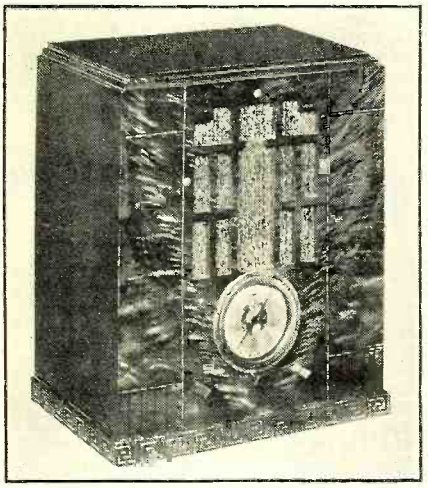
position "V" for voltage readings. The ohmmeter range is from 0 to 10,000 ohms and the d.c. voltmeter range from 0 to 300 volts. The instrument measures 3 inches in diameter by 1½ inches deep and it contains two 1½-volt "pen-light" cells to furnish the testing current. The cells are inexpensive and easily replaced. The testing leads are 32 inches in length and they are furnished with red and black terminals for polarity identification.

A Modernistic Receiver

In addition to its new 1935 line of standard broadcast, all-wave, short-wave and automobile radio receivers the Allied Radio Corporation introduces a new "skip-band" or dual-wave set for reception on the regular broadcast band from 191 to 555 meters and on the short-wave bands from 14.9 to 74.9 meters. It is a five tube superheterodyne receiver equipped with an airplane type dial, conveniently calibrated and marked for the principal European short-wave reception ranges. The follow-



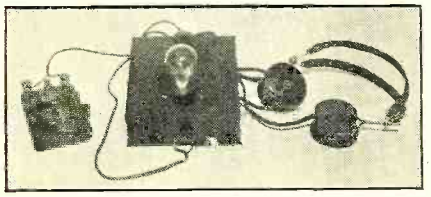
ing tubes are utilized: one 6A7, one 6D7, one 75, one 42 and one 80 type rectifier.



The cabinet measures 14 inches high by 12 inches wide by 8 inches deep.

Code Practice Oscillator

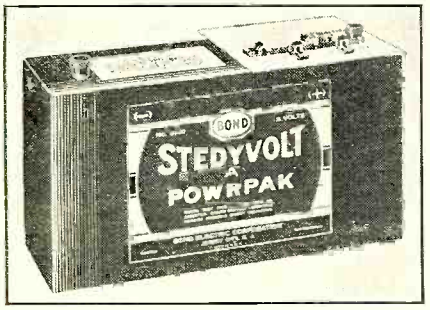
This illustration shows the new National type GPO audio oscillator for code practice. To operate this device, simply insert



a type –30, 2-volt tube in the socket mounted on top of the instrument, plug headphones of 2000- or 3000-ohm resistance into the terminals marked "phones" and a telegraph key into the "key" terminals. It uses four flashlight cells which are mounted inside the base and are easily removable for replacement.

New Three-Volt Dry Battery

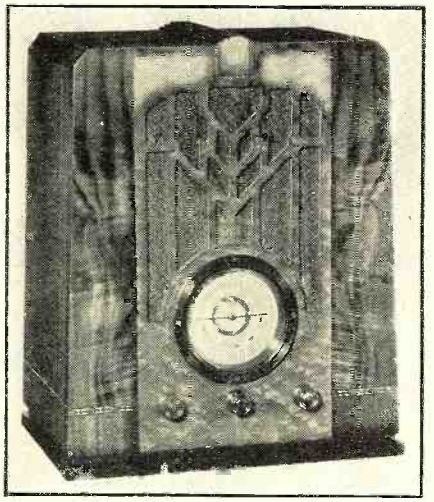
This is an announcement of the new



Bond Stedyvolt "A" Powrpak three-volt dry battery especially designed for use with two-volt tube receivers. A tapped resistance insures accurate voltage control. This new battery makes use of a special formula mix which enables the battery to deliver from 300 to 400 hours of service when used with the standard two-volt battery operated sets. The battery is built into a heavy, impregnated, moisture resisting case.

An Attractive Table Model Set

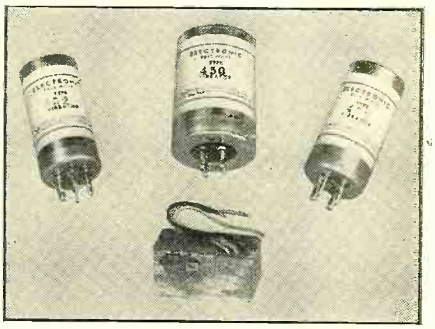
The latest addition to the Belmont Radio Corporation's new line of 1935 receivers is this table model 675 six-tube dual-wave set with automatic volume control, tone control and airplane type tuning dial. In addition to covering the regular broadcast and police wave bands from 555 to 175 meters it provides short-wave reception from the principal domestic and foreign short-wave stations operating be-



tween 55 and 17.5 meters. The cabinet dimensions are: 17 inches high by 14 inches wide by 11¼ inches deep.

Replacement Vibrators

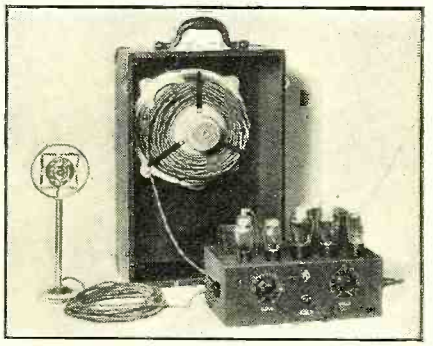
Servicemen, dealers and automobile radio enthusiasts will be glad to hear of the new line of Electronic full-wave replacement vibrators for automobile B eliminators. There are seven models designed for replacement use in over sixty different automobile radio receivers. The vibrators are made for simplicity and durability and are built under a new construction principle. The frame structure is of cast iron in order to give a more perfect magnetic path for the actuating electromagnet. The vibrating reed is made of three pieces and is called a cushion reed, inasmuch as the two small pieces holding the contacts are attached only at one end to the center vibrator reed and consequently during the vibration an air cushion is developed beneath each reed. This eliminates a great deal of the mechanical noise. The short outside reeds are made of spring-tempered Monel metal. This company publish a replacement guide to tell the correct vibrator



replacement unit for the various standard motor-car receivers.

Portable P. A. System

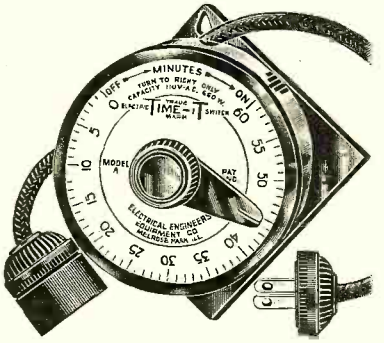
The accompanying photograph shows the new Webster model P.A. 17 portable public-address system designed to provide 15



watts of output power. It employs a 2B6 type tube in the power stage and the system is equipped with a 12-inch dynamic type speaker and a double-button carbon type microphone. The output circuit is arranged for the connection of additional speakers and the amplifier input has a dual control with provisions for fading voice and music.

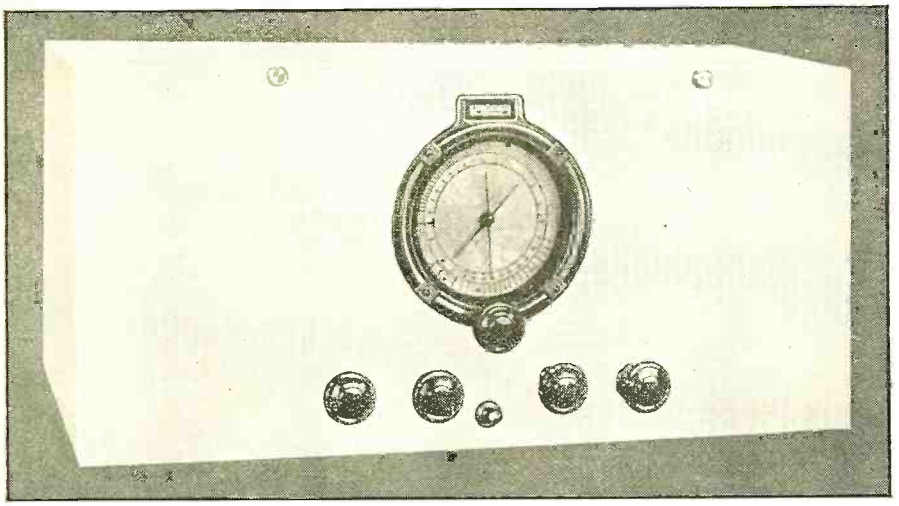
New Electric Time-Switch

The Jones and Lohley Company "Time-It" switch meets a demand for an electric automatic switching device for starting and stopping all kinds of electrical equipment at any pre-determined time up



to 24 hours. The switch is entirely automatic and it is only necessary to plug it into the circuit of the electrical device it is to operate, and to turn the pointer to the required time. It is light in weight, neat in appearance and is enclosed in a bakelite case. One model is adjustable for any period from a minimum of 15 seconds to a maximum of one hour. A second model of the same size and appear-

(*Continued on page* 256)



FORWARD LOOKING DESIGN IN 12.8-550 METER *SUPERHETERODYNE*

McMurdo Silver

THE custom-built Masterpiece II all-wave receiver was perfected in October, 1933 (see November, 1933, RADIO NEWS), and has been built continuously since that time. From time to time minor changes have been made to incorporate new advances as they have been developed. But now, a year later, several quite important developments have been perfected and are being incorporated. The model designation is therefore being changed from Masterpiece II to Masterpiece III, even though the essential circuit, layout and operation remain substantially unchanged.

Most noticeable of the changes is the airplane dial—a radically new departure just developed. This dial, called the "watch dial" because of its "minute" and "second" hands, simplifies short-wave tuning to a point where it is easier than is broadcast-band tuning in ordinary receivers. It is actually a simplification of the two-dial band-spread tuning system of the Masterpiece II.

Briefly, the tuning condenser, as shown in Figure 2, consists of two three-gang condensers in one unit. One section is of 335 mmfd. capacity and is used for broadcast-band tuning. It actuates the "minute hand" of the dial, when the tuning knob is pushed in, through a 9:1 automatic take-up string drive which is extremely smooth and positive. This hand travels over four 180-degree dial scales, two above and two below, for the four tuning ranges of the receiver, which are accurately calibrated in megacycles, with short-wave broadcast bands clearly marked on them. The "second hand" of the dial travels over two 0-100 dial scales just inside the main calibrated scales, and is linked to the second three-gang condenser of 25 mmfd. capacity. This is the band-spread condenser, and it is brought into use by simply pulling out the tuning knob. This shift of tuning condensers is effected through a positive cone clutch which is simple and positive in the extreme.

Through this arrangement, band-spread tuning may be had anywhere in the range of the receiver. It is most valuable on short waves. In operation, the "minute hand" is set to any desired short-wave band; then the tuning knob is pulled out, and the band will be found completely spread out on the "second hand" scales, easy to read and even easier to tune, for the effective ratio of the band-spread tuning averages 100:1. This is not only the ratio in terms of knob (*Continued on page* 247)

FIGURE 2

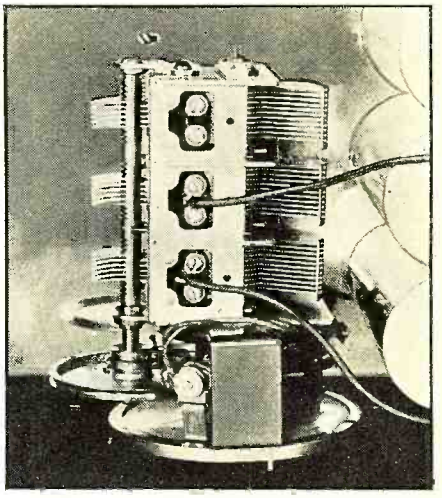
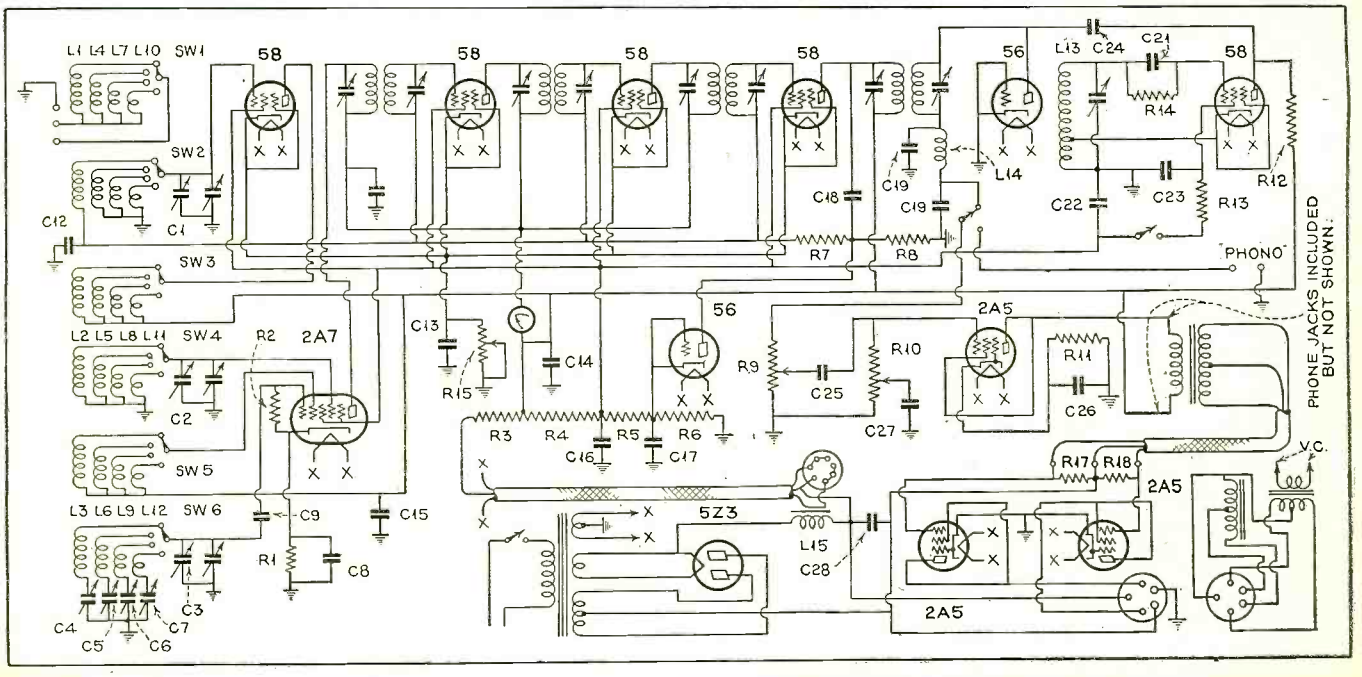


FIGURE 1



RADIO NEWS LABORATORY EQUIPMENT No. 1

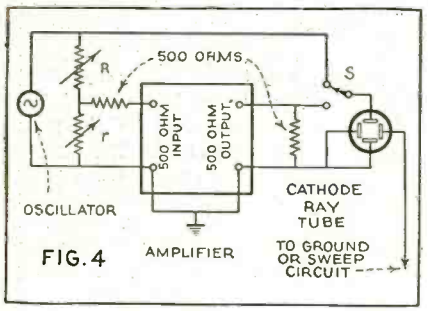


FIG. 4

THE LABORATORY AMPLIFIER TEST SET-UP

This is the testing apparatus for making the studies resulting in the oscillograms and curves shown on these pages. The picture shows the amplifier centrally located, with the signal generator and voltage dividers at the right. At left is the cathode-ray tube and the cabinet containing its power supply and sweep circuit. Directly above this, in Figure 4, is shown the fundamental test circuit. Below, in Figure 5, is the modified test circuit to take care of phase shift. Below this, in turn, are the oscillograms explained in the text

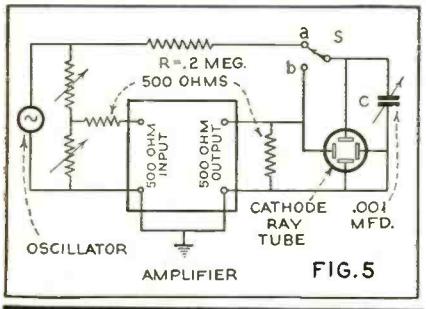
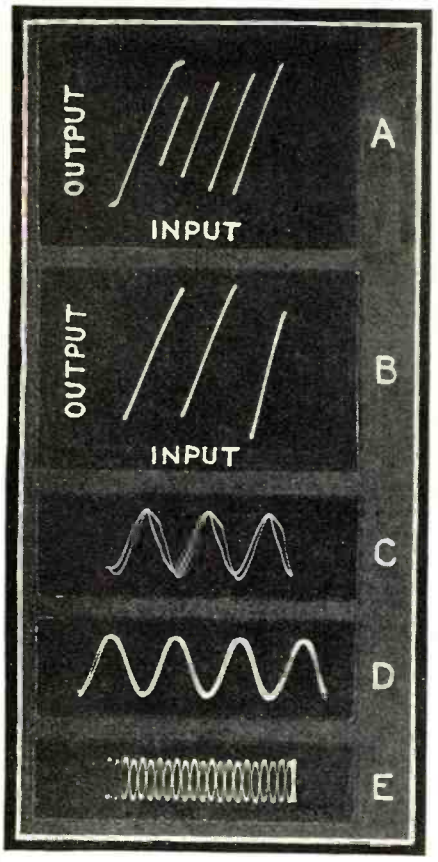


FIG. 5



A HIGH-GAIN, HIGH-FIDELITY "LAB" AMPLIFIER

This and next month's article describe the unusual amplifier recently installed in the laboratory as part of a new audio channel for test purposes

J. M. Hollywood *and* M. P. Wilder

Part One

THERE are probably many other laboratories and service shops which have similar high-standard amplifier requirements and it is hoped that this discussion and description of a new RADIO NEWS Laboratory High-Fidelity Amplifier will provide helpful and interesting information. The amplifier in question was designed by Messrs. Hollywood and Wilder in collaboration with the RADIO NEWS Technical Staff.—*Editor's Note.*

THE RADIO NEWS high-fidelity amplifier to be described contains the following features: A maximum gain of 124 db., a frequency characteristic that is flat within 2db. from 30 to over 13,000 cycles at gains up to more than 80 db. A tone control system which is a variable filter circuit to cut off at various high frequencies without affecting the lower frequencies, and a system of meter jacks that permits checking the operation of all stages. It is completely a.c. operated. Tests show that its gain is such that it is capable of delivering full output (4 watts) when operating directly from a ribbon (velocity) microphone, without a preamplifier.

Figure 1 shows the frequency response for several values of gain. At all except unusually high gain, the response curve is substantially flat to 13,000. Stuart Ballantine, in a paper presented before the Institute of Radio Engineers, proposed that response uniform within 5 db. from 50 to 8000 cycles will be considered as a requirement for "high fidelity" broadcast systems. This amplifier far exceeds these requirements at values of gain below 90 db. At higher gains, a certain amount of regenerative feed-

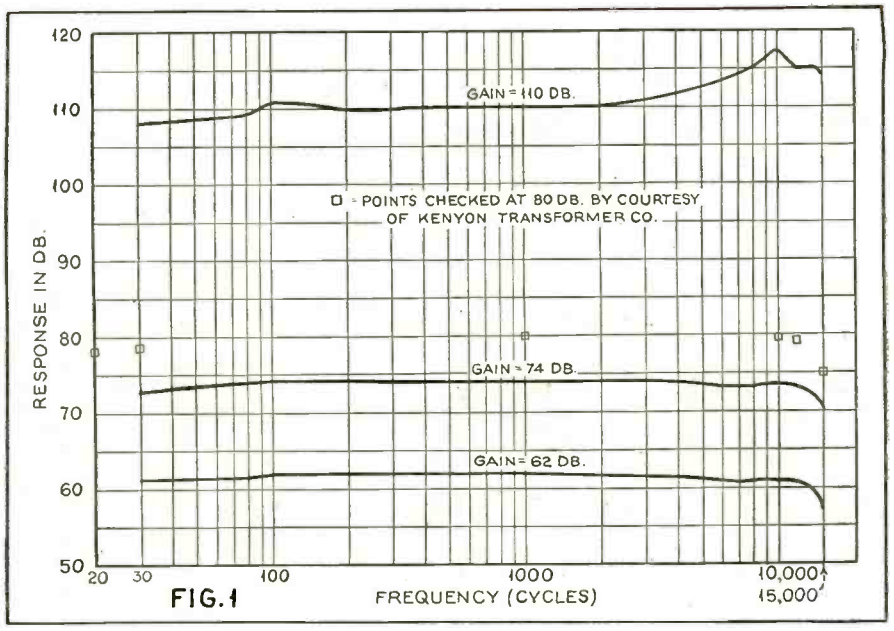
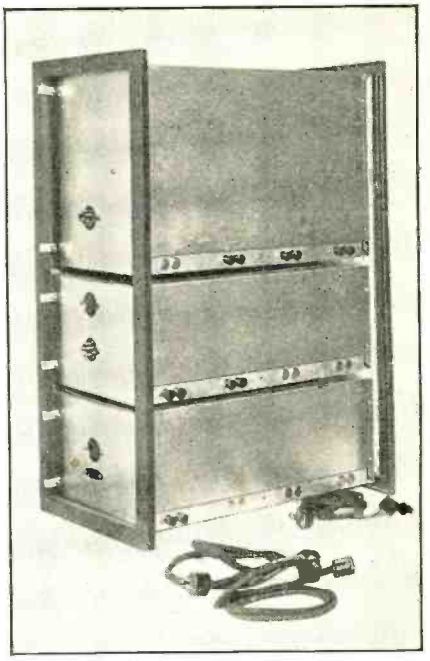


FIG. 1



RESPONSE CURVES

Figure 1. These curves were taken at several values of gain and show an excellent response. At right is a rear view of the amplifier

back occurs which causes a peak at 10,000 cycles. This could be reduced by better shielding; in practice, however, the full gain is never required and therefore the peak does not show up.

The curves at the 62, 74 and 110 db. levels were made by the authors, using the cathode-ray set-up mentioned later. The oscillator employed did not provide a pure output below 30 cycles, so no measurements were possible below this region. The points indicated as squares represent measurements of the low- and high-frequency response made by the Kenyon laboratory at an 89 db. level. This measurement at 20 cycles shows the loss negligible even at this low frequency, and the other points show close agreement within the authors' 74 db. curve, so far as gain variations are concerned, providing a close check on the accuracy of the measurements.

Figure 2 shows the measured attenuation due to the tone control, as a function of frequency. This tone control consists of two resistance-capacity filter circuits, each of which is made up of the coupling resistor between resistance-coupled stages, and a shunt capacity which is varied in seven steps. The type consisting of a condenser and variable resistor in series gives a much less

TONE CONTROL CURVES

Figure 2 shows the measured attenuation due to varying of the tone control

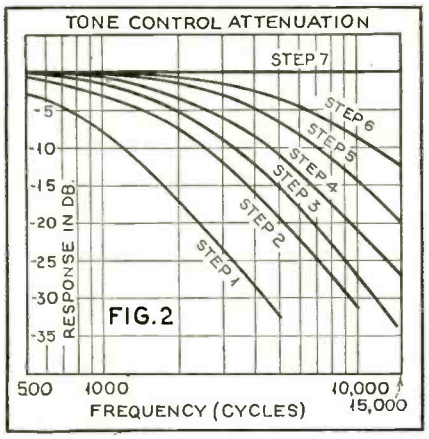


FIG. 2

satisfactory frequency response curve.

Figure 3 is a curve of the variation in gain with different settings of the volume control. The curve was made up from actual measurements and is helpful when using the amplifier in the "Lab," as it enables the operator to tell at a glance the approximate gain level being employed, or to set the volume control for any desired gain.

Photograph (A) shows the curve of output versus input voltage, with distortion patterns, from left to right at over 4 watts, 1 watt, 2 watts, 3 watts and 4 watts. It can be used to estimate distortion. Up to 4 watts, the second harmonic distortion is negligible, and the third harmonic (although perceptible as a very slight "pinwheel" shape of the curve, see the four right-hand patterns of A) is too small to be measured accurately by this method, and is well under 5%, the permissible value. Above 4 watts output, the distortion increases rapidly, as shown by the longest curve (the left-hand pattern with its "pinwheel" hooked-ends shape). The frequency used was 1000 cycles and the gain 80 db.

Photograph (B) also shows distortion curves, in this case at frequencies of 500, 1000 and 1500 cycles (left to right) the maximum output in each case being 4 watts.

The methods of taking measurements are of some interest. These were all done with the use of an Electron Research Laboratories Type F-101 cathode-ray tube as the indicating device, and General Radio calibrated audio-oscillator and decade resistance boxes. For the frequency response curve, the circuit arrangement used is shown in Figure 4 and the set-up is shown in the photograph above.

In Figure 4, (r) is a decade resistance box reading up to 100 ohms in .1-ohm steps. (R) is a 10,000-ohm decade box together with larger accurate resistors. (r) was normally at 10 ohms, and (R) set so that the ratio R:r would be equal to the amplifier voltage ratio at which the measurement was to be taken. Thus, for a 10,000:1 voltage ratio (80 db.), R was made 100,000 ohms and r 10 ohms. The voltage outputs of the oscillator and amplifier were then made equal at 1000 cycles by adjusting the amplifier gain control. Observation of the two voltages was made by using the cathode-ray tube as an a.c. voltmeter, using switch S to make the change from oscillator to amplfier output.

Measurements of the frequency response curve were then taken by varying the oscillator frequency and comparing the oscillator and amplifier output voltages by means of a graduated calipers placed on the screen of the cathode-ray tube. This voltage ratio when given in db. (db. equal 20 log voltage ratio) gave the drop in gain at the various frequencies as compared to the response at 1000 cycles.

Photograph (C), (D) and (E) illustrate such measurements by voltage comparison. They show the wave forms seen on the screen of the cathode-ray tube for the oscillator and amplifier outputs, (*Continued on page 252*)

VOLUME CONTROL CURVE

Figure 3 shows the curve of gain variation, with different settings of the volume control

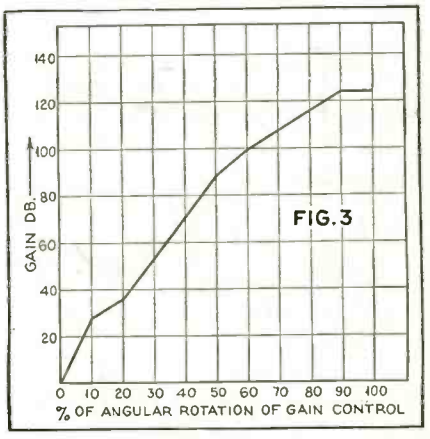
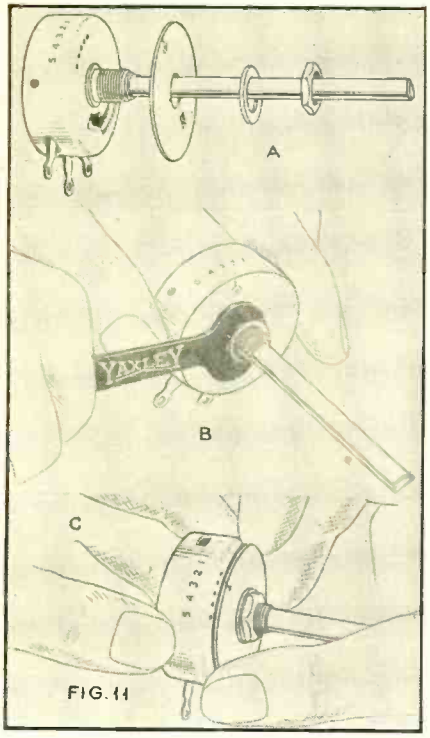
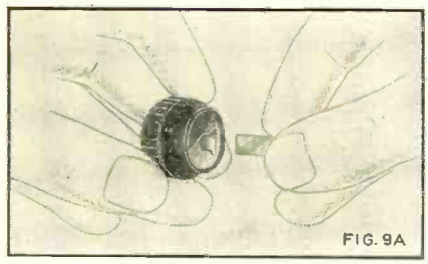
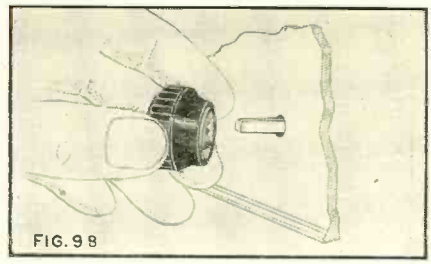


FIG. 3







THE HISTORY AND ANALYSIS OF RECEIVER

Paul G.

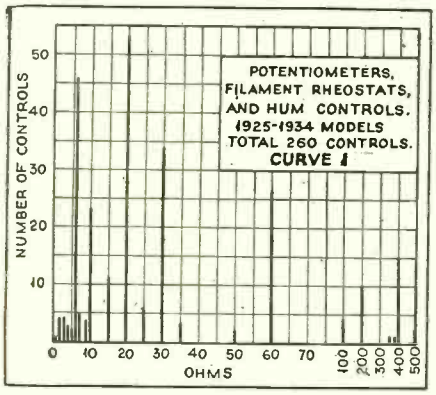
DURING the last ten years radio receivers have gone through various stages of development from the separate unit, battery receiver to the complete-unit a.c. receiver; from the use of filament to heated-cathode emitters; from simple triode to complex pentode tube applications; from insensitive 2- and 3-tube receivers to receivers of unusual sensitivity; from tuned-radio-frequency to superheterodyne receivers. Aside from tuning the receiver to the desired broadcasting station, the listener operates the volume control and the tone control and suppressor control in later receivers. In any one receiver, if the nature of service calls are analyzed, it would appear that attention to the controls would be second only to service demanded by the tubes. The danger of using force on the part of the listener to wrest the last bit of gain from the receiver, together with the fact that early variable resistors were not adverse on occasion to open circuit, due to wear and passage of current, cause these components to "go West" and in a measure contribute to the reason for the existence of the radio serviceman.

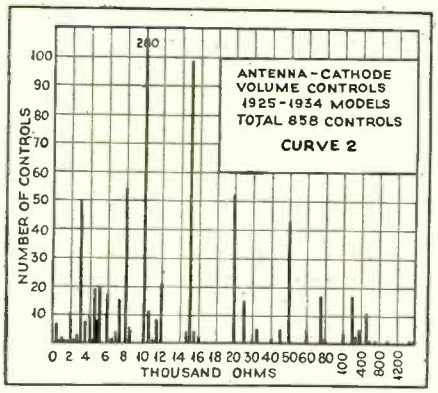
A recently completed survey shows in excess of 3000 different models of receivers manufactured during the last ten years. With the increasing number of models, annually, it was considered advisable to analyze the various controls as used during the last decade with a view toward determining the most popular use of controls. From the serviceman's standpoint a reduced number of controls insures a more complete stock on the part of jobber and dealer and consequently less possibility of delay in obtaining a suitable replacement control.

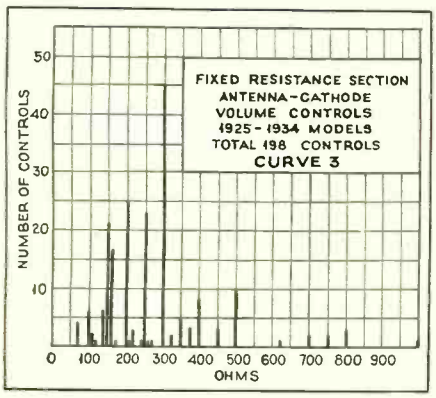
Very early receivers used "series-filament" rheostats to control emission and gain. The conventional 6-ohm rheostat is familiar to all servicemen. In addition to this, a potentiometer of relatively low resistance was connected across the filament supply and the grid return connected to the slider arm, permitting an adjustment of more or less negative bias on the control grids. In early a.c. receivers low-resistance "hum controls" were also frequently used. Curve 1 gives the number of low-resistance controls used in all models of 1925-1934 receivers. Of a total of 260 models, approximately 9% were equipped with controls of this type. Of these 6-, 10-, 20-, 30-, 60- and 400-ohm controls were the most popular.

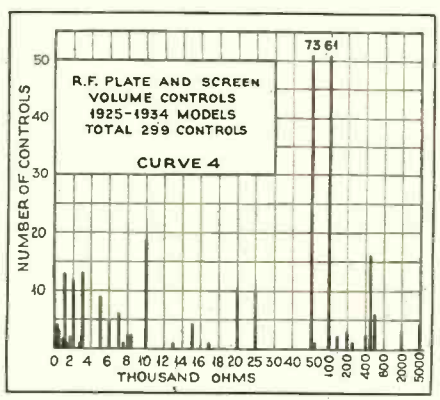
Almost concurrent or in some cases slightly after this the antenna control became popular. It was found that leaving the tubes set at fixed values of voltage (for filament and plate supply) and varying the amount of input into the receiver caused less tuning drift compared to the method when the tube current supply was changed. Shortly after this the advent of the separate heater or cathode independent electrically from the heater connection with a.c. sets came into use. The antenna control was retained, but, in addition, the cathode bias was varied, causing a compound action, reducing antenna input and causing insensitivity of the r.f. tubes by changing the cathode bias simultaneously. Out of the 300 circuits, 858 models used antenna or antenna-cathode volume controls, 10,000 ohms was the most popular design value; out of the 858 models, 280 used this value. Curve 2 shows the distribution of the various models with respect to their control resistance value using antenna and antenna-cathode circuits. The next popular values were 15,000, 8000, 20,000 and 3000 ohms. It is interesting to note that values as low as 400 ohms and as high as 2.5 megohms were used.

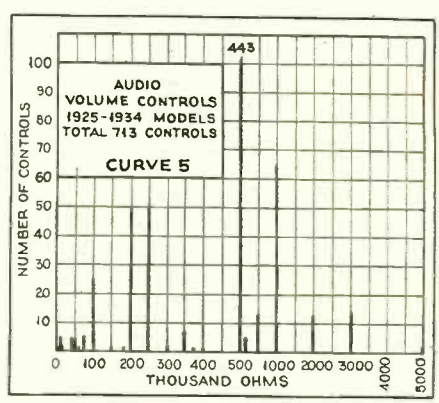
When antenna-cathode or cathode controls are used, a fixed minimum resistance is required in the cathode circuit to maintain the maximum value of grid bias. This minimum resistance is placed external to the control in some cases while in others it is incorporated in the control. In the latter case the stop on the control pre-











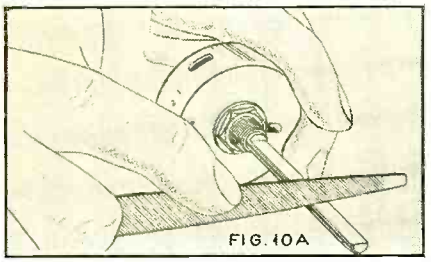


FIG. 10A

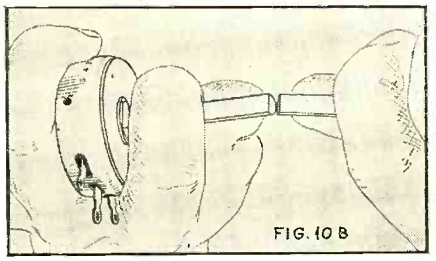


FIG. 10 B

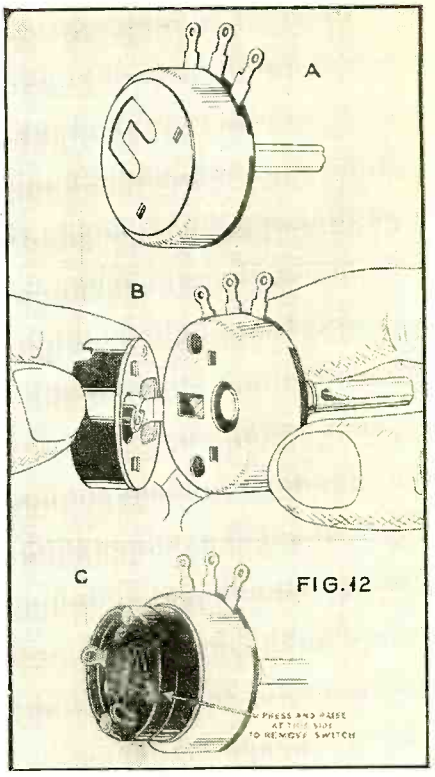


FIG. 12

VARIABLE RESISTANCES AS CONTROLS

Andres

vents the arm from being rotated below this minimum resistance. A total of 198 models incorporated this fixed resistance in the control. The most popular value was 300 ohms, which was in 45 models, with 200, 250 and 150 ohms next in popularity. The use of different values of plate and screen voltage obviously accounted for some of the special values which designers used. In some cases these controls with their fixed sections were used on one, two or three tubes, and often a bleeder was used from the plate supply to the cathode, which accounts for the values of 70 ohms to 1000 ohms shown on Curve 3.

The r.f. plate voltage control was a popular method some years ago and was widely used. In its application, one or more r.f. tubes are supplied with plate voltage through the variable control. This method was used before the use of screen-grid tubes. When these came into vogue, popularity shifted toward the use of the control in the regulation of the supply voltage to one or more screen grids. Infrequently these controls were placed in series with the screen grids, more commonly they were part of the voltage-divider circuit (or in shunt to a section of it). A total of 299 or approximately 10% of all models were equipped with controls of this type. The most popular value was 50,000 ohms, used in 73 models, with 100,000 ohms as close second, used in 62 models. Curve 4 shows the distribution of resistance values of this group of controls. The resistance values vary from 150 ohms io 5 megohms, due to the particular value of bleeder used.

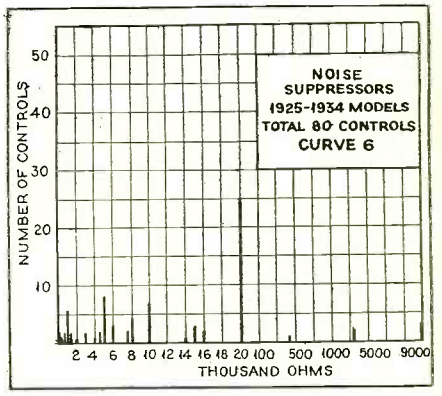
Variable-mu tubes and the introduction of automatic volume-control circuits have resulted in the use of controls in the audio circuit. These controls are usually employed across the first stage audio, across the two grids of the push-pull stage (if only one stage is used) and more commonly as the load circuit of the duo-diode-triode tube in a.v.c. circuits. Of the 3000 models, 713 were equipped with audio controls. Of these, 443 had a value of 500,000 ohms, the next popular value being 1 megohm (used in 65 controls). The controls range in value from 7500 ohms to 5 megohms, as shown in Curve 5.

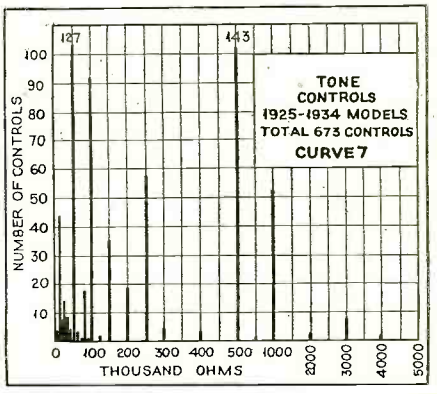
A few models designed in recent years are equipped with noise-suppression controls. These are auxiliary cathode-bias controls, which allow the listener to adjust the receiver, at the time of listening, to the minimum noise level and consequently to that insensitive condition above which all stations that can be tuned in can be listened to without excessive extraneous disturbance. Eighty models were so equipped and the popular value was 20,000 ohms (used on 25 models). As shown in Curve 6, value of resistance for suppressor controls range between 100 ohms and 9 megohms. This extreme range is caused by the use of bleeders, application to various numbers of tubes and choice of plate and screen potentials.

Tone controls became popular about five years ago and are still used extensively. During this period 673 models were equipped with such controls. They are usually used "in series" with a fixed condenser across the tube input circuit, in which case they are of high resistance and less frequently in the plate circuit (where the resistance value is lower). The grid circuit of 143 models used a popular value of 50,000 ohms (used in the plate circuit of 127 models). The values range between 2500 ohms and 5 megohms, the wide choice depending on whether used in grid or plate circuit, on the value of the series condenser, and on the audio response of the receiver. (See Curve 7.)

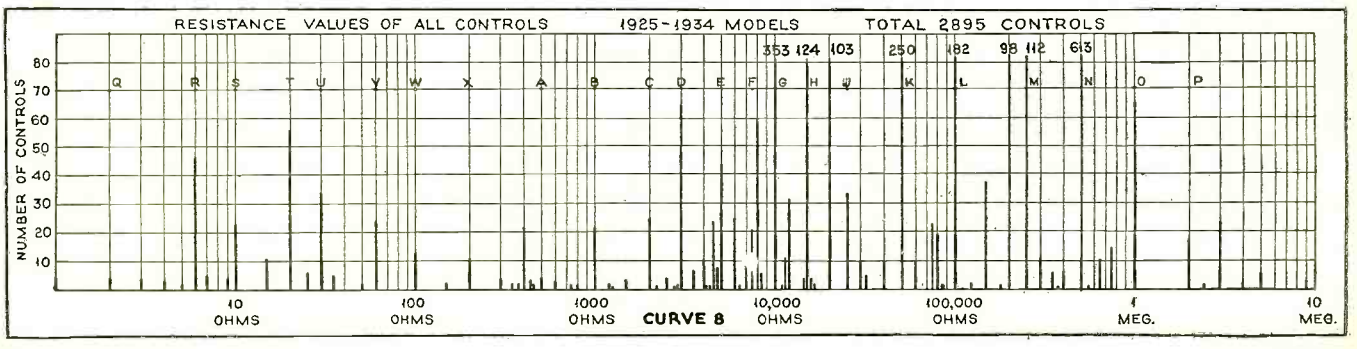
Relatively few controls were used for phonograph or combination radio and phonograph. These controls are commonly used on the pick-up direct or across the coupling transformer to the first tube. The popular values are 5000 and 50,000 ohms, depending on whether the pick-up

(*Continued on page 258*)

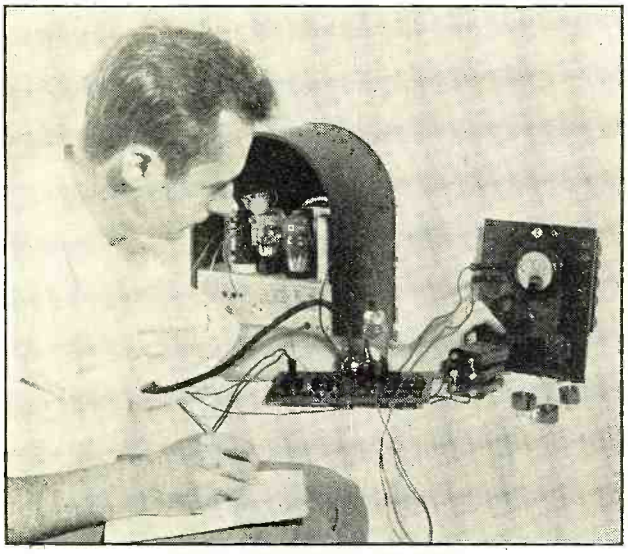




1925 TO 1934 STYLES IN RESISTORS



RADIO NEWS SERVICE INSTRUMENTS No. 3



THE ANALYZER IN USE

The analyzer panel is shown with the "Universal" Multimeter, in actual use. The great flexibility of this combination not only permits the use of the common methods of analysis, but also provides a check on tubes

New "ALL-METHOD" ANALYZER

Designed primarily for use with the "Universal" Multimeter described last month, but equally applicable for use with any other suitable meter, this analyzer panel provides the utmost in flexibility

John H. Potts

AS a result of the influx of multi-element tubes, the so-called "free reference point" method of set analysis has become an essential feature of modern set analyzers. By this method the voltage or resistance across any two socket terminals, or the current in any tube circuit, may be tested through the analyzer cable. Although modern tube and receiver design imposes limitations on the use of this method for some voltage and current measurements, its usefulness for the general run of radio service work is unquestioned.

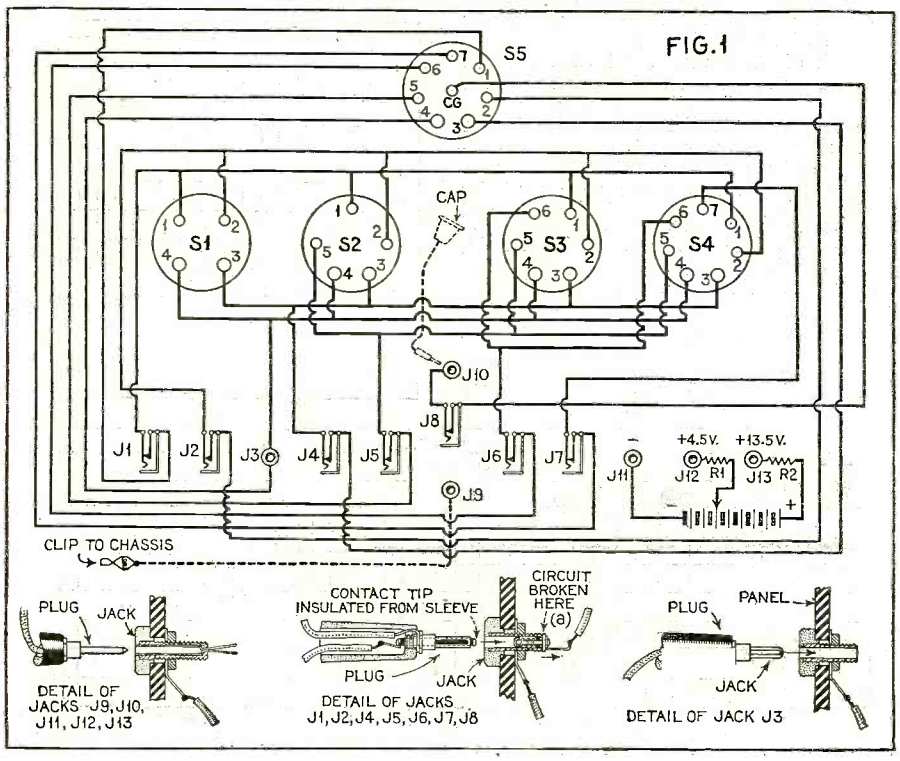
Many types of apparatus which incorporate this feature have been described. Usually a switch and jack, or two jacks, are required for each circuit. In the design described in this article, however, it has been found possible to accomplish the same result with but one jack for each circuit, due to the recent development of a special, small-size jack for this purpose. An unusually compact and effective test panel is the result.

As will be noted from the schematic diagram of Figure 1, this analyzer unit is composed of five sockets and 13 jacks mounted on a bakelite panel. In addition to the socket terminal jacks, provision has been made on the panel for two test voltages, so that the apparatus may be used for testing amplifier, rectifier and power tubes, by the well-known grid-shift method. The low voltage is used for small amplifier tubes, and the higher voltage for high-current power tubes for which the usual 4.5-volt swing is insufficient. This method will be found indispensable in locations where no a.c. supply is available for the tube checker.

While there are composite 4-5-6 prong sockets on the market, the use of which would somewhat reduce the required panel size, there would be no room on the panel for 8- and 9-prong sockets, when and if such types are required. With this design, when it becomes necessary, we may substitute 8-

THE SCHEMATIC DIAGRAM

Figure 1. Here is the simple circuit. Details of the new miniature plugs and jacks are also shown. At the lower right of the diagram is the bias battery employed in tube testing



Instruments for Servicemen

IT is the purpose of this series of articles to describe two complete groups of service instruments which the serviceman can construct himself and which incorporate the most modern advances. The first group will include all essential portable instruments, while the second group will describe the more important units of shop equipment.

This series started in the July, 1934, issue and the articles published thus far are:

July, A Portable Tube Checker

August, A Universal Multimeter—Part I

September, A Universal Multimeter—Part II

and 9-prong sockets in place of the present 4- and 5-prong ones, and install a composite 4-5-6 prong socket in place of the present 6-prong socket. There is sufficient space available for any other required changes which may become necessary for future tube developments.

The pin-jack labeled "Chas" (J9) has been provided so that a lead may be clipped to the chassis, enabling voltage and resistance tests to be made from this point to any socket terminal.

Since, in present tube type design, grids, plates and cathodes may be found in a large variety of prong allocations, the RMA system of socket terminal numbering has been adopted. While there has been some criticism of this system because a filament terminal was not chosen as the starting point for the numbering system, it is easy to remember that the left side filament terminal, viewed from the top of the socket, is always number 4, with smaller numbers appearing in counter-clockwise and larger numbers in clockwise rotation. It is to be hoped that manufacturers of sets will eventually have their tube sockets stamped on the underside with this numerical system, thus simplifying servicing and production inspection.

In Figure 1 are included drawings of the Na-ald miniature circuit-opening jacks used in this layout. A spring-actuated plunger, insulated from the sleeve of the jack, completes the circuit at point a. When the miniature plug is inserted, the circuit is opened. For shop testing on a wide commercial scale, where space is not a consideration, Figures 2A and 2B show how the same results may be obtained with ordinary telephone type jacks and plugs, which naturally are more ruggedly built. The plug shown in Figure 2A has a fibre stop, shown at "a," so that the plug tip makes contact only with the lower jack spring, leaving the circuit closed for voltage tests. These plugs are not available so constructed, but the fibre stop is not difficult to install. Two are required for voltage tests. In Figure 2B the standard phone plug is shown, which is adaptable without change for current measurements.

The construction of the panel will be found very simple. A drilling layout is shown in Figure 3. The panel is of $\frac{3}{16}$-inch bakelite. After drilling, mount the sockets and jacks, turn the panel face down and number each point and jack as indicated in the schematic diagram of Figure 1. The leads to the plungers of the miniature jacks should be of flexible wire to avoid strain on the springs. Ordinary tinned hook-up wire may be used for the balance of the wiring.

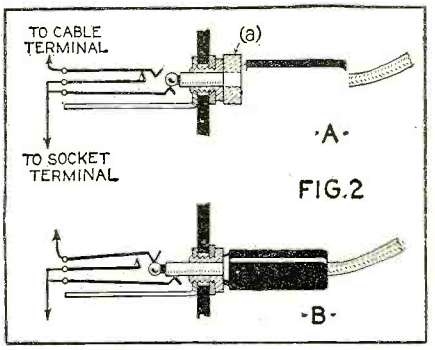
While this test panel has been specifically designed for use with the RADIO NEWS universal multimeter described in the last two issues of this magazine, it is equally adaptable to other suitable instruments.

To operate the apparatus, assemble proper Na-ald points in the test-panel handles. There are two types of points, one for voltage and resistance measurements and the other for current and tube tests. The type "S" points are used for voltage measurements. When inserted in the panel jacks, they do not touch the plunger and therefore will not open the circuit. Two handles should be equipped with these points and a single lead brought out from each for connection to the multimeter voltage terminal jacks. After adjusting the meter multiplier for the proper voltage scale, voltage measurements may be made by inserting the test-panel points in the desired circuits.

With the set voltage off, resistance measurements may be made with the same handles and points, transferring the terminals which connect the multimeter to the resistance output terminals and adjusting the selector switch until the most conveniently read scale is obtained.

For current measurements, a single test-panel handle fitted with a "D" point, to which two leads terminating in two similar test-panel handles with phone-tip terminals, is used. The phone-tip terminals are inserted in the proper multimeter jacks, the current scale adjusted to an appropriate value, and the current in the circuit read by inserting the "D" point in the desired jack.

For tube testing, another "D" point is assembled in the manner described above, shorter leads being used. The phone-tip terminals are connected to the jack marked (—) and the "+4½" for voltage amplifier tubes, such as the -24A, -26, -27, etc. Proceed as in the preceding paragraph, obtaining a plate-current reading of the tube under test. With the meter still connected, insert the "D" point with the short leads in the control-grid circuit of the tube under test. The plate current should increase, the difference being an indication of the tube worth. If the reading decreases, reverse the leads to the battery jacks and mark same for future reference. For power amplifier tubes, proceed in similar manner, but plug into the jack marked "+13½." If a resistance input is used in the grid circuit of the power (*Continued on page* 261)

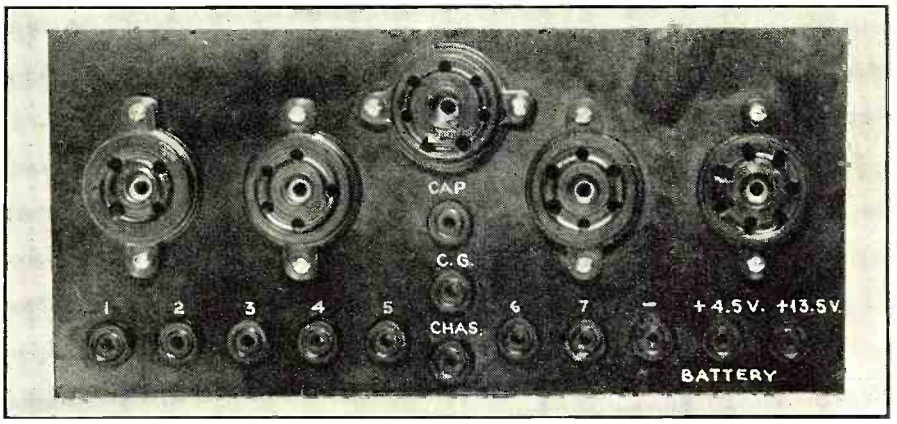


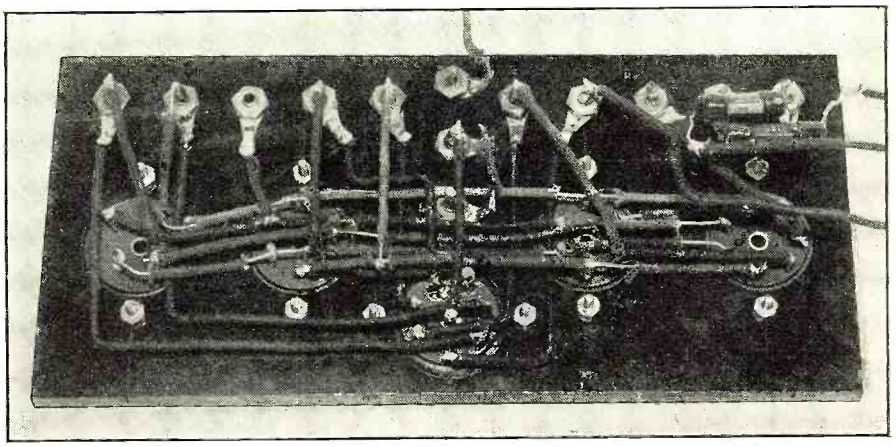
ALTERNATE JACK SYSTEM

Figure 2. Where space is not at a premium standard 'phone jacks and plugs, as shown here, may be employed in place of the miniature types

THE TOP VIEW

The 13 insulated jacks are a new development. Seven of them are the circuit opening type which permit current to be measured in any tube element circuit, the insertion of the 2-circuit plug automatically opening the circuit and connecting the meter. The insertion of a single circuit plug in these jacks provides a contact for point-to-point resistance-voltage measurements, between any two elements, any one of which (or the chassis) may be used as the reference point. The under view appears below





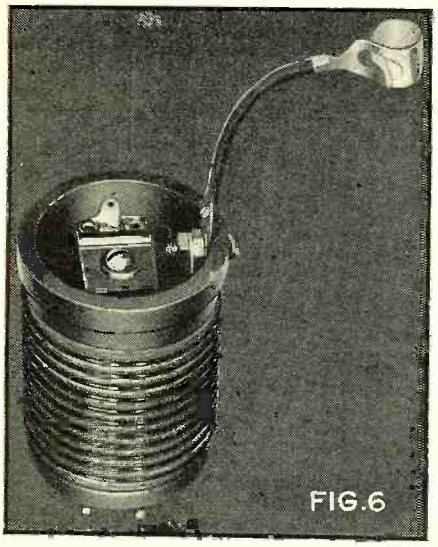


FIG. 6

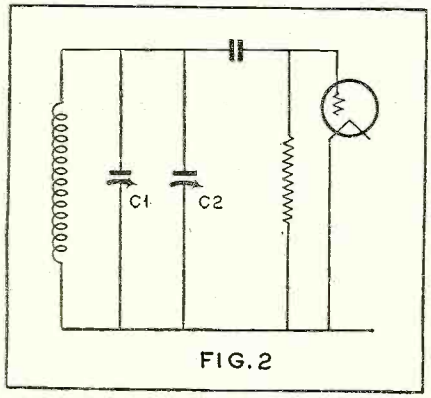


FIG. 2

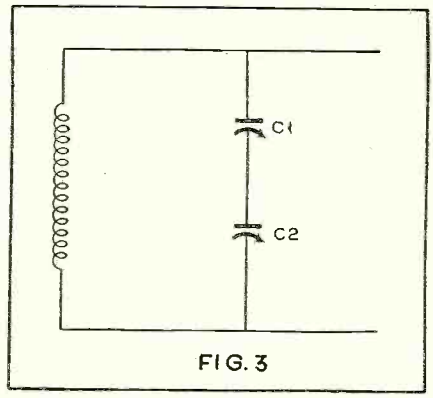


FIG. 3

SOME PRACTICAL "BAND

ALONZO

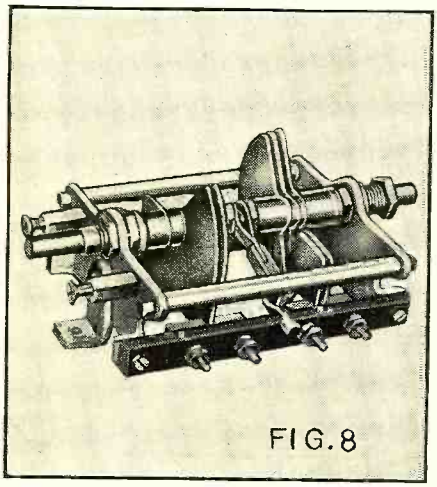


FIG. 8

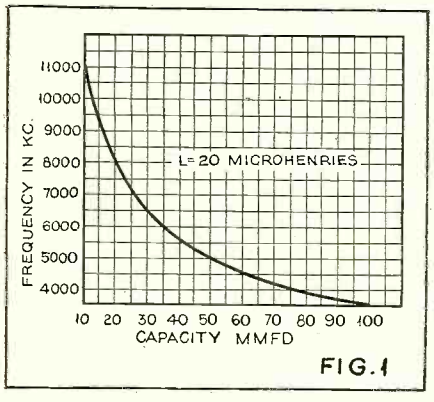


FIG. 1

THE object of band spreading, stated simply, is to design the tuning circuit in such a way that certain relatively narrow sections of the high-frequency spectrum can be made to cover almost the entire dial of the tuning condenser. If one is interested in short-wave broadcasting it is desirable to have the stations in the 50-meter group, for instance, well separated and not all bunched together in a few degrees on the dial. In all amateur work it is essential that this be done because the frequency bands are narrow, widely separated and extremely crowded. Many methods are in use. Some are given here with a view to helping those who do not understand the problem and desire good results without a great deal of experimentation.

A single tuning condenser with several plug-in coils will not provide satisfactory spread, because unless its capacity is extremely low (requiring a large number of coils) it will cover too wide a range. Moreover, it will cover more kilocycles per dial degree at the high-frequency end than at the low-frequency end. Figure 1 represents graphically the tuning range of one type of condenser coil. The condenser has a minimum capacity of 10 mmfd. and a maximum of 100 mmfd. If a 20-microhenry coil is used, the arrangement will cover approximately 7500 kc. Between capacities 90 and 100 mmfd. the tuning range is about 190 kc., while between 10 and 20 mmfds. it is 3250 kc. This shows clearly, then, why a single condenser is not likely to be entirely satisfactory for careful tuning, even though several coils were used.

This can be shown mathematically from the formula

$$f = \frac{159.15}{\sqrt{LC}}$$

where f is frequency in kilocycles, L inductance in microhenries, and C capacity in microfarads. It is evident from this that the frequency is inversely proportional to the square root of the capacity. This simply means that an increase of nine times in tuning capacity results only in a decrease of frequency three times.

The above discussion immediately suggests the use of separate tuning condensers of different capacities for each band of frequencies. This scheme is entirely practical and is used by many experimenters. Some form of plugs should be soldered directly to the different condensers and arranged so that they can be conveniently plugged into suitable jacks. If the condenser does not lend itself to this type of direct mounting, then a small piece of bakelite can be bolted to the end and the plugs mounted on this. In order to change bands it is necessary to change both condenser and coil. In a set with a single tuned circuit this is not objectionable, but where more are involved some inconvenience results.

When a certain size condenser has been chosen, then the coil to go with it is somewhat critical. It is suggested that a few extra turns be wound on in making the coil, and then taken off one at a time until the desired frequency is reached. On the higher frequency bands even a half turn may make a considerable difference. If this is the case, then the last fine adjustment can be made by spacing the turns. Approximate data for this system follows. In winding the coils many factors affect the inductance, as for instance, size of wire, insulation, spacing of turns, etc. In general,

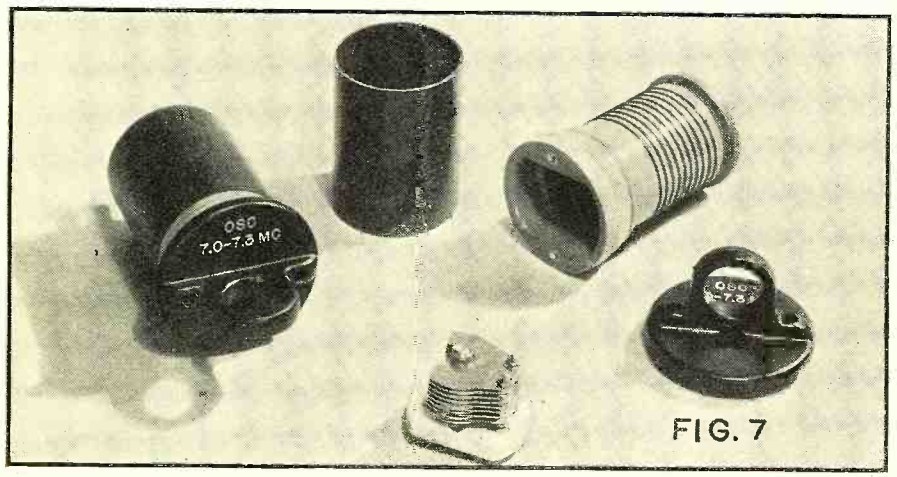


FIG. 7

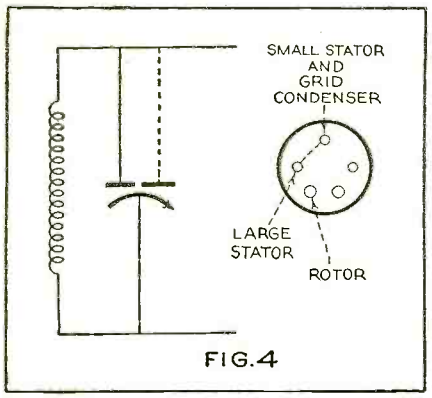


FIG. 4

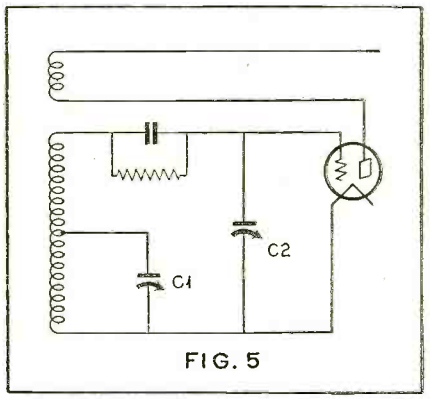


FIG. 5

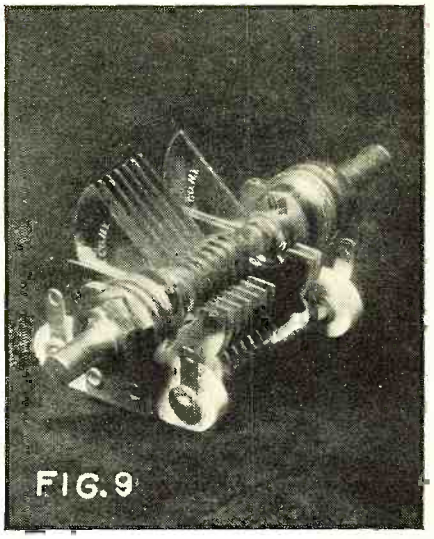


FIG. 9

METHODS FOR SPREAD"

WIERENGA

using the larger sizes such as No. 20 or 22 for the small coils will be suitable and smaller sizes of wire such as No. 30 or 28 for the larger ones.

Band	*Midget Condenser*	*Turns on 1½-in. Form*
14,000-14,400 kc.	2-plate	6
7000- 7300 "	3-plate	14
3500- 4000 "	6-plate	31

Another method that has some decided advantages is illustrated in Figure 2 where two condensers are connected in parallel. C1, the main tuning or band-spreading unit, is small and has a capacity of about 10 to 25 mmfds., while the band-*setting* one is larger and is anything from 100 to 200 mmfds. If we refer to the graph of Figure 1 we see that to cover from 4000 to 4500 kc. requires a capacity change of 15 mmfds. At the other end of the curve a 15 mmfd. change means a frequency shift from 11,200 to 7150 kc. If we had two condensers in parallel and one had a capacity range of 15 mmfds. from minimum to maximum and another whose value could be set to 62 mmfds., then 500 kc. would be spread over the entire dial of the tuning condenser. If the band-setting condenser C2 were set at only 10 mmfds., then the small one would cover 4050 kc. From this it is evident that the larger size of C2, the smaller will be the range of the tuning condenser C1. Thus it is possible to arrange coils and condenser sizes to give any desired spread on practically all frequency bands.

To make adjustments, begin with the highest frequency band to be used. The small tuning condenser is set at minimum. A coil is wound and then the other condenser set so that the highest frequency is obtained. The coil should be made so that the large condenser is almost at maximum. Note the spread afforded by the tuning condenser. If it is not sufficient, remove a plate or two from the tuning condenser. One could also use a larger condenser for C2 and then cut the coil size. If the spread is too great, then add a turn or two to the coil so that the spreading unit will have to be reduced, thereby giving the tuning unit more coverage in kilocycles. The other bands are then adjusted in order. Always remember that if the spread is not enough, then remove turns; if too much, add turns. Never change the size of the tuning unit after the first band has been adjusted. Small condensers suitable for this circuit are shown in Figure 10.

In the author's opinion, this method far surpasses any of the others for the average experimenter, because of its ease of adjustment. One trial will convince anyone of its simplicity. It also has the advantage that a large capacity is placed in parallel with the tube elements, thus reducing frequency changes due to tubes warming up, voltage changes, etc.

The data, given below may serve as a guide to those who wish to try this system. The values are only approximate, but sufficiently close for the average experimenter.

With capacities of 35 and 100 mmfd., the coils on 1½-in. forms will be about 28 turns for 3500 kc., 11 turns for 7000 kc. and 5 turns for 14,000 kc. The spread will be about 60, 40 and 25 divisions on a 100-division dial. On one set the author is using the condensers are 15 and 200 mmfd. They give spreads of 100, 60 and 30 divisions when coils are wound on tube bases with 28, 11 and 4 turns.

Of such popularity is the above method that manufacturers are now producing (*Continued on page* 251)

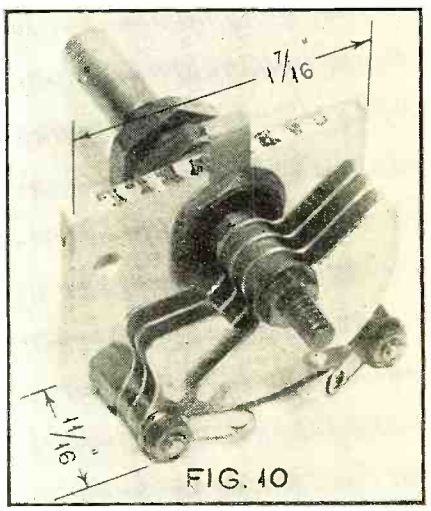


FIG. 10

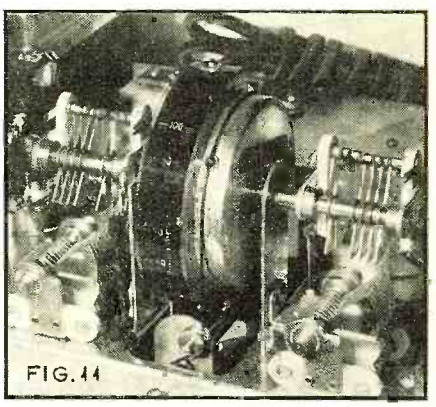


FIG. 11

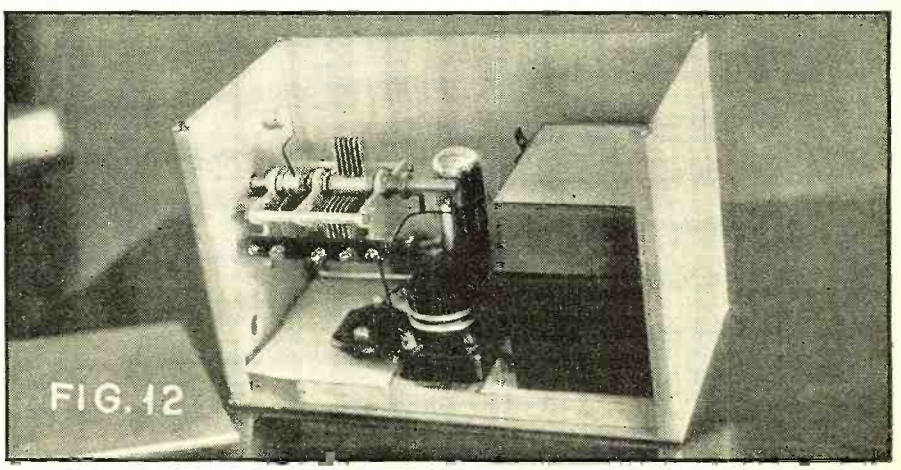


FIG. 12

OLD "HAM" READER

Heinz Funck, an old reader of RADIO NEWS *residing in Dresden, Germany, sends in this photograph of his "ham" transmitting and receiving station; call letters D4BZM. His transmitter is crystal-controlled and he uses cathode-ray oscilliscope for checking transmissions. He operates to the 20, 40 and 80 amateur bands*

THE "HAM" SHACK

CQ CQ CQ

THIS marks the inaugural of a new department in the pages of RADIO NEWS. Your editors have ordered a department that will be conducted *for* and *by* the licensed amateur. It will be devoted to spreading useful information in the amateur field, although limited to a page for the present, it is hoped that we will be able to describe the construction of apparatus ranging from antennas to transmitters and receivers, and to offer suggestions that will help the amateur keep pace with advancement in short-wave radio.

Your editors have designated that this department shall be a general meeting place for amateur discussions, and that it shall be conducted anonymously (at least for the present).

RADIO NEWS, since its inception, has devoted a large amount of space to articles of interest to the amateur. It is one of the pioneer radio publications and originally was known as "RADIO AMATEUR NEWS," which name implies that it was *inaugurated for the amateur!* Today amateur radio has exceeded (far beyond) the expectations of the period when RADIO NEWS was first published. In July, 1919, the date of the first issue, there were less than 10,000 amateurs in the United States. It was the period immediately following the World War, and most of those who acquired licenses at that time were either the pre-war pioneers or those who had had some contact with "wireless" during the war. One glimpse of a current callbook reveals the story. The total now exceeds 45,000 in the United States, and is gaining daily.

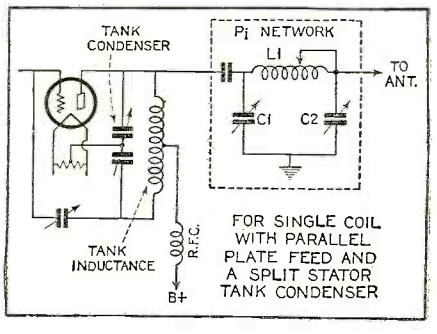
Until this announcement reaches our amateur readers, it cannot be expected that many contributions will be available, so your "conductor," who found romance in amateur radio in 1916, and still finds plenty of it despite a family and house on his hands, will start it going with the hope that his delightful burden will be lightened when the "owners" of the page start providing its material in true amateur fashion.

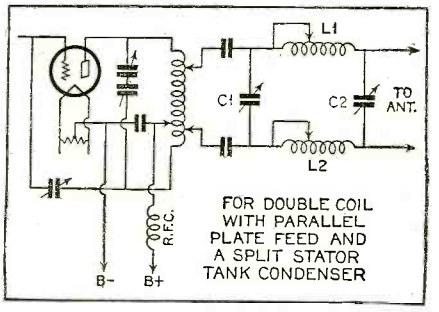
MUCH has been written about the so-called Collins impedance-matching network for tuning an antenna of any length, height or kind to any desired frequency. Despite all that has been said, it is not uncommon to hear stations on the air saying they have tried "everything" and still cannot make it work according to Hoyle. This has been found to be particularly true on the 1500-kilocycle band where antennas usually are proportionately shorter and the amount of inductance necessary is larger. Most users of the *pi* network have followed the design suggested by Mr. Arthur Collins which calls for an inductance of thirty turns of No. 12 wire, wound on a 2½-inch form with the turns spaced so the winding spreads out over about five inches for a single-wire feeder system; and in cases where two feeders are employed, coils of fifteen turns wound on the same size form and spaced proportionally about the same distance. Coils of these dimensions are all right for the higher-frequency bands, but we found that the coil sizes, particularly the single coil for single-wire feeder systems that couple to a reasonably short antenna, are *too small for operation in the 1500-kilocycle channel!* At our location we are handicapped for antenna space, and as we wanted to shift from 7000-kilocycle c.w. to 3500- and 1500-kilocycle phone, the *pi* network system was used. We could not make it "tune," so immediately decided there was something wrong and started a series of tests.

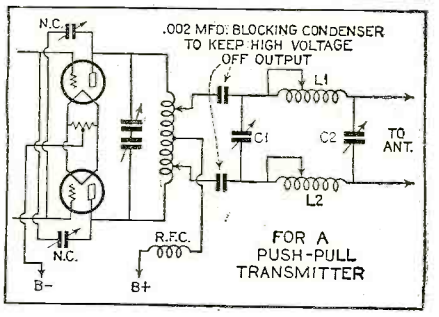
Reasoning that the coil dimensions were too small for 1500-kc. operation, we constructed one of larger dimensions. The result was one 3-inches in diameter with forty-five turns of No. 14 wire spaced the diameter of the wire between turns. With such an arrangement it was possible to obtain good output and efficiency with an indoor wire 38 feet long. Using a pair of 46 type tubes in parallel in the final amplifier of a 1500-kc. phone rig, reliable local communication was effected and several stations within a hundred-mile radius were worked. The reports locally were all R9 and the lowest received during the two days of operation with the short antenna was R6. All were QSA4 to 5. The same results were obtained with a two-wire feeder system. Here, too, it was found the given coil dimensions were too small for operation on the lower-frequency amateur bands, and it was necessary to wind larger coils. The dimensions of these coils were half the number of turns as the single coil arrangement and the same diameter.

Another thing we found during our *pi* network tests was that for transmitters using 46's, 210's, 830's or other similar power tubes, the variable condensers should have a capacity maximum of not less than 360 micromicrofarads, and when using tubes in this category with a single coil and ground arrangement, the network tap may be taken directly from the plate or "hot" end of the final tank circuit. For those who are unfamiliar with the method of tuning the *pi* network (referring to the accompanying diagrams), the procedure follows: After the Class C amplifier has been properly neutralized, the tank circuit should be tuned to direct resonance *with the network disconnected!* After this step, these two condensers (or tuned circuits) should *not* be touched again during the tuning of the network. The next step is to set the condenser C2 at about midscale and connect the network to the transmitter. Then apply the power to the amplifier and tune C1 until a *decided* resonance dip is obtained in the plate current of the Class C amplifier. This means that C1 apparently is tuning the tank circuit, but also it indicates that the network is functioning correctly. If the plate current is too high or too low, then C2 should be increased or decreased and C1 *readjusted* to get the the dip in plate current again. These two operations should be continued until the desired condition is obtained. It will be found that it is possible to obtain an adjustment of the two condensers that will give the correct load for the tube used in the final stage or for matching the impedance in phone work. It also may be found that more or less inductance is needed to obtain the resonant "dip." Experimentation will reveal this, and if the

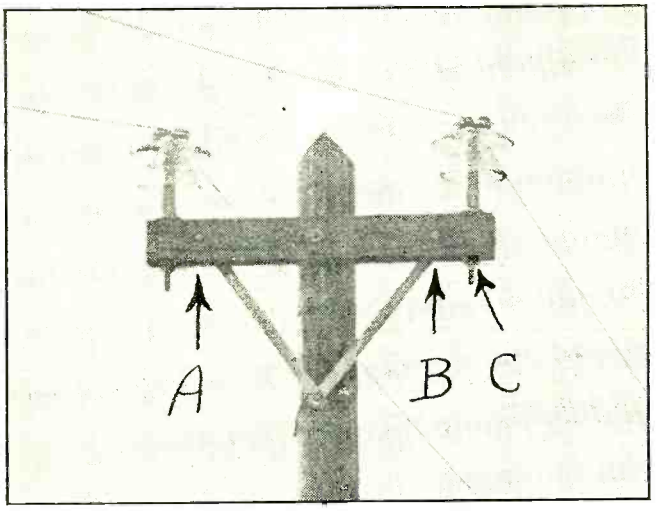
(*Continued on page 263*)







MATCHING IMPEDANCES IN ANTENNA AND FEEDER DESIGN



THE WRONG WAY

Figure 4. The braces short-circuit the cross-arm between A and B, leaving but the resistance of the wood between B and C and that at the other end as the total cross-arm insulation

Continuing his discussion from last month, the author explains the procedure of tuning the transmitter and adjusting the coupling at both ends of the transmission line

Verne V. Gunsolley

Part Two

LAST month the general principles of transmission lines were discussed and it was shown how the line will transmit its power efficiently when it works out of and into its characteristic impedance. Then equations were derived for the calculation of the characteristic impedance when the size of wire and the spacings are given. Having found the impedance of the line, if it is terminated at both ends with impedances of unity power factor and equal to 600 ohms, it will behave as if infinitely long. That is, waves sent along it will not be reflected but will continue as if to infinity. Since there can be no reflection, there will be no standing waves, as is the case with a tuned feeder. The transmission may be effected throughout hundreds of feet or only a few feet, and the impedance is the same. This idea is a little puzzling at first thought. and may tend to confuse first principles for one not in the habit of dealing with surge impedance problems.

Another characteristic of the surge impedance which is a little puzzling is the fact that it behaves as a pure resistance; that is, with unity power factor. Examination of the formula for the characteristic impedance shows it to be independent of frequency. Therefore at all points along the line the phase angle is zero, and in order to match an impedance whose phase angle is zero, it is necessary to use another impedance of equal argument and modulus; that is, of zero phase angle. Since this is true only of a pure resistance, or of a resonant circuit (in which the impedance is equal to the resistance, due to the net reactance being zero), we may terminate the transmission line only in a resonant circuit or a pure resistance, if we are to match the line impedance. Proper terminations are shown in Figure 6.

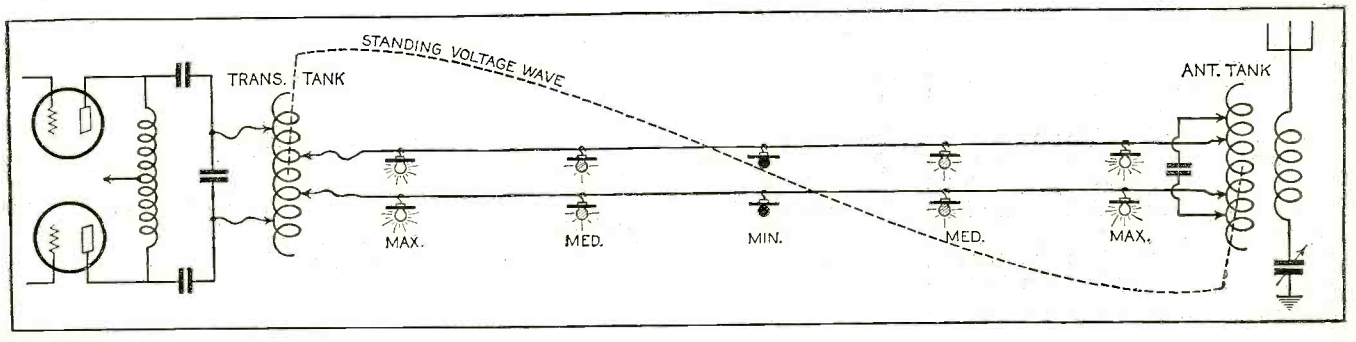
The characteristic of a tuned circuit is that the power factor is unity, and the phase angle is zero. Thus no matter where the inductance is tapped, the current drawn therefrom is in phase with the voltage. The impedance between the taps is a pure resistance, therefore, and proportional to the square of the reactance betwen the taps. (See Morecroft's "Principles of Radio Communication," page 84, page 587). Thus the sending end impedance may be matched to the line by varying the number of turns included between the taps until there are no standing waves upon the line. This will be more convenient if a known radio-frequency resistance unit of 600 ohms is first connected across the receiving end. The sending end taps are then adjusted until the meters on the transmitter tank, plates and lines are proper for the power being used. When the sending-impedance is matched, it will be possible to take a neon lamp and explore the length of the line and find equal voltage all along. If the lamp is brighter at some points a half-wavelength apart, then the impedance is not matched. If no amount of adjustment of taps gives uniform voltage, no reflection, then there has been an error in determining the impedance of the line, and the resistance at the far end should be altered to equal the line impedance as found upon closer calculation.

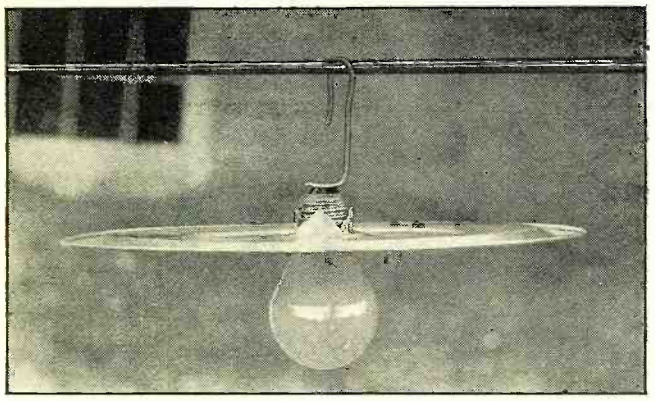
When the line is perfectly matched, the resistance used as a load behaves exactly like an antenna, as far as the transmitter is concerned, and it must be capable of absorbing the power that would ordinarily go into the antenna.

Since the impedance of the antenna is only a few ohms, the line must be coupled to the antenna by a transformer, the turns ratio of which is equal to the square root of the ratio of the impedances. Thus if the antenna has a resistance of 43.5 ohms, it will be found that the autotransformer formed by the antenna inductance has the turns ratio of 3.71 to 1. However, it is not necessary to know the antenna resistance. Once the line has been matched at the sending end, it is only necessary to note meter readings, replace the resistance with a tank circuit, and adjust the taps on the antenna inductance after the same principles as used on the sending end until the meter readings are restored and the line is again free of

SCHEMATIC OF FEEDER AND TERMINATIONS

Figure 6. This is one way the output circuit might be arranged. When lamps burn brighter at the loops and darker at the node, a standing wave is present indicating an unmatched line. For proper matching all lamps should burn equally bright





THE INDICATING LAMP

Figure 5. The body capacity of the reflector causes sufficient charging current to light the lamp. (See Figures 3 and 8)

standing waves. (See Figure 6.) If now the turns ratio is observed, a very good idea of the antennna resistance may be obtained by making use of the foregoing relations between turns ratio and impedance.

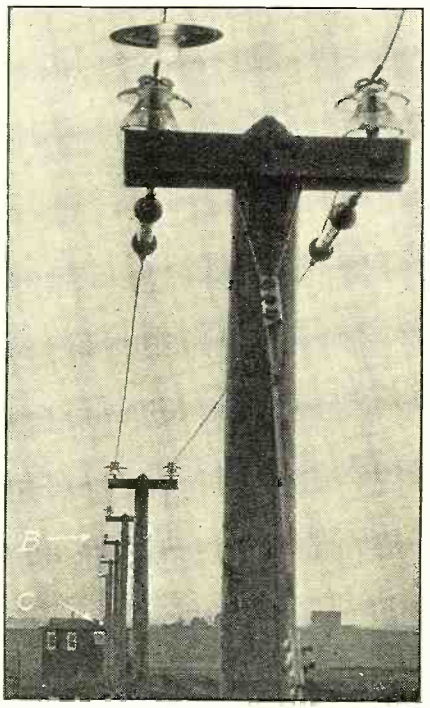
Figure 6 shows the conventional type of transmitter, line and antenna coupling. To match the impedance of this characteristic layout, first determine the line impedance by accurate calculations according to the instructions given elsewhere in this article. Next disconnect the line taps from the transmitter tank coil and substitute a non-reactive resistor of exactly the same resistance as that of the calculated line, remembering to make the resistor of sufficient thermal capacity to absorb the entire power of the transmitter without seriously changing value. Proceed to tune the power amplifier in the regular manner and adjust the taps from the resistor so that an ammeter in series shows a maximum power input for the plate currents recommended in the ratings. Having completed this operation, remove the resistor and replace the line taps in its place. Next take the resistor to the far end of the line, remove the antenna tank taps and connect them to the resistor. When the resistor has again come up to temperature, the lamps should burn equally bright if the impedance of the line and resistor are equal. If the lights indicate a mismatch, vary the resistance slightly until the match is as uniform as can be made. Then go back to the transmitter and repeat the matching operation with the new value of resistance, after which again try the matching at the far end of the line, each time allowing the resistor to reach its final temperature. When, by this cut-and-try method, the resistor has a resistance equal to the line resistance, and the line and transmitter are matched, connect the line taps to the antenna tank coil and tune the tank circuit in the usual manner.

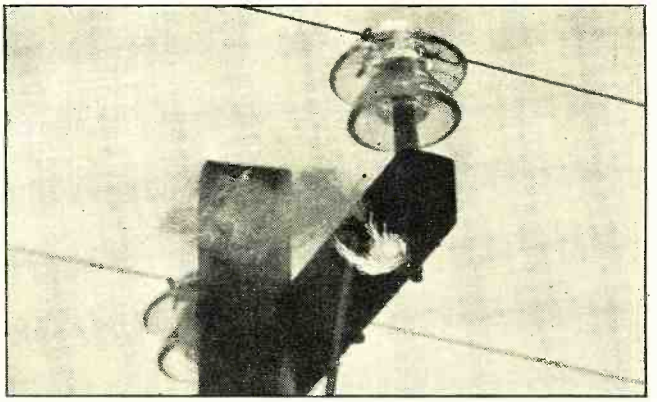
Elsewhere in this article we show how to compute the resistance between line taps presented by the antenna tank inductance, and we saw that it was of the nature L/CR. Thus increasing the amount of L between taps by increasing the number of turns between taps increases the resistance offered to the line. On the other hand, increasing the series resistance R decreases the impedance between taps and permits more current to flow along the transmission line into the tank. Antenna resistance is reflected into the tank coil in series, consequently, by increasing the coupling and thus the resistance in series, R, the value L/CR is less and the tank circuit offers less impedance to the line. Thus to increase the antenna coupling is to decrease the tank impedance, while to increase the L between taps is to increase the tank impedance offered to the line.

The object desired is to tune both tank and antenna; to obtain maximum power transfer from tank to antenna; and to match the tank to the line. Since the tuning adjustments of tank and antenna are interlocking, each different coupling requires retuning. However, with these principles in mind and a knowledge of their effects, the antenna coupling and tuning may be adjusted for maximum power. When, after a little patience, the adjustments are closely correct, the final impedance-matching may be accomplished by simply varying the antenna coupling and watching the lamps for equal brilliance. If, with a final check on the tuning the lamps still remain uniformly bright, the job is complete.

LOOKING ALONG THE LINE

Figure 8. Another angle of the line. Voltage loops are shown by the brightness of the lights at A and C, which are one-half wavelength apart. The voltage node is indicated by dimness of the light as at B





FIREWORKS

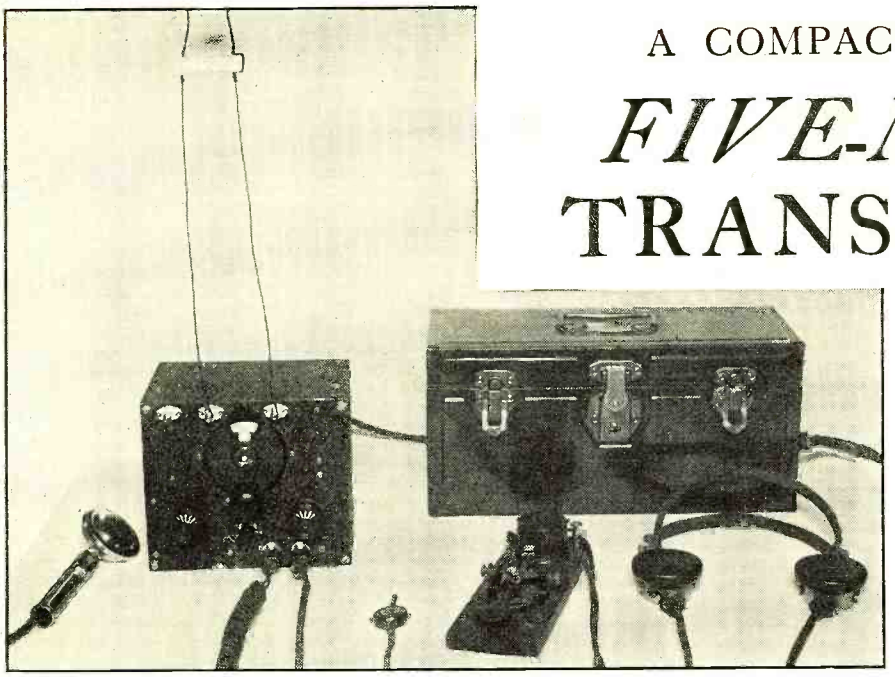
Figure 7. The insulator cracked, allowing arc-over to the pin. The pin then arced over to the brace. The top of the insulator was brilliant as the sun, while the cross-arm burned as if the pin were red hot

In matching the impedance on lines employing great power, as in the case of large transmitters of 10 kw. or more, it must be realized that since the reflected waves are additive, enormous voltages will be built up at points every half-wavelength along the line (see Figure 3 in the September issue). If the insulation happens to be a little inadequate or the line improperly constructed, destruction to insulators may be the result if much power is used before the line is fairly well matched. Figure 7 gives a very good illustration of this point.

Figure 4 shows how not to construct a transmission line. The pins within the insulators were steel. The cross-arm braces were steel and came within about two inches of the pins at either end of the braces. This left the net cross-arm insulation at about four inches between wires, throwing considerable additional unnecessary stress on the pyrex insulators. The capacity coupling was also greatly increased at these points, causing not only greater strain on the insulator but tending to upset the calculations of line impedance.

The same thing as illustrated in Figure 7 was going on down the line at each half-wavelength, but in less degree, since there was attenuation of power in the first fault shown here. The line was very talkative in the early frosty morning, the whole transmission line setting up a clamor of at least 70 db. to the tune of "Do What You Do." By noon the line had been reconstructed more in accordance with first principles shown in Figure 8, and this time the power limited until the impedances were more nearly matched. No further trouble was experienced.

In order to avoid the loss of time involved in using the neon lamp, 5-watt, 110-volt mazdas may be fixed up as shown in Figure 5. The hook forms one terminal (*Continued on page* 259)



THE COMPLETE OUTFIT

At the left is the transceiver and at the right the battery box. The microphone is in the left foreground and the i.c.w. buzzer with key in the center

A COMPACT AMATEUR *FIVE-METER* TRANSCEIVER

This combination transmitter and receiver has provided excellent results as described on pages 154-155 last month. Now that 5-meter mobile operation is permitted, units such as this will be increasingly in demand

Ed. Glaser*

THE neat and compact transceiver about to be described was built by Dick Depew, owner of W2SB, Garden City, L. I., and a "ham" of 25 years standing. The little outfit is well known among the Long Island 5-meter gang, having been used in many airplane and automobile tests, two of which were described in the last issue of RADIO NEWS. The transceiver is 7 inches wide, 6 inches high and 5 inches deep. Plug-in coils are used so that both 5- and 10-meter operation is possible. Although voice is most often used, buzzer (i.c.w.) operation is available, which increases the range materially. The advantage of i.c.w. is very apparent when receiving in a noisy location such as in a moving car or airplane where a weak voice seems to be modulated by the noise, making reception difficult and sometimes impossible.

One of the photographs shows the whole set-up, including the transceiver, tool-chest battery box, phones, mike and i.c.w. buzzer and key. The transceiver box is so designed that, by removing a few screws, any side may be taken off and when the four front-panel screws are removed, the whole "works" slides out. The two other views show the arrangement of parts, most of which are easily recognized. It is not necessary to copy the layout 100%, changes and improvements undoubtedly being possible without sacrificing performance.

Let us start with the wiring diagram, Figure 1. A type –30 tube is used as oscillator-superregenerator, only a change in grid leak resistance being necessary when switching from transmitting to receiving position. Provision is made for two types of antenna coupling. A type –33 tube is used as modulator-amplifier, three circuits being switched for the changeover. Thus when the switch is thrown to the "Send" position it cuts in the mike, cuts out the phones and switches the oscillator from grid to plate for Heising modulation. There is nothing difficult in wiring the audio end, but a great deal of care is advised in wiring the oscillator. The coils, you will note, are plugged into a small sub-panel and well spaced from any large metal parts. The latter is particularly important. Similarly, the leads to the tuning condenser, C3, should be well spaced from metal and should run direct to L1 and L2. C5 is tapped two turns from the "cold" side (near C4) of L2.

When wiring, all grounds should be brought to one point, then from this point to the panel. Isolantite, or equal insulation, is advised wherever possible. Under no condition use wood. Bakelite is none too good. The power is so low that every effort must be made to avoid losses.

The details of the battery box are left to the ingenuity of the builder. The tool box used at W2SB has been found very convenient. A four-prong socket, mounted on one end, provides the external connections through the medium of a cable and plug. At home, for fixed service, a B eliminator and a storage battery are used for power.

Assuming the wiring job to be completed and all ready for the crucial moment, connect the A battery first. The tubes should glow dimly. Throw switch to the "Receive" position and connect B battery. There should be a loud rushing sound if the detector is properly superregenerating. For a preliminary receiving check, attach any antenna (the higher, the better) to A1. If no 5-meter stations are heard, start up the old "Flivver." Most cars are quite good 5- and 10-meter transmitters, their ignition systems being audible for several hundred feet. If a regular amateur, low-frequency transmitter is available, turn on the oscillator and tune for its harmonics. As a carrier is tuned in, the

TABLE I

VOLTS	POWER INPUT	"C" BIAS
90	.5 W.	7.5
135	1 W.	13.5
157	1.5 W.	18
180	2 W.	22.5

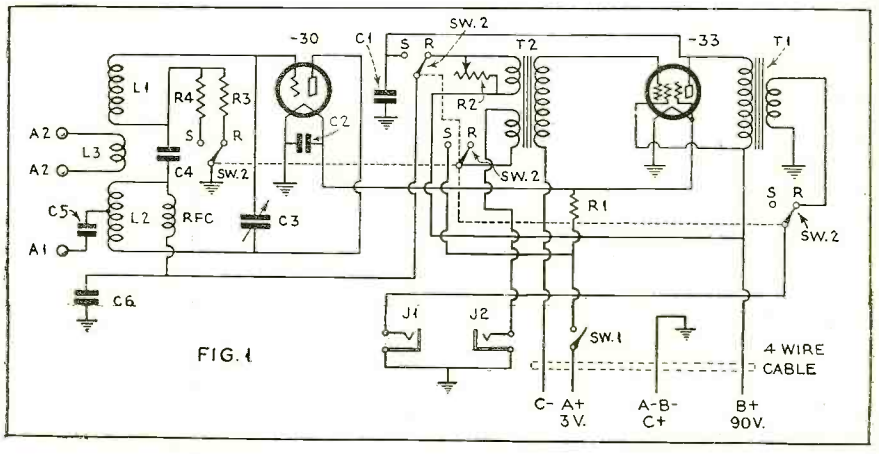
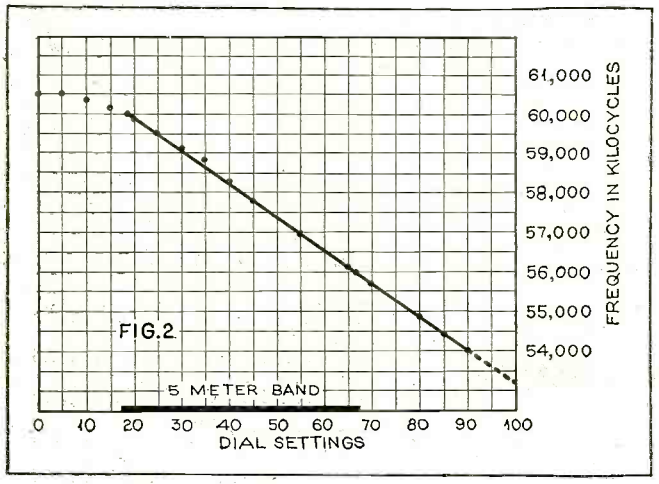
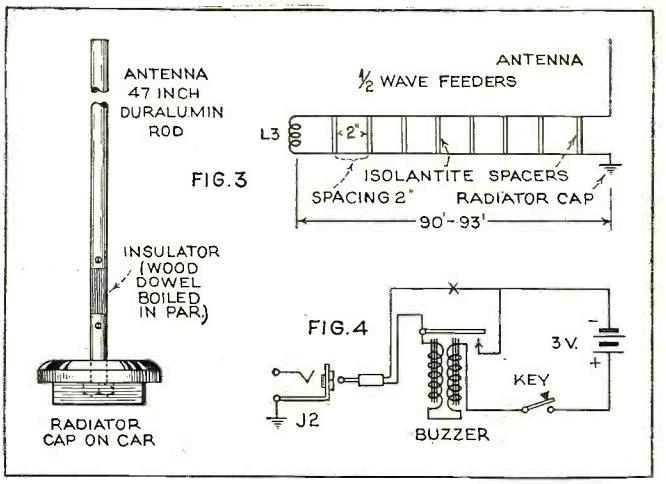


FIG. 1

* Owner, amateur radio station W2BRB.





THE TUNING CHART, ANTENNA SYSTEM AND THE I. C. W. BUZZER CIRCUIT

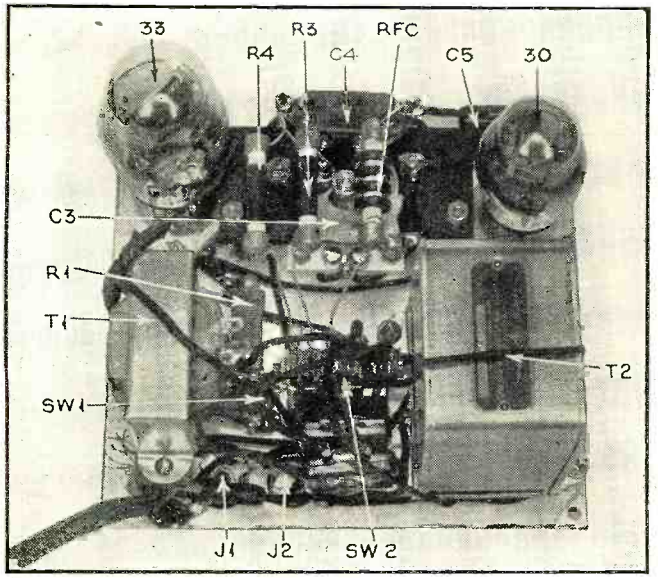
Figure 2 shows frequency plotted against dial setting. Figure 3. The details of 5-meter antenna for use on a car are given here. The feeder is brought in through the open windshield or window. Figure 4. For buzzer modulation of transmitter, the buzzer unit is plugged in the microphone jack. A condenser or resistor at X is recommended for reasons discussed in the text

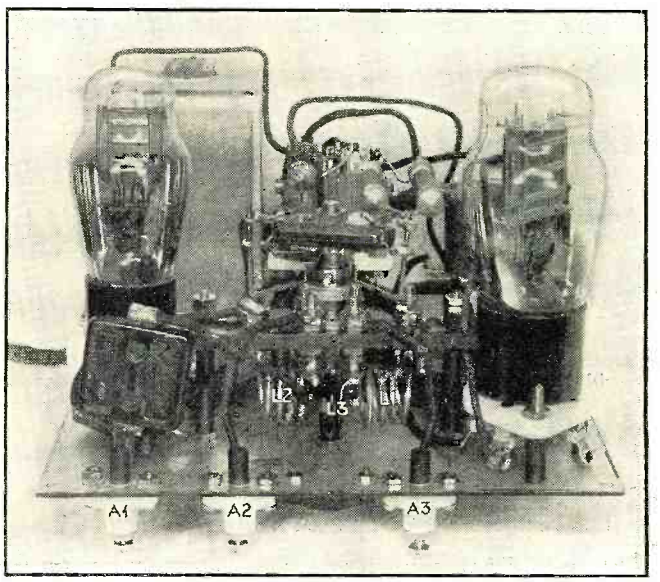
characteristic superregenerative hiss diminishes. This deadening of the hiss is caused by a strong carrier much the same as a.v.c. action in a broadcast receiver, the modulation riding through beautifully under this condition. If the signals are weak, however, the rush is not entirely eliminated and reception is more difficult, especially on voice.

Now to check the "Send" position—which is not quite so easy. A friend with a 5-meter receiver is really necessary. One thing that can be done, however, is to use 150 volts or so on the plates (correcting the C bias accordingly—see Table 1) so that there will be enough r.f. power to light a 6-volt dial lamp connected across the two A2 posts. (It might be advisable to use three or four turns soldered directly to the lamp, substituting this coil for L3.) When the mike is spoken into, the lamp should brighten, this indicating that the modulation system is probably o.k., although the only real test is to listen to it! A 100-ma. antenna meter could of course be used instead of a lamp. With a high B voltage there is occasionally set up a type of parasitic oscillation which sounds like hasp in a receiver. There is no main carrier, but, instead, a thousand weak ones. Changing one or more of the following will effect a cure: Lower B voltage, lower grid leak (R4), change detector tube, antenna coupling, C4 or number of turns in L2.

With the transceiver working in both positions, the next step is to obtain a frequency calibration. Figure 2 is the calibration curve for the model described here. Some hams are lucky enough to have commercial "marker" stations within range, but the rest of us will have to employ one of the usual calibrating means. If you know some amateur you can trust, accept his calibration by simply noting the edges of the band (56 and 60 mc.) and obtaining enough points in between to draw a suitable curve. Or you may set your main transmitter to various frequencies the harmonics of which bound or lie within the 5-meter band. It is too easy to get mixed up with the wrong harmonic, however, so some additional help is necessary. A simple coil-and-condenser wavemeter held near the receiver will stop superregeneration when resonant. It is only necessary to calibrate one point on the wavemeter. Then the previous method of harmonics can be relied upon to do a good job.

Having the calibration, we are ready to go on the air and contribute our share to the QRM. Hi! But first a few words regarding antennas. *In all ultra-high-frequency work, height is the one important factor, all others, even power and type of antenna, being of secondary importance where distance is the main consideration.* With one of these transceivers on a mountaintop, it might be possible to work a hundred miles! On the other hand, the car-to-car radius is probably between one-half and three miles. A vertical half-wave radiator or some directional system composed of half-wave elements will be most suitable for the home installation. Either a half-wave or quarter-wave vertical mast should be used on the car. Figure 3 shows the car antenna used by Dick Depew for this transceiver. A "Zepp" type feeder spaced 2 inches and a little less than a half wavelength long (to allow for L3) feeds a quarter-wave mast and ground (the radiator cap). The length of both line and antenna are critical and for best performance (*Continued on page* 249)





A NEW DAY IN FRENCH *BROADCASTING*

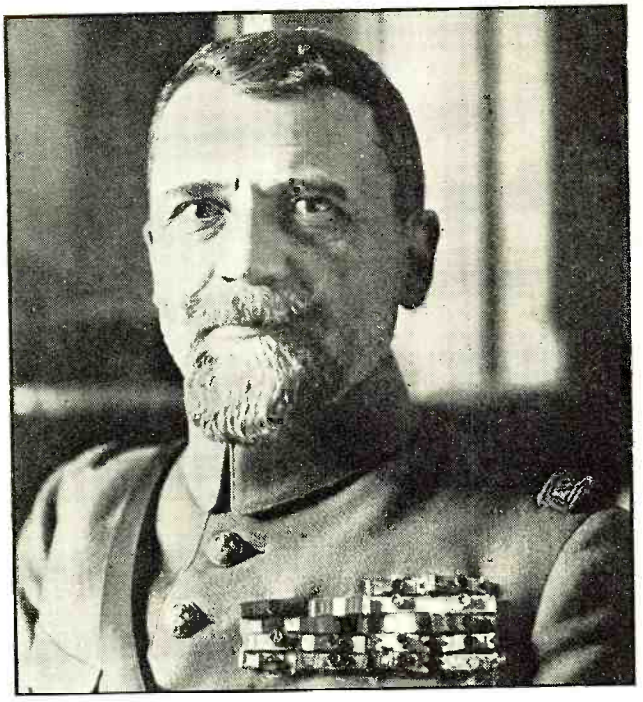
A new broadcast scheme for France—holding out promise of a co-ordinated and effective system, when the high-power stations now under construction are completed

Kurt Lang

IN 1933, French Broadcasting, which until then had been held of little importance, received legal and technical attention which promise a more brilliant future. In July 1933, a law was passed which imposed a tax of 50 francs on every radio set in use. Consequently the Postmaster General, who has the direction of broadcasting, was enabled to initiate an extensive plan for its development. This plan is now being executed and is based on the scheme of General Ferrié, who was among the first to envision the importance of radio during the World War. He is considered as the father of the Eiffel Tower radio station and his statue was erected, last year, in the Champ de Mars, at the foot of the Tower.

This scheme of General Ferrié involves the construction of eight 60-150 kw. broadcasting stations in France. The Paris (PTT), Lyon, Marseille, Bordeaux, Rennes and Toulouse stations are now in course of construction and will be finished early in 1935. Construction work on the Lille and Nice stations will soon be started. Thus, France will, within a short time, have a broadcasting system in keeping with its national importance. The new stations will each bear the name of the nearest important town and also of the place where the masts will be erected, for example "Lille-Camphin".

In 1933, the state bought "Radio-Paris." A committee has been formed to see that the two official Parisian Stations, "Radio-Paris" and "Paris-PTT" broadcast very different programs. At the same time, "Federal Emissions" have been inaugurated which give the daily news and the important musical events, the latter being relayed from Bayreuth, Vienna, Milan and Salzburg. Owing to that fact, French listeners have been able to enjoy a wide variety of broadcast concerts, and operas. Many provincial stations have specialized in their program material. Grenoble, for instance, is the French station for sports. In their programs they feature mountaineering, skiing, motoring and cycling races on the Alpine roads. Rennes deals with naval topics and fishing. Let us add that the former uniformity and dull monotony of French broadcasting emissions are said to be things of the past and that the quality of the emissions (*Cont'd on page* 245)

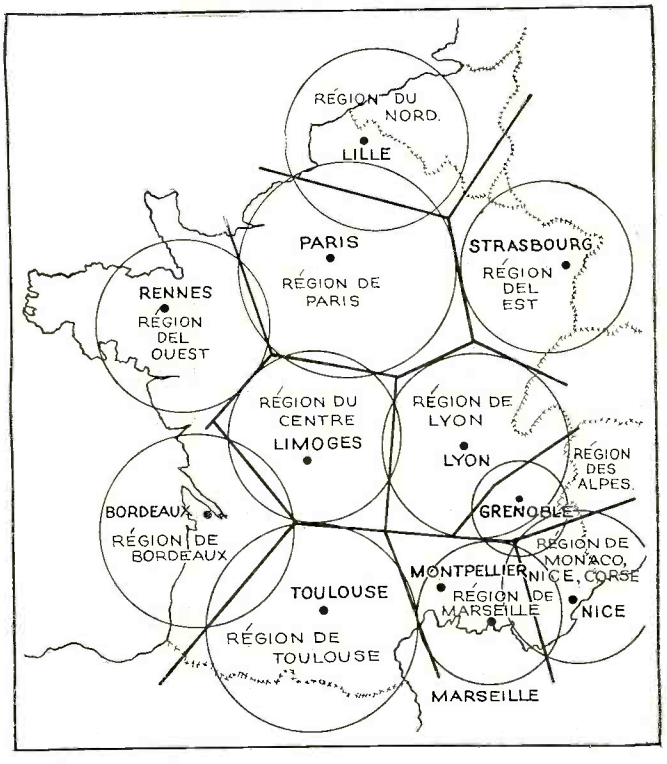


GENERAL FERRIÉ

Le General is credited with being the "Father of Broadcasting" in France and has been instrumental in the development of the new national system

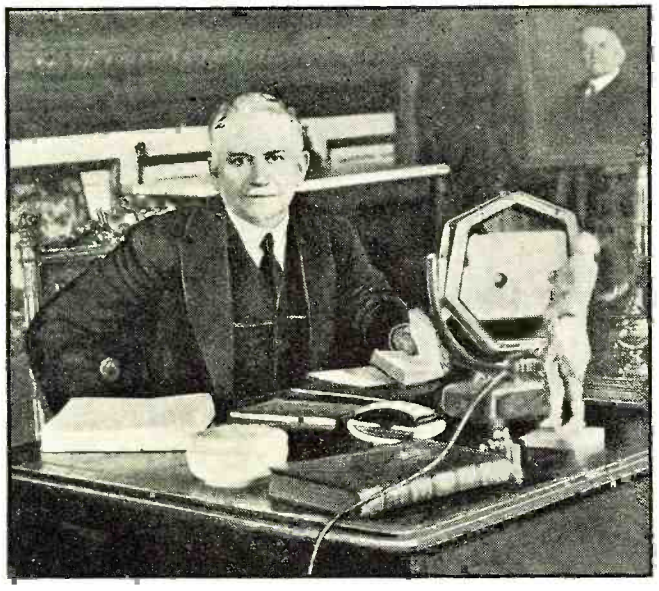
THE NEW BROADCAST SYSTEM

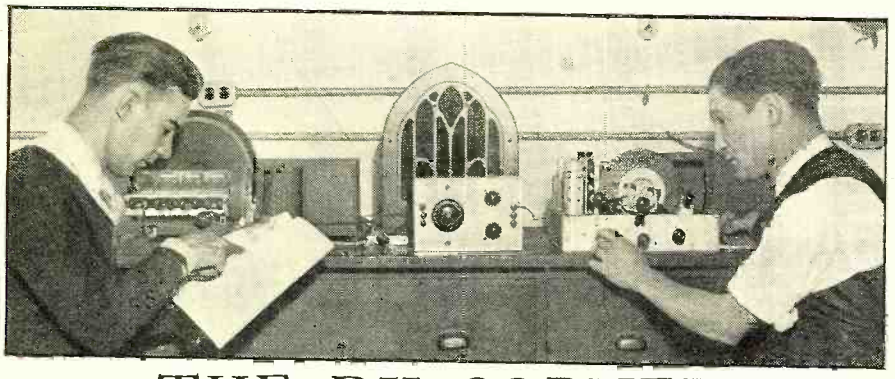
The group of stations now under construction will provide complete coverage in France



PRESIDENT DOUMERGUE

Like President Roosevelt, the French President finds radio important for establishing direct contact with the public





THE DX CORNER

FOR BROADCAST WAVES

Invitation to All Readers

The time has arrived when it seems appropriate to start making appointments of Official RADIO NEWS Listening Post Observers for the Broadcast Band. Invitations have been extended to readers to apply for such appointments in several issues during the past few months, but quite a number of the applications received did not carry sufficient evidence of qualifications to be acceptable at this time. For this reason only four actual appointments have been made thus far. Others who have applied need not give up hope, as all applications received to date are still under consideration—and new applications will be welcome from those who have not yet applied. If you have applied, continue sending in reports of reception, etc., to this department, as these reports will provide more definite and complete evidence of your qualifications. If you have not applied heretofore, send along your application together with reports of reception, your DX record to date, or any other information which, if published in this department, would be helpful and interesting to other listeners, or which will help the editors to form a more definite idea as to your qualifications for an appointment.

There is no fixed limit as to the number of appointments which will eventually be made. Many individual states are large enough to permit several appointments. Likewise with foreign countries. In view of the widely divergent conditions which may exist at two or more points in the same locality, there is nothing to prevent appointments of Official Listening Post Observers separated by only a few miles. For this reason readers who seek appointments need not hesitate, even in cases where someone nearby has already been appointed.

So come through with your application, you fellows who have rolled up enviable DX logs. Send your applications in to the Broadcast Band DX Editor.

Listening Post Appointments

THE following have received their appointments as Official RADIO NEWS Listening Post Observers for the Broadcast Band.

Additional appointments will be announced monthly as other applicants qualify:

C. H. Long, Winston, Missouri
J. H. Woodhead, Monarch, Wyoming
John C. Kalmbach, Jr., Buffalo, New York
F. L. Biss, Brittmount, Minnesota

DX Receiver Design

In spite of the tremendously large number of present-day DX listeners, relatively few receiver designs especially for this type of service have been published. It is true that many present-day commercial receivers are highly sensitive, nevertheless contacts with numerous DX fans seemed to indicate that many would be interested in constructing (or in having constructed for them) receivers which are designed to provide the utmost in sensitivity, selectivity, etc.

RADIO NEWS' laboratory is giving thought to this problem at this time and it is believed that within the next few months complete constructional descriptions on two or three receivers of this type will be presented to our readers. One of these receivers which is now being constructed in the experimental stage will employ five tubes in a simple superheterodyne circuit which will be unique in that by throwing a switch to one side, the receiver becomes a high-fidelity job of moderate sensitivity and moderate selectivity, excellently suited for high-quality reception of local stations. When the switch is thrown to the other side, sensitivity will be tremendously increased and the selectivity will be increased to the point of side-band cutting, thus providing an excellent outfit for DX work.

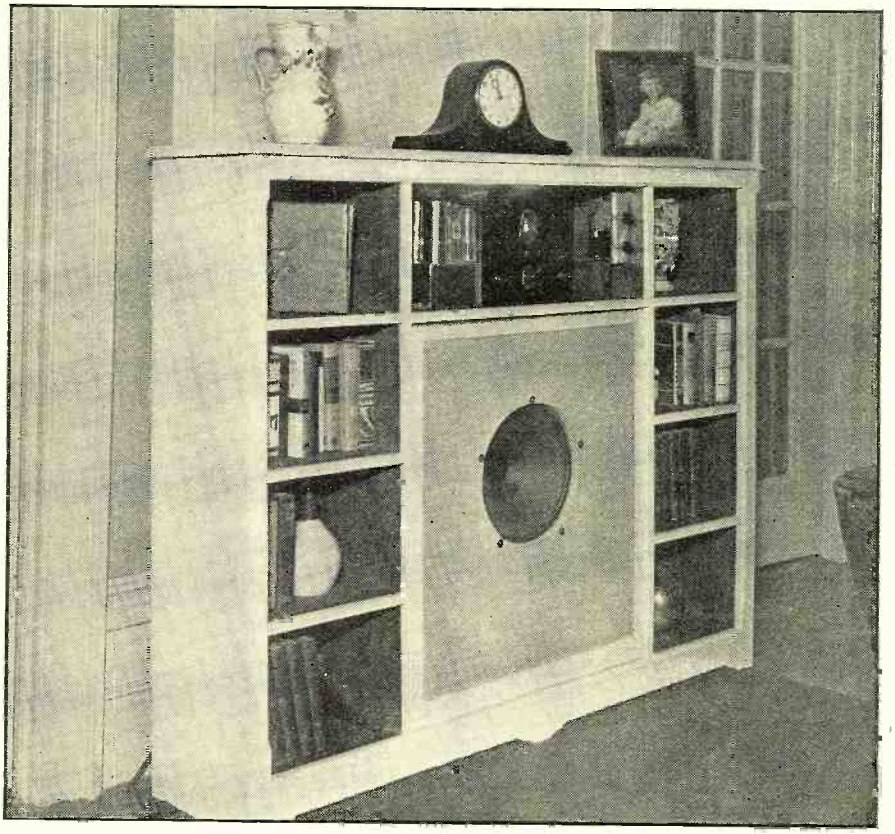
Another receiver which is being tentatively planned will probably include ten tubes. Little can be said about this now because it is not considered advisable to event hint at the novelties to be incorporated until they have been definitely tried out and have proven successful. This receiver will be a radical change over existing models and will provide, if plans carry out as anticipated, a degree of sensitivity and selectivity heretofore unheard of except perhaps in a few commercial relay and code installations.

It is felt that many readers will be interested in knowing of the above circumstances and will look forward with interest to these developments.

Attractive DX Installation

The installation pictured here shows one of the receivers employed at the New York City Official Listening Post. It shows an excellent example of how a little ingenuity may be applied in adapting a radio set to its surroundings. The receiver employed is a Scott twelve-tube model, nine of these tubes being included in the tuner chassis and the other three in the power pack, which is a separate unit.

The bookcase in which the equipment is mounted was especially designed and constructed for the purpose, allowing space for a large celotex baffle. The receiver itself, mounted in the upper compartment, rests on thick sponge-rubber kneeling pads, such as are obtainable in any 5- and 10-cent store. This provides mechanical insulation so that even when the loudspeaker is operating at full blast, little if any vibration is transferred to the tuner. The Jensen auditorium type speaker is mounted on a stand on the base of the baffle assembly. This is necessary because this speaker weighs approximately 40 pounds and therefore cannot be safely supported on the baffle itself. This stand



is made high enough to allow space underneath for the power pack.

In this particular installation, where it was necessary to stand the bookcase with its back within about 5 inches of the wall, special precautions were necessary if bad cavity resonances were to be avoided. Experiments were conducted to determine just how much doctoring was required. First a mat of hair-felt about 4 feet square was suspended between the rear of the loudspeaker compartment and the wall. Then the entire loudspeaker compartment was lined with acousti-celotex. This deadened the installation too much and about the right conditions were obtained by removing the large hair-felt pad.

The eight compartments for books are provided with backs, but the compartments in which the receiver and loudspeaker are housed are left open at the rear. The loudspeaker and baffle assembly is solidly constructed so that access can be obtained to either the speaker or power pack by sliding the whole assembly out of the bookcase from the front.

One advantage this type of cabinet has over the ordinary radio cabinet is that the books on the shelves help to increase the overall weight and thus aid in the elimination of undesirable resonance characteristics.

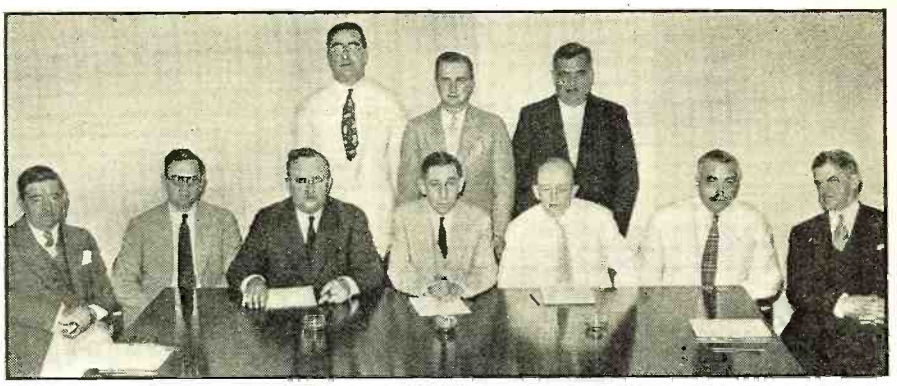
Detailed dimensions are not given here, as these will naturally vary with every different installation. Anyone desiring to make a similar layout can readily adapt this idea to his own requirements.

Undoubtedly many readers of this department have special installations. The editor will be glad to receive photographs and descriptive material on these so that good ideas can be passed along to other readers who may contemplate changing their present installations for new ones that are more sightly, acoustically better or more effective from the standpoint of reception.

Newest Canadian List

The following is the list of broadcasting stations of Canada, corrected to September 1st, 1934, as supplied by the Canadian Radio Broadcast Commission.

Freq.	Call	Location	Power
540	CJRM	Belleplaine, Sask.	1000
550	CFNB	Fredericton, N. B.	500
580	CKUA	Edmonton, Alta.	500
	CHRC	Quebec, Que.	100
	CKCL	Toronto, Ont.	100
600	CJOR	Sea Island, B. C.	500
	CFCO	Chatham, Ont.	100
	CFCF	Montreal, Que.	500
630	CKOV	Kelowna, B. C.	100
	CJGX	Yorkton, Sask.	500
	CFCY	Charlottetown P. E. I.	500
690	CJCJ	Calgary, Alta.	100
	CFRB	Twp. of King, Ont.	10000
730	CJCA	Oliver, Alta.	500
	CFPL	London, Ont.	100
	CKAC	St. Hyacinthe, Que.	5000
780	CHWK	Chilliwack, B. C.	100
840	CFQC	Saskatoon, Sask.	1000
	CRCT	Bowmanville, Ont.	5000
880	CFJC	Kamloops, B. C.	100
	CRCO	Hawthorne, Ont.	1000
890	CJIC	Sault Ste. Marie, Ont.	100D
910	CJAT	Trail, B. C.	250
	CRCM	La Prairie, Que.	5000
930	CFAC	Calgary, Alta.	100
	CKPR	Port Arthur, Ont.	50
	CFCH	North Bay, Ont.	100
	CKPC	Brantford, Ont.	100
	CFLC	Prescott, Ont.	100
	CHNS	Halifax, N. S.	500
950	CRCS	Chicoutimi, Que.	100
960	CKY	Winnipeg, Man.	15000
1010	CKCD	Vancouver, B. C.	100
	CKWX	Vancouver, B. C.	100
	CHWC	Pilot Butte, Sask.	500
	CKCK	Regina, Sask.	500
	CHML	Mount Hamilton, Ont.	50
	CKCO	Boom Island, Que.	100
	CKIC	Wolfville, N. S.	50
1030	CFCN	Strathmore, Alta.	10000
	CKLW	Sandwich South Twp., Essex County, Ont.	5000
1050	CRCK	Charlesbourg, Que.	1000
1100	CRCV	Lulu Island, B. C.	1000
1120	CKOC	Fruitland, Ont.	1000D 500N
	CHLP	Montreal, Que.	100
	CHSJ	Saint John, N. B.	100
1200	CHAB	Moose Jaw, Sask.	100
	CKTB	Port Dalhousie, Ont.	100
1210	CKBI	Prince Albert, Sask.	100
	CKMC	Cobalt, Ont.	50
	CKCH	Hull, Que.	100
	CHNC	New Carlisle, Que.	100
1230	CJOC	Lethbridge, Alta.	100
1240	CJCB	Sydney, N. S.	1000
1260	CFTP	Edmonton, Alta.	100
1310	CJKL	Kirkland Lake, Ont.	100
	CKCV	Quebec, Que.	50
	CJLS	Yarmouth, N. S.	100
	CHCK	Charlottetown, P. E. I.	50
1370	CKCW	Moncton, N. B.	100
1390	CJRC	Middlechurch, Man.	100
1410	CKFC	Vancouver, B. C.	50
	CKMO	Vancouver, B. C.	100
1420	CKGB	Timmins, Ont.	100
	CKNC	Toronto, Ont.	100
1450	CFCT	Victoria, B. C.	50
	VKX	Brandon, Man.	500
1500	CHGS	Summerside, P. E. I.	50
1510	CKCR	Waterloo, Ont.	100
	CFRC	Kingston, Ont.	100
6150	CJRO	Middlechurch, Man.	2000
11720	CJRX	Middlechurch, Man.	2000



FEDERAL COMMUNICATIONS COMMISSION

Seated, left to right, G. H. Payne, I. Stewart, T. H. Brown, E. O. Sykes, Chairman, P. A. Walker, N. S. Case and H. Gary. Standing, P. Spearman, General Counsel, H. L. Pettey, Secretary and Dr. C. B. Jolliffee, Chief Engineer

Antenna Tuner—Wave Trap

Edwin Hoover of Pittsburgh, Pa., sends in the circuit of an interesting arrangement he has for tuning the antenna. This circuit is shown in Figure 1. When the switch is thrown to the left, the variometer and variable condenser are connected in series between the antenna and the antenna binding post of the receiver and thus serve to tune the antenna for maximum efficiency. When he is troubled by interference from powerful locals, however, he can convert the antenna tuner into a wave trap by simply throwing the switch to the right. This shunts the variable condenser across the variometer and effectively eliminates the undesirable station when tuned to the frequency of that station. The variometer employed by Mr. Hoover is one of the old-time wood-block affairs. These are no longer generally available and for those who have difficulty in obtaining such a device, the modern counterpart will be found in a very compact bakelite-case variometer put out by General Radio.

Mr. Hoover also uses a home-made line filter to prevent noise from coming in over the a.c. lines. The details and connections of this filter are shown in Figure 2. A fil-

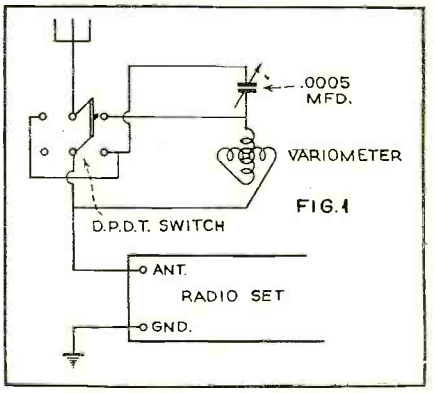


FIG. 1

ter of this kind is most effective if completely enclosed within a metal box; otherwise it is found in many cases that the noise is blocked by the filter but in turn

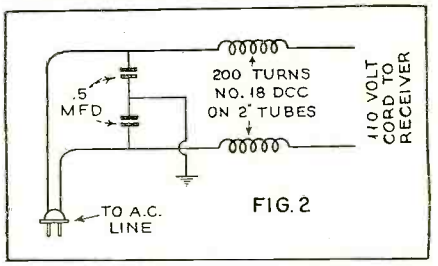


FIG. 2

is radiated from the chokes, with the result that it is picked up by the antenna and is heard in the receiver just as if no filter were present. The metal case should, of course, be grounded.

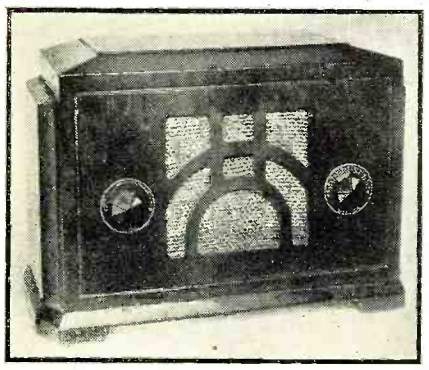
U. S. Station Changes

The following changes were authorized by the Federal Communications Commission (formerly the Federal Radio Commission) during the month of July.

Abbreviations employed are: Mod., modification; spec., special; CP construction permit; temp., temporary; ext., extension; LS, local sunset; exp., experimental; auth., authority; ltd., limited; unltd., unlimited; eqpt., equipment.

Call	Change
WNBX Springfield, Vt.	Granted license to increase power from 250 to 500 w. 1260 kc., daytime hours.
WATR Waterbury, Conn.	Granted license covering new station. 1190 kc. 100w. daytime.
KTBR Modesto, Cal.	Granted license covering new station, 740 kc. 250 w. daytime.
WTBO Cumberland, Md.	Granted freq. change from 1420 to 800 k.c and hours from Unltd. to Daytime.
WCAX Burlington, Vt.	Granted Mod. of Lic. to change specified hours from: Daily exc. Sunday 12 noon to 1:30 p.m.; Mon., Wed. & Fri. 6 to 9 p.m. To: Daily, exc. Sunday 12 noon to

(*Continued on page 252*)



HOW TO BUILD

A Unique

A. C.-D. C. MIDGET

The author presents complete constructional data on an a.c.-d.c. midget receiver which employs voltage doubling on a.c. line operation, permitting a greater power output

George Day

THE advantage of high voltages on the performance of vacuum tubes has always been recognized but with the advent of the midget universal a.c.-d.c. receivers the plate voltages available have been limited to a value approximating that of the voltage supplied by the line. Now, however, with the introduction of the 25Z5 voltage-doubler rectifier tube this type of receiver can be designed to operate at higher voltages when plugged into an a.c. line although it still has to fall back on low voltages when operated from the d.c. line.

The author has designed a 4-tube receiver to take advantage of the good features of this new rectifier tube. The receiver operates on 110 volts, either a.c. or d.c., line supply. By means of a switch the rectifier can be used either as a voltage doubler or as a regular half-wave rectifier. In one position of the switch the plate voltage is approximately equal to that of the line and it can be used this way on either a.c. or d.c. supply. With the switch in the other position and the receiver plugged into an a.c. line the voltage doubling feature is employed and a voltage approximately double that of the line is available.

As a result this compact receiver, as described in this article provides exceptional results in the way of sensitivity and volume on weak signals when using the voltage-doubler feature. When used on either a.c. or d.c. and the switch in its normal half-wave rectifier position the receiver functions in the manner of a high-grade universal set, comparable with the best of the "compacts" now available on the market.

The schematic circuit diagram is shown in Figure 1. From this it is seen that the tubes employed are right up to the minute. The 6C6 tube employed as the detector is probably the most sensitive detector available today while the type 78 tube employed in the single r.f. stage is not only capable of extremely high amplification but is of the super-control type and can therefore handle both large and small signals with minimum distortion. The type 43 tube employed in the audio-frequency amplifier stage is too well known to require discussion here. It provides a voltage step-up of between 50 and 75 and is capable of handling 2 watts without overloading.

The r.f. stage has a band selector coil, L1, in the grid circuit of the 78 tube. The resonant sections of this coil are tuned by means of the two sections of the three-gang variable air condenser, C; the coil L1 is designed to have a peak around 550 kc. The band-pass filter due to the combination of L1 and C afford a more uniform selectivity throughout the broadcast range.

The plate section of the r.f. stage comprises an interstage high-gain r.f. coil which feeds into the type 6C6 detector. This tube is self-biased by means of a 15,000-ohm resistor R3, shunted by a 10-mfd. tubular electrolytic condenser C4. All the suppressors are strapped to the corresponding cathodes at the sockets except in the case of the 43 power tube where the suppressor is internally connected to the cathode. A high grade mica condenser, C5, is used in the plate circuit of the detector to bypass the r.f. currents.

Neither the 78 tube nor the coils L1, L2 are shielded. However it is advisable to shield the detector tube. The structure of the screen grid of this tube necessitates this shielding.

The power stage is resistance-coupled to the preceding stage. The plate resistor of the 6C6 tube has been sectionalized for filtering purposes; the junction of R5 and R8 is connected to ground through a tubular paper condenser, C7. The grid resistor of the 43 tube R9, in conjunction with the coupling condenser C6, affords a maximum input to the power stage. The 43 tube is biased by means of resistor R7, shunted by a 25 mfd. tubular electrolytic condenser C8. The combination of the values selected gives a flat response to the audio-frequency reception, thus providing good quality and no undue cutting of the side bands.

A 0.006 mfd. tubular condenser is used to improve the quality of the speaker reproduction.

The 43 tube is capable of delivering 2 watts power output, with 135 volts impressed on its plate and screen and a negative grid bias of 20 volts. However, with the voltage doubling circuit in this receiver these voltages were measured as 172 for the plate and screen and 28 volts negative bias on the grid. With these values the tube is capable of giving probably 3 watts output or more if a 28-volt signal is impressed on its grid.

When high voltage is impressed on a type 43 tube, a violet glow is noticeable around the inside surface of the glass bulb. This glow changes with the intensity of the signal and may at times become quite brilliant. It has absolutely no effect on the operation of the receiver. In fact, tubes with this characteristic are particularly good as

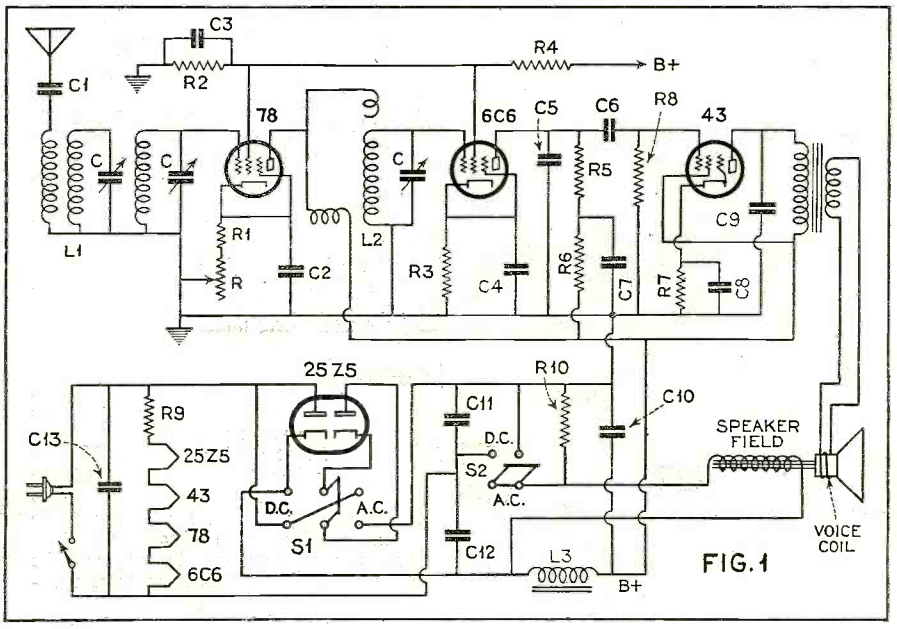


FIG. 1

regards gas content. In order not to confuse this glow with that caused by gaseous tubes, a sure test can be made by moving a magnet around near the tube. If the glow shifts as the magnet is moved the tube is a good one.

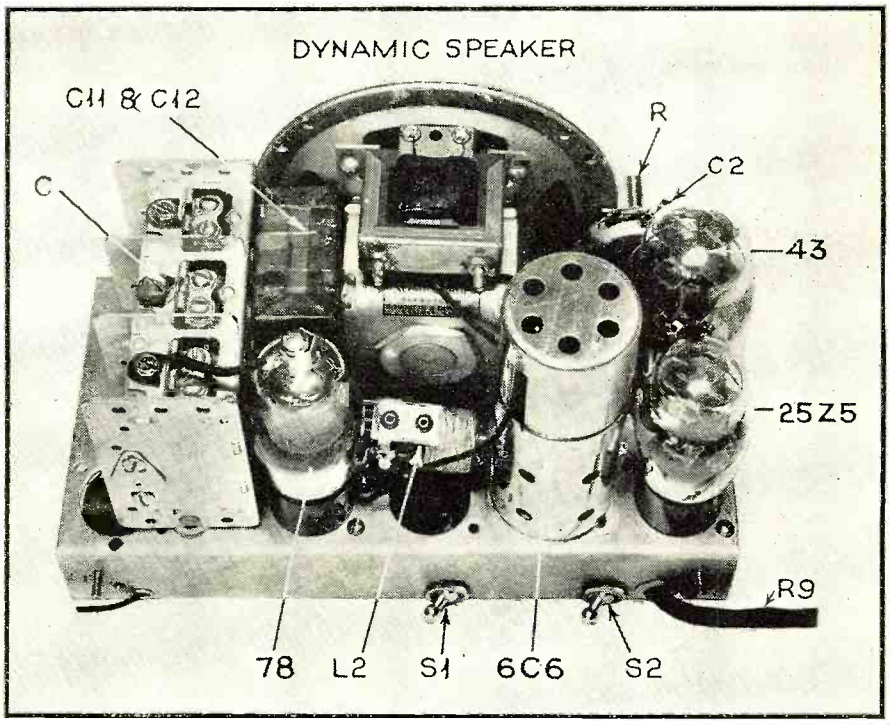
The volume is controlled by changing the bias of the 78 tube. The heaters of the four tubes are connected in series; the sequence of connections should be as shown as this arrangement was found to give a minimum amount of hum. The line voltage is reduced to the correct filament voltage value by means of R9.

The 25Z5 tube was originally designed for voltage doubling. However, the unfortunate experiences as to its low inverse voltage has discouraged many radio engineers from voltage-doubling circuits. Outside of this, the fact that voltage doubling circuits are only practical for a.c. lines was another drawback.

To overcome the first obstacle it is desirable that C11, C12 have a small power factor; i.e., less than 0.1 milliampere per microfarad. The excessive drain due to a poor power factor will tend to break down one of the cathodes of the 25Z5 tubes or perhaps both of them. This will render the 25Z5 unsuitable for voltage doubling circuits. If the dry electrolytic condensers have had a long shelf life, it is necessary that they be formed again.

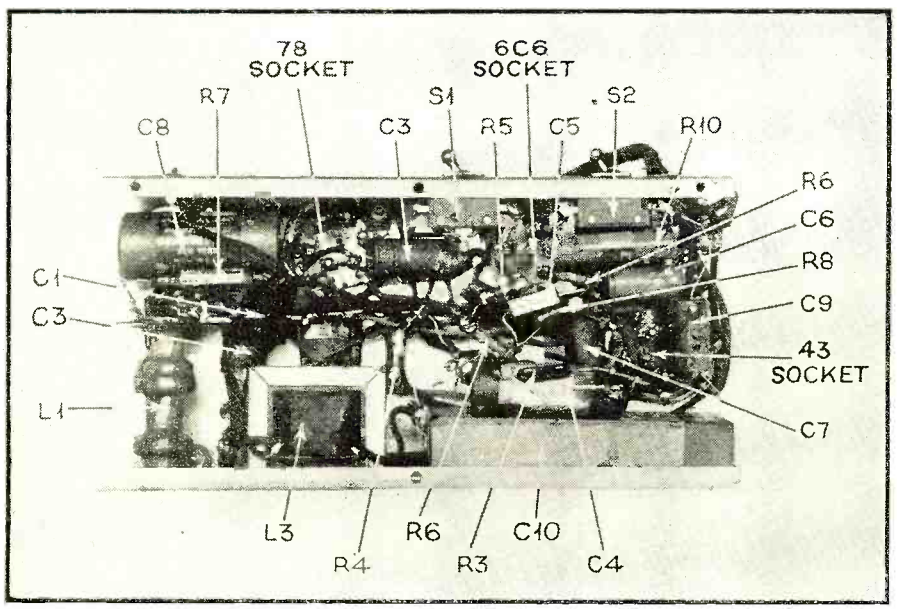
The second difficulty not present in Universal receivers, where a reversal of the plug would render the set operative on d.c. voltages, can be overcome by mechanical switching. In the schematic circuit it is seen that by utilization of tumbler switches S1 and S2 the circuit can be either a voltage doubler circuit or a Universal half-wave rectifier circuit. In the latter case the set will operate on direct current if the plug is inserted with proper line polarity on the two strapped plates of the 25Z5 tube.

It is very important that in changing from d.c. to a.c. light lines to turn off the line switch before setting tumbler switches S1 and S2 at the required position. Otherwise there will be a heavy drain through the 25Z5 tube which will damage the tube permanently. So, for the sake of safety, always set S1 and S2 at proper positions before turning on the power.



How sensitive this set is may be appreciated from the fact that with only 25 feet of aerial and no ground connection (S1 and S2 set on a.c. position) distant stations such as WTAM, Cleveland were heard with good volume in a location in New York. The receiver chassis is one of the smallest found on the market; its dimensions are 9 inches by 4½ inches by 1½ inches high.

To obtain a maximum output from this receiver, however, the author recommends the use of an outdoor aerial 60 ft. in length. With an aerial of this size the probable output of this receiver when operating on a.c. light lines is on the order of 3 watts. This latter value will answer the demand of any household.



Considering the results obtained and the low construction expenses, this receiver (in saving an additional stage due to the voltage doubling circuit) should prove to be an additional source of income to custom set builders.

Construction Data

Specifications for cutting and drilling the chassis are shown in Figure 2. Any equivalent layout chassis will answer the purpose. If this is not available, an Electralloy (radio metal) 16 gauge piece 9 inches by 8⅛ inches will suffice. Before bending the piece along lines 5/16 inches and 1½ inches from both sides as illustrated in the mechanical layout diagram, it is necessary to cut, with a cold chisel, an opening for mounting the speaker. In the case of the Beaudette speaker, the space shown by the mechanical layout diagram was found satisfactory. However, for a different manufacturer's speaker, a different cut may be necessary. The speaker is mounted on two 1¼ inch studs and fastened to the chassis by means of 8-32 machine screws and nuts.

The three-gang variable air condenser C is placed on the extreme right and the proper holes necessary for mounting are indicated in the mechanical layout diagram. The volume control, R, is located at the extreme left. An L-shaped bracket provides the necessary mounting for it.

The high gain unshielded interstage coil L2 is mounted on top of the chassis between 6C6 tube and the 78 r.f. tube. This interstage coil as recommended in the list of parts is RFB No. 4 interstage coil of General Manufacturing Co. of Chicago. However, in this case, as well as in any other, electrically equivalent parts from other reputable manufacturers can easily be substituted. A large hole underneath this interstage coil provides a conduit to the leads. (See Figure 2)

The pre- (*Continued on page 261*)

PIONEERS

Official RADIO NEWS Listening Post Observers

LISTED below by States are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner.

United States of America:

Alabama, J. E. Brooks; **California**, E. G. DeHaven, C. H. Canning, E. S. Allen, A. E. Berger, Ralph Leavitt, George C. Sholin; **Arkansas**, Don Pryor; **Colorado**, Wm. J. Vette, F. Erich Bruhn; **Florida**, E. M. Law, James F. Dechert; **Georgia**, James L. Davis, C. H. Armstrong, Guy R. Bigbee, John McCarley; **Idaho**, Bernard D. Starr, Lawrence Swenson; **Illinois**, Phillip Simmons, E. Bergeman, Robert L. Weber, Floyd Waters; **Indiana**, Freeman C. Balph; J. R. Flannigan; **Iowa**, J. Harold Lindblom; **Kansas**, C. W. Bourne, Wm. Schumacher; **Kentucky**, Wm. A. McAlister, George Krebs; **Maine**, R. I. Keeler; **Maryland**, Howard Adams, Jr., James W. Smith, J. F. Fritsch; **Massachusetts**, Armand A. Boussy, J. Walter Bunnell, Harold K. Miller, Donald Smith, Elmer F. Orne, Arthur Hamilton, Roy Sanders; **Michigan**, Stewart R. Ruple; **Minnesota**, Dr. G. W. Twomey, M. Mickelson; **Mississippi**, Dr. J. P. Watson, Mrs. L. R. Ledbetter; **Missouri**, C. H. Long; **Montana**, Henry Dobrovalny; **Nebraska**, P. H. Clute, G. W. Renish, Jr., Harold Hansen; **New Hampshire**, P. C. Atwood, A. J. Mannix; **New Jersey**, William Dixon, R. H. Schiller, William F. Buhl; **New Mexico**, G. K. Harrison; **New York**, Capt. Horace L. Hall, S. G. Taylor, John M. Borst, Wm. C. Dorf, R. Wright, I. H. Kattell, Donald E. Bame, Albert J. Leonhardt, H. S. Bradley; **Nevada**, Don H. Townsend, Jr.; **North Carolina**, H. O. Murdoch, Jr., W. C. Couch, E. Payson Mallard; **North Dakota**, Dr. F. C. Naegeli; **Ohio**, Oker Radio & Electric Shop, R. W. Evans, C. H. Skatzes, Donald W. Shields, Albert E. Emerson, Samuel J. Emerson, Clarence D. Hall; **Oklahoma**, H. L. Pribble, Robert Woods; **Pennsylvania**, Edward C. Lips, K. A. Staats, C. T. Sheaks, George Lilley, John A. Leininger, F. L. Stitzinger, Hen F. Polm, Chas. Nick; **South Carolina**, Edw. F. Bahan; **Tennessee**, Charles D. Moss, Adrian Smith; **Texas**, Heinie Johnson; Bryan Scott, John Stewart; **Utah**, Harold D. Nordeen; **Vermont**, Joseph M. Kelley, Eddie H. Davenport; **Virginia**, Gordon L. Rich, G. Hampton Allison, D. W. Parsons; **Washington**, A. D. Golden, Glenn E. Dubbe, Chas. G. Payne; **West Virginia**, Kenneth Boord, R. E. Sumner; **Wisconsin**, Willard M. Hardell, Walter A. Jasiorkowski.

S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

THE 19th installment of the DX Corner for Short Waves features a "World Short-Wave Time-Table" for 24-hour use all over the world. The list starts at 08 G.M.T., which is 3 a.m. E.S.T., and runs through 07 G.M.T., or 2 a.m. E.S.T., right around the clock. The Time-Table contains a list of short-wave stations, logged during the last month in the RADIO NEWS Westchester Listening Post, as well as at other Official RADIO NEWS Short-Wave Listening Posts throughout the world. It provides an hour-to-hour guide for short-wave fans whether experienced or inexperienced. The Time-Table also contains a list of station locations and gives Wavelength, Call Letters, Frequency and Location.

Listening Post Observers Wanted!

We are especially desirous of locating reliable listening post observers in the following remaining states in the United States of America. Any one feeling that they would like to undertake this work and that they have the necessary qualifications and interest in Short Waves to be able to log stations for us accurately, should make their application for appointment immediately, sending in at the same time a sample log, made at their receiving apparatus: **Arizona, Connecticut, District of Columbia, Louisiana, Oregon, Rhode Island, South Dakota, Wyoming.**

We also want to locate reliable listening posts in the following countries outside of the United States: **Alaska, Algeria, Argentina, Austria, Belgium, Bolivia, Canary Islands, Central America, Colombia, Czechoslovakia, Denmark, East Indies, Ecuador, Egypt, Finland, Germany, Greece, Holland, Hungary, Irish Free State, Italy, Java, Japan, Malay State, Manchuria, Norway, Paraguay, Portugal, Poland, Siberia, Spain, Sweden, U. S. S. R.**

All applications should be accompanied with a statement as to qualifications, the kind of receiving set used, antenna, etc., and a sample log. Appointments will be made as the individual cases are considered and passed upon by the Editor.

THREE THOROUGHBREDS

Mr. Baadsgaard of Ponoka, Canada, seated at his "Marconiphone" alongside of his Steinway "Grand," two thoroughbred musical instruments owned by a thoroughbred short-wave fan. Mr. Baadsgaard also has some thoroughbred police dogs which we pictured in an earlier issue

Affiliated DX Clubs

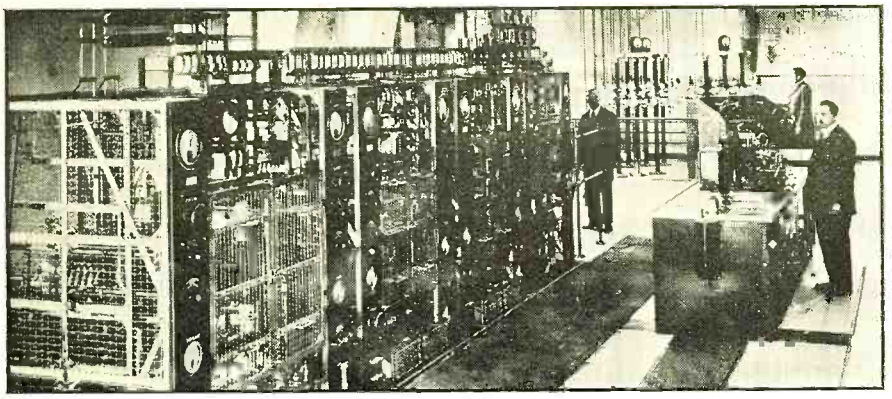
The policy of the Editor of this department is to expand its activity and usefulness to include news of value to *all* short-wave listeners. With this policy in mind we are inviting reliable DX clubs to become affiliated with the Short-Wave DX Corner, as associate members, to act as advisers on short-wave activities in promoting short-wave popularity and reception efficiency. The first Association to become thus affiliated, as an associate member, is the Society of Wireless Pioneers, of Bloomington, Minneapolis, Minn.; President, Charles A. Morrison; Vice President, M. Mickelson. Beginning next month we will also run Club News and Announcements for the various Associate Member Societies.

The Denton Trophy Winners

According to the recent announcement of the Examining Committee of the Denton Trophy Contest for the year 1933-1934, RADIO NEWS listeners and Short-Wave Listening Post Observers have taken high honors. The First Prize, which is the Trophy cup, shown some months ago on the cover of RADIO NEWS, was won by Mr. H. S. Bradley of Hamilton, New York. The Second Prize, a silver medal, goes to Raymond M. Marti of Puerto Rico. The Third Prize, also a silver medal, goes to Mr. C. H. Armstrong of Atlanta, Georgia. The next three contestants in line were Mr. F. L. Stitzinger of Erie, Pennsylvania, Mr. J. B. Hines of Yonkers, New York, and Mr. Arthur Lunn of Maplewood, New Jersey, in the order mentioned. Thus, RADIO NEWS readers and Official Observers place First, Third and Fourth in this world-wide competition for short-wave receiving honors. The Editors are gratified at this fine standing as it denotes the quality of our listening posts. Congratulations Fellows!

Reception Conditions This Month

O.R.N.S.W.L.P.O.'s report very peculiar



THE RUYSSELEDE TRANSMITTER IN ACTION

This is the Belgian station ORK, transmitting on 10330 kc., using a power of 9 kw. and approximately 60% modulation. The Marconi system of modulation is employed

reception conditions for the past month. After the Australian stations shut down in the early morning hours it seemed as though one might have shut off the short-wave set until late afternoon. The 19 meters was not as good this month and the 25-meter band was not really good until late afternoon and evening. The 31-meter band has shown considerable improvement as has also the 48-meter band although the latter has been quite noisy. Listeners throughout the world reported that stations W3XAL, W2XAD, W2XAF and W2XE have been the best and most consistent Americans.

Outstanding Short-Wave Reception Features

The outstanding regular S.W. features in America as voted by our Listening Posts seem to be still favoring DJD and FYA with EAQ a good third, (although their modulation is not all that it should be). South American stations have been increasing in popularity with the "mystery" station on 31.58 meters winning the prize (we believe it is PRBA at Rio de Janeiro). An increasing number of reports came in regarding the popularity of the Japanese broadcasts. Probably the most exciting and dramatic short-wave episode was the flight of the stratosphere balloon.

Listening Post Observers and Other Fans, Please Note!

Listed below is this month's partial information regarding short-wave stations heard and reported by our World-Wide Listening Posts. Can you supply actual Time-Schedules, actual Wavelengths, correct Frequencies and any other information regarding them? There are some hard ones to pull in, here, so get busy and try your skill in logging these stations and getting correct information about them. When you are satisfied you are correct, send this information in to the Editor. The list follows:

PRBA, The National Radio Press, Rio de Janeiro, 31.58 meters heard with great signal strength in many Listening Posts. Definite schedule not known.

KIO heard on 25.6 meters.

El PRADO, Riobamba, reported many times on 15430 kc. or about 19.4 meters, has new call letters, HC1FG (heard Sundays).

Reported on 31.45 meters, 6:45 to 8 p.m., E.S.T., a station announcing as Berlin (experimental) with the same program as DJA.

PRA8 reported on 6057 kc. also reported on slightly lower frequency.

VUB variously reported around 31 meters. (We believe the correct frequency 31.36 meters, 4½ kw., 16 to 17:30 G.M.T. Station believed to be at Kirkee, near Bombay. VUB, by the way, is a long-wave station call.)

YBG, Medan, Sumatra, reported on 28.8 meters.

Salisbury, Southern Rhodesia, South Africa. An experimental station reported on 80 meters and also on 50 meters. Broadcasts at 18.15 G.M.T.

Those Japanese "ghost" stations reported variously as JVH, on 27.5 approximately, broadcasting to Holland. Other Japs are JVT, JVF, JHO, JVN, J1AA (11750 kc., 6 to 7 a.m., E.S.T.), JVH (10800 kc., 3 to 6 a.m., testing with PHI), JVI (reported at Nagasaki).

I3RO reported on 70 meters.

XAM reported on 26.8 meters.

VE3ME has been reported as an amateur on 75 meters playing music at Simcoe, Ontario.

ORP, Ruysselede, 22.75 meters, 9:30 a.m., 'phone Belgian Congo, also reported from 1 to 3 E.S.T.

W10XDA, Schooner Morrissey, reported working amateurs on 20 meters (Captain Bartlett's expedition).

LAIG, Oslo, Norway, heard Saturday and Sunday afternoons on the 20-meter band, playing phonograph records. (An amateur station.)

HJB, reported on 14.96 megacycles.

(*Continued on page 229*)

OBSERVER FOR ALABAMA

This is The Listening Post of J. E. Brooks, of Montgomery, Alabama. On the right is an antenna tuner, connected to a short-wave convertor, with a broadcast receiver, next. On the left is another convertor and a "phone" output unit

PIONEERS

Official RADIO NEWS Listening Post Observers

LISTED below by countries are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner:

Australia, C. N. R. Richardson, C. Arthur Matthews, A. H. Garth.

Brazil, W. W. Enete, Louis Rogers Gray.

British Guiana, E. S. Christiani, Jr.

British West Indies, E. G. Derrick, Edela Rosa.

Canada, Douglas Wood, Jack Bews, W. H. Fraser, Robert Edkins, Charles Eugene Roy, J. T. Atkinson.

Chile, Jorge Izquierdo.

China, Baron P. D. N. von Hoyningen-Huene.

Cuba, Frank H. Kydd.

England, Kenneth Judd, C. L. Wright, John J. Maling, Alan Barber, Donald Burns, L. H. Plunkett-Checkemian, L. H. Colburn, Norman C. Smith and John Parkinson, Norman Nuttall, L. C. Styles, Frederick W. Gunn, R. Lawton, R. Stevens, W. P. Kempster, R. S. Houghton.

France, J. C. Meillon, Jr.

Honduras, R. Wilder Tatum.

Hawaii, O. F. Sternemann.

India, D. R. D. Wadia.

Japan, Masall Satow.

Mexico, Felipe L. Saldana.

New Zealand, Dr. G. Campbell MacDiarmid, Kenneth H. Moffatt.

Philippine Islands, Victorino Leonen.

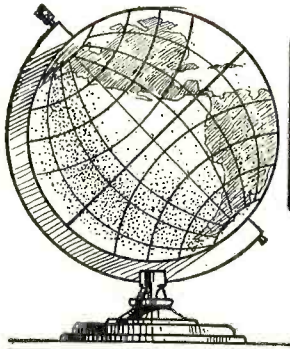
Scotland, Duncan T. Donaldson.

South Africa, C. McCormick, Mike Kruger.

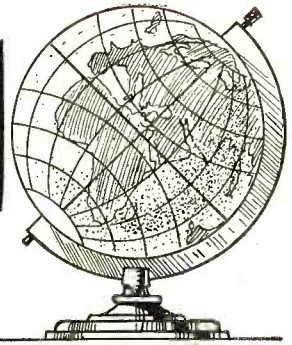
Switzerland, E. J. de Lopez, Dr. Max Hausdorff.

Venezuela, Francisco Fossa Anderson.

Applications for Official Observers in the remaining countries should be sent in immediately to the DX Corner. Listeners outside of the United States who feel that they would like to serve in this capacity are hereby requested to file their applications as soon as possible before final appointments are made.



WORLD SHORT WAVE TIME-TABLE



The schedule of short-wave broadcasting stations listed below includes only those that are received best in RADIO NEWS LISTENING POSTS. This new schedule is from 8 G. M. T. right around the clock. Both wavelength and frequency are noted for each station. Station locations are found on page 228.

International Short-Wave "Best Bets"

Wavelengths in Meters	*Call Letters*	*Frequency in k.c.*
08 G. M. T. 3 A. M. E. S. T.		
27.9+	JVM	10740
30.4 Irregular	JYS	9840
31.3 Except Sun.	VK3LR	9580
31.4+ Sun.	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
38.0+	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.4+ Tues.	VQ7LO	6060
70.2 Except Sun.	RV15	4273
09 G. M. T. 4 A. M. E. S. T.		
19.7 Sun.	DJB	15200
27.9+	JVM	10740
28.1	CEC	10670
30.4+	JYS	9840
31.2 Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3 Wed., Sat.	VK3ME	9510
31.3+ Sun.	DJA	9560
31.4+ Sun.	LKJ1	9540
38.0+	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.9+ Ex. Tu., Th., Sat.	RV59	6000
70.2 Except Sun.	RV15	4273
10 G. M. T. 5 A. M. E. S. T.		
19.7 Sun	DJB	15200
19.8+ Except Sun.	HVJ	1512
27.9+	JVM	10740
28.1	CEC	10670
30.4+	JYS	9840
31.2+Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	DJA	9560
31.4+	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
38.0+	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.4+ Mon., Wed., Fri.	VQ7LO	6060
49.8+ Mon., Wed., Thur	ZHI	6012
50.2 Sun.	HVJ	5969
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
11 G. M. T. 6 A. M. E. S. T.		
13.9+	GSH	21470
14.2+	LSN	21020
16.8+	GSG	17790
25.1+ Sun.	RNE	11924
27.9+	JVM	10740
30.4+	JYS	9840
19.6+	CP5	15308
19.6+	FYA	15243
19.7	DJB	15200
19.7+ Irregular	RKI	15170
19.8	GSF	15140
26.0	XGR	11530
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.3+ Sun.	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8 Except Sat., Sun.	PLV	9415
48.9+	ZTJ	6122
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.0+ Irregular	VUC	6109
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+ Tues.,Thurs.,Irreg.	OER2	6072
49.4+ Irregular	W8XAL	6060
70.2	RV15	4273
80.0 Sun.	CT1CT	3750
15 G. M. T. 10 A. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
15.2+	IRW	19700
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
19.6+	W2XE	15270
19.6+	FYA	15243
19.7	W8XK	15210
19.7	DJB	15200
19.8	GSF	15140
19.8	VE9DN	15130
19.8+ Irregular	HVJ	15123
25.1+ Sun.	RNE	11924
25.2+	GSE	11860
25.4+ Sun.	W1XAL	11790
30.0+	KAZ	9990
30.5+ Irregular	IRM	9820
31.2 Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+ Sun.	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8 Irregular	PLV	9410
48.9+	ZTJ	6122
49.0+	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.0+ Irregular	VUC	6109
49.2 Thu., Fri., Sat.	VE9GW	6095
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8+ Sun.	ZHI	6012
49.8+	XEBT	6010
16 G. M. T. 11 A. M. E. S. T.		
13.9+	W8XK	21540
25.5	DJD	11760
29.0+	ORK	10330
30.4 Sat.	EAQ	9860
30.6+ Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
40.5	HJ3ABD	7402
47.5 Sun.	HIZ	6315
48.7+	YV3RC	6150
48.9+	ZTJ	6122
49.0+ Except Sat., Sun.	VE9HX	6110
49.0+ Sat.	VUC	6109
49.2 Ex. M., T., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.3+ Sun.	VE9CS	6070
49.4+ Sat. Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	XEBT	6010
73.0+ Except Mon.	HCJB	4107
84.6+ Mon. Thu., Sat.	CR7AA	3543
19 G. M. T. 2 P. M. E. S. T.		
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.5 Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
19.8	GSF	15140
22.7+	ORP	13200
25.2	FYA	11900
25.3+	W2XE	11830
25.4	12RO	11810
25.5	DJD	11760
29.0+	ZFD	10335
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6 Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
32.2+ Sun.	CNR	9300
36.2+	CM6XJ	8265
43.8+ Irregular	HAS	6840
48.5+ Sun.	HJ1ABB	6447
47.5 Sun.	HIZ	6315
47.8	HI1A	6272
48.9+	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.0+ Sat.	VUC	6109
49.2 Except M., T., W.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
47.8 Sun.	HI1A	6272
48.8+	W8XK	6140
48.9+ Sat.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1 Ex. M., Wed., Sat.	W9XF	6100
49.2 Ex. M., Tues., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8+	COC	6010
49.8+	XEBT	6010
49.9+	HIX	6000
49.9 Ex. Tues., Thu. Sat.	RV59	6000
22 G. M. T. 5 P. M. E. S. T.		
15.9+ Irregular	PLE	18860
19.4 Sun.	HC1FG	15430
19.8	GSF	15140
24.8+ Ex. Sun.	CT1CT	12082
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
25.4+ Except Sat.	W1XAL	11790
25.5	DJD	11760
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+ Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.5	GSB	9510
31.5 Irregular	PRBA	9500
38.4+ Sat.	HBP	7790
43.8+ Irregular	HAS	6840
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5 Sun.	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
48.7+	YV3RC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+ Sat.	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Sun.	VE9GW	6095
49.3+	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8+	COC	6010

THE WORLD SHORT

WAVE TIME TABLE

31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+ Irreg.	VUB	9565
31.4+ Irregular	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
38.0+	JYR	7880
48.9+ Tu., Fri., Sun.	ZGE	6130
48.9+ Except Sun.	ZTJ	6122
49.4+ Mon. Wed., Fri.	VQ7LO	6060
49.4+ Except Sun.	W8XAL	6060
49.8	CQN	6020
49.8+ Mon.,Wed., Thu.	ZHI	6012
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273

12 G. M. T. 7 A. M. E. S. T.

13.9+	W8XK	21540
13.9+	GSH	21470
14.2+	LSN	21020
16.8+	GSG	17790
16.8 Ex. Tues., Wed.	PHI	17775
19.6+	FYA	15243
19.7	DJB	15200
23.3+ Sun.	CNR	12830
24.8+ Sun.	CT1CT	12082
26.0	XGR	11530
27.9+	JVM	10740
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8	PLV	9415
38.0+	JYR	7880
48.9+ Tu., Fri., Sun.	ZGE	6122
48.9+ Except Sun.	ZTJ	6122
49.4+	W8XAL	6060
49.8	CQN	6020
49.8+ Mon., Wed., Thu.	ZHI	6012
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273

13 G. M. T. 8 A. M. E. S. T.

13.9+	W8XK	21540
13.9+	GSH	21470
14.2+	LSN	21020
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
17.2	J1AA	17380
19.6+	CP5	15308
19.6	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
24.8+ Sun.	CT1CT	12082
25.1+ Sun.	RNE	11924
26.0	XGR	11530
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+ Sun.	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8	PLV	9415
48.9+ Sun.	ZTJ	6122
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+ Tues.,Thurs.,Irreg.	OER2	6070
49.4+ Thurs.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Sun.	OXY	6062
49.8	CQN	6020
49.8+ Mon., Wed., Thur	ZHI	6010
52.9+ Irregular	XQAJ	5663
70.2	RV15	4272

14 G. M. T. 9 A. M. E. S. T.

13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
14.2+	LSN	21020
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
25.2+	GSE	11860
25.4+ Sun.	W1XAL	11790
30.0+	KAZ	9990
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+ Irregular	VUB	9565
31.4+ Irregular	LKJ1	9540
36.2+	CM6XJ	8265
46.5	HJ1ABB	6450
47.8 Tues., Fri.	HI1A	6272
48.7+	YV3RC	6150
48.9+ Except Sun.	ZTJ	6122
49.0+ Sun.	YV2RC	6110
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Exc. M., Tu., W.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sat., Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8+ Sun.	ZHI	6012
49.8+	XEBT	6010
50.2	HJ2ABC	5973

17 G. M. T. 12 Noon E. S. T.

13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
25.2+	GSE	11860
25.4	I2RO	11810
25.5	DJD	11760
25.6 Irregular	FYA	11720
26.0 Irregular	XAM	11530
30.4+ Sat.	EAQ	9860
30.6+ Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.3+ Irregular	VUB	9565
31.4+ Irregular	LKJ1	9540
40.5 Except Sun.	HJ3ABD	7402
45.3+	RV72	6611
46.5	HJ1ABB	6450
47.5 Sun.	HIZ	6315
47.8 Tues., Fri.	HI1A	6272
48.7+	YV3RC	6150
48.9+	ZTJ	6120
49.0+ Ex. Sat., Sun.	VE9HX	6110
49.0+ Sat.	VUC	6109
49.2 Ex. M., Tu., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sat. Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8	DJC	6020
49.8+ Sat., Sun.	ZHI	6012
49.8+	XEBT	6010

18 G. M. T. 1 P. M. E. S. T.

13.9+	W8XKJ	21540
14.2+	LSN	21020
15.2 Irregular	IRW	19700
16.5+	LSY	18115
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
19.8	GSF	15140
22.7+	ORP	13200
25.2	FYA	11900
25.4	I2RO	11810
49.3+ Tues., Thurs. Ir.	OER2	6270
49.3+ Sun.	VE9CS	6070
49.4+ Sat.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	XEBT	6010
49.9+	RV59	6000
50.2+	HVJ	5969
73.0+ Except Mon.	HCJB	4107
84.6+ Mon., Thur., Sat.	CR7AA	3543

20 G. M. T. 3 P. M. E. S. T.

16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.4 Sun.	HC1FG	15430
19.5+ Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
19.8	GSF	15140
22.7+	ORP	13200
25.1+ Sun.	RNE	11924
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
28.9+	LSX	10350
29.0+	ZFD	10335
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+ Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
32.2+ Sun.	CNR	9300
43.8+ Sun.	HAS	6840
46.5+ Sun.	HJ1ABB	6447
48.9+ Sat.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.1 Ex. M., W., Sun.	W9XF	6100
49.2 Ex. Mon., Tues., W	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.3+ Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	COC	6010
49.8+	XEBT	6010
49.9+ Irregular	RV59	6000
50.1	TGX	5984
84.6+ Mon., Thurs., Sat.	CR7AA	3543

21 G. M. T. 4 P. M. E. S. T.

15.9+	PLE	18860
17.3+ Fri.	W3XL	17300
19.4 Sun.	HC1FG	15430
19.7	W8XK	15210
19.8	GSF	15140
24.8+ Except Sun.	CT1CT	12082
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
29.0+	ZFD	10335
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+ Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
31.8+	PLV	9415
32.2+ Sun.	CNR	9300
43.8+ Irregular	HAS	6840
46.5+ Sun.	HJ1ABB	6447
47.5	HIZ	6315
49.8+	XEBT	6010
49.9+	HIX	6000
49.+ Irregular	RV59	6000
50.4	HJ2ABA	5880
50.6 Irregular	HJ4ABE	5860

23 G. M. T. 6 P. M. E. S. T.

15.9+ Except Sat., Sun.	PLE	18864
19.4 Sun.	HC1FG	15430
25.2	W8XK	11870
25.4+ Sun.	W1XAL	11790
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+	XETE	9600
31.3	GSC	9585
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
31.5+ Irregular	PRBA	9500
38.4+ Sat.	HBP	7790
40.5	EA8AB	7403
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5 Sun., Irregular	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8 Sun.	HI1A	6272
48.7+	YV3RC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon. Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Sun	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	CQN	6020
49.8+ Sun., Irregular	COC	6010
49.8+	XEBT	6010
50.1	YV4RC	5984
50.6 Tues., Thurs., Sat.	HJ4ABE	5860
51.4+	HJ2ABC	5824
69.4 Irregular	G6RX	4320

00 G. M. T. 7 P. M. E. S. T.

15.9+ Except Sat., Sun.	PLE	18860
25.2	W8XK	11870
25.4+ Sun.	W1XAL	11790
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
28.9+	LSX	10350
30.4 Sat., Sun.	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+	XETE	9605
31.3	GSC	9580
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4	W2XAF	9530
31.5+ Irregular	PRBA	9500
32.8+	CP5	9122
38.4+ Sat., Irregular	HBP	7795
40.5	HJ3ABD	7400
45.0+ Sun.	HC2RL	6660
46.1	HJ5ABD	6504
46.5+	HJ1ABB	6447
46.6+ Fri.	W3XL	6425
47.8	HJ3ABF	6275
48.5	TGW	6180
48.7+	YV3RC	6150
48.8+	W8XK	6140

(Continued on next page)

SHORT-WAVE TIME TABLE

48.9+	ZGE	6130
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.2 Sun.	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.8+	CQN	6020
49.8+ Sun.	COC	6010
49.8+	XEBT	6010
49.9+	HIX	6000
50.1	TGX	5984
50.1	YV4RC	5984
50.4 Irregular	HJ2ABA	5880
50.6 Except Wed., Sun.	HJ4ABE	5860
51.4+	HJ2ABC	5824
69.4 Irregular	G6RX	4320

01 G. M. T. 8 P. M. E. S. T.

15.9 Except Sat., Sun.	PLE	18800
25.2	W8XK	11860
25.5	DJD	11772
25.6	FYA	11760
25.6	CJRX	11720
31.2	XETE	9600
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
37.5	HC2JSB	8000
40.5+	HJ3ABD	7402
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HJ3ABF	6275
47.8	HI1A	6272
48.5+	TGW	6180
48.7+	CJRO	6150
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2+ Except Fri., Sat.	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W3XAU	6060
49.8	DJC	6020
49.8+	COC	6010
49.8+	XEBT	6010
49.9+	HIX	6000
50.1 Irregular	YV4RC	5984
50.1	TGX	5984
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
51.4	HJ2ABC	5824
69.4 Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

02 G. M. T. 9 P. M. E. S. T.

25.2	W8XK	11870
25.5	DJD	11760
25.6	CJRX	11720
28.1	CEC	10670
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
37.5	HC2JSB	8000
40.5+ Except Sun.	HJ3ABD	7402
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HJ3ABF	6275
47.8	HI1A	6272
48.5+	TGW	6180
48.7+	CJRO	6150
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Sun.	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+	YV5RMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8 Irregular	DJC	6020
49.8+ Sun.	ZHI	6012
49.8+	XEBT	6010
49.9+ Sat.	HIX	6000
50.1 Irregular	YV4RC	5984
50.1	TGX	5984
50.6 Mon., Wed., Fri.	HJ4ABE	5860
69.4+ Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

04 G. M. T. 11 P. M. E. S. T.

25.1+ Irregular	RNE	11924
25.2 Sun.	W8XK	11870
25.6	FYA	11720
25.6	CJRX	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
40.5 Irregular	HJ3ABD	7402
45.0 Fri.	TGW	6180
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
47.8	HI1A	6272
48.7+	CJRO	6150
48.7+	CJRX	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
48.9+ Except Sun.	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.3 Tues., Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8+ Sun.	ZHI	6012
49.8+	XEBT	6010
49.9+	XEBT	6006
49.9+ Sat.	VE9DN	6005
49.9+ Sat.	HIX	6000
50.1	TGX	5984
73.0+ Except Mon.	HCJB	4107

05 G. M. T. 12 Midnight E. S. T.

19.7	DJB	15200
25.2 Sun.	W8XK	11870
25.5	GSD	11750
27.9+	JVM	10740
30.4+	JYS	9840
31.2+	XETE	9600
31.2+	VK2ME	9590
31.3+	W1XAZ	9570
31.5	GSB	9510
45.0+ Tues.	HC2RL	6668
47.8	HI1A	6272
48.8+	W8XK	6140
48.9+ Except Sun.	ZTJ	6122
49.0+	VE9HX	6110
49.1+ Except Sat.	W9XF	6100
49.3 Tues., Sun.	VE9CS	6070
49.4+	W3XAU	6060
49.4+	W8XAL	6060
49.8	DJC	6020
49.8+ Sat., Sun.	ZHI	6012
49.8+ Sat.	COC	6010
49.8+	XEBT	6010

06 G. M. T. 1 A. M. E. S. T.

19.0+	JVT	15760
19.7	DJB	15200
25.5	GSD	11750
27.9+	JVM	10740
30.4+	JYS	9840
31.2+	XETE	9600
31.2+	VK2ME	9590
31.5	GSB	9510
38.0+	JYR	7880
49.1+ Except Sat.	W9XF	6100
49.3 Wed.	VE9CS	6070
49.4+	W8XAL	6060
49.8+ Sat., Sun.	ZHI	6012

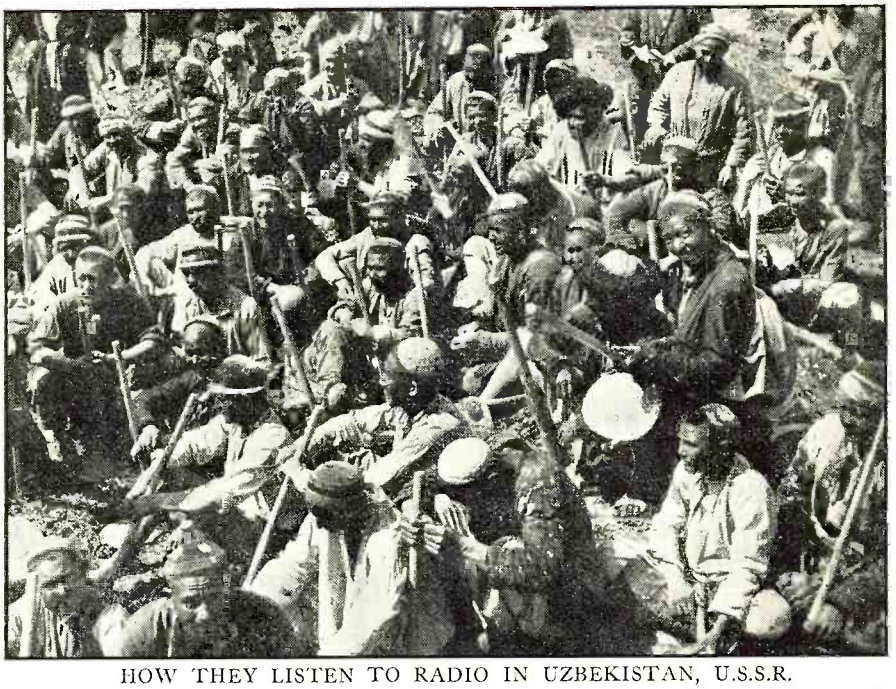
07 G. M. T. 2 A. M. E. S. T.

19.7	DJB	15200
22.0	JVK	13610
27.9+	JVM	10740
30.4+	JYS	9840
31.2+	VK2ME	9590
25.5	GSD	11750
31.2+ Irregular	XETE	9600
31.5	GSB	9510

Station Locations

Wave-length Meters	*Call Letters*	*Frequency Kc.*	*City Country*
13.9+	W8XK	21540	Pittsburgh, Pa.
13.9+	GSH	21470	Daventry, England
14.2+	LSN	21020	Buenos Aires, Argen.
15.2+	IRW	19700	Rome, Italy
15.9+	PLE	18860	Bandoeng, Java
16.5	LSV	18115	Buenos Aires, Argen.
16.8+	GSG	17790	Daventry, England
16.8+	W3XAL	17780	Bound Brook, N. J.
16.8+	PHI	17775	Huizen, Holland
17.2+	J1AA?	17380	Kemikawa-Cho., Jap.
17.3+	W3XL	17300	Bound Brook, N. J.
19.4	HC1FG	15430	Riobamba, Ecuador
19.5	W2XAD	15330	Schenectady, N. Y.
19.6+	CP5	15308	La Paz, Bolivia
19.6+	W2XE	15270	New York, N. Y.
19.6+	FYA	15243	Pontoise, France
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.7+	RKI	15170	Moscow, U. S. S. R.
19.8	GSF	15140	Daventry, England
19.8	HVJ	15123	Vatican City
22.0	JYK	13610	Kemikawa-Cho. Jap.
22.7+	ORP	13200	Ruysselede, Belg.
23.3	CNR	12830	Rabat, Morocco
24.8+	CT1CT	12082	Lisbon, Portugal
25.1+	RNE	11924	Moscow, U. S. S. R.
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.2+	GSE	11860	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.4	12RO	11810	Rome, Italy
25.4	W1XAL	11790	Boston, Mass.
25.5	DJD	11760	Zeesen, Germany
25.5	GSD	11750	Daventry, England
25.6	FYA	11720	Pontoise, France
25.6	CJRX	11720	Winnipeg, Canada
26.0	XGR	11530	Shanghai, China
26.8	CT3AQ	11180	Funchal, Madeira
27.9+	JVM	10740	Nagasaki, Jap.
28.1	CEC	10670	Santiago, Chile
28.9+	LSX	10350	Buenos Aires, Argen.
29.0+	ZFD	10335	Hamilton, Bermuda
29.0+	ORK	10330	Ruysselede, Belgium
30.0	KAZ	9990	Manila, P. I.
30.4	EAQ	9860	Madrid, Spain
30.4+	JYS	9840	Kemikawa-Cho. Jap.
30.5+	IRM	9820	Rome, Italy
30.6+	GCW	9790	Rugby, England
31.2+	XETE	9600	Mexico City, Mexico
31.2+	CT1AA	9600	Lisbon, Portugal
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.3	HBL	9580	Geneva, Switzerland
31.3	VK3LR	9580	Lindhurst. Victoria, Australia
31.3	GSC	9575	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.3+	VUB	9565	Bombay, India
31.3+	DJA	9560	Zeesen, Germany
31.4+	LKJ1	9540	Jeloy, Norway
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Australia
31.5	GSB	9510	Daventry, England
31.5+	PRBA	9500o	Ride Janeiro, Br.
31.8	PLV	9415	Bandoeng, Java
32.2+	CNR	9300	Rabat, Morocco
36.2+	CM6XJ	8265	Tuinucu, Cuba
36.6+	PSK	8185	Rio de Janeiro, Braz.
37.5	HC2JSB	8000	Guayaquil, Ecuador
38.0+	JYR	7880	Kemikawa-Cho. Jap.
38.4+	HBP	7790	Geneva, Switzerland
40.5+	HJ3ABD	7402	Bogota, Colombia
43.8+	HAS	6840	Budapest, Hungary
44.8	VNLF	6692	Managua, Nicaragua
45.0+	HC2RL	6668	Guayaquil, Ecuador
45.3	PRADO	6618	Riobamba, Ecuador
45.3+	RV72	6611	Moscow, U. S. S. R.
46.1	HJ5ABD	6504	Cali, Colombia
46.5+	HJ1ABB	6447	Barranquilla, Col.
46.6	W3XL	6425	Bound Brook, N. J.
47.5	HIZ	6315	San Domingo, D. R.
47.8	HJ3ABF	6275	Bogota, Colombia
47.8	HI1A	6272	San Domingo, D. R.

48.5	TGW	6180	Guatemala City
48.7+	CJRO	6150	Winnipeg, Manitoba
48.7	YV3RC	6150	Caracas, Venezuela
48.7	VE9CL	6150	Winnipeg, Man.
48.8+	W8XK	6140	Pittsburgh. Pa.
48.9+	ZGE	6130	Kuala Lumpur, F. M. S.
48.9+	ZTJ	6122	Johannesburg, Africa
49.9	W2XE	6120	New York, N. Y.
49.0+	YV2RC	6112	Caracas, Ven.
49.0+	VE9HX	6110	Halifax, N. S.
49.0+	VUC	6109	Calcutta, India
49.1+	W3XAL	6100	Bound Brook, N. J.
49.1+	W9XF	6100	Chicago, Ill.
49.2	VE9GW	6095	Bowmanville, Can.
49.3+	CP5	6080	La Paz, Bolivia
49.3+	W9XAA	6080	Chicago, Ill.
49.3+	OER2	6072	Vienna, Austria
49.3+	VE9CS	6070	Vancouver, B. C.
49.3+	VV5RMO	6070	Maracaibo, Venez.
49.4+	VQ7LO	6060	Nairobi, Kenya, Afr.
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	W3XAU	6060	Philadelphia, Pa.
49.4+	OXY	6060	Skamlebaek, Den.
49.5+	GSA	6050	Daventry, England
49.6+	W4XB	6040	Miami, Fla.
49.8	DJC	6020	Zeesen, Germany
49.8	CQN	6020	Macao, China
49.8+	ZHI	6012	Singapore, Malaya
49.8+	COC	6010	Havana, Cuba
49.8+	XEBT	6010	Mexico City, Mex.
49.9+	VE9DN	6005	Montreal, Quebec
49.9+	HIX	6000	San Domingo, D. R.
49.9+	RV59	6000	Moscow, U. S. S. R.
50.1	V54RC	5984	Caracas, Venezuela
50.1	TGX	5984	El Liberal, Guatemala
50.2+	HVJ	5969	Vatican City
50.4	HJ2ABA	5880	Tunja, Colombia
50.6+	HJ4ABE	5860	Medellin, Colombia
51.4+	HJ2ABC	5824	Cu Cuta, Colombia
52.9+	XQAJ	5660	Shanghai, China
69.4	G6RX	4320	Rugby, England
70.2	RV15	4273	Khabarovsk, Siberia
73.0	HCJB	4107	Quito, Ecuador
80.0	CT1CT	3750	Lisbon, Portugal
84.6+	CR7AA	3543	Lourenzo Marques, Mozambique



HOW THEY LISTEN TO RADIO IN UZBEKISTAN, U.S.S.R.

Uzbekistan peasants, known as Dehkans, as they gather in the field and listen to radio and speech-making

The DX Corner (Short Waves)

(*Continued from page 225*)

RKI, Moscow, U.S.S.R., heard testing on 15.04 and 15.12 megacycles from 9 to 10 a.m., E.S.T. Also reported on 19.88 meters and one observer reported hearing the announcer state "15170 kc., and 19.76 meters."

XA5, Sarabia's Oceanic plane reported on 40 meters and on 52 meters (To fly from Mexico to Spain).

El PRADO reported talking to amateurs on Saturday nights from 9 to 10 p.m.

NAFT, U. S. S. Saratoga reported on 6900 kc.

XENT still reported somewhere between 65 to 70 meters (Station writes that this is a long-wave station and what is being heard must be a harmonic.)

VUC, Calcutta, reported on the 49-meter band.

OK1MPT, an experimental station at Prague, reported on 5145 kc.

PMY still reported on 5170 kc. (Bandoeng, Java).

F1QA reported—shut down indefinitely.

W10XCW, The Schooner Mary (whoever that is) reported as heard testing with New York.

FZR reported heard.

XGBB, Shanghai, China, reported on 16.8 meters.

EAJ25, Barcelona, Spain, 6000 kc., heard Saturdays, 3:30 to 4:30 E.S.T.

The Australian Transmissions

An official communication from the Amalgamated Wireless (Australasia) Ltd., states that station VK2ME, Sydney, New South Wales, transmits on a wavelength of 31.28 meters, 9590 kc., 20 kw. power, and will be on the air as shown in this month's Time-Table. Station VK3ME, Melbourne, Victoria, wavelength 31.55 meters, 9510 kc., 5 kw. power, is also transmitting as per our Time-Schedule. They also advise that station VK2ME intends shortly to tender a portion of their program in honor of each State in the United States of America. These programs will be given to the states, in alphabetical order, to be transmitted at the peak period for each State's reception. They expect these broadcasts to be under way by the time this publication appears on the newsstands. Announcements will be made over VK2ME when arrangements near completion.

VE9GW Transmissions

An official communication from the Canadian Radio Broadcasting Commission states that radio station VE9GW of Bowmanville, Ontario, will be on the air with the following schedule until at least October 8th: Thursday, Friday and Saturday from 8 a.m. to 5 p.m., Sunday, 11:30 a.m. to 8 p.m. All times E.S.T.

HJ3ABD Transmissions

An official communication from station HJ3ABD at Bogota, Colombia, states that HJ3ABD is a 50-watt transmitter operating on 40.5 meters, 7406 kc., daily, from 12 noon until 2 p.m. and from 7 p.m. to 11 p.m. On Sundays it is in operation from 7 to 11 p.m., Colombia time.

XEBT Transmissions

An official communication from Mexico City states that the short-wave station XEBT, using a power of 1 kw., will be on the air from 9 o'clock in the morning to midnight. The plant is at Huipulco, Mexico. The frequency is 6010 kc. (49.9 meters). They further state that they recognize veri's which are signed by Sr. Henry Guerro and by Sr. B. Sancristobal.

W9XF Transmissions

An official communication from the National Broadcasting Company states that W9XF, Chicago, is on the air Tuesdays, Thursdays, Fridays and Saturdays from 4:30 p. m. to 2 a.m. They state that it is their understanding that W3XAL is operating on a schedule not conflicting with W9XF.

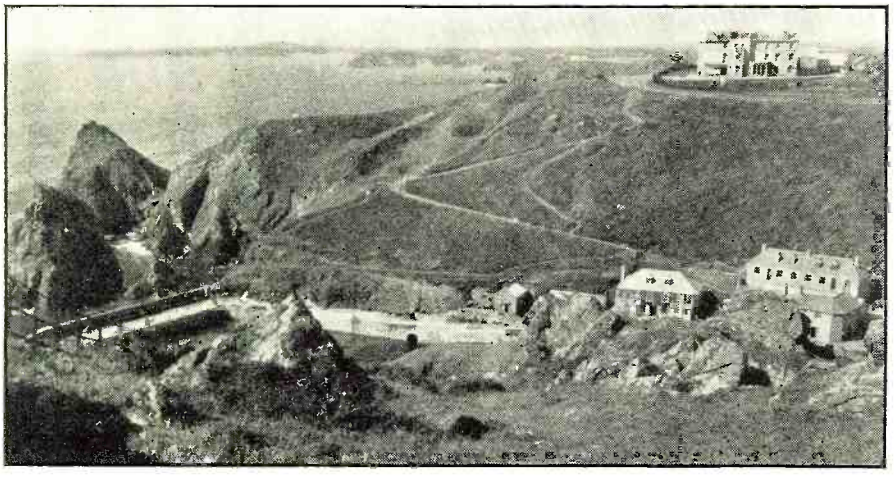
The German and British Transmissions

Official communications received from Richsfundfungesellschaft and from the British Broadcasting Company state that these transmissions are as shown in this

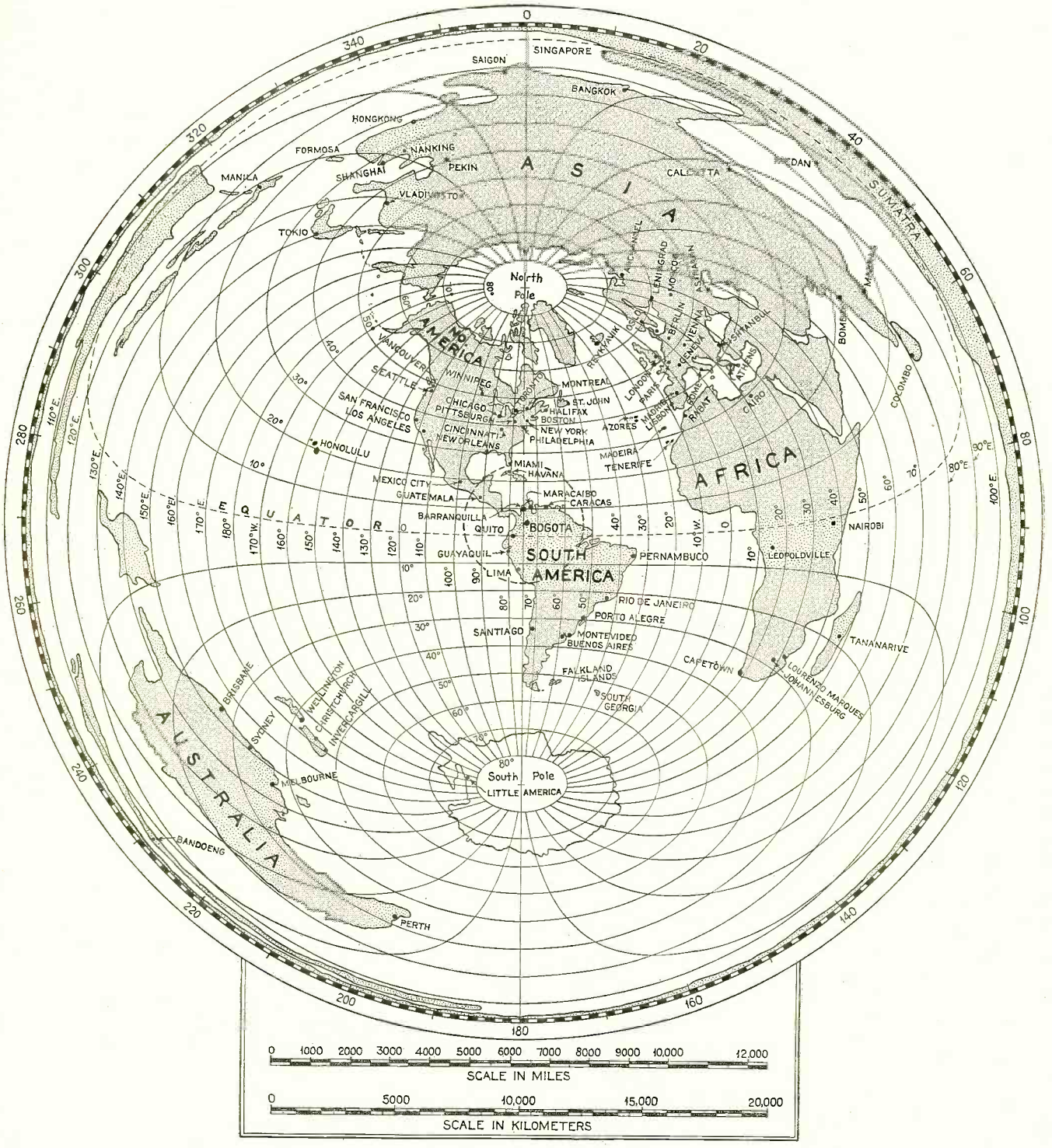
(*Continued on next page*)

UNUSUAL SITE FOR SUMMER LISTENING POST

One of our leading Listening Post Observers, in England, summered at Mullion and set up a portable Listening Post for logging short-wave stations for RADIO NEWS



WORLD DISTANCE CHART No. 4



month's "World's Short-Wave Time-Table" with possible substitutions or alternatives.

Two Stations Still Off the Air

We still miss I2RO on the air, which is reported inoperative while improvements are being made. Nothing has been heard of COC, Cuba, which is reported to have burned, due to an accidental fire. This latter station may not be back on the air. (We are still keeping these two stations' call letters in our Time-Table in the hope that they may be back on the air by the time this Time-Table is printed, or until we have definite information that they are off the air permanently.—Editor's note).

THE WORLD DISTANCE MAP FOR SOUTH AMERICA

Here is the fourth RADIO NEWS *azimuthal map, which is for the Northern part of South America, centered on Bogota. Measurements can accurately be made from any spot within the dotted circle to any other place on earth. Simply have a ruler connecting any spot within this circle to any other location on the map and refer this distance to the scale in miles; this will give the actual distance. This is the fourth exclusive* RADIO NEWS *chart published in this series*

Official Report from Ohio

Mr. C. H. Skatzes, Official Observer for Ohio, reports that Riobamba on 19.4 meters is using the call HC1FG. He states that the "JY" Japanese stations were formerly J1AA and that the "JV" Tokyo stations report their locations as Nagasaki. He includes a list of stations and frequencies: JDY, Dairen, 9925.; JIA, Taikohu, 15740 kc.; JIB, Taikohu, 10535 kc.; JIC, Taikohu, 5890 kc.; JVA, Tokyo, 18910 kc.; JVB, Tokyo, 18240 kc.; JVC, Tokyo, 19050 kc.; JVD, Tokyo, 15860 kc.; JVE, Tokyo, 15660 kc.; JVF, Tokyo, 15620 kc.; JVG, Tokyo, 14910 kc.; JVH, Tokyo, 14540 kc.; JVI, Tokyo, 13560 kc.;

(*Continued on page* 254)

SHORT-WAVE STATION LIST

(Giving Wavelength, Frequency, Call, Location and Service)

(Continued from the September issue)

meters	kc.	call	location	Service and schedule
34.21	8,770	RSZ	Irkutsk, U. S. S. R.	Phone; tests with Moscow
34.50	8,690	W2XAC	Schenectady, N. Y.	Experimental
34.54	8,680	GBC	Rugby, England	Phone to ships
34.66	8,650	W2XCU	Rocky Point, N. Y.	Experimental
34.66	8,650	VE9BY	London, Ontario	Experimental
34.74	8,630	W2XDO	Ocean Gate, N. J.	Experimental
34.74	8,630	WOO	Deal, N. J.	Phone
35.00	8,566	IBEJ	S. S. Conte Rosso	Phone
		ICEJ	S. S. Rex	Phone
		IDLI	S. S. Conte di Savoia	Phone
34.98	8,570	RV15	Khabarovsk, U. S. S. R.	Broadcast
35.03	8,560	WOO	Ocean Gate, N. J.	Phone to ships
35.40	8,470	DAF	Norddeich, Germany	Phone to ships
35.48	8,450	PRAG	Porto Alegre, Brazil	Phone, occasional bc.
35.78	8,380	IAC	Coltano, Italy	Phone
36.00	8,328	DDAC	S. S. Europa	Phone
		DDAS	S. S. Bremen	Phone
		DDBR	S. S. Berlin	Phone
		DDCB	S. S. Columbus	Phone
		DDCG	S. S. Resolute	Phone
		DDCP	S. S. Cap Polonio	Phone
		DDDT	S. S. Deutschland	Phone
		DDDX	S. S. Hamburg	Phone
		DDEA	S. S. Cap Arcona	Phone
		DDED	S. S. New York	Phone
		DDFF	S. S. Reliance	Phone
		DDFT	S. S. Oceana	Phone
		DDNY	S. S. Albert Ballin	Phone
36.65	8185	PSK	Rio de Janeiro, Brazil	Phone; also broadcast relays PRA3
36.70	8170	RV5O	Moscow, U. S. S. R.	Phone
36.92	8120	KTP	Manila, P. I.	Phone to Dixon, Calif.
36.92	8120	PLV	Bandoeng, Java	Phone
36.92	8120	KAZ	Manila, P. I.	Phone to Calif.
37.00	8103	HCJB	Quito, Ecuador	Broadcast
37.01	8100	EATH	Vienna, Austria	Phone; 5.30-7 P.M., Mo., Thu.
37.01	8100	JIAA	Kimikawa-cho, Chiba Ken, Japan	Experimental
37.33	8035	CNR	Rabat, Morocco	Broadcast, Sundays and holidays
37.48	8000	HC2JSB	Guayaquil, Ecuador	Broadcast, Mo., Wed., Sat., 8-11 P.M.
37.57	7980	HSJ	Bangkok, Siam	Phone
37.57	7980	VIJ	Sydney, Australia	Phone
37.77	7945	VK2ME	Sydney, Australia	Tests with England
37.81	7930	DOA	Doeberitz, Germany	Phone
38.00	7890	VPD	Suva, Fiji Islands	Phone
38.05	7880	JYR	Kemikawa-Cho, Chiba Ken, Japan	Experimental and relay broadcast
38.06	7877	SUX	Cairo, Egypt	Phone
38.10	7870	RXC	Panama City	Phone HJP afternoons, irr.
38.29	7830	PDV	Kootwijk, Holland	Phone
38.49	7790	HBP	Geneva, Switzerland	Broadcast
38.51	7785	TIR	Cartago, Costa Rica	Phone
38.59	7770	FTF	Ste. Assise, France	Phone
38.64	7760	PCK	Kootwijk, Holland	Phone; 9 A.M.-7 P.M.
38.86	7715	KEE	Bolinas, Calif.	Tests irr.; sends music evenings
39.14	7660	FTL	Ste. Assise, France	Phone
39.28	7632	OEJ	Vienna, Austria	Phone
39.29	7630	RIM	Irkutsk, U. S. S. R.	Phone to RKI; 6 A.M.-8.15 A.M.
39.40	7610	KWX	Dixon, Calif.	Phone to Hawaii, nights
39.63	7565	KWY	Dixon, Calif.	Phone
39.87	7520	KKH	Kahuku, Hawaii	Phone to KWO, 9 P.M.-2 A.M.
39.97	7500	RKI	Moscow, U. S. S. R.	Phone to RIM; 6 A.M.-8.15 A.M.
40.28	7444	HBQ	Geneva, Switzerland	Phone
40.46	7410	WEG	Rocky Point, N. Y.	Phone
40.48	7406	HJ3ABD	Bogota, Colombia	Broadcast; noon—2 P.M. and 7-11 P.M. daily; Sun. 7-11 P.M.
40.52	7400	WEM-W2XBJ	Rocky Point, N. Y.	Tests, irregular
40.57	7390	ZLT	Wellington, N. Z.	Phone to Sydney, mornings
40.68	7370	KEQ	Kahuku, Hawaii	Phone to Calif., nights
40.96	7320	ZTJ	Johannesburg, So. Africa	Broadcast; 9.30 A.M.-2.30 P.M.
41.30	7260	VS1AB	Singapore, Brit. Malaya	Broadcast
41.47	7230	DOA	Doeberitz, Germany	Phone
41.60	7207	EA8AB	Tenerife, Canary Island	Broadcast: temporarily closed will open with increased power
41.93	7150	HJ4ABB	Manizales, Colombia	Broadcast
41.98	7142	YV2AM	Maracaibo, Venezuela	Broadcast
42.71	7020	EAR125	Madrid, Spain	Broadcast
42.89	6990	LCL	Jeloy, Norway	Experimental
42.95	6980	EAR110	Madrid, Spain	Broadcast
43.04	6966	EDO	Madrid, Spain	Phone
43.23	6940	WEB	Rocky Point, N. Y.	Experimental
43.45	6900	GDS	Rugby, England	Phone to New York, nights
43.52	6890	KEB	Bolinas, Calif.	Phone
43.71	6860	KEL	Bolinas, Calif.	Phone
43.77	6850	VPE	Labasa, Vanua Levu, Fiji Islands	Experimental
		VQL	Savu Savu, Vanua Levu, Fiji Islands	Experimental
		VRO	Suva, Vili Levu, Fiji Is.	Experimental
		VPF	Taveuni, Taveuni, Fiji Is.	Experimental
43.83	6845	KEN	Bolinas, Calif.	Phone
43.83	6840	CFA	Drummondville, Que.	Phone
43.83	6840	HAS	Szekesfehervar, Hungary	Broadcast
44.38	6755	WOA	Lawrenceville, N. J.	Phone to England
44.38	6755	WNB	Lawrenceville, N. J.	Phone to Bermuda
44.38	6788	WND	Lawrenceville, N. J.	Phone
44.49	6738	TIGP	San Jose, Costa Rica	Broadcast
44.48	6740	WEJ-W2XBJ	Rocky Point, N. Y.	Tests, irregular
44.62	6720	WQO	Rocky Point, N. Y.	Phone
44.66	6716	KBK	Manila, P. I.	Phone
44.68	6710	KEF	Bolinas, Calif.	Phone
44.70	6707	YNTRG	Granada, Nicaragua	Broadcast
44.85	6685	YNLF	Managua, Nicaragua	Broadcast
44.88	6680	DGK	Nauen, Germany	Experimental
44.93	6672	YVQ	Maracay, Venezuela	Phone
44.95	6670	KFZ, KFY	Little America	Phone
44.96	6668	HC2RL	Guayaquil, Ecuador	Broadcast; Sun., Tue.
45.02	6660	KNRA	Schooner "Seth Parker"	Phone
45.02	6660	KFY, KFZ	Little America	Phone
45.02	6660	F8KR	Constantine, Algeria	Broadcast
45.02	6660	TGW	Guatemala City	Broadcast
45.09	6650	XFD	Mexico City	Phone
45.09	6650	KFZ, KFY	Little America	Phone
45.09	6650	IAC	Coltana, Italy	Tests, irregular
45.30	6618		"El Prado," Riobamba, Ec.	Broadcast; Thursdays, 9-11 P.M.
45.36	6610	REN	Moscow, U. S. S. R.	Broadcast
46.02	6515	WOO	Deal, N. J.	Phone
46.48	6450	HJ1ABB	Barranquilla, Colombia	Broadcast
46.67	6425	VE9BY	London, Ontario	Broadcast
46.67	6425	W3XL	Bound Brook, N. J.	Experimental
46.73	6420	RGX	Minsk, U. S. S. R.	Phone
46.99	6380	HJ5ABD	Cali, Colombia	Broadcast
46.99	6380	HC1DR	Quito, Ecuador	Broadcast
47.33	6335	VE9AP	Drummondville, Que.	Broadcast
47.48	6315	HIZ	Santo Domingo, Dominican Republic	Broadcast
47.80	6272	HI-1-A	Santiago de Caballeros, Dominican Republic	Broadcast
47.97	6250	HJ3ABF	Bogota, Colombia	Broadcast
47.97	6250	OCI	Lima, Peru	Phone
48.51	6180	TGW	Guatemala City	Broadcast
48.59	6170	HJ3ABI	Bogota, Colombia	Broadcast
48.75	6150	CJRO	Winnipeg, Manitoba	Broadcast
48.75	6150	YV3RC	Caracas, Venezuela	Broadcast
48.83	6140	KZRM	Manila, P. I.	Broadcast
48.83	6140	W8XK	E. Pittsburgh, Penna.	Broadcast; relays KDKA after 4.30 P.M.
48.87	6135	ZGE	Kuala Lumpur, Federated Malay States	Broadcast
48.91	6130	LCL	Jeloy, Norway	Experimental
48.91	6130	XETE	Mexico City	Broadcast; relays XEAL
48.91	6130	VE9BA	Montreal, Que.	Broadcast
48.97	6122	ZTJ	Johannesburg So. Africa	Broadcast
48.99	6120	VE9HK	Halifax, N. S.	Broadcast
48.99	6120	W2XE	Wayne, N. J.	Broadcast, relays WABC after 6 P.M.
48.99	6120	PK3AN	Soerabaja, Java	Broadcast
49.05	6112	YV2RC	Caracas, Venezuela	Broadcast
49.07	6110	VUC	Calcutta, India	Broadcast
49.07	6110	VE9HX	Halifax, N. S.	Broadcast
49.07	6110	VE9CG	Calgary, Alberta	Broadcast
49.15	6100	W3XAL	Bound Brook, N. J.	Broadcast; relays WJZ, Mo., Wed., Sun.
49.15	6100	VE9CF	Halifax, N. S.	Broadcast
49.15	6100	W9XF	Chicago, Ill.	Broadcast; relays WENR, Tu., Thu., Fri., Sat., 4.30 P.M.-2 A.M.
49.19	6095	VE9GW	Bowmanville, Ontario	Broadcast
49.23	6090	VE9BJ	St. John, N. B.	Broadcast
49.31	6080	CP5	La Paz, Bolivia	Broadcast
49.31	6080	W9XAA	Chicago, Ill.	Broadcast; relays WCFL
49.31	6080	TIRA	Cartago, Costa Rica	Broadcast
49.31	6080	VE9EH	Charlottetown, P. E. I.	Broadcast
49.37	6072	OER2	Vienna, Austria	Broadcast
49.39	6070	VE9CS	Vancouver, B. C.	Broadcast
49.39	6070	YV5BMO	Maracaibo, Venezuela	Broadcast
49.39	6069	JB	Johannesburg, So. Africa	Broadcast
49.44	6065	SAJ	Motala, Sweden	Broadcast
49.48	6060	CMC1	Havana, Cuba	Broadcast
49.48	6060	W8XAL	Cincinnati, Ohio	Broadcast; relays WLW
49.48	6060	VQ7LO	Nairobi, Kenya, Africa	Broadcast
49.48	6060	OXY	Skamlebaek, Denmark	Broadcast
49.48	6060	W3XAU	Byberry, Penna.	Broadcast; relays WCAU
49.48	6060	ZL2ZX	Wellington, New Zealand	Broadcast
49.56	6050	VE9CF	Halifax, N. S.	Broadcast
49.56	6050	GSA	Daventry, England	Broadcast
49.56	6050	HJ3ABI	Bogota, Colombia	Broadcast
49.64	6040	W1XAL	Boston, Mass.	Broadcast
49.64	6040	.....	Bandoeng, Java	Broadcast
49.64	6040	W4XB	Miami Beach, Florida	Broadcast; relays WIOD
49.72	6030	VE9CA	Calgary, Alberta	Broadcast
49.78	6023	XEW	Mexico City	Broadcast
49.80	6020	CQN	Macao, China	Phone
49.80	6020	DJC	Zeezen, Germany	Broadcast
49.87	6012	ZHI	Singapore, Malaya	Broadcast
49.89	6010	COC	Havana, Cuba	Broadcast; temporarily closed
49.89	6010	XEBT	Mexico City	Broadcast; relays XEB
49.93	6005	VE9DR	Drummondville, Que.	Broadcast
49.93	6005	VE9DN	Drummondville, Que.	Broadcast
49.93	6005	VE9CU	Calgary, Alberta	Broadcast
49.97	6000	YV4BSG	Caracas, Venezuela	Broadcast
49.97	6000	.....	Bucharest, Rumania	Broadcast
49.97	6000	XGOX	Nanking, China	Broadcast
49.97	6000	FIQA	Tananarive, Madagascar	Broadcast
49.97	6000	.....	St. Denis, Isle de Reunion	Broadcast
49.97	6000	EAJ25	Barcelona, Spain	Broadcast
49.97	6000	RV59	Moscow, U. S. S. R.	Broadcast
49.97	6000	ZL3ZC	Christchurch, N. Zealand	Broadcast
50.23	5969	HVJ	Vatican City	Broadcast
50.39	5950	HJ2ABA	Tunja, Colombia	Broadcast
50.40	5948	HIX	Santo Domingo, Dominican Republic	Broadcast
50.47	5050	TGX	Guatemala City	Broadcast
50.64	5930	HJ4ABE	Medellin, Colombia	Broadcast
50.82	5900	CMB1	Havana, Cuba	Broadcast
51.18	5857	XDA	Mexico City	Tests with Merida
51.25	5850	WOB	Lawrenceville, N. J.	Phone

(To be continued next month)

RADIO CENTER, BERLIN

At the left is the broadcasting center in Berlin, where the programs for German broadcasting, as well as the German short-wave broadcasting, are produced. Insert shows Dr. Kurt Boekmann.

The GERMAN SHORT-WAVE TRANSMISSIONS

W. W. Diefenbach

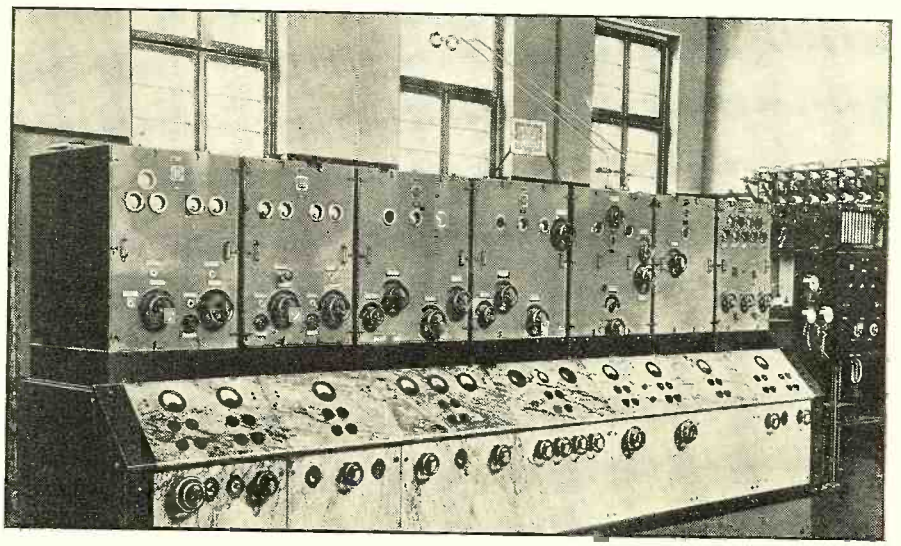
Our short-wave readers will be interested in this interesting story of the famous "D" station transmissions giving detailed information on their history, their operating staff, their method of zoning transmissions, their time schedules.

THE beginning of German short-wave broadcasting goes back to the year 1929. Trial transmissions then proved the possibilities of spanning great distances on the short-waves. A 20 kw. broadcasting station, which at first used a simple dipolar antenna and then a vertical bar antenna, was placed in service in Zeesen, near Koenigswusterhausen, on August 26, 1929. Since December 22, 1933, the German short-wave broadcaster has utilized four straight antennas for the following zones: Africa, Eastern Asia, South America, and North America. Each of these zones is provided with a special program. The broadcasting hours are arranged so that the particular zones can tune in at their most opportune hours of the night. The program for the first zone of Asia now begins at about 12:45 p.m. middle European time (M.E.T.), and lasts until 3:45 p.m. (M.E.T.). That coincides with local time from 7:45 p.m. to 10:45 p.m. in Shanghai. At about 6:30 p.m. (M.E.T.) the program for zone 2, Africa, begins and ends at approximately 10:00 p.m. (M.E.T.). The African local time coincides with the middle European time. From 11:00 p.m. (M.E.T.) until 2:00 a.m. (M.E.T.), the broadcast is to zone 3, for South America. These offerings are audible in South America between 6:00 p.m. and 9:00 p.m. The transmissions for the remaining zone, North America, begin at 3:30 a.m. (M.E.T.) and last until 6:00 a.m. (M.E.T.).

This German schedule was officially installed February 1st, 1934, with a number of special performances. In honor of the opening of the South American antenna array, the ambassadors of Brazil, Argentina, and Mexico spoke to the listeners of their native countries. Similar performances were offered at the opening of the Eastern Asiatic antenna array as well as the African antenna.

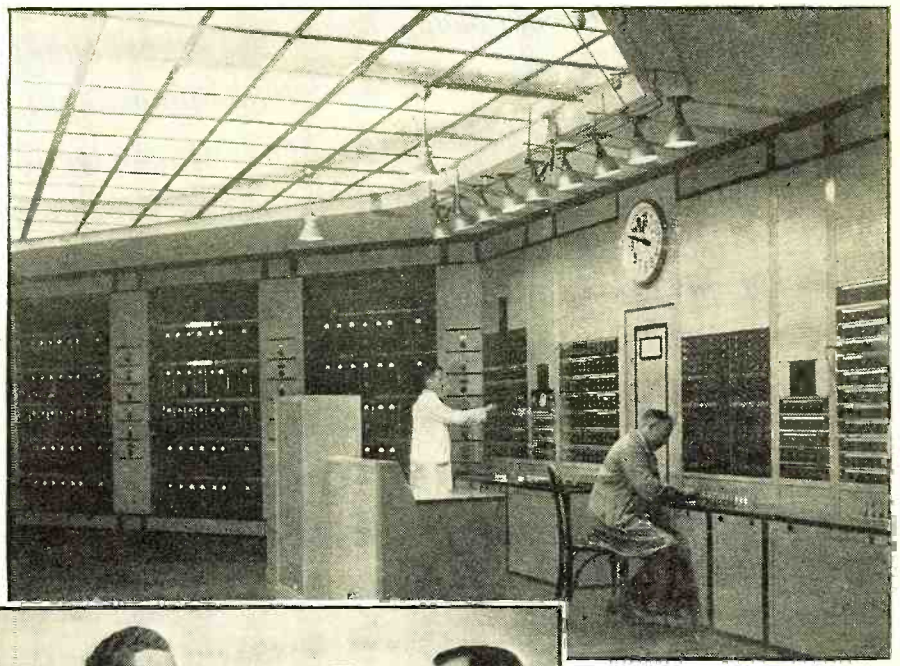
The manager of the system is Dr. Kurt von Boekmann, an expert who formerly supervised the Bavarian broadcasting station in Munich. The programs of the system are intended to portray a picture of the life of modern Germany to peoples of foreign countries. The daily current-event service, offered in German, English, Spanish, and Portuguese tongues, comprise an important part of all the zone programs. Four trained speakers carry out this part of the program: Hans Jürgen Maraun (German and English); Harold Dietrich, director of this service; Horst Cleinow (German, English, and Spanish); and Johannes Schmidt-Hausen (German and English). The characteristic opening of all programs begins with a German folksong. Serious as well as lively music vary with short lectures, scanty descriptive monologues and current news. A number of short lectures are held in foreign languages. The individual transmissions are suited to the special prerequisites of the individual broadcasting zones.

The actual scene of the German broadcasts is the "Haus des Rundfunks" in Berlin. The radio house in Berlin is numbered among the most interesting radio buildings of Europe. The programs intended for the short waves are transmitted by land wire through a new amplifying room of the most modern construction and thus to the transmitter at Zeesen. There is close cooperation between this service and the largest broadcasting companies of for-



THE ZEESEN TRANSMITTER

One of the 20-kw. Telefunken short-wave transmitters which is located at Zeesen near Koenigswusterhausen



THE LINE AMPLIFIERS

At the right is shown two operators controlling switching between the studios and the transmitters, as well as the banks of line amplifiers, loaders, etc.

eign countries. The programs of the German transmission are often received by radio through special receiving circuits in the respective countries, and are retransmitted on the broadcasting networks. It is, therefore, often possible to reach both the short-wave listener as well as the regular listeners of the world. Almost all of the important political mass meetings of the New Germany were made accessible to millions of foreign German listeners, in this way. Besides these regular program exchanges, the broadcasting stations of North and South America as well as Dutch India tune in on the German Short-Wave Broadcasting Station whenever they like to do so.

As different wavelengths are used for the respective zone-programs, and more than one transmission must be made on two different wave units a second short-wave station of 20 kw. output was recently added. At present, the stations work on the following wavelengths: Zone 1 (Asia) Station DJB—wavelength 19.73 m., and Station DJA—wavelength 31.38 m., Zone 2 (Africa) Station DJD—wavelength 25.51 m., DJC—wavelength 49.83 m., Zone 3 (South America) Station DJA — wavelength 31.38 m.; Zone 4 (North America) Station DJD—wavelength 25.51 m., and Station DJC—wavelength 49.83 m.

It is intended to establish another directed antenna array for the Central American zone to achieve a complete coverage of the whole world through the German system. This new array could also be used for an Australian zone by proper adjustment of the individual dipolars. The broadcast energy also could be made to radiate not only in the desired direction, but also in the opposite direction. For this purpose, reflector-dipolars are arranged behind the transmitting dipolars. The former cause a one-sided concentration of the transmitting energy and can be used for opposite direction of 180 degrees.

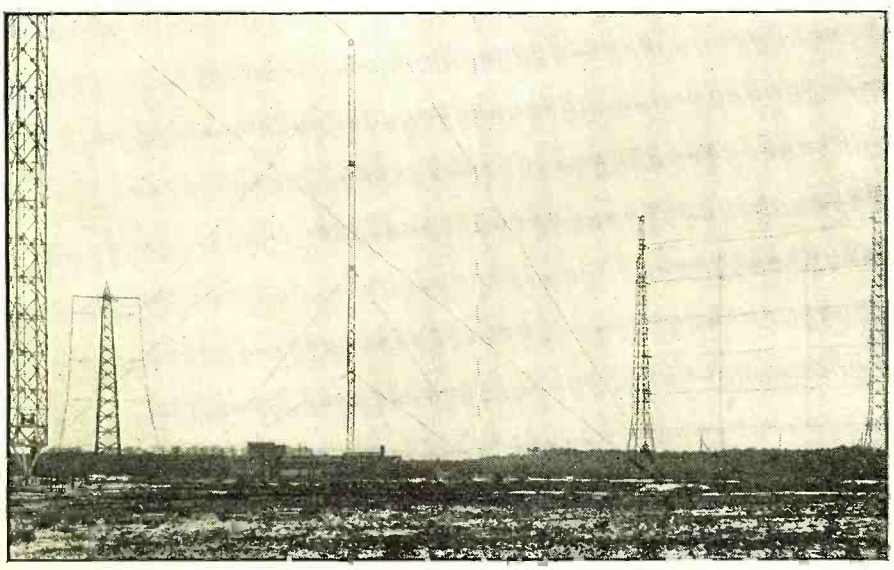
THE STATION'S LINGUISTS

From left to right they are: Hans J. Maraun (German and Spanish), Harold Dietrich (Director), Horst Cleinow (German, English and Spanish), Johannes Schmidt-Hausen (German and English)

The wavelength, on which the individual antenna arrays work, depends on the season of the year, and also on the time of day. With approaching darkness, higher wavelengths are used. For North American transmissions (for instance during daylight) one chooses a wavelength of 25 m.; at night, a wavelength of approximately 50 m. By using directed antenna arrays there is a gain of 200 times as much energy transmitted to the desired points.

The German Short Wave Broadcasting Station has made it its duty to unite the scattered foreigners of the whole world into an international companionship, and thus tighten the ties between them and Germany. During the broadcasting, the German short-wave broadcasting station tells all their listeners about the accomplishments and the happenings in Germany in a lively and interesting manner. The short waves reach the lonely inhabitant shut off from the Universe, even in the most out-of-the-way sections of South Africa, South America and the Orient. The short waves encircle the globe in 1/7 second and, thus, form the most ideal spot-news medium that one can possibly imagine.

Day by day, the mail brings the German short-wave broadcasting system stacks of enthusiastic and deeply appreciated letters from listeners in all parts of the world.



WHERE WAVES ORIGINATE

General view of the vertical antenna and the directional antenna for North America

Summer Listening in England and Germany

LONDON, ENGLAND—The official report of the British Postmaster General shows that during the month of May 318,445 new listeners obtained their licenses, while 289,832 listeners discontinued their licenses. This makes an increase of 28,622 listeners for the month of May. In previous years the number of listeners has always decreased during the summertime; England thus shows an increase for this year and last year. In Germany during the month of May the number of listeners decreased by 38,610. This decrease, however, is less than that of previous years.

SHORT-WAVE PAGE

IT seems to be weakness of "travelers" on the higher frequency ether paths, to always begin a story with, "I remember when." Well, readers, this is one of those "yarns." Sea Captains are notorious tellers of fish stories but this one is not a fish "tale" but my early actual experiences in short waves.

IN 1929, (should I say "Way back in 1929"?) there were strong rumors that there was an actual thing as short waves. Being a dyed-in-the-wool long-wave DX'er and having logged and had verified all but three states in the Union, I was vastly interested in this "unknown" that brought the world to a man's receiver. I used to go down to the then popular Radio Row and look around or "window shop." Finally I spied a short-wave set (in kit form, as in those days there was no such thing as manufactured or laboratory-tested receivers). Every short-wave set then was "custom built" because the "customer" built it himself. When I saw this kit I thought to myself, "well, I don't know the first thing about technical radio, so how will I ever get it together? Faint heart never won fair lady, therefore, if I wanted a short-wave receiver, it was either build it myself or be without. To make a long story short, I bought the kit. I'll never forget; it was four o'clock in the afternoon when I arrived home with it. Thank the stars, the diagram was in picture form. I immediately went to work on it. At five o'clock the next morning, after working on it steadily for eleven hours, I was all ready to DX. I found that when I connected my outside broadcast aerial to it, the receiver let out the most awful howls ever heard this side of Hades. After a few hours of trying to chase the ungodly sounds, I disconnected the outside antenna and experimented with an inside one. This proved satisfactory, but the best aerial was about six or eight feet of wire hanging over the back of a chair!

Several days passed before I took courage in my hands and dared turn on my newly acquired receiver. About three days later I went at DX'ing with a vengeance. I tuned and tuned. Nothing. But as I had the virtue of patience, I was not dismayed. And my dial-twisting was rewarded. I heard a voice! It sounded clear but hopelessly far away. Then music. I looked at the clock; it was just about five o'clock in the morning. I continued to listen. Then I heard something about this being a program for Admiral Byrd at the South Pole. Then came the station announcement. VK2ME, Sydney, Australia! "It can't be," I thought. Within an hour I had written my letter to VK2ME, Sydney, Australia. Did I enclose an International Reply Coupon? I did not! Never heard of them!

Days passed into weeks, weeks drifted into months. And one morning I opened my letter box and there was a card. It was my first short-wave veri. I still have it today and it reads, "We confirm your report of the 28th June, 1929, on the interception of our station 2ME. We have no regular transmission schedule as 2ME is experimental only. This station was designed and built in Australia."

On this first receiver I never got more than than one station, and that was VK2ME. About three months later I decided to move. When the moving man arrived and had taken all my things out, he said, "What is that on the window-sill?" I said, "Oh, that is a short-wave receiver." He said, "What did you ever hear on it?" Staring him straight in the eye, I said, "Australia." What he thought I'll never know. Two days after, now installed in my new home, a knock came at my door. It was the moving man. With a sheepish look, he said, "I was wondering about that short-wave receiver. Did you really get Australia on it?" Then I showed him the veri and told him what I had heard. To my surprise, he said, "How much do you want for it?" Taken off my feet, I said, "Only what I paid for it." The deal was made and he walked off the proud owner of a set that had a reputation of getting Australia and never anything else.

From then until 1931 I let short waves alone, mainly because there was so little information about them, no schedules, etc. In the early part of 1931 I went "short-wave" again. This time I was more cautious. Finally, after much lengthy window shopping, I purchased a 5-tube regenerative battery-operated receiver. This receiver I have today. With it I have covered many thousands of miles and logged all the continents and have verified 50 countries. I use superheterodyne receivers for general reception, but when I want to "tour the world" my trusty "5-tuber" is by my side.

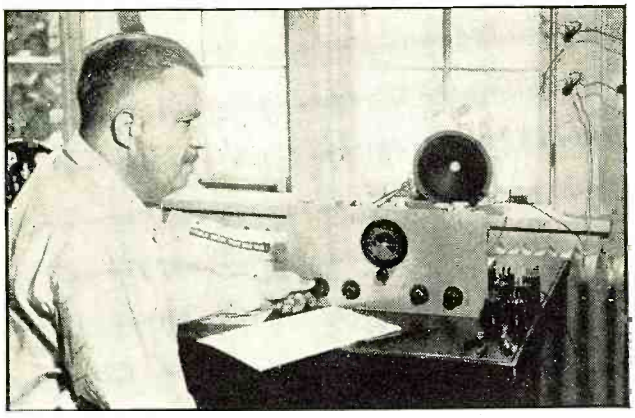
Reception in General

Not so long ago short-wave listeners could "count" on the transmission coming from 2RO, 25.4 meters, especially during the summer months. But during the warm weather this year their signals were not heard at all. They were off the air. Occasionally IRM, 30 meters, the powerful Italian phone circuit, did radiate the "Raddio-Napoli" operas, Mussolini's speeches and Balbo's air flights, but otherwise the transmissions from Italy were "out." Listeners missed the saccharine-voiced lady announcer who has definitely identified herself with 2RO's programs. RV59, 50 meters, Moscow, U.S.S.R., terminated broadcasting on this comparatively high wavelength and was missed, not because of program value, but principally because RV59 was considered by many listeners to be a fairly "hard catch." Hearing Moscow and cold weather seem to go "hand in hand," and although during some of our hottest days RNE, 25 meters, was heard testing with Rocky Point, we all must acknowledge that RV59 was "the" station that DX'ers were after. For a period of over six months, or to be accurate, not since February 24, was this station heard by the writer. Some time ago we received a letter from Miss Inna Marr, informing us that the 50-meter transmissions would be abandoned until a later date. Judging from this, we imagine that RV59 is back with us this fall and probably will be heard very well during the cold days. Let us hope that the code interference that was one of the reasons many fans did not "pull in" RV59 will be absent. It is also hoped that COC, Havana, Cuba, who did mar Moscow's programs will *not* be on the same frequency as they were before they (COC) were burnt down. There is much discussion at present whether COC will be rebuilt again or not. Reception of Germany, the only "foreign local" that continues to cling to the "roaring" 49-meter band, fell far below par. But who cannot say that the Deutschlander's radiations on DJD, 25.51 meters, have not been excellent? Politics and more politics did fill the ether waves, but very few listeners tune to foreign stations for the program value, but for the main reason of comparing signal strength of the various stations. Listeners who dote on symphony orchestras never would tune to HI1A or any of the South American stations for that type of entertainment, but listen to one of the "big four" locals. Pontoise, France, transmitting on 25.2 meters from noon to early evening and then on 25.63 meters until midnight, certainly earned the title bestowed on her as one of the foreign locals.

One can readily say that Daventry transmissions have not been as good as

(*Continued on page 257*)

HENRY GUERRERO



OPERATING DATA ON THE "ALL-STAR" *ALL-WAVE* RECEIVER

Some tests and the results on short-wave world-wide reception

Laurence M. Cockaday

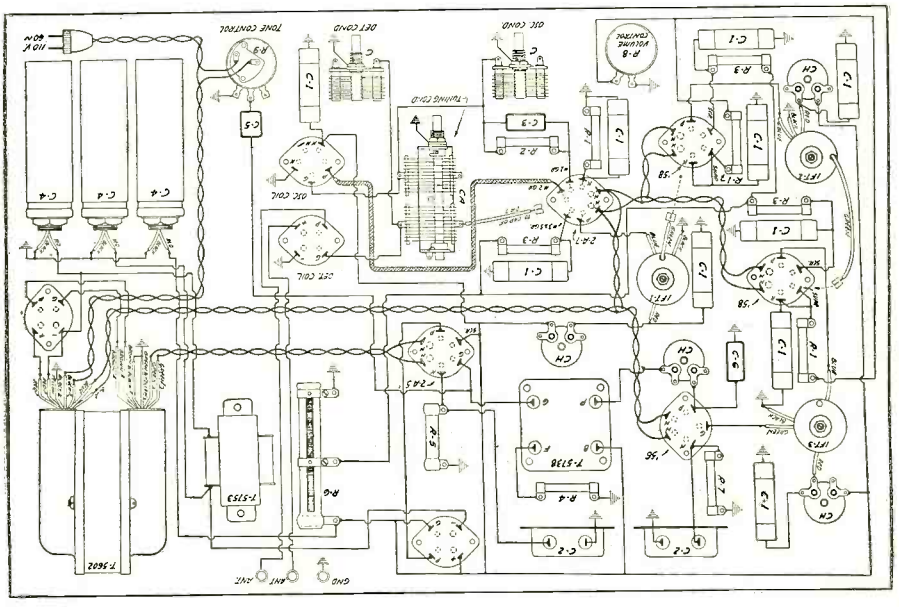
LAST month I promised a few more details on installation, adjustment and operation of the "All-Star" all-wave receiver, as well as some of the results obtained in testing it.

After the completed receiver was brought to the Westchester Listening Post, it was set up in the following manner: The two leads from a bipole antenna were attached to the two binding posts on the rear of the receiver and the set was grounded at the remaining binding post to a good low-resistance ground. A suitable 8-inch dynamic loudspeaker (with a 2500-ohm field coil and equipped with an output transformer for the 2A5 tube) was plugged in by means of the four-prong plug-and-socket arrangement. The power plug was also inserted in the 110-volt, 60-cycle a.c. lighting line.

During this test I wanted to be sure that the intermediate-frequency transformers were aligned properly and for this I selected a standard short-wave signal from W8XAL in Cincinnati, whose reception is received very steadily at this listening post. First of all, the 45-90 meter coils were inserted in the detector and oscillator positions in the receiver. Then the detector and oscillator tank condensers were properly set for the 48-meter band. The middle dial was then rotated from zero—anti-clockwise—until station W8XAL was picked up. The volume control and tone control were then adjusted for a rather low intensity of signal. Then, one after another, the adjustments on the "cans" holding the three intermediate frequencies were slowly rotated back and forth until the best signal was obtained. This adjustment improved the signal, although the set has so much sensitivity that the little bit it was "out" did not amount to much. On another day the receiver was again adjusted on a more distant station (it happened to be JYS in Japan) for more accurate settings.

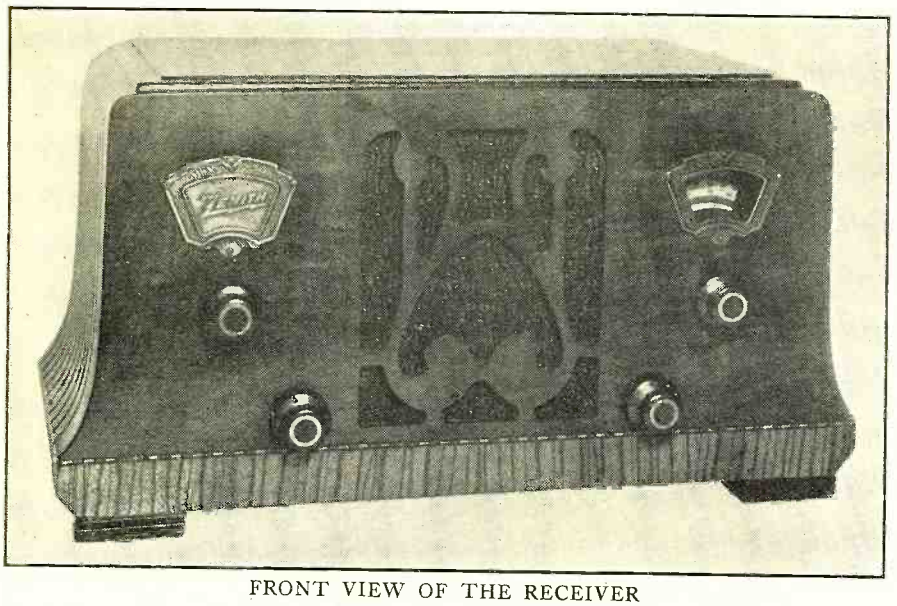
To a person not used to this type of band-spread tuning, it might take a little time before the locations of the proper spots on the dials would be found for different frequencies. I am going to give, therefore, the approximate adjustments of the receiver tuning for the various wave bands, so that readers who build this set will have something to go by when they come to log their own receivers. Starting at the 48-meter band, I find that I used the 45-to-90 meter coils and set the oscillator condenser at 3 on the small dial and the detector condenser also at 3, with the main band-spread tuning control (at the center) set at 5. When this was done, all I had to do to tune in the whole 48- 50-meter bands was to rotate the middle dial anti-clockwise, from zero to about 30, and all the stations on the band are tuned in automatically. With this adjustment I found that at 10 on the middle dial I got YV3RC; at 15, W8XK; at 17, W2XE; at 20, W9XF; at 24, W8XAL; at 28, DJC; to name a few easy-to-get stations. For the 31-meter band I changed the coils to the 22-46 meter coils and set the oscillator tank condenser on 41 with the detector condenser at 38, respectively. Then with the middle dial set again at 5, I started swinging it anti-clockwise through the 31-meter band. Or, I might set the dials for the 30-meter band the oscillator at 36 and the detector at 34, and starting again with the middle dial at 5, swinging through EAQ, GCW and then on through the 31-meter band by simply keeping on going with the middle dial. The 25-meter band uses the same coils as the 31-meter band and the adjustments are, on the left, 22 (oscillator) on the right, 12 (detector) and the 25-meter band stations are brought in with the middle dial, starting at 5 and going up. For the 19-meter band I again changed coils, using the 10-24 meter coils and setting the left-hand dial at 70, the right-hand dial at 95 and starting again (at about 5 on the middle dial), swinging (*Continued on page* 259)

THE PICTORIAL WIRING DIAGRAM



Do You Want Complete Instructions for Building This Set?

A FOUR-PAGE descriptive folder on the All Star superheterodyne receiver is waiting for you, to help you build this set. Simply address your request for this informative literature to RADIO NEWS, Blueprint Department, 222 West 39th Street, New York City. The folder contains a schematic diagram, a pictorial wiring diagram, a parts list, as well as assembly, wiring and tuning instructions. These will be sent to any of our readers free of charge.



FRONT VIEW OF THE RECEIVER

A New 3-BAND "SUPER"

(Zenith Model 825)

The Technical Editor

THE illustration above proves that a combination long- and short-wave receiver can be built very compact. The cabinet measures only 17 inches long, 8¼ inches high and 7¼ inches deep. It contains the receiver with power pack and speaker.

The Zenith Model 825 is a three-band superheterodyne covering the broadcast band and all short waves down to 25 meters. It thus includes the short-wave broadcast bands which are of greatest interest while the elimination of a fourth band simplifies the construction and reduces cost.

Model 825 employs seven tubes, including the rectifier. Three type 6D6 tubes serve as r.f. amplifier, first detector and i.f. amplier. The oscillator is a type –37, a –75 serves as second detector, a.v.c and first audio stage. A –42 pentode is used as output tube and the rectifier tube is a type –80.

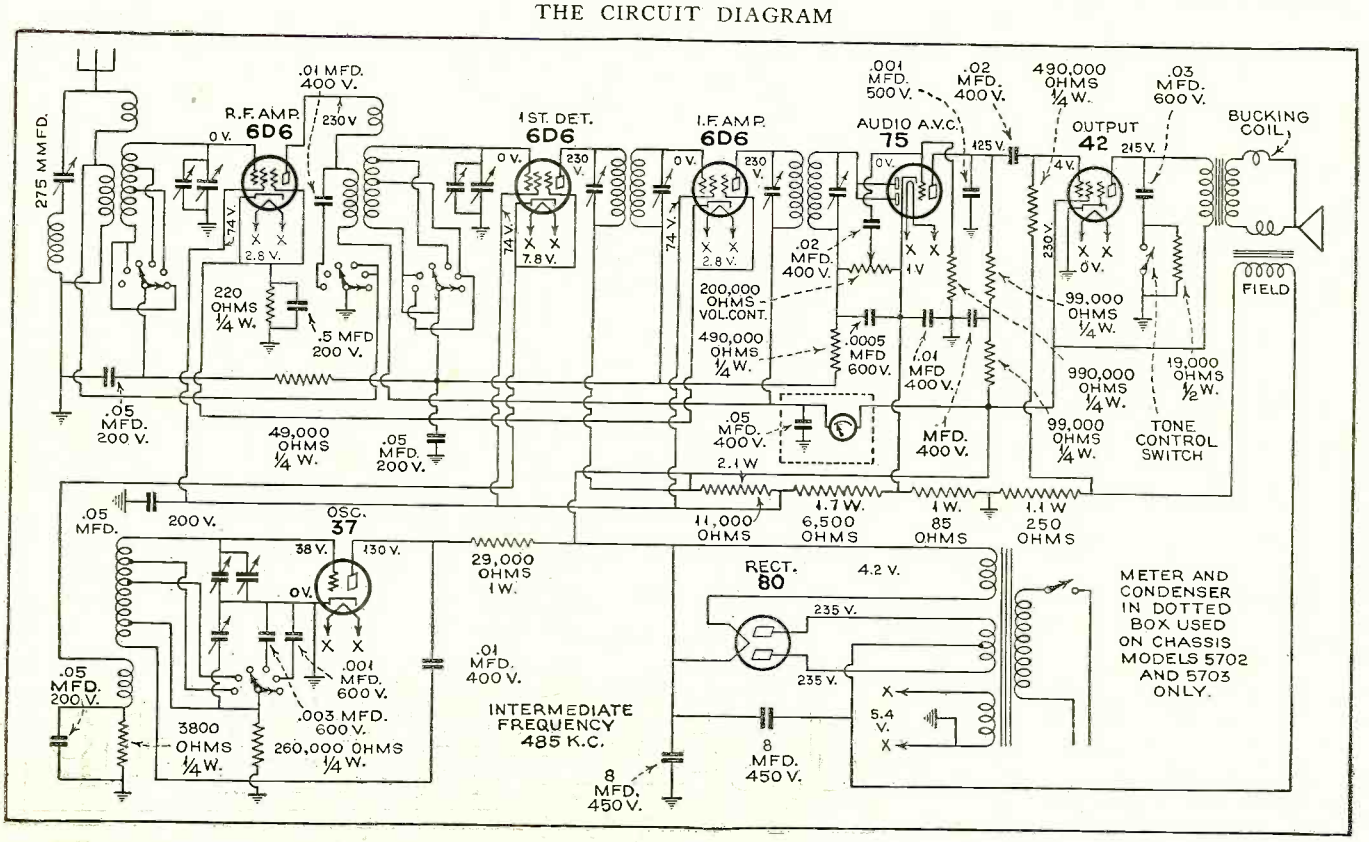
Thus all tubes are of the 6.3-volt series. These are preferred by many manufacturers because they are somewhat more economical in the use of filament power and the lower filament current results in less hum. This can be understood when one considers that much of the hum is picked up from the filament circuit which forms a loop. The field intensity in this loop is dependent on the current; reducing the current to 30 percent results in a material reduction of hum. The saving in filament power can easily be demonstrated. A –58 is rated at 2.5 volts and 1 ampere, which makes 2.5 watts. The 6D6, which is similar to a –58, requires 6.3 volts and .3 amperes or 1.89 watts—a considerable saving.

The intermediate frequency is 485 kc. In order to reduce image interference, a tuned r.f. stage is used; a wave trap, tuned to 485, is connected across the input so as to reduce code signals from ships or coast stations.

The oscillator is of the Hartley type and is coupled to the first detector inductively through a small coil in the detector cathode circuit.

The receiver has only one set of coils. The switching arrangement is such that for short-wave reception some portions of the tuning coils are shorted. So it can be seen, for instance (Figure 1), that there are two primaries in series, both in the antenna circuit and in the plate lead of the r.f. tube. When the switch is set for the short-wave bands, it shorts the larger section of the antenna primary. Moving the switch to the low-wave range, it connects a condenser across a section of the primary in the r.f. plate circuit—this amounts to a short-circuit. (*Continued on next page*)

THE CIRCUIT DIAGRAM



The oscillator circuit is switched also by shorting a portion of the tuning coil, at the same time adding a padding condenser. After one stage of intermediate frequency amplification, the signal is rectified by the duplex-diode-triode. The audio-signal is built up across the grid-leak resistor (volume control); any desired portion of this audio signal can be applied to the grid of the triode section. At the same time, the d.c. component of the voltage developed across the grid-leak, is applied to the control grids of the r.f. amplifier, the detector and the r.f. amplifier, automatically controlling their sensitivity.

The dial is calibrated in kilocycles and megacycles; it carries three scales in different colors. The frequencies of short-wave broadcast-bands are plainly marked. A tone control is included; it has two fixed positions, one for normal reception and one for reduction of high frequency response.

The Models 826, 827, 870 and 829 have practically the same circuit. Model 826 is designed for 25 cycles; model 827 includes a tuning meter while model 870 has a larger speaker, a tuning meter and an aeroplane dial.

This receiver was tested at three different listening posts in and near New York City. The aerials employed were the normal variety available at these posts varying in length from 25 to 150 feet. Reception can be had on very short antennas but it is much better with an antenna length of approximately 75 feet. If a noise reduction antenna with double lead-in is used, a coupler unit should be added, since the primary in the set is grounded.

During the weekend of the 29th and 30th of June and July 1st, it was at the Westchester listening post at the same time with several other receivers. In order to make some comparison, a certain foreign short-wave station would be tuned in on a receiver with which we are well familiar and which is always at that post. Now the same station was tuned in on other sets in turn, using the same aerial, also trying other aerials. This way one can identify stations more readily and compare reception on different receivers.

Curiously enough, there was not any instance where we could not tune in on the Zenith any station which was found on the standard receiver (which is more expensive and much more sensitive). However, some of the weak ones were very weak indeed on Model 825. Stations received include all three Australian stations, VK2ME, VK3ME, VK3LR , all British empire stations above 25 meters, DJD, DJA, DJC, HBL, HBP, RNE, I2RO, EAQ, CT1AA, GCW, FYA and of course all the Americans and Canadians.

Reception on all but the weakest stations is generally clear enough for entertainment value. Even VK3LR is loud enough as long as one gets him early. Later on in the morning he becomes too weak.

The middle band covers mostly police stations and aviation stations. Reception was had of stations over practically all of the United States and Canada. The calibration on short-wave bands is close enough to find a station easily when the frequency is known.

National Union Elects Officers

NEW YORK—H. A. Hutchins, formerly general sales manager of the National Union Radio Corporation, has been elected vice-president and general sales manager, as was also George Ernst, who holds the position of general superintendent of factory operations. Dr. Ralph E. Meyers was elected as first vice-president. H. R. Peters remains as president.

ROSALINE GREENE
RIGHT: LOMBARDO BROS.

KATE SMITH

FRANK MUNN
AND MURIEL WILSON

BACKSTAGE *in* BROADCASTING

ROSALINE GREENE, the radio actress assigned the speaking rôle of Mary Lou in the Thursday night NBC Maxwell House Show Boat programs, boasts of the fact that all of her dramatic efforts have been confined to the air. She has never been on the stage or in talkies. She entered the radio dramatic ranks during the pioneer days of broadcasting and was starred in many notable programs. She feels that stage or screen work can hamper a radio actress's microphone work in which the voice alone must convey the illusion of action. Although Miss Greene speaks the lines of Mary Lou, the singing of the Show Boat heroine is done by Muriel Wilson, soprano.

THE song-and-comedy team of Tim Ryan and Irene Noblette recently shifted its NBC program, "Tim Ryan's Rendezvous," to a Tuesday night spot. Tim and Irene (who are really Mr. and Mrs.) came to radio after several years in musical comedy and vaudeville and scored a hit in their first program from San Francisco. After several months on the West Coast, they hied to New York, where

TIM RYAN AND IRENE NOBLETTE

Samuel Kaufman

their "Rendezvous" series won them a sizable following. The series is built around a mythical night club and the atmosphere is so genuine that some listeners have written to NBC asking for the club's address.

SHORTLY after Guy Lombardo and his Royal Canadians switched their microphone allegiance to the NBC, the stellar radio orchestra won a commercial spot on the network. The Lombardo. dance tunes are now heard on the Plough, Inc., program on Wednesdays. Guy's three brothers—Carmen, Leibert and Victor—participate in the programs.

FRANK MUNN, tenor, and Muriel Wilson, soprano, two of radio's best-known vocalists, are starred on the new "Lavender and Old Lace" series sponsored by the Bayer Company over CBS Tuesday nights. Gustave Haenschen's Orchestra, one of the busiest musical organizations on the air, supplies the instrumental background. The series features sentimental ballads and old-time song favorites.

FAY BAINTER, the stage star, made two guest appearances in the CBS Ward Family Theatre series and had some interesting comment on radio drama. "I believe," she said, "that one of radio's most valuable contributions to the dramatic art

FAY BAINTER
AT MICROPHONE

Chatty Bits on Radio Personalities

lies in the revival of stage successes of some years ago, such as those being presented by the Family Theatre, a leading force in this movement. Radio is replacing and extending by far the scope of 'the road,' which has dwindled to almost a shadow of its former glory."

AFTER a long absence from the airlanes, during which she toured the nation's vaudeville theatres, Kate Smith has returned to the CBS. She is presented Monday, Thursday and Friday evenings with an orchestra conducted by Jack Miller. The big noticeable change in Kate's new programs is that she has dispensed with her old signature song, "When the Moon Comes Over the Mountain." We're told that Kate appeared before more than 1,000,000 people in 35 cities on her vaudeville tour.

MRS. FRANKLIN DELANO ROOSEVELT, wife of the President, recently returned to the air in a series of programs sponsored by the Simmons Company over an NBC hook-up. Mrs. Roosevelt agreed to appear on five programs as a news commentator. The first broadcast occurred in July and the remaining four were to take place at dates not determined at the time of this writing. It is the custom of the First Lady to donate her radio earnings to charity. It was announced that the money she received for her first broadcast of the Simmons series went to the American Friends Service League.

MAY SINGHI BREEN
AND PETER DE ROSE

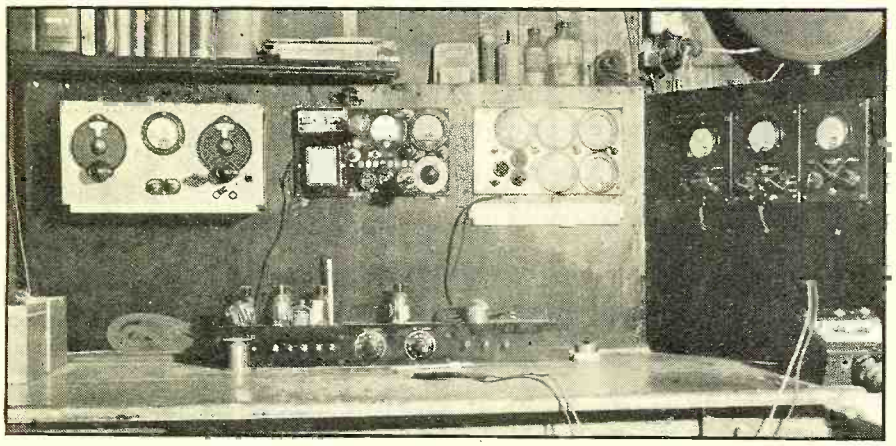
MRS. F. D. ROOSEVELT

MAY SINGHI BREEN and Peter de Rose—the "Sweethearts of the Air"—recently celebrated their eleventh broadcasting anniversary. Paul Whiteman joined in the event with a birthday party broadcast on his Thursday night NBC program. During their eleven years on the air, Breen and de Rose were away from the microphone only two weeks, during which they were married and went on a honeymoon trip. The team has been before the microphone more than 2000 times since launching its radio career in 1923. The team is heard regularly on several daytime programs.

IT'S certainly pitiful to see anyone crying. And this is especially true when you see a pretty girl shedding tears. But if you ever come across Sally Belle Cox weeping before an NBC microphone, don't waste any sympathy. She gets paid for it! Sally has been featured on the air for a long period in cry-baby rôles. She boasts that she can imitate the howls and yelps of any infant, and she's so good at filling the claim that casting directors have frequent assignments for her. Sally was born in Parkersburg, West Virginia, twenty-two years ago. While working in a Cleveland orphanage, she learned the knack of being a professional cry-baby.

LISTENERS to the programs of the American Broadcasting System—the new Eastern network—have noted that Station WMCA, key of the chain, has recruited the services of a lady announcer.
(*Continued on page* 251)

SALLY BELLE COX



THE SERVICE BENCH

ZEH BOUCK

Getting Your Money Back on Trade-Ins

"Every dealer appreciates that the trade-in of obsolete receivers is, and always will be, an important factor in the successful radio business. It is often a case of either taking in the old set, with the usual credit allowance and corresponding loss of profit, or losing the sale altogether. Yet, comparatively few radio dealers make any intensive effort to get rid of these sets at a profit or even at a price that will compare favorably with the trade-in allowance. We have developed a satisfactory method of handling these used sets, as outlined below, which gives a fair profit on even the oldest models and at the same time keeps the number of these receivers on hand down to the minimum.

"The used sets are divided into three classes as follows: (1) *Semi-modern sets.* A-c and d-c models later than 1930. (2) Single-control sets using '01As, '12As and '71s. (3) *Obsolete Receivers.* Sets designed and built before 1930 and having two or more controls.

"The method of handling the above type of sets according to their classification is as follows: (1) The set is thoroughly overhauled and tested for defective parts. All worn and burned resistors, volume controls, etc., are replaced with new material of the same type. The set is then adjusted and fitted with a new set of tubes and is offered for sale at a price ranging up to one-half the original list price. This type is known as a 'rebuilt radio' as opposed to a 'used set' which is sold with the old parts, tubes, etc., intact. (2) This type of set is given a thorough reconditioning similar to that described above. If the set has the old UV type standard sockets these are taken out and the UX and UY types put in their place. A new set of '30, '31, '32 or '33 type tubes is installed for dry cell or Air-Cell operation. When using type '33 tubes the second audio stage is removed, three of the pentodes being paralleled for greater output. This type of set is also known as a 'rebuilt radio'. (3) This class includes the two and three dial sets designed and built before 1929 or 1930. These sets are torn down, the parts being carefully sorted out according to quality, condition, etc. The good quality condensers, coils, transformers, etc., are built up into one, two and three-tube receivers and sold to people who cannot or will not use the larger sets. The unused parts are sold to experimenters. I know several dealers who are reaping quite a profit by building this type of set up into 'police adapters' which seem to find a ready sale." Harry D. Hooton, Radio Service Co., Beech Hill, West Virginia. (Figure 1)

On the subject of remodeling old receivers along the lines suggested above, Jess M. Reed of Los Angeles, Calif., sends along the following notes:

"The service man is often asked whether or not an old model radio receiver can be brought up to date by changing to the new type tubes. If the original receiver is an all electric model, this change can be made without a great deal of trouble and little expense. The purpose of this article is to show the modifications necessary to get results when changing from low impedance to high impedance tubes.

"High impedance tubes such as the -57, -58, -24A, -35, and others, cannot effectively replace such tubes as -27's or -26's unless certain changes are made in the r.f. and antenna coils. The r.f. coil for a low impedance tube usually does not have enough primary, or plate turns for a high impedance tube. Of course a certain amount of amplification will be obtained by using the old r.f. coils, but in order to take advantage of the high amplification factor of the modern tubes, the primaries should have more turns so that the external plate impedance will enable the tube to deliver a higher voltage gain.

"A compromise must be made on the number of turns, because, as the primary turns are increased, the transformation ratio of the transformer decreases. A practical design is to use about 40 or 45 turns for the primary with tubes having the higher plate impedance. For the lower impedance tubes, a few less turns will give good results. It is usually only a matter of a few minutes to tear off the old primary winding and substitute the new primary which has more turns. Care must be taken not to couple the new primary too tightly, otherwise the selectivity will be impaired and the set will have a tendency to break into oscillations.

With tubes having a medium amount of negative bias, no change in the antenna coil may be necessary. However, if a tube such as the -35 or the -24A type is used, the grid bias is of such a value that a strong signal voltage may cause the grid to become momentarily positive, causing a flow of grid current and consequently decreasing the selectivity of the first stage. Cross modulation caused by strong local signals may also take place. The cure for these troubles is, obviously, to increase the selectivity of the antenna unit. A short antenna may cure the trouble; or it may be necessary to loosen the coupling in the antenna coil or replace the original coil with one having a higher degree of selectivity."

From Walter J. Robertson, of Robertson's Radio Service, Long Beach, California, comes additional suggestions on the revamping of old receivers that should interest rural and urban servicemen alike.

"So far as sales are concerned, I deal exclusively in second-hand sets. This feature of my sales plan may be frowned upon by some servicemen; nevertheless, I have found it muchly worth while. While the sale of used radios may not be very profitable in more prosperous times, it is decidedly in line with present-day conditions. Good reconditioned radios are coming more and more into their own.

"I can pick up radios that have been traded in for other sets, for anything from three to ten dollars. Most of these, of course, require working over. Tightening of connections, realignment of tuning condensers, cleaning of volume controls, etc., are usually in line. Occasionally I rewire the receiver—particularly if it is a battery model—for air-cell operation with the series 30 tubes. Such sets are readily salable in rural districts.

"As a rule, the tubes do not require much attention, although I make it a policy to put in a new rectifier. After the radio is in good order, it is sold for from eight to twenty-five dollars. Obviously, there is a very fair margin of profit.

"These sets are sold almost exclusively to my service customers. Since I am one of those servicemen who work only in their own shops, I make it a practice to leave a reconditioned radio in the customer's living room while I am repairing his own set. The price tag is attached conspicuously to the tuning control knob. Naturally, if the customer has a good set to begin with, he is not interested in the purchase of another set. But some friend of his may be! Also, as many servicemen will agree, there are plenty of sets in use today that should be relegated to the Smithsonian. It is to customers owning this class of sets that the largest proportion of my sales are made. I find that a great many of the older sets will not get the police broadcasts. As a

FIGURE 1

consequence, I have made it a practice to specializing in the old Atwater-Kent model 40 radios. A slight adjustment on the third tuning condenser makes it possible to pick up the police calls very nicely. I find this a great assistance in selling these old type radios. I also make it a point to log several stations at least 1500 miles distant to demonstrate the DX possibilities of the set I am trying to sell.

"The above two points, in addition to the savings in buying a good used set, usually clinches the sale. I have also found it worth while to give my used sets a ninety-day guarantee—the same as a new radio. This may seem to present difficulties, but it is good psychology, and it works out nicely in practice. The proof of the pudding is in the eating. The merits of this idea are shown in the records of the organization. In the last six months of 1933, we sold seventy-six reconditioned sets at an average price of around fifteen dollars. Our average cost was eight dollars a set."

SERVICE SHOPS

This month's shop, shown in this month's heading, shows the installation made by Mr. T. K. Church in the John Beno department store, Council Bluffs, Iowa. The usual equipment is in evidence, and includes a modulated oscillator covering all broadcast and i.f. frequencies in fundamentals, a Hickok tube tester and analyzer and a complete array of current, voltage, resistance and capacity meters. The equipment is so arranged that it may be demounted and used as portable equipment in the field. Mr. Church writes: "All of my work is done on a contract basis, which I have always felt is the fairest method for one who knows his own ability and limitations."

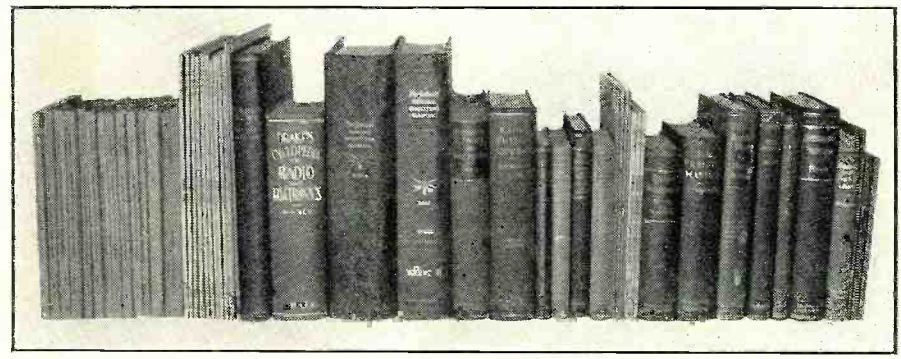
THE DAYS WORK

Stewart J. Robinson, of Sacramento, California, revives the *bête noire* of radio servicing and writes:

"Another case of intermittent reception was a 9-tube Philco with automatic volume-control—a model 90, using one –47 tube in the output stage. This receiver was exasperatingly peevish when it arrived in the shop. It would play by the hour without a hiccough, then quit entirely, to be brought back to life by stamping on the floor! A record was made of all voltage readings at normal operation, and compared with similar readings when off. This meant waiting for several hours and then sneaking up on it! Both sets of readings were identical! This suggested an intermittent open in some circuit carrying no d.c. It turned out to be an a.f. coupling condenser.

"A Zenith 8-tube super acted up in a similar manner. This receiver used type –51 tubes in the preselector and i.f. circuits, a –47 output tube and a –24 in the automatic volume control, receiving i.f. voltage through a grid leak and condenser circuit. Snapping a light on or off—or momentarily turning off the radio itself—would return the operation to normal. Unfortunately, the receiver cannot be operated with an analyzer plugged in any r.f. sockets, or the second detector. It was therefore difficult to check voltages under normal and abnormal conditions. However, as almost any voltage variation will cause corresponding plate current changes, space current measurements were made instead. Again this was a rather long procedure, but it was hastened a bit by including the milliammeter in a common plate circuit of all tubes affected by the automatic volume control. There was no difference in current readings when the set was operating correctly or when it was dead. This

(*Continued on page* 245)



THE TECHNICAL REVIEW

JOSEPH CALCATERRA

Electrical Communication, by Arthur Lemuel Albert; published by John Wiley and Sons Inc. A new technical reference book for the communication industry, in which those not having technical training will also find much of value. It was primarily designed for a college text book and although higher mathematics are used, where advisable, the reader can follow solutions in the text itself. The first chapter deals with the history of electrical communication and the following chapters discuss theoretical considerations of sound, echoes, reverbration, etc. Speech and hearing, the electrical fundamentals of communication, different kinds of microphones and loudspeakers with a discussion of the design and application, follow. The next chapters deal with the communication systems themselves: Telegraph systems, telephone systems, networks and wave filters, inductively loaded circuits, inductive interference, theory of electron tube, applications of tubes in both wire and radio communication service. At the end of each chapter is a reference of authors who have written on the subjects treated and at the end of the book is an 8-page index for quick reference. A welcome book for the radio student, engineer, school or technical library.

Applied Acoustics, by H. F. Olson and F. Massa; T. Blakiston's Son & Co. 1934. This new textbook will certainly fill a definite need in the library of radio engineers; it deals with theoretical and experimental acoustics applied to the problems of the radio industry. The first chapters are concerned with fundamental equations and definitions and a comparison of dynamical systems. Chapter III is entitled "Fundamental acoustical measurements" and Chapter IV "Electrical apparatus for the laboratory." These two chapters should be of great interest to anyone who has occasion to make any kind of acoustical measurement. Microphones form the subject of a long chapter; all types of microphones are discussed from the carbon to the ribbon. Response characteristics, directional properties, sensitivity, construction and some considerations of the design are given of each type. A similar treatment of telephone receivers and loudspeakers follows in the next two chapters. Then follows the subjects of testing loudspeakers and calibrating microphones. Finally one comes to architectural acoustics, discussing properties of rooms and auditoriums. The last chapters deal with the measurement of noise, physiological acoustics and miscellaneous applications.

Radio Receiver Measurements, by R. M. Barnard; Iliff and Sons, 1934. This is a treatise on the measurement of the performance of radio receivers according to the standards of the Institute of Radio Engineers. The book instructs the "Service engineer" how to adjust a receiver for best response and then proceeds to explain the standard measurements of sensitivity, selectivity and fidelity. Descriptions are given of several makes of apparatus, each as standard signal generators, beat frequency oscillators, etc., which are suitable for such measurements. Detailed instructions are given in using these; there are, however, no diagrams of these commercial instruments and the few diagrams shown in the book to illustrate the purpose of oscillators, attenuators, etc., do not show constants of the parts. Therefore the book is not claimed to be a guide for building measuring instruments but it is a guide on how to use them.

La Moderna Supereterodina (The modern Superheterodyne) by D. E. Ravalico; Ulrico Hoepli, Milan, 1934. Nearly all the new receivers are superheterodynes which include so many special circuits and innovations that it furnishes enough material for a good-sized book on this superheterodyne alone. This book is written entirely in the Italian language. It is intended for readers who do not yet have much knowledge of radio. It begins with discussing wave motion in general, harmonics and the principle of beats; it explains the working of the superheterodyne. Here one finds all the newest circuits discussed in plain language. Such circuits as a.v.c., squelch circuits, automatic tone compensation, automatic tuning and remote control tuning are explained and illustrated. There is also a description of all the newest tubes like the 2A7, 2B7, 6F7, Wunderlich, etc. Other chapters deal with the actual construction of the receiver, its installation and repair; there is also a discussion of automobile receivers and short-wave receivers. The appendix contains an explanation of the decibel and a list of American tubes with their characteristics. This last is quite complete and up to date.

Review of Articles in the July, 1934, Issue of the Proceedings of the Institute of Radio Engineers

The Practical Measurement of Amplitude Modulation, by L. F. Gaudernack. The term "degree of modulation" and some questions met with when measuring the degree of amplitude modulation.

The Directivity of Antenna Arrays, by F. G. Kear. How slight detuning effects in one antenna of a group alters the pattern, and means of overcoming this trouble. By using the methods described in this paper, the directivity characteristics of an array may be maintained constant in spite of wide changes of antenna tuning.

75-Centimeter Radio Communication Tests, by W. D. Hershberger. A simplified theory of the mechanism of oscillation used in a directional 75-centimeter Barkhausen-Kurz transmitting and receiving equipment for both telephone and code work. The results of tests with this equipment is also given.

Transmission Lines As Frequency Modulators, by Austin V. Eastman and Earl D. Scott. A method of producing frequency modulation wherein an eighth-wave radio-frequency transmission line is used as a modulation device.

Distributed Capacity of Single-Layer Coils, by A. J. Palermo. Previous theory, with regard to the distributed capacity of single-layer coils, does not agree with experiment. The reasons for this disagreement are discussed and a formula which corrects this discrepancy is given.

Echoes of Radio Waves, by N. Janco. The existence of long-delay echoes of radio waves on the basis of the difference in the sense of polarization of the ordinary and extraordinary rays.

Review of Contemporary Literature

Maintaining Quality in Dry Batteries, by J. C. Wright. Bell Laboratories Record, July 1934. The methods used by the Bell System for testing dry batteries for use in telephone work are described in this article. The standard types of dry batteries used in telephone work are listed.

A 5000-Volt Mercury-Vapor Rectifier for the 6B Radio Broadcasting Transmitter, by H. A. Reise. Bell Laboratories Record, July 1934. The theory and use of the new mercury vapor rectifier capable of supplying plate power at a voltage of 5000 for replacing high voltage motor-generator equipment and providing means of obtaining symmetrical 100% modulation.

Electron Oscillography. General Radio Experimenter, June 1934. The electrical and mechanical specifications of the new General Radio type 687-A electron oscillograph and sweep circuit which includes sweep circuit, power supply and tube in a single portable unit entirely operated from the alternating-current line, are given in this article.

High Efficiency in Audio-Frequency Amplifiers, by E. K. Sandeman. The Wireless Engineer and Experimental Wireless, July 1934. A high power amplifier designed especially for centralized radio and sound systems in which programmes picked up by a radio receiver are distributed, at audio frequency, over a wire network connected to a number of subscriber points.

Gas Discharge Tubes as Intervalve Couplings, by H. Smith and E. G. Hill. The Wireless Engineer and Experimental Wireless, July 1934. How to use a glow tube as an intervalve coupling device in audio-frequency amplification to eliminate the troubles usually encountered in amplifying signals of small magnitude.

Notes on the Policy of the Administration with Reference to the Control of Communications, by Bethuel M. Webster, Jr. Air Law Review, April 1934. This lengthy article goes into considerable detail into the past, present and future status of communications control, and analyzes the legislation enacted, pending and suggested which affect communications operation in general, including radio broadcasting. Numerous suggestions are made for the improvement of broadcast conditions and control.

High Fidelity Standards and Broadcast Stations. The Broadcast Engineer, June 1934. The problems which the station engineer may encounter in improving the performance of his station from the standpoint of range of response to audio frequencies, percentage of wave-form distortion and reduction in noise and other forms of interference.

Vibrator Power Supply from Dry Cells, by Walter Van B. Roberts. Electronics, July 1934. Circuits and formula for the calculation of the constants required in the design of vibrator-type, dry-battery-operated power supplies for portable sets are given in this article.

How to Get Copies of Articles Abstracted in This Department

The abstracts of articles featured in this department are intended to serve as a guide to the most interesting and instructive material appearing in contemporary magazines and reports. These publications may be consulted at most of the larger public libraries or copies may be ordered direct from the publishers of the magazines mentioned. RADIO NEWS *cannot undertake to supply copies of these articles. They are NOT included in the* RADIO NEWS *Free Technical Booklet Service.*

Free Technical Booklet Service

THROUGH the courtesy of a group of manufacturers, RADIO NEWS offers to its readers this Free Technical Booklet Service. By means of this service, readers of RADIO NEWS are able to obtain quickly and absolutely free of charge many interesting, instructive and valuable booklets and other literature which formerly required considerable time, effort and postage to collect. To obtain any of the booklets listed in the section herewith, simply write the numbers of the books you desire on the coupon which appears farther along in this column. Be sure to print your name and address plainly, in pencil, and mail the coupon to the RADIO NEWS Free Technical Booklet Service. Stocks of these booklets are kept on hand and will be sent to you promptly as long as the supply lasts. To avoid delay, please use the coupon provided for the purpose and inclose it in an envelope, by itself, or paste it on the back of a penny postcard. The use of a letter asking for other information will delay the filling of your request for booklets and catalogs.

Review of Technical Booklets Available

2. *1934 R.F. Parts Catalog.* Specifications on the entire line of Hammarlund variable and adjustable condensers, r.f. transformers, sockets, shields, and miscellaneous parts for broadcast and short-wave receivers, complete short-wave receivers and transmitting variable condensers.

4. *A 15 to 200-Meter Superheterodyne.* A description of the outstanding features of the Hammarlund-Roberts high frequency superheterodyne designed especially for commercial operators for laboratory, newspaper, police, airport and steamship use.

5. *A 1934 Volume Control, and Resistor Catalog.* Data on standard and replacement volume controls, truvolt adjustable resistors, vitreous wire-wound fixed resistors, voltage dividers, precision wire-wound non-inductive resistors, high-quality at-

(*Continued on page* 263)

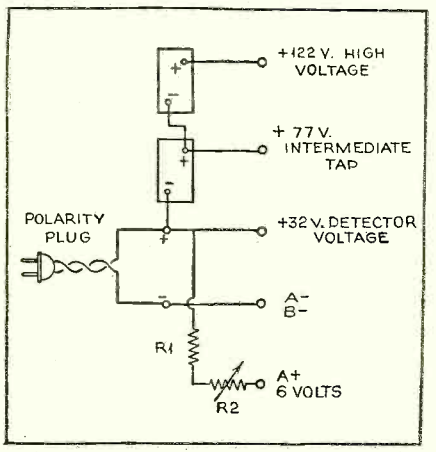
WITH THE EXPERIMENTERS

WILLIAM C. DORF

An A Eliminator for 32 Volt Supply

In the accompanying diagram is a circuit of a 6-volt A eliminator, to operate from a 32-volt power plant. I have used this eliminator on several battery operated receivers and always with satisfactory service.

A reference to the circuit will show that

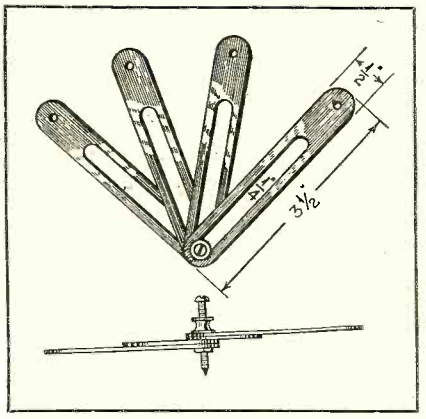


it takes advantage of the input 32 volts in eliminating one B battery block for the plate supply. The constants are as follows: R1—19 feet 10 inches of No. 22 nichrome wire, R2—10 ohm power rheostat capable of carrying 1.5 amperes.

MILTON SCHRAG,
Augusta, Kans.

An Adjustable Drilling Template

The sketches show an adjustable drilling template that can be made from 4 pieces of $\frac{1}{16}$-inch-thick brass or aluminum and



one binding post. This tool has many uses for the experimenter. It indicates the exact location for drilling holes in panels and chassis, for mounting various radio parts.

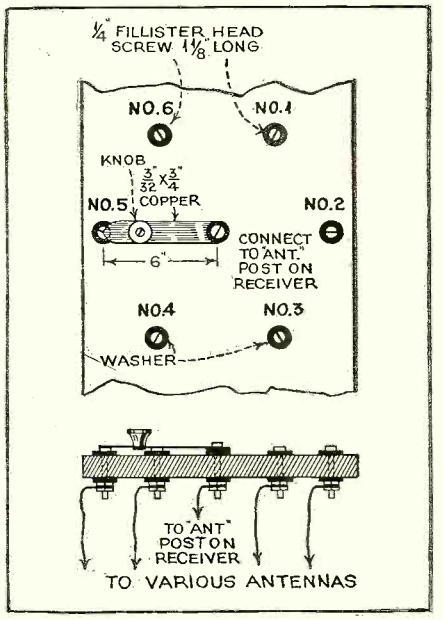
Slots are cut into the brass strips about ¼ inch in from one end to approximately three-quarters the length of the strip as shown, then drill ⅛-inch holes in the other end of the gauge. By adjusting the slides, the holes are put over the mounting holes of the condenser or the rheostat which is to be mounted and the binding post is tightened. The pattern thus obtained is then transferred to the panel for the correct position of the holes to be drilled.

J. E. KITCHIN,
Vancouver, B. C.

Antenna Switching Panel

Here is a simple idea for an antenna switching panel that works out extremely well. With this arrangement one can change instantly to different type aerials and to antennas of different lengths, all of which is particularly helpful in short-wave reception.

I am showing the dimensions of my panel and the facilities for six antennas



which I am fortunate enough to have. However, the size of the panel and number of connecting points can be reduced or enlarged to one's requirements.

The construction of the panel is simple. Obtain a board 18 inches long by 12 inches wide by ½ inch thick and then assemble and mount the screws, washers and nuts as shown in the drawing.

The leads from the various antenna systems are connected at the back of the panel to the six switch connecting points. Connect a lead from the arm of the device over to the antenna binding post on the receiver.

ROY SANDERS,
Worcester, Mass.

French Broadcast

(*Continued from page 219*)

is to be made comparable to that of other large nations.

The new listener license system provides a means for determining the exact number of French listeners. Former estimates set the figure at 2,000,000 radio sets in France at the end of 1933, but today the preliminary license figures show no more than 1,400,000. If compared to the huge body of English and German listeners, these figures seem to be small. But one must consider the former deficiency of French broadcast development; the most powerful provincial stations, Lyon and Bordeaux, had a power of only 20 kw. Statistics of the listeners of today show that the most considerable audience (except for the regions of Paris, Lyon, Marseilles and Bordeaux) is in the north of France. But this is a fact which might have been observed in any of the continental countries. In Germany, for example, it is in Bavaria that the smallest number of listeners is found.

The number of French listeners will very probably increase in the future as the reception continues to be improved, owing to the new stations under construction, and to the improvements in programs which will undoubtedly follow. There are still many theatres and variety shows which refuse to broadcast their programs because they want to be subsidized by the state. But it is obvious that this is not possible because only 17 million francs per year are granted by the State to the official broadcasting stations. In spite of such limited means, a national orchestra of 80 members has just been created. It is hoped to be considered as one of the main broadcasting orchestras in Europe.

It is a surprising fact that in France, in spite of the literary élite, and good dramatic authors, a good broadcast play has not yet been produced. A prize of 3,000 francs (and it is not much) which was to be given for the best broadcast play, has been disputed with the result that none of the 10 competitors actually obtained the prize, as none of the plays met the requirements.

School broadcasting does not exist as yet, but it will probably be accepted when sponsored by the Board of Education, as it may be later.

The Lucerne plan is said to be a dangerous one for the few private stations which remain. They try to obtain cleared channels by changing their wavelengths, but these channels assigned to France will soon be occupied by the official stations now under construction. In Paris, there are so many stations: Radio-Paris, Paris-PTT and Eiffel Tower on the one hand; and on the other, the private station, that the two smaller .5 kw. stations, Radio-LL and Radio-Vitus are threatened by the annulment of their transmission licenses.

The important political events of this year have exerted a great influence on French broadcasting. It had been suffering from perpetual changes of the Cabinet, which brought in action a new Postmaster General each time. At the beginning of the year, the interdiction of the religious transmissions from "Radio-Paris" (where they had been part of the program for over 6 years), interdiction which was based on the neutrality of the State towards the Church, has deeply stirred certain classes of listeners. Later, broadcasting was threatened by a political censorship which might have brought, in the beginning of February (during the riots) a complete silence on political events. On the day of the general strike, "Paris-PTT" could not be heard and a "cut" in the officials' salaries was the cause of a break in the programs of this station. Now, however, with the new cabinet, French broadcasting is springing into life and vigor. Religious lectures from "Radio-Paris" have begun again, and a series of philosophical lectures, the first of which was given by M. Henri Bergson, give a new interest to the listeners. They have been filled with enthusiasm over M. Doumergue's two broadcast speeches; there will be some more of them as M. Doumergue is a great friend of broadcasting. 1934 will be a hard-working year for French broadcasting, but that it will gather the fruits of its labor seems assured. The powerful new stations should start new interest in Broadcast band DX from Europe.

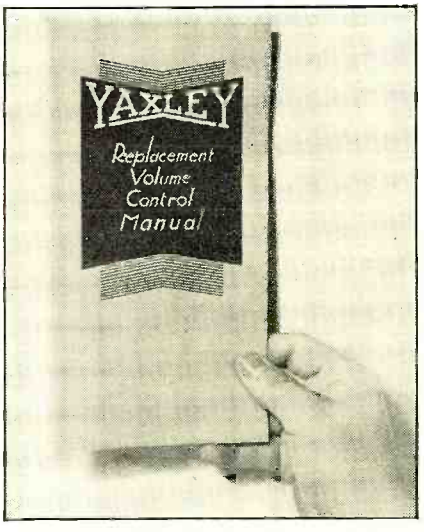
The Service Bench

(*Continued from page 241*)

seemed to indicate that the receiver was okay from the antenna to the secondary of the last i.f. transformer—for most anything wrong in this part of the circuit would have shown up in the plate current through these tubes, whether it be trouble in the voltage supply, open i.f. transformer, shorted turns, etc. A.F. by-pass condensers, the coupling condenser between the second detector and the –47 output tube, voice current circuits in the speaker were next inspected and exonerated. By a process of elimination, only the secondary of the last i.f. transformer remained. This was removed and given a careful once-over which disclosed a 'rosin joint.' All connections were resoldered, the coil tested for shorted turns, the trimmer condenser freed from dust, the transformer reassembled, the shield cleaned at the contact surfaces and the unit replaced in the set. The receiver has been playing now for about a month with no sign of trouble, so it is reasonable to suppose that we have eliminated it."

Replacement Volume Control Manual

Radio dealers and servicemen will want to obtain the new Yaxley replacement volume control manual of over 100 pages. It will be full of important information for service workers. Through a special arrangement, these manuals are made available, free, to radio servicemen and dealer readers. The only requirement is that all requests be written on letterheads indicating that the reader is a bonafide radio serviceman or dealer. Address requests to Department Y, RADIO NEWS, 222 W. 39th St., New York City.



RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 33
Capacitors

EVERY radio circuit is merely a combination of resistors, inductors and capacitors, arranged to produce certain desired characteristics. These three elements form the basis of all electrical circuits we will come in contact with. A complete knowledge of the action and construction of all forms of capacitors is essential in radio work. We have already studied the behavior of resistors and inductors, and will now consider the capacitor. The term *capacitor* has lately been adopted as the correct one to designate devices which are used in electrical circuits to purposely introduce the element of capacitance. While the term capacitor is a very good one, the term *condenser,* used commonly to denote the same thing, is perhaps used much more in radio and electrical work. The term condenser is a very poor one, for it has no relation to the action of the device in a circuit. The so-called "condenser" does not "condense" anything, except possibly the negative electrons crowded into the negative plate. As we will see presently, a capacitor or condenser stores an excess of electrons on one set of plates when charged. The condenser is the only electrical device which actually stores electricity; that is, electrical charges. Its capacity for storing electrical charge or electrons is called the *capacitance.* The term *capacity* is commonly used in practice instead of capacitance. The student should become familiar with all of these terms, for while it is desirable to use the correct one always, one must sometimes do as the Romans do when in Rome. Many manufacturers still mark their units as "condensers of so-and-so much capacity."

Also both sets of terms are found in radio and electrical literature. It is very difficult and almost impossible in some cases, to change a term which has been in common use for years, so it is doubtful if the terms *capacitor* and *capacitance* will ever entirely supplant the more popular terms *condenser* and *capacity.*

The application of an e.m.f. to a conductor causes a transfer or "drift" of electrons around the circuit. If the circuit is continuous, a continuous flow of electrons takes place around it, and we have a continuous electric current. If the circuit is not continuous, but terminates in two ends separated from each other, a somewhat similar action takes place for a short time. A general definition of a condenser or capacitor would be, *any two conductors between which a difference of electrical potential exists, and which are separated by an insulator.* Thus the ends of two wires held apart in air really form a capacitor if an e.m.f. is applied to them, but, as we shall see later, such a device would have very little capacitance or ability to store electric charges simply because its surface areas are too small.

The actions of capacitors is so intimately tied up with electrons and electric charges that it would be well at this point to briefly review the theory of the electron structure of matter which we studied in earlier lessons. Let us consider the capacitor shown in (A) of Figure 1, consisting of two sheets of metal separated by some insulating material. The insulating material between the plates is called the *dielectric.* If the plates are separated by air, then air is the dielectric. If separated by mica, then mica is the dielectric, etc. The plates of a condenser merely act as storage places for the collection of electrons and for applying electric fields to the dielectric material. It is the electronic distortion of the atomic structure of the dielectric material that is responsible for the capacitive action, as we shall see. A source of e.m.f. is connected in the circuit through a switch K. We know from our previous study that all materials are composed of molecules which are made up of atoms of basic materials known as elements. These atoms are composed of electrons revolving about the central portion in established circular orbits, just as if each atom were a miniature solar system. In any such material, we also have free electrons not permanently attached to any one atom, moving around more or less in the same manner as comets in our universe. In materials which are good conductors of electricity, a large number of these free electrons are roaming about the interior structure of the material, occasionally breaking their way into one of the small solar systems, and usually in such cases bumping one of the planets or electrons free to wander around, until it in turn strikes another planet and knocks another electron loose, etc. Each of these free electrons carries a small negative charge and if a sufficiently large number of them are set in motion by the application of an e.m.f., we have an appreciable electric current and the material is said to be a conductor. On the other hand, in some materials there are almost no free electrons, that is, the electrons are bound tightly to their own orbits. These materials are known as insulators.

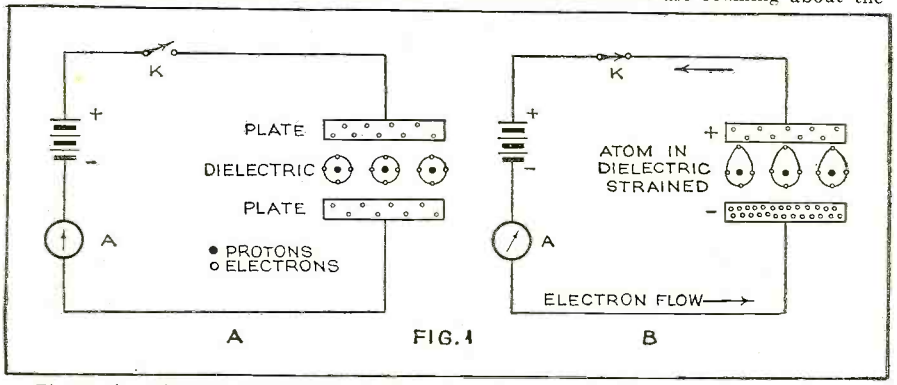


Figure 1. Electron movements during charging and discharging of a condenser (conductor). The electrons in the atoms of the dielectric are strained out of their normal orbits by the electric charges of the electrons transferred around to the negative plate during charge

12.8-550 Meter "Superhet"

(*Continued from page* 205)

movement for ordinarily hair-line sharp, short-wave stations, but it is the readable dial ratio—in sharp contrast to many receivers having ten and fifteen short-wave stations crowded into an eighth inch of dial scale.

This band-spread system was introduced to all-wave broadcast receivers in the Masterpiece II, through two dials and two separate condensers, of necessarily high minimum capacity, necessitating a 410-mmfd. tuning capacity to cover the required wavelength ranges. Perfected in the new model, it allows of so low a minimum capacity that 335-mmfd. tuning capacities may be used, with resultant greater signal strength on short-wave stations. The new three-gang band-spread tuning of r.f. stage, detector and oscillator does not show the variation in band-spread sensitivity that the single oscillator band-spread condenser of the older model did.

The Masterpiece II used a tuned r.f. stage on short waves for noise reduction and image selectivity. During a year's use of this important feature, it has been found possible not only to obtain accurate tracking, but also to effect quite accurate dial calibration as well—something at first found difficult.

While a careful analysis by the writer's own and independent (RCA, for example) laboratories has shown that the r.f. coils of the older model had the ideal wire sizes and form factors (ratio of diameter to length), research has also shown how to increase the amplification of r.f. and detector stages, and this knowledge has been incorporated in the Masterpiece III, with quite noticeable improvement in signal-to-noise ratio and in short-wave station volume. This has been accomplished largely through the proper use of high-impedance primaries on all bands, which provides the only way to insure accurate circuit tracking without excessive adjustment complications, and to approach uniform gain on all wavelengths.

At the request of certain foreign users, the 2B6 output tubes, while thoroughly satisfactory, have been replaced by 2A5's operated as triodes Class A prime simply because these tubes are obtainable anywhere in the world. The power output stage develops 18 watts undistorted output at less than 5% harmonic distortion, and while employing different tubes, driven by a third triode 2A5 power amplifier, shows the same fine frequency characteristics, plus "high fidelity" reproduction, as did the previous amplifier—and one watt more undistorted output.

The three-stage, air-tuned, 465-kc. i.f. amplifier has been retained, but instead of losing a portion of its entirely excessive gain (see July RADIO NEWS for reasons, pages 100 and 123) by means of grid resistors in each stage, with the noise possibilities they may introduce during aging of even the best resistors, the i.f. grids have been tapped down the i.f. secondary coils. The third stage is used for the extreme selectivity required for European 9-kc. broadcast separation, not for gain, which is not only not necessary, but is so excessive with three full gain stages as to introduce unnecessary noise.

The tuner of the Masterpiece III is illustrated herewith, as is its circuit diagram (Figure 1). The tuner and amplifier are finished in polished chromium, with speakers to match, shielding being effected by complete enclosure of the tuner both by a chassis bottom pan carrying all service data, and by a removable cover shield as well.

The wavelength ranges, selected by a four-position, six-section gang switch of dependable, trouble-free performance. are:

White	540 to	1520 kc.
Green	1500 to	4500 kc.
Yellow	4200 to	12,500 kc.
Red	9000 to	23,500 kc.

A fifth band, 150 to 400 kc., can be had for European use, its inductances housed in the three round shields to the right of the six-gang condenser, being enclosed with the broadcast-band r.f., detector and oscillator inductances. Six separate coils are used for each range, padded for tracking and alignment by individual trimmers for each coil, plus the customary oscillator low-frequency trimmer for each range. Trimmers are mounted close to coils and wave-change switch for short, efficient leads. The overlap between yellow and red ranges is intentional—to provide high efficiency, low tuning for the important 16-, 19-, 25- and 31-meter broadcast bands.

The Radio Show

(*Continued from page* 199)

countries. In Germany the Leipsig Fair, always famous for its ability to draw crowds, showed many new radio inventions and created much interest. Philadelphia holds its seventh Annual Radio and Electrical Show from October 8th to 13th. And we have records of radio shows scheduled for the Fall in many other countries throughout the world, including South America, Australia, Africa and the Orient.

The whole world is becoming radio-minded and the great new development of the Short Waves is revivifying radio interest and making the whole world a playground for the owner of a short-wave set. And television is another thing that is interesting and drawing crowds—at least in America and England. The greatest crowds in the expositions can usually be found waiting their turn at television demonstrations or standing in a large hall viewing some of the new "giant" television screens and perhaps waiting to be televised.

"The return of the Radio Show"—what does this all mean? It means that radio is increasing in popularity and it also means that the radio business, with business in general, is getting better. It *is* true that radio has *more* to to offer today than at any time in the past and that American radio engineers, manufacturers and sales organizations have been able to combine their efforts in producing wonderful new machines for receiving that open up the whole world to the average listener.

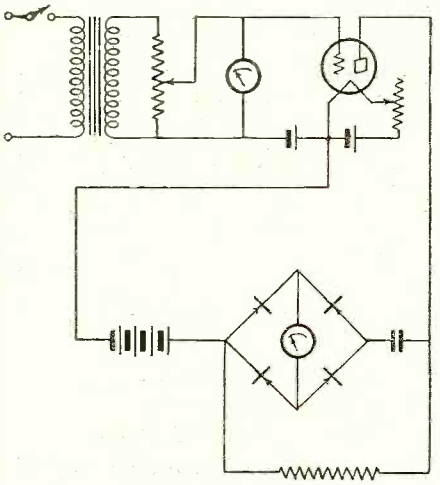
RADIO NEWS, this month, is holding what might be termed a Unique Radio Show—between these covers. No matter where you are in the world, all that you need to enable you to visit this Show is the small newsstand or subscription price. In the following pages you can *see* the new inventions and developments and read the details of their construction. You can follow all these developments sitting at home in your easy chair. Our Editors have combed the Research Laboratories of American Manufacturers and interviewed the Country's foremost engineers for the detailed descriptions that follow. These are the American units that will be shown at the Radio Shows around the World and we feel that our readers will thus get their first-hand information on the new radio developments for 1935.

LATEST RADIO PATENTS

BEN J. CHROMY*

1,920,906. TUBE TESTER. WILLIAM NELSON GOODWYN, JR., Newark, N. J., assignor to Weston Electrical Instrument Corporation, Newark, N. J., a Corporation of New Jersey. Filed October 31, 1930. Serial No. 492,560. 7 Claims.

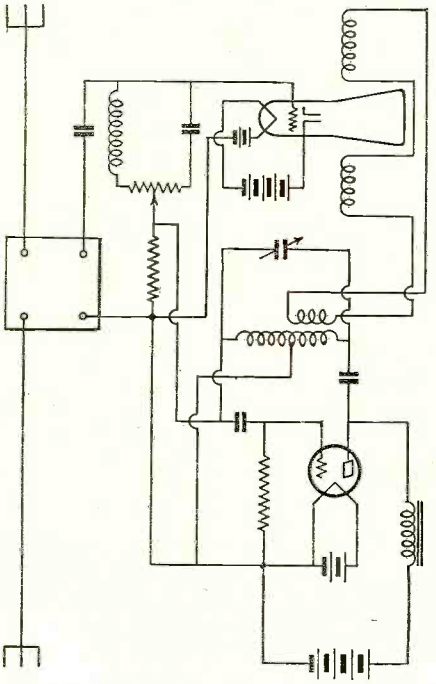
1. In the process of determining the mutual conductance of a vacuum tube, the



method which comprises impressing a predetermined alternating current voltage upon the grid circuit of said tube, rectifying the alternating component resulting in the plate circuit from said impressed voltage, and measuring the rectified current.

1,923,252. PHASING DEVICE. ARCHIBALD H. BROLLY, San Francisco, Calif., assignor to Television Laboratories, Inc., San Francisco, Calif., a Corporation of California. Filed May 31, 1930. Serial No. 457,879. 7 Claims.

6. In combination with a cathode ray tube having a control electrode therein, a



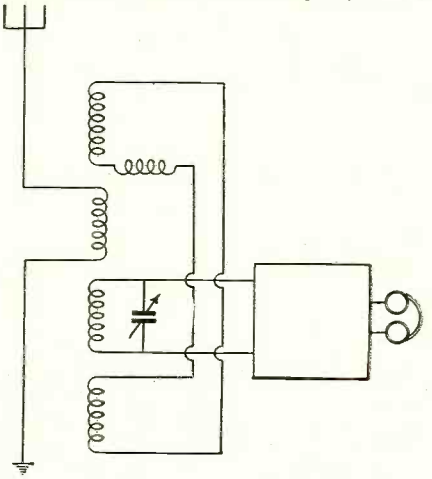
phase shifting network connected across the control electrode circuit, an oscillator for supplying power for deflecting the cathode ray stream, and means for applying a voltage from said network to control said oscillator.

1,922,282. SIGNAL RECEIVING SYSTEM. HENRI JEAN JOSEPH MARIE DE REGNAULD DE BELLESCIZE, Neuilly-sur-Seine, France. Filed February 24, 1932. Serial No. 594,885, and in France April 29, 1931. 5 Claims.

1. A receiving system adapted to receive a signal consisting of an oscillation whose frequency is constant and whose phase assumes alternately two values in opposition, comprising, a local generator supplying a continuous oscillation having the same frequency as the signal oscillation, means for obtaining from the said signal oscillation a first auxiliary oscillation whose phase is constant and whose frequency is a multiple of that of the signal oscillation, means for obtaining from the continuous oscillation supplied by the local generator a second auxiliary oscillation having the same frequency as the first-mentioned auxiliary oscillation, means for effecting the interference of the two auxiliary oscillations for producing a resulting interference current, means for controlling the frequency of the said local generator by the said interference current, and means for simultaneously impressing the signal oscillation and the continuous oscillation supplied by the local generator on the detector of the receiving system.

1,935,738. RADIO RECEIVING SYSTEM. PALMER H. CRAIG, Cincinnati, Ohio, assignor to Invex Corporation, a corporation of New York. Filed October 1, 1929. Serial No. 396,562. 4 Claims.

2. The method of discriminating between static impulses and signalling currents in radio reception which consists in, collecting both static and signal wave energy, transmitting both static and signal wave energy to a detecting device over one path, trans-



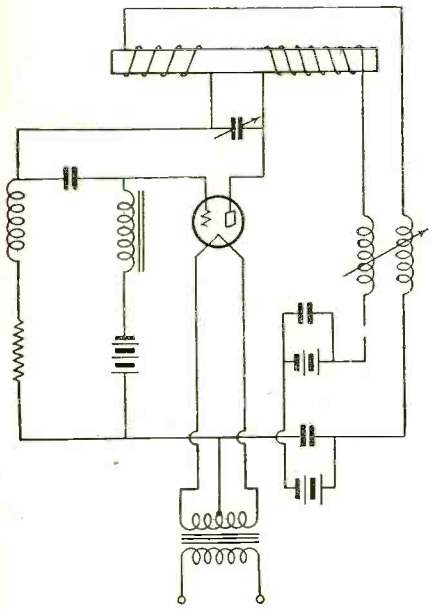
mitting static energy to said detecting device over another path, constantly excluding from said second path signal energy of a band of frequencies including all frequencies lying within the tuning range of the receiver, and opposing the static energies in said detector device.

1,937,333. MAGNETOSTRICTION OSCILLATION GENERATOR. ROBERT B. DOME, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York. Filed October 23, 1929. Serial No. 401,846. 6 Claims.

1. The method of operating a magnetostrictive electron discharge oscillation generator having an oscillating circuit, an

* Patent Attorney, Washington, D. C.

anode circuit, a grid circuit, and a coupling between said circuits including a magnetostrictive body which includes subjecting the magnetostrictive body to a relatively small portion only of the total oscillatory energy of said oscillating circuit, and supplying



energy from the anode circuit to the grid circuit in addition to that supplied through the magnetostrictive body.

A 5-Meter Transceiver

(*Continued from page* 218)

a few trials are advised. An 8-foot wire or pole split in the center and fed with a twisted pair of random length taken off at right angles will work fairly well. When parked, a wire thrown over a high branch or a nearby tree can be made to work very well.

In transmitting, beware of overmodulating, the one prevalent trouble with 5-meter phones. The signals get louder, but intelligibility decreases and, too, the width of channel occupied may increase considerably. Be fair to yourself and your fellow ham. Don't overmodulate. When using phone, the volume control should usually be turned on full for transmitting, although, in a noisy location, better results will be obtained by shouting into the mike and using the volume control as a gain control to adjust the degree of modulation. When using buzzer i.c.w. it is absolutely necessary to do this, or overmodulation will surely result. A few words on i.c.w. will probably be helpful.

Some buzzers, if plugged into the microphone jack and keyed may work at times, but cannot be relied upon. Some won't even squeak. The reason for this is that an inductance (the primary of the modulation transformer) is in series with the buzzer and the 3-volt A battery. Putting another 3 volts in series (correctly poled) will work in many cases, but if even this fails, the circuit shown in Figure 4 will do the trick. Here the buzzer acts as a relay, putting the A battery periodically across the primary winding. This produces a violent kick, so it might be a good idea to insert a resistance of one or two hundred ohms or, better, a .1 or .25 mfd. condenser in series at point X. This will obviate the necessity of turning down the volume control to prevent violent overmodulation.

Overmodulation might wreck the type -33 modulator tube where the voltage exceeds 135, the rated maximum, although the author has found 157 volts to be perfectly safe and 180 volts may be used with care (although a voltage this high is not recommended) if violent modulation is prevented. Another reason for watching that percentage! Table 1 gives the approximate power input to the oscillator.

Parts List

C1, C2—Aerovox .002 mfd. mica condenser, type 1460 or 1467
C3—National midget condenser (STN type, cut down to 2 stator and 2 rotor plates or STN6 with 1 rotor and two stator plates) or a 15-mmfd. Cardwell "Trim-Air" RT15
C4—Aerovox .0001-mfd mica condenser, type 1460 or 1467
C5—Aerovox .001-mfd. mica condenser, type 1460 or 1467
C6—Aerovox .004-mfd. mica condenser, type 1450
R1—Filament supply resistor, 2 ohms
R2—Variable resistor, 10,000 ohms
R3—Lynch 100,000-ohm, 1-watt resistor
R4—Lynch 10,000-ohm, 1-watt resistor
RFC—National R-100, r.f. choke
SW1—Yaxley rotary type filament switch
SW2—Yaxley 4-pole, double-throw jack switch
T1—Kenyon type KOMO output transformer
T2—Kenyon audio transformer with extra microphone winding, type BPR
6 General Radio plugs and jacks for coils
1 National isolantite 4-prong socket
1 National isolantite 5-prong socket
1 type -30 tube
1 type -33 tube
1 National flexible shaft coupling
1 piece ¼-inch bakelite shafting (cut when assembling—about 1 inch required to extend condenser shaft)
2 Yaxley short type single-circuit jacks
1 National "Velvet vernier" dial (small)
1 plug for microphone
1 plug for headphones
1 Blan aluminum case, 1/16-inch aluminum, 7 inches wide by 6 inches high (panel size) by 5⅛ inches deep. Black crackle finish if desired. Has triangular inside corner blocks.
3 "Tiny Mite" stand-off insulators.
1 single-button microphone (Universal "Handi-mike")
1 four-prong cable connecter plug
3 feet or more of battery cable, 4-conductor
2 lengths round bus-bar for coils
L1 and L2—4 turns ½-inch diameter for 5 meters
L1 and L2—9 turns ⅝-inch diameter for 10 meters
L3—2 turns ½-inch diameter for 5 meters
L3—3 turns ⅝-inch diameter for 10 meters
25 feet push-back hook-up wire
1 pair headphones
Assorted brass and bakelite spacers, machine screws and nuts, lock washers

Battery Box

1 mechanics' tool box, 14 inches long by 6⅝ inches high by 6 inches wide, outside
1 wafer type 4-prong tube socket
1 single-circuit jack (for buzzer power supply)
1 3- or 4½-volt C battery for buzzer power
2 Eveready No. 6 dry cells for filaments
3 or 4 Eveready 45-volt B batteries
13½ to 22½ volts of C battery (see Table 1)

Antenna

47-inch dural tube, ½-inch diameter
No. 14 enamel antenna wire for feeders
Isolantite or other good spreaders to suit dimensions

QRD? QRD? QRD?

CONDUCTED BY GY

IT is to be noted that most of the "op" mail coming in appreciates the balance that has been shown in this department in regard to the ARTA and the IBEW. We wish to make it understood that this column takes an unbiased attitude toward both organizations, only expressing its likes and dislikes as affects the general well-being of the radio operator. We have continually stressed that if *"both organizations are working towards the end of giving the radio operator and radio technician the best cooperation towards a liberal wage and the best working conditions such as are enjoyed by every type of professional man,"* this column will extol or berate, as the case may be, the virtues or discrepancies of any of their actions. For years, radio operators have tried to have organizations represent them, but there was always that fly in the ointment, human nature, which eventually "cracked up" the works. Now that we have two organizations in this country to look after the well being of the operator, we believe that the time has come when operators will be considered as officials capable of performing important duties and recognized as such. We wish to continually receive your comments, good or bad, so as to guide us as to the individual reactions of the operators.

The heading this month shows the licensing section of the new Federal Communications Commission, at Washington.

WABC, in its efforts to put on spectacular programs, tried to re-broadcast the Arctic and Antarctic by radiophone. Announcers at the northern terminal in Alaska were in constant daylight while those in Little America were in total darkness. The broadcast, while very successful from the standpoint of an engineering feat, was not what one would call enjoyable for the listening public, due to atmospheric conditions which blurred radio reception.

The Madrid Conference bearing the above title and consisting of general radio telephone and telegraph regulations was ratified by the United States and signed May 1, 1934. The general radio regulations contained therein were published in last month's issue of RADIO NEWS, in an exclusive article by G. C. Gross, Chief of the International Relations Section of the Federal Radio Commission. Those of you, however, who desire to study the reams of details of new convention may write to the U. S. Government Printing Office, Washington, D. C., asking for "International Radio Telegraph Conference Madrid 1932." The price of this is thirty cents.

It seems to be a little difficult for those men who have just received their second-class operator's license to land assignments. They try buzzer rooms and write long, lengthy letters to shipping companies, but find that jobs are as scarce as the proverbial tooth in the hen's mouth. Hundreds of letters have come to this desk soliciting advice. There are many ways to become connected, the easiest method being to remain in one of the various static rooms of the RMCA or the Mackay Radio. Of course, during the present scarcity of jobs in the operating profession, first class men are taking second class billets, but with stick-to-it-ive-ness and persistence, an assignment on a freighter or on some sea-going tug can eventually be obtained. With this experience for a background the climb up the ladder to assignments on passenger vessels will result in due time. The addresses of the various static rooms will be gladly forwarded upon request.

Broadcast engineers of WGN have become affiliated with Chicago local No. 134 of the IBEW. Through this action WGN becomes the first major Chicago station whose broadcast technicians are identified with the AFL, WCFL engineers already belonging to the union. The agreement provides for a six-day week of not more than 48 hours. The contract runs until July 1, 1936 and will be automatically renewed annually thereupon unless negotiations are inaugurated sixty days prior to the expiration of the agreement. New technicians are to be selected from the members of the Chicago local. This is a great victory for the IBEW who have gone in strongly for the continued unionization of broadcast stations. They have done much towards gaining the proper working conditions for broadcast technicians and this column hopes that they will continue to do so.

Complaints have been coming in from readers in some parts of the country that they have been neglected in this column, but those who do complain are in great measure responsible. Although fan mail is received from all parts of the world, not always enough information is enclosed therein to warrant publicity. We hope to remedy this with additional correspondents in the districts of the Great Lakes, West Coast, and the Gulf. Remember this is your column and in this we are all for one and one for all.

Marshall J. Williams of Dorchester, Mass., sends regards and states that he is *on the beach,* taking advantage of the sights offered by the bathing beauties. . . . Paul Lindlau, W2GEG, of Hillside, N. J., blasts out with the news that the 25-meter

band is the "cats" for daylight reception. . . . Farmington, Ohio, comes through the ether, via Bob Gervaneck, with the information that radio broadcasting watches are his meat, when and if he hooks up, and we hope it won't be long. That's all for the nonce, gang, and with 73 and ge. . . . GY.

"Band Spread"

(*Continued from page 213*)

special condensers having two rotors that are entirely separate as to tuning and two stators that are insulated from each other. One section is high in capacity and the other low. Figure 12 shows a Cardwell type 518 which has 25 and 100 mmfd. sections. Another Cardwell model (No. 517) is shown in Figure 8. These are sturdy and well-built condensers and have an excellent non-mutilating locking device on the high capacity section. Such condensers are of special interest to those building frequency meters. They lend themselves nicely to receiver construction. In a set having a tuned r.f. stage and tuned detector the two condensers in each stage can be replaced by one of this type and arranged mechanically so that a drum dial turns the small sections and the shafts of the large sections can extend from the sides of the cabinet, where knobs can be placed on them. Another example of this type of handspreading condenser is the Hammarlund MC-120B shown in Figure 9.

Figure 3 represents a method where two condensers are connected in series. Suppose the tuning unit C_1 has a minimum value of 6 mmfd. and a maximum of 100 mmfd. and the band-setting unit a minimum of 4 mmfd. and maximum of 25 mmfd. The capacities of condensers connected in series is found by formula

$$C = \frac{C_1 C_2}{C_1 + C_2}$$

Where C represents the total value and C1 and C2 the separate capacities. Using this we find the minimum capacity when both are set at their smallest value to be 2.4 mmfd. If the band-setting unit (C2) is set at maximum and the tuning unit (C1) at minimum, then we find a total capacity of only 4.8 mmfd. This clearly shows that the minimum capacity changes very little with any setting of C2. Now if the tuning unit is at maximum and the band-setting one at minimum, then the capacity is about 3.8 mmfd., and when both are at maximum, then the value is 20 mmfd. Thus it is evident that the maximum capacity can be varied over wide limits depending upon the setting of C2. With these values it is then possible to have the full dial cover anything from 1.4 to 16.2 mmfds. Thus if one band requires only 2 mmfds. for tuning, then these can be spread over the entire dial, or if 10 or 15 mmfds. or any other value is required, it can be spread by proper adjustment of the band-setting unit.

Using condensers whose maximum values are 100 and 50 mmfds., the ranges for full-dial coverage will be anything between 2 and 28 mmfds. With these condensers the coils for the amateur bands will be about as follows, using National forms:

3500 kc.	34 turns
7000 kc.	16 turns
14,000 kc.	7 turns

This method has an advantage in that the small condenser is readily shorted and then a wide band of frequencies can be covered with the tuning condenser alone.

Another method is shown in the drawings of Figure 4 where the condenser has a single rotor but two stators. This type can be made quite easily by cutting the stator frame in an old condenser and removing plates until there are 2 or 3 plates in the small section and 4 or 5 in the larger part. Care must be taken to make sure that the two stator sections are insulated from each other and that they are mechanically solid. On the high-frequency bands only the small part is used and fairly good spread results. For lower frequencies both sections come into play. This is done automatically when the coils are changed, because of the jumper in the coil. This wire simply connects the two stator sections in parallel. The coils to be used will depend upon the condenser sizes. This method, although not offering maximum spread, has the advantage that no adjustments are necessary when coils are changed.

A very interesting tuning scheme has been developed by the National Company. The hook-up is shown in Figure 5 and a photo in Figure 6 shows the complete assembly. The tuning condenser C1 shunts only a portion of the coil and the grid condenser and leak which are mounted inside the form connect directly to the top of the coil. The trimmer C2 is in parallel with the whole assembly and has a capacity of about 3 mmfds. The tuning unit has a value of 100 mmfds. These coil assemblies can be purchased complete.

For the proper operation of the new type single signal superheterodyne, great stabiltiy is necessary. Air dielectric condensers must be used for alignment of the high-frequency circuits necessary for single-control tuning. Figure 7 shows the complete details of a newly developed National coil-and-condenser assembly to meet the new requirements. The single-bearing type condenser is mounted on Isolantite and fits inside the coil form. A slot in the shaft allows tuning with a screw-driver. As it has a capacity of 140 mmfds., it is suitable over a wide range. If a tapped coil arrangement is used as described above, this condenser is placed in parallel with the windings, but can also be connected in series with the main tuning unit as a tracking condenser for untapped coils.

Those interested in superheterodynes and band-spreading data will be interested in the Hammarlund Comet "Pro" booklet which describes a method similar to the one above where condensers are connected in parallel. The band-setting units are large, about 138 mmfds., and the tuning units 15 mmfds. These alone are inadequate for proper band width below 5 mc. so that another condenser of 26 mmfds. is brought into play when the low-frequency coils are plugged in. The scheme here is similar to that in Figure 4. A picture of this assembly is shown in Figure 11.

Another method well worth consideration is that of placing a padding condenser in series with the tuning condenser and a small trimmer in parallel with the entire assembly. The padding and trimmer units should be mounted directly on the coil and then when coils are changed no other adjustment is necessary. When once the proper values have been determined, band changing is a simple matter.

Backstage in Broadcasting

(*Continued from page 239*)

Ardath Johnson, niece of Hiram W. Johnson, the United States Senator from California, won the distinction of being one of the few female announcers in the East. Miss Johnson, a native of California, is an accomplished actress, pianist and vocalist.

The DX Corner
(Broadcast Band)

(*Continued from page 221*)

	1:30 p.m.: Mon., Wed. 5 to 7 p.m. Fri. 5 to 10 p.m.
WSAI Cincinnati. Ohio	Granted power increase from 500 w. night 1 kw. LS: to 1 kw. night 2½ kw.-LS.
WRBX Roanoke, Va. WQBC Vicksburg, Miss.	Granted Mod. of Lic. to increase daytime power from 250 to 500 w. Granted power increase to 500 w. night, 1 kw. day; change hours from daytime only to specified as follow 8 to 10 a.m.; 12 noon to 3 p.m. and 5 to 7 p.m. CST. 1360 kc.
KFKU Lawrence, Kans. KGGC San Francisco, Cal.	Granted Mod. of Lic. to increase power from 500 w. to 1 kw. Granted Mod. of Lic. for two add'l night time hours of operation, 9 to 11 p.m.
WREC Memphis, Tenn.	Granted Auth. to increase power from 500 w. night, 1 kw. LS to 1 kw. night, 2½ kw.-LS.
WMT Waterloo, Iowa	Granted Auth. to increase power from 500 w. night 1 kw.-LS to 1 kw. night, 2½ kw.-LS.
KUJ Walla Walla, Wash.	Granted extension of auth. to operate unltd. time instead of daytime only.
WBRC Birmingham, Ala. WRC Washington, D. C. KRE Berkeley, Calif. WLVA Lynchburg, Va.	Granted Mod. of Lic. to increase night power from 500 w. to 1 kw. Granted Mod. of Lic. to increase day power from 500 w. to 1 kw. Granted Mod. of Lic. to change hours from specified to unltd. Granted Mod. of Lic. to change freq. from 1370 kc. to 1200 kc. unltd. time.
WBTM Danville, Va.	Granted Mod. of Lic. to change hours of operation from sharing with WLVA to unltd.
KROW Oakland, Calif.	Granted Mod. of Lic. to increase night time power from 500 w. to 1 kw.
WORK York, Pa.	Granted auth. to change freq. to 1320 kc.; increase power to 1 kw. and operate unltd. time, experimentally.
WMC Memphis, Tenn.	Granted auth. to increase power from 500 w. to 1 kw. LS to 1 kw. and 2½ kw.-LS.
KGKO Wichita Falls, Texas KRMD Shreveport, La. KFQD Anchorage, Alaska WBAA W. Lafayette, Ind.	Granted Mod. of Lic. to increase day power from 500 w. to 1 kw. Granted Mod. of Lic. to increase hours of operation to unltd. Granted Mod. of Lic. to change freq. from 600 kc. to 780 kc. Granted Mod. of Lic. to change freq. from 1400 kc. to 890 kc.; increase day power to 1 kw.-LS. and change in specified hours.
WKBF Indianapolis, Ind. KGBX Springfield, Mo.	Granted Mod. of Lic. to change hours from specified to unltd. Granted Spec. Temp. Author. to move trans. install new eqpt. change freq. from 1310 to 1230 kc. and power from 100 to 500 w., and change hours from LS to midnight.
KMA Shenandoah, Iowa KGBZ York, Neb. KWCR Cedar Rapids, Iowa	Appl. granted to increase night power to 1 kw. Appl. granted to increase night power to 1 kw. Ext. of Spec. temp. auth. to operate on 1430 kc. with 250 w., for period beginning July 1 and ending not later than Jan. 1, 1935.
WSBT South Bend, Ind. WFBM Indianapolis, Ind.	Granted Mod. of Lic. to change freq. from 1230 kc. to 1360 kc. Granted Mod. of Lic. to change hours from specified to unltd. 1230 kc. 1 kw.
WKBB Dubuque, Ill. WLBW Erie, Pa. WTOC Savannah, Ga. KMMJ Clay Center, Nebr.	Granted Mod. of Lic. to increase hours of operation to unltd. Granted appl. for increase in night power from 500 w. to 1 kw. Granted appl. for increase in night power from 500w to 1 kw. Granted spec. temp. auth. to operate station from 5 to 6 a.m. CST, for period Aug. 1 to not later than Feb. 1, 1935.
WJAG Norfolk, Nebr.	Granted auth. to operate on 1060 kc. with 1 kw. for period ending Feb. 1, 1935.
KWWJ Portland, Oregon	Granted auth. to operate on 1040 kc. ltd. time, and resume operation from 9 p.m. to 2 a.m. PST, Aug. 1 to Feb. 1, 1935.
WESG Elmira, N. Y.	Granted auth. to operate on 1090 kc. daily until sunset, CST, for period Aug. 1 to Feb. 1, 1935.
WTIC Hartford, Conn.	Granted extension of spec. temp. auth. to operate unltd. time, on, 1040 kc. for period Aug. 1 to Feb. 1, 1935.
KRLD Dallas.Texas	Granted ext. of special temp. exp. auth. to operate unltd. time, for period Aug. 1 to Feb. 1, 1935.
WBAL Baltimore. Md.	Granted extension of spec. temp. exp. auth. to operate simultaneously with KTHS on 1060 kc. from 6 a.m. to sunset, CST, to operate from sunset CST, to 9 p.m. EST, on 1060 kc.; and to operate synchronously with WJZ on 760 kc. with power of 2½ kw. from 9 p.m. EST for period Aug. 1 to Feb. 1, 1935.
KTHS Hot Springs, Ark.	Granted extension of special temp. exp. auth. to operate simultaneously with WBAL from 6 a.m. to LS CST; remain silent from LS to 8 p.m. CST and to operate from 8 p.m. to 12 midnight, CST, on 1060 kc. for period Aug. 1 to Feb. 1, 1935.
WJZ New York City	Granted extension of special temp. exp. auth. to operate with additional 20 kw. power for term Aug. 1, 1934 to Feb. 1, 1935.
KPCB Seattle, Wash.	Granted extension of spec. exp. auth. to operate on 710 kc. 100 w. unltd. time for period Aug. 1 to Feb. 1, 1935.
WGCP Newark, N. J.	Granted license covering increase in power and installation of new eqpt.; 1250 kc. 1 kw. night, 2½ kw. day, shares with WNEW.
KTRH Houston, Texas	Granted license covering changes in eqpt. and increase in daytime power; 1330 kc. 1 kw. night, 2½ kw. day unltd.
KLRA Little Rock, Ark.	Granted license covering changes in eqpt. and increase in daytime power; 1390 kc. 1 kw. night, 2½ kw. day, unltd.
KOOS Marshfield, Ore. WPTF Raleigh, N. C.	Granted Mod. of Lic. to change freq. from 1370 to 1200 kc. Granted extension of spec. exp. auth. to operate until 8 p.m. PST for period ending Feb. 1, 1935.
WBBM Chicago, Ill.	Granted extension of spec. exp. auth. for synchronous 3-7 night time operation with KFAB from Aug. 1 to Feb. 1, 1935.
LFAB Lincoln, Neb.	Granted ext. of spec. exp. auth. for 3-7 night time hours operation synchronously with WBBM and additional night time hours 7:30 to 8:30 p.m. from Aug. 1, 1934 to Sept. 30, 1934. and from 8:30 to 9:30 p.m. from Oct. 1, 1934 to Jan. 31, 1935.
KXA Seattle, Wash.	Granted ext. of spec. exp. auth. to operate simultaneously with WJZ from local sunset to 10 p.m. PST, using 250 w. for period ending Feb. 1, 1935.
WLBL Stevens Point, Wisc.	Granted Mod. of Lic. to change hours of operation from 6 a.m. to LS, to: 8 a.m. to LS.
KGDM Stockton, Cal.	Granted spec. temp. auth. to operate on present freq. and power from midnight until 6 a.m. PST, for period ending Feb. 1, 1935.
KSOO Sioux Falls, S. Dak.	Granted spec. temp. auth. to continue operating daily until 6:30 p.m. CST, and on Sunday night beginning at 9:30 p.m., with reduction of power to 1 kw. for period Aug. 1, 1934, to Feb. 1, 1935.

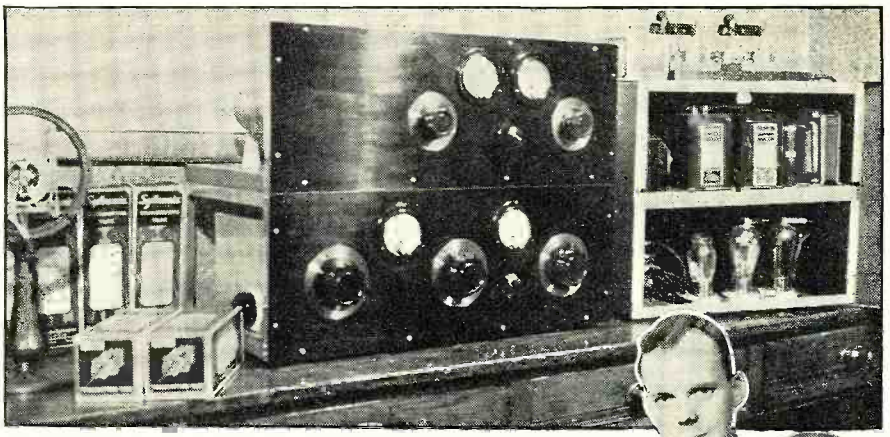
"Lab" Amplifier

(*Continued from page 207*)

superimposed. (C) is for 1000 cycles, where the two voltages were made equal. (D) is for 30 cycles, showing a loss of 8% or .8 db. (E) is for 10,000 cycles, showing a loss of 5% or .4 db. These were taken at a gain of 62 db. These five illustrations are *unretouched photographs* of the image as it appears on the screen of the cathode-ray tube.

Since these were comparison measurements, it was unnecessary to use accurate resistors for (R) or (r) unless the actual gain was to be determined. Also it was unnecessary to know the voltage deflection sensitivity of the cathode-ray tube and power supply, unless the actual output voltage and power of the amplifier were to be found. For use as a voltmeter, a sweep circuit was not required with the cathode-ray tube, but this addition was well worth while, because it made possible observation of the waveform of the oscillator and of the amplifier while measurements were being made. Also, if a bad a.c. hum had been present (actually the hum level in this amplifier reached appreciable proportions only at the highest gain level), the sweep circuit could have been kept in step with the a.c. so that a pattern would be obtained on the screen in which the amplitude of a higher frequency could be measured accurately in spite of the hum level.

(*Continued on page 260*)



LISTEN FOR BARTLETT

Short-wave fans should keep an ear "pealed" for Captain Bartlett's Schooner Morrissey, now making an Arctic exploration. Photograph shows the transmitter on the schooner and the insert is a picture of Bob Moe, radio engineer and operator

The DX Corner (Short Waves)

(*Continued from page 230*)

JVJ, Tokyo, 12155 kc.; JVK, Tokyo, 11495 kc.; JVL, Tokyo, 11430 kc.; JVM, Tokyo, 10740 kc.; JVN, Tokyo, 10660 kc.; JVO, Tokyo, 10375 kc.; JVP, Tokyo, 7510 kc.; JVQ, Tokyo, 7470 kc.; JVR, Tokyo, 7390 kc.; JVS, Tokyo, 6990 kc.; JVT, Tokyo, 6750 kc.; JYR, Kemikawa-Cho, 15760 kc.; JYS, Kemikawa-Cho, 9840 kc.; JYT, Kemikawa-Cho, 15760 kc. He credits the short-wave reporter and QRC and a number of listeners for this information.

Report from England

Mr. R. Stevens of Romford, Essex, England, reports a communication from station FIQA, Tananarive, Madagasca, 52.7 meters, saying that the station has suspended working for an indefinite period. He gives his list of Best Bets as VQ7LO, HVJ, W3XAL, W8XK, DJD, DJA, W1XAZ, VUB, RW72, OXY, LKJ1, HBL, HBP, HJ1ABB, FYA, VK2ME, W2XAD.

Report from Idaho

Mr. Lawrence Swenson reports the 25-meter stations being the best this month, with the 31-meter band also improving greatly in his location. With a Midwest receiver he lists VK2ME, VK3ME, CJRX, XETE, HC1FB as some of the Best Bets. Of course he gets all the United States broadcasting stations.

Report from Ohio

A very fine report from Samuel J. Emerson of Cleveland, gives us information on stations ORP, CJRX, CJRO, W10XDA, LKJ1 and the new "mystery" Brazilian station. He heard them announcing as the Radio Society of Brazil. We are sorry to hear that his brother, Albert E. Emerson, also an Official Listening Post Observer, is in the hospital. We all wish him a speedy recovery.

Report from Minnesota

We wish to thank Dr. G. W. Twomey for his very fine reports for his location. "In general, the results have been just fair," he says, "with European stations erratic." He reports that a number of Japanese stations have come in the fact that VK2ME has shown a lot of improvement. His Best Bets are DJD, CJRX, CJRO, HJ1ABB, HC2RL, GSD, W3XL, W3XAL, W9XAA, W9XF, W8XAL. He also gave us very fine reports on other stations, including the Stratosphere Balloon. He mentions that at 10 p.m. it was "88 degrees on his front porch, humidity 55 degrees and it is HOT!" Dr. Twomey, by the way, is stationed at the Veterans Hospital, Fort Snelling.

Best Bets from South Carolina

Mr. E. F. Bahan of Greenville, South Carolina, using a Scott DeLuxe receiver, sends in the following list of Best Bets: DJD, GSD, GSC, VK3ME, DJC, PHI. He reports the 19-meter stations very poor and reception unfavorable lately dué to electrical storms.

An Incident from Ponoka

Mr. A. B. Baadsgaard of Ponoka, Alberta, Canada, says: "It is awful hard to get an acknowledgment from you. So I am trying again. In the July issue mention was made of a certain radiogram received from Baron Huene of Tientsin, China, requesting supplies through the medium of your publication. This was augmented in the August number with Best Bets received at the Baron's location. Later he was appointed Official Listening Post Observer for China. I am writing the Baron, informing him that his brother, Theodore, visited Ponoka last Sunday and we had an enjoyable chat. RADIO NEWS is responsible for this remarkable contact. The writer acted as Colonization Agent in 1924 when a number of White Russians from Harbin, China, founded a colony a few miles from here. The Baron's brother was a member of this organization, many of whom occupied high positions under the former Imperial regime. What do you think of RADIO NEWS being responsible for a contact between an O.R.N.S.W.L.P.O. in Tientsin, China, and his brother and the writer in Western Canada?

"Yesterday the President of your country docked in Honolulu at 1 p.m. This was broadcast over KIO, 25.63 meters, and came in here QSA-5-R9, excellent. The President was honored with the customary gun salute and their booming over the radio was most pronounced."

Report from California

Mr. George C. Sholin, O.R.N.S.W.L.P.O. for California, sends in a very fine report, including the following Best Bets for his

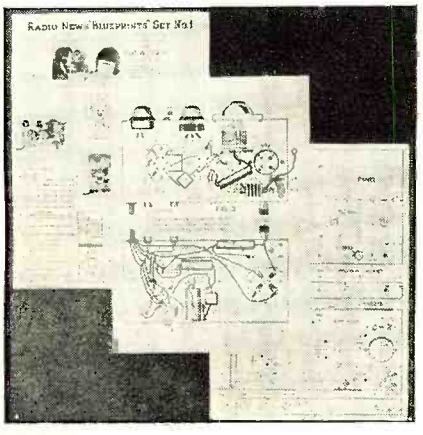
location: W8XK, W3XAL, W3XL, W1XAZ, W2XAF, W9XF, W8XAL, VE9GW, CJRO, XEBT, VK2ME, VK3ME, VK3LR, YV3RC, HJ1ABB, LSX, FYA, DJD, KNRA. All the "JY" stations, GSB, GSD and the "JV" stations in Nagasaki came in. He gives the program for the Japanese schedule: children's hour, 4 a.m., E.S.T.; talks, 4:25 a.m.; news in English, 4:55 a.m., news in Japanese, 5 a.m.; talks, music, etc., 5:30 a.m.; time signal, news, etc., 7:30 a.m.; sign off between 7:30 and 8 a.m., E.S.T. The time signal consists of three gongs, pause, two gongs, pause, one gong, pause, one chime. The last chime is exactly 7:30 a.m. He also writes: "VK3LR at Melbourne is planning to have transmitters operating at 13, 19, 25 and 49 meters in the near future. They feature programs of the International Broadcasting Company of London, relaying long-wave stations 3LO and 3AR."

Reports on the Stratosphere Flight from Our Listening Posts

Word was sent out to all Official Listening Posts, by your editor, to listen in to W10XCW, the stratosphere balloon, during its recent flight. The response has been very gratifying and we thank our Listening Posts who have done such good work in reporting the flight. We have had more than 35 contacts with the balloon through these Posts and it has been heard in more than 20 states, direct, as reported to RADIO NEWS. From this data we have been able to piece together the complete transmissions from the beginning to the end of the flight, even down to the last minute when the carrier finally broke off due to the balloon smashing up on the ground. Again let us thank all our Listening Posts who have done such fine work in reporting what has turned out to be an *epic of the short waves!* At this writing we have not had time to receive any reports from foreign short-wave listeners whom we asked to be on the lookout for the balloon's signals. The balloon's transmitter used only 8 watts and we do not know as yet whether any of our Official Listening Posts outside of the U. S. heard them. A complete article will be published in next month's issue on this flight.

Blueprints for Set Builders

Readers who want to take a hand in the short-wave game but who do not have suitable receivers can do much worse than build one of the receivers described in the August and September issues. Either one is capable of bringing in stations on other continents with comfortable headphone volume. Best of all, their cost is low enough to avoid being a drawback. For those who desire them, full-size blueprints, 18 inches by 12 inches, are available from RADIO NEWS at a cost of 25 cents per set. Blueprint Set No. 1 covers the "Dragnet" 2-tube receiver, constructional data on



which was published in the August issue. Set No. 2 covers the "Scout's Own" 1-tube receiver which was described in the September issue.

Report from the Philippine Islands

George Illenberger of Iloilo, Iloilo, P. I., writes as follows: "Dear Editor—I am submitting to you the Best Bets of short-wave stations heard here in our locality. I do not think any short-wave fan from the Philippines has submitted such a list. The following stations are heard here regularly: FYA, PRB, JVT, VK3ME, VK2ME, KAZ, DJA, EAQ, RV15, KES, CQM, JVM."

Report from Arkansas

O.R.N.S.W.L.P.O. Don Pryor of Texarkana, Arkansas, sends in the following Best Bets on his 7-tube all-wave superheterodyne: GSB, HIZ, HJ1ABB, JYA, VK2ME, VK3ME, XETE, DJD, FYA, W8XK, W3XAU and other United States short-wave stations as well as the 20- and 160-meter amateurs.

Report from a New Listener

Charles Michalcyzk of Philadelphia, Pennsylvania, says: "As soon as I received my Silvertone 7-tube all-wave set, I began searching for distant stations. The first station I picked up was DJD. I located the following stations listed below: GSE, GSD, W8XK, EAQ, CJRX, FYA, W3XAL, VE9GW, W2XE, W2XAF, PRADO, W8XAL, LSX." A good beginning, Charles. —*Editor.*

ZU6G, Johannesburg, Speaks Up

Mr. C. McCormick, O.R.N.S.W.L.P.O. for South Africa, reports overseas reception there on an improved scale and sends in a very wonderful report for the month, which has been incorporated in our Time-Table. Some of his best ones we are picking out here: RV15, PHI, FYA, VQ7LO, RV59, HBJ, RV72, CR7AA, CNR, W8XK, W2XAF, W3SAL, W9SF, the "G" stations, DJB, DJA, W2XE, W2XAD.

A Mexican Report

Official Listener F. L. Saldana of Huamantla, Tlax, Mexico, reports QRN in his location very bad. Some of his Best Bets are HJ5ABD, VK3ME, CEC, DJC, XEAL, XEBT, HJABB, HC2RL, DJD, FYA, DJC, EAQ. He reports hearing a c.w. station calling "CAVIAR, CAVIAR, CAVIAR de UB" on 28 meters. He says, "I do not imagine what this UB station may be and why it calls the exquisite Russian dish. I think it is a dummy call for some illegal station. Has anyone heard it?" He also says that XEAL transmits on the 31-meter band practically all day long. (This is probably station XETE, which rebroadcasts long-wave programs and probably the long-wave call has been announced.—*The Editor.*)

Readers Who Helped Log Stations for This Month's Report

We are indebted to the following readers of RADIO NEWS who furnished important information in their reports of short-wave reception this month: C. H. Skatzes, Delaware, O.; L. R. Gray, Rio de Janeiro, Brazil; A. Hamilton, Somerville, Mass.; W. S. Robinson, Sarepta, La.; C. D. Hall, Chillicothe, O.; M. B. Edwards, Brentwood, Essex, Eng.; R. Stevens, Romford, Essex, Eng.; D. E. Bame, Copiague, L. I.; D. Shields, Roseville, O.; L. Swensen, Eden, Idaho; K. A. Staats, Aliquippa, Pa.; S. J. Emerson, Cleveland, O.; F. C. Balph, Indianapolis, Ind.; L. P. Plunket Checkemian, Uckfield, Sussex, Eng.; Albert E. Emerson, Cleveland, O.; Dr. G. W. Twomey, Fort Snelling, Minn.; J. H. Logan, Houston, Tex.; R. Lawton, Whitefield, near Manchester, Eng.; E. F. Bahan, Greenville, S. C.; L. C. Styles, Ingatestone, Essex, Eng.; W. Schumacher, Ellis, Kans.; A. B. Baadsgaard, Ponoka, Alberta, Can.; J. Stewart, Houston, Tex.; O. L. Ramsey, Struthers, O.; R. S. Houghton, Abram, Lancs, Eng.; A. Kunz, McGregor, Tex.; G. C. Sholin, San Francisco, Calif.; W. Brennan, Brooklyn, N. Y.; S. H. Millen, Jr., Roxbury, Mass.; J. T. Spalding, Louisville, Ky.; J. McCarley, Decatur, Ga.; C. A. Steele, Port Arthur, Tex.; A. M. Weigand, Weatherly, Pa.; E. Servis, Holt, Mich.; J. Bews, Revelstoke, B. C., Can.; G. Illenberger, Iloilo, Iloilo, P. I.; J. F. Fritsch, Baltimore, Md.; R. Woods, Sand Springs, Okla.; Felipe L. Saldana, Huamantla, Tlax, Mexico; F. Waters, Charleston, Ill.; A. E. Koivisto, Hibbing, Minn.; F. C. Phelps, San Francisco, Calif.; L. T. Lee, Jr., Union Springs, Ala.; W. B. Piersol, Rio de Janeiro, Brazil; R. Legge, Jr., Binghamton, N. Y.; J. C. Balmbach, Jr., Buffalo, N. Y.; C. McCormick, Johannesburg, South Africa; D. Pryor, Texarkana, Ark.; G. A. Goller, Long Island City; C. H. Armstrong, Atlanta, Ga.; D. R. D. Wadia, Bombay, India; C. Michalczyk, Philadelphia, Pa.; C. Pryor, San Francisco, Calif.; R. Leader, San Francisco, Calif.; (Mrs.) R. L. Ledbetter, Vicksburg, Miss.; W. C. Evans, Chicopee Falls, Mass; A. Barber, Blackpool, Lancashire, Eng.; C. T. Howie, Capetown, South Africa; Margaret L. Hamilton, Coopersville, Mich.; H. G. Dage, Jr., Detroit, Mich.; W. Dixon, Plainfield, N. J.; N. C. Smith, Sidecup, Kent, Eng.; E. H. Mihlig, Great Falls, Mont.; J. E. Brooks, Montgomery, Ala.; J. M. Kelley, North Bennington, Vt.; C. H. Allison, Emory, Va.; R. Wright, Brooklyn, N. Y.; B. Scott, Corpus Christi, Tex.; H. Adams, Jr., Baltimore, Md.; A. J. Mannix, Portsmouth, N. H.; G. K. Harrison, Hobbs, N. M.; G. Krebs, Louisville, Ky.; H. F. Polm, Harrisburg, Pa.; W. F. Buhl, Newark, N. J.; F. L. Stitzinger, Erie, Pa.; C. Nick, Philadelphia, Pa.; G. R. Bigbee, Fort Benning, Ga.; J. H. Lindblom, Lansing, Ia.; C. H. Long, Winston, Mo.; J. L. Davis, Savannah, Ga.; E. H. Davenport, Pittsford, Vt.; C. A. Morrison, Bloomington, Ill.; T. E. Screyer, Chicago, Ill.; W. A. Shane, Bowmanville, Can.; C. McIntosh, Sydney, Australia; Dr. Max Hausdorff, Lugano, Switzerland, P. Swanson, New London, Conn.

"Our Own" Radio Show

(*Continued from page* 204)

ance is designed to turn the power on at any pre-determined time and can also be set to turn the power off at any later time up to 24 hours. These switches are especially suitable for starting or stopping a radio receiver, an electric fan, lights, cooking ranges and many other purposes.

New Tube Base Chart

The Sylvania Tube-base Chart, so popular among experimeters, designers and servicemen, has recently been revised to include base diagrams for the new line of Sylvania tubes. The chart now shows 34 base diagrams, including tables of base arrangements by tube types as well as tube types by base arrangements. It may be obtained by writing to RADIO NEWS, Department S, 222 W. 39th St., New York City, requesting the new Sylvania tube-base chart.

Cap't Hall's Page

(*Continued from page* 234)

they were a few months ago. Many a program from GSD, 25.53 meters, was completely "blotted out" by DJD, 25.51 meters. Leaving the 49-meter band, Daventry made a clever move. Concentrating their efforts on GSB, 31.55 meters, was "fine business." But along came Pittsburgh, and many a listener bemoaned the fact that he was unable to "pull in" Daventry with any degree of satisfaction. If this same fan tuned down to GSD, 25.51 meters, sometimes CJR, 25.6 meters, Winnipeg, Canada, "hashed" Daventry's programs beyond recognition.

The South American stations signals have been literally saturated with static.

Raba, Morocco, has not been heard in many a day either on 23.38 meters or 37.33 meters. Although we have short-wave pen pals throughout the world, not one has mentioned hearing them. Every Sunday I have tuned for them and they have always scored a zero. Rather a bad record for our once reliable African station. But this fall we can all hope to hear them and, from past experience, the best time to log them is about 4:30 p.m., E.S.T. Remember, Rabat is a Sunday special. The three "Aussies" were heard. Their signals were good.

Now we will go to that most interesting of the continents, Asia. Japs were (and are) here, there and everywhere. Calling Holland; men talking endlessly; goings; mort gongs, bells. The best part of the entire "parade" was the thought back in every listener's mind; i.e., Japan at last verifies. JVM, 27.93 meters, Nagasaki, was heard regularly from 5:30 to 7 a.m., E.S.T. Japs were logged on 28.47 meters, 19 and 22 meters. No attempt will be made to list the calls letters! xx?? Brhh! KAY, 20.03 meters, Manila, P. I., was heard for the first time and talking to DFB, Nauen, Germany. An hour of talk on the part of the Manila engineer failed to convince the German engineer that the circuit was clear enough to put through a call from Miss YL of Berlin to Mr. OM of Manila.

The Story of EXBT, El Buen Tono, Mexico City

How many fans have listened to the Spanish-speaking station just above DJC, 49.8 meters, Germany, and heard coo-coo calls between selections? That listeners, is XEBT. The station that came on the air and brought many a gray hair into your head trying to identify them.

Way back in 1923, XEB was the pioneer of long-wave broadcasters. At first they were only "on the air" three times a week, for one or two hours a day. At that time the announcer pinch-hit for the musician and vice versa. In less than a year the listeners to XEB had grown so rapidly that they had a regular schedule and went commercial. During these days XEB was using only 500-watts power, but within another year they increased to 1000 watts. Now XEB's programs are relayed over XEBT, their short-wave station, from 9 a.m. to midnight, E.S.T. Mr. B. Sancristobel, general station manager, and Mr. Henry Guerrero, chief correspondent, skillfully conduct the station's routine. Mr. "Henry," as Mr. Guerrero is known to his radio listeners, sings in truly Mexican style. This clever linguist, interpreter and vocalist, has lived in New York City and, as he said in one of his letters, "I love to hear from fans in the United States." Mr. Henry broadcasts three half hours of American songs. The address of XEBT is: Apartado 79:44 Mexico D. F.

Receiver Controls

(*Continued from page 209*)

is of low or high impedance. With the advent of audio controls, circuits have been so designed that the volume of phonograph combinations can be controlled by the same control used on the radio part of the receiver. Only 12 models incorporated the use of a separate control.

During the transition period of tubes and circuits, some manufacturers used dual or twin controls (to control antenna and screen voltage, antenna and audio, cathode and audio, etc.) The most popular use was in antenna control for one section and screen-grid control for the other section, the values of resistance in this case being 10,000 ohms and 100,000 ohms. One hundred and twenty-one models were equipped with dual controls which classify themselves in seven controls.

The taper of resistance value (with rotation) usually follows a logarithmic taper of such value that a 50% of the rotation of the control, approximately 10% of the total resistance of the control is in circuit.

When all models are combined and the results plotted on semi-logarithmetic paper, we get a fairly comprehensive picture of controls used within the last decade. (Curve 8.) Table 1 gives a tabulation of the values of resistance leading in popularity.

Number of Models	*Resistance Value of Control*
613	500,000 ohms
353	10,000 "
250	50,000 "
182	100,000 "
124	15,000 "
112	25,000 "
103	20,000 "
98	200,000 "
66	1 megohm
65	3,000 ohms

These 10 controls, having values of 3000, 10,000, 15,000, 20,000, 25,000, 100,000, 200,000, 500,000 ohms and 1 megohm, take care of 1966 models out of the 3000 or approximately 65% of all controls.

Variable-resistance controls have in part reached standardization of certain mechanical dimensions. In general, the tendency has been toward a reduction in size, particularly for midget and automobile receiver applications. The increasing use of controls in audio circuits, where practically no power is dissipated in the control, allows the use of a small resistance unit. Former aplications of controls in cathode and voltage-supply circuits required a definite current-carrying capacity and in consequence required controls capable of carrying the required current without excessive heating or deterioration. The control diameter most commonly used is 1½ inches, with a depth of approximately 1 inch. The mounting bushing, by means of which the control is fastened to the chassis, is ⅜ inch in diameter.

The greatest variance in controls used by manufacturers concerns the length of shaft and the application of the control knob. The knobs used have been of two general designs, the "screw" type and the "push-on" type knob. The shaft diameter has (practically from the start) been ¼ inch in diameter, so from the replacement-control angle, the main concern consists in providing a universal means which will allow the use of either the screw type or the push-on type. Provision of a flat on the shaft accommodates the screw type; it provides a secure mounting. The push-on type also utilizes a flat on the shaft, but in the design of such knobs two types have been developed, one which uses a shaft milled down $\frac{3}{32}$ inch and one which uses a $\frac{1}{32}$ inch milling. The former was extensively used in earlier receivers. The application of making a universal line of controls has been met by one manufacturer by milling all shafts to $\frac{3}{32}$ inches which covers the majority of push-on type knobs and also accommodates the screw type. For those cases which require a $\frac{1}{32}$ inch milling, a small $\frac{1}{16}$ inch inset or plate is used on the deeper milling to bring it up to $\frac{3}{32}$ inch. This plate is inserted in the knob resting on the flat spring member and when this assembly is pushed on the shaft provides a secure and simple method of application. Figure 9-A shows the assembly knob while Figure 9-B shows the assembly application to the shaft. The milled side of the shaft is turned to the downward position allowing the plate to remain in the proper location in the knob during assembly.

As has been stated, the length of shaft is another variable. It depends on the chassis mounting and thickness of the receiver panel. This dimension varies from ½ inch, up to 6 inches or more, with the majority of controls having shaft lengths of 1 to 1½ inches. In order to adapt a line of replacement controls to all receivers the shaft length is made 3 inches. For the few receivers having longer shaft controls an extension shaft is provided. For shorter shaft controls the shaft (which is made from a special grade of aluminum alloy) can be notched by means of a file or knife as shown in Figure 10-A after which it can be easily broken as shown in Figure 10-B and is then ready for application to the receiver.

The main difficulty, however, toward the solution of the replacement-control problem has been the obstacle of the fixed-resistance section of cathode and antenna-cathode controls. This (as has been shown in Curve 3) is used in a large number of controls and the valve used varies throughout a wide range. This fixed section remains in the circuit when the control is turned to the "full-on" (or in the maximum clockwise rotated) position. An ingenious method has been evolved which allows adjustment of the stop at that end of the control. As shown in Fig. 11-A the control is provided with a large slot in the housing. An adjustable stop plate is provided which slips over the bushing and is locked by the bushing nut. This plate has an indentation which meshes into any one of five positions marked 1 to 5. This allows the shaft to be rotated only to the predetermined stop position which fixes the residual resistance. The adjustable section is customarily wound to allow a maximum fixed section of 500 ohms, since values higher than this are, in practically all cases, supplied by means of a separate fixed resistor—external to the control. In case the serviceman wishes to provide a fixed value exactly between the indicated values, or in those cases where a lower value of resistor may be desirable for increased gain, the indentation can be removed with a file and the plate adjusted to the value desired as shown in Figure 11-B. After adjustment, the plate is securely anchored by tightening the bushing nut. See Figure 11-C.

AC switches have been used on either volume or tone controls. Some sets use separate switches or they may be incorporated with other controls. To supply a line of replacement controls, all equipped with switches, obviously increases the cost of those controls where switches are not required. This problem has been met by the design of a removable AC switch. The control is provided with a switch-actuating pin and switch-mounting holes in the cover of the control. These holes are normally covered with a plate as shown in Figure 12-A. When a switch is required the plate is removed and the switch is attached to the cover by meshing the

parts (similar to the conventional bayonette lock except that no rotation is required). See Figure 12-B. The actuating pin meshes with the switch cam in the most counterclockwise position of the control and opens or closes the power circuit. The final assembly is shown in Figure 12-C. This also provides means for the utilization of single pole double throw switches used on certain receivers.

In the survey (as outlined above) it was apparent that 8 controls supplied the range between 2 and 200 ohms; 15 controls covered the range between 500 ohms and 2 megohms; and 7 dual controls covered the required values on those receivers designed for such controls. The use of an extension shaft, a flat knob-insert and an adjustable fixed resistance section supply those additional mechanical and electrical features which make the above controls universal in application. *Paul G. Andres,* Chief Engineer, Yaxley Mfg. Co., Division of P. R. Mallory, Inc.

Feeder Design

(Continued from page 246)

of the lamp and the aluminum pan-cover forms the other. A cross slot is cut in the center and the base of the lamp forced through. The prongs are then taped down tight (not shown), and the copper wire-hook soldered to the middle tap of the base. Several of these lamps are hung on the line at equal distances. It is then only necessary to look out the window and along the line (Figure 8) to see the effect of varying the taps on the inductance. The location of any standing wave is indicated by a much brighter lamp at that point. When all lamps burn equally bright, the impedances are matched. Larger lamps may be used, but are more liable to upset the impedance of the line as calculated, and for this reason it is also well to use as few lamps as will serve the purpose. When the job is completed, the lamps may be removed and the neon lamp used as a final check-up.

"All Star" Set

(Continued from page 235)

counter-clockwise up to the 19-meter broadcasts and the 20-meter amateurs. The settings for the 16-meter band are made on the same coils, with the left-hand dial at 42 and the right-hand dial at 73 and the middle condenser bringing in in W3XAL at about 5 or 6 and swinging through the other stations at slightly higher settings. The main condenser to be set accurately on these settings is the left-hand, lower one, which should first be adjusted so that the plates are "all out" when the pointer is at zero. When this has been adjusted for the proper band, the volume control is turned up, and the right-hand lower dial should be set for the *loudest hissing sound!* Then the middle dial picks up your station and the right-hand, lower dial should be readjusted for best reception (which will hold true for the whole band). The volume control should then be reduced by turning anti-clockwise until the signal is of the proper strength. *It will be terribly distorted if it is left too high!* The tone-control dial (at the right) also contains the "on-off" switch and it should be turned all the way to the right and then backed up a little bit to the point where the high-frequency hissing noises are not too strong. Turning it all the way to the right cuts out all high frequencies, and

turning it all the way to the left brings in so much high-frequency noise that reception would be spoiled.

The receiver is, I must say, ultra-sensitive and full sensitivity was not once needed during these tests. If the set is to be used with a single aerial it should be connected to the first binding post and the second one should be short-circuited to ground. Reception this way, however, is very noisy in most locations, but with the noise-reducing bipole (or feeder) antenna it was really enjoyable. Some of the best catches that were gotten during these tests are: the Japanese stations on 30 and 38 meters and the Japanese station on about 27.9 meters that, we believe, is JVM. All three Australian stations were easily picked up as well as HVJ on 19 meters, all the British transmissions throughout the day from 16 meters to 49 meters, all of the German stations, CT1AA, RNE, as well as a new station that signed itself as National Radio Press of Rio de Janeiro (on about 31.6 meters), HJ1ABB, XEBT, YV3RC, YV2RC, HBL, FYA on its various wavelengths, PLV, W10XCW, the stratosphere balloon during its flight, KNRA, etc. We spent a whole day listening in on the various amateur bands and got them, literally, from all over the word. Yes, it makes a good receiver!

"Lab" Amplifier

(*Continued from page 252*)

Measurements of attenuation due to the tone control were made in the same way, except that the oscillator and amplifier output voltage were equalized with the tone control all out, and the two voltages then compared as the various steps of the tone control were brought into action.

The method of obtaining the distortion figures, photographs (A) and (B), was to connect the input voltage of the amplifier to one pair of deflecting plates of a cathode-ray tube and the output of the amplifier to the other pair. The curve of input versus output was therefore traced automatically, once for every cycle, on the screen of the cathode-ray tube. The phase shift which occurs in the amplifier would cause the figure to be an ellipse instead of a line, but this situation is corrected by shifting the phase of the voltage delivered to the other pair of deflecting plates by an equal amount. The circuit used is shown in Figure 5.

R and C are the phase-shifting controls, to be adjusted so that a line is obtained rather than an ellipse. The pattern obtained should be a straight line if no distortion is present. Second harmonic distortion shows up as a departure of the center of the curve from a straight line drawn between the ends of the curve. Third harmonic distortion gives a pinwheel effect. By shifting switch S to position (b), a forty-five degree line is obtained free from distortion, which serves as a check on the measurement.

The R. N. Lab. amplifier consists of two 57 resistance-coupled stages and a 56 transformer coupled to two 45's in push-pull, which deliver the output. The impedance-matching transformers employed in the input and output provide a variety of impedance-matching values suitable to meet practically any requirements. Provision is made for use of a double-button carbon microphone, with a 3-volt battery, button current control and current measuring circuit all included in the amplifier. Special precautions have been taken to avoid instability at the high gain obtainable, and to insure a flat frequency characteristic. The amplifier will be described in more detail next month.

R.N. Analyzer

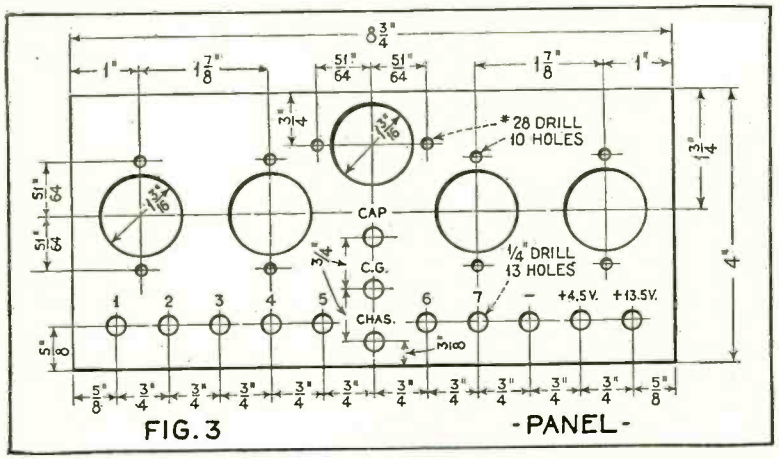
(*Continued from page 211*)

tube, little difference in the plate-current reading will be secured. Under such conditions it is advisable to ground the grid to the chassis, if convenient, in making this test.

External apparatus other than meters may likewise be connected in or across tube circuits. When the particular circuit under test is sufficiently stable, temporary operation be sometimes be restored by connecting a replacement resistor or condenser across the proper circuit, thus making it possible to check the diagnosis without removing the chassis, a valuable aid when an estimate is required before work is authorized.

The resistors in series with the batteries are for the purpose of limiting the battery current during the momentary short-circuit which takes place while the plug is being inserted in one of the circuit-opening jacks, just before the circuit opens.

This panel will be found a welcome addition to any service kit. The cost of construction is negligible, it is so designed that it will not become obsolete, it permits all types of tests to be quickly made and it is extremely simple to use.



Parts List

J1, J2, J4, J5, J6, J7, J8—Na-ald circuit-opening jacks, type 102-JR
J3—Na-ald pressure-plug jacks, type 100-JR
J9, J10, J12, J13—Na-ald phone-tip jacks, type 101-JR
J11—Na-ald phone-tip jack (black), type 101-J
R1—Carbon resistor, 100 ohms, ½ watt
R2—Carbon resistor, 300 ohms, ½ watt
S1—Na-ald panel-mount socket, type 424, 4-prong
S2—Na-ald panel-mount socket, type 425, 5-prong
S3—Na-ald panel-mount socket, type 426, 6-prong
S4—Na-ald panel-mount composite 7-7 socket, type 477
1 Na-ald analyzer plug assembly, type 907-WLCAP, including analyzer plug, 8-wire cable, special plug and special 8-contact socket (S5)
1 Na-ald adapter, type 974-DSA
1 Na-ald adapter, type 975-DSA
1 Na-ald adapter, type 976-DSA
1 Na-ald adapter, type 977-DSA
1 Na-ald tube cap lead, type 91-T
2 Na-ald double-circuit points, type D
2 Na-ald expanding side-pressure points, type S
4 Na-ald phone-tip points, type T
8 Na-ald test-panel handles, type 111
1 spring clip
Bakelite panel 8¾ by 4 inches, 1/8-inch thick
3 4½-volt flat-type flashlight batteries
Hardware, etc.

A.C.-D.C. Midget

(*Continued from page 223*)

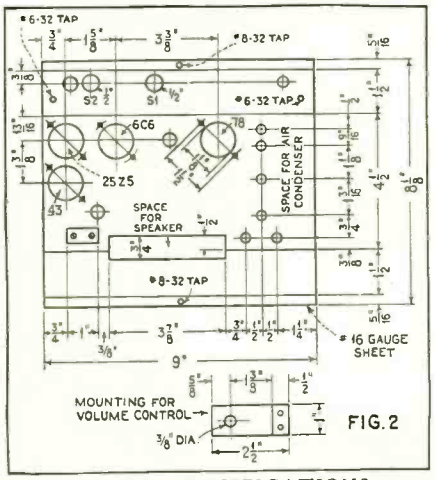
selector coil L1 is mounted on the bottom of the chassis directly underneath the three gang variable air condenser C.

The dual dry electrolytic condenser C11, C12 can be easily mounted on top of the chassis between the three gang condenser and the dynamic reproducer.

No ballast resistor is used in this design. A resistor built in the line cord is used to bring down the line voltage to the required heater voltage. It is more satisfactory than a ballast resistor mounted in the chassis as it excludes the excessive heat from the chassis, thereby minimizing the damage to the receiver parts and affording a larger ventilating surface for this heat.

List of Parts

C—General Instrument 3 gang variable air condenser, counterclockwise type, 365 mmfd.
C1—Solar high grade mica condenser, 0.001 mfd., 300 volt peak.
C2, C3, C7—Solar tubular paper condensers, 0.1 mfd., 300 volt peak.
C4—Solar tubular electrolytic condenser, 10 mfd., 35 volt peak.



PANEL SPECIFICATIONS

C5—Solar high grade mica condenser 0.0005 mfd., 300 volt peak.
C6—Solar tubular paper condenser, 0.03 mfd., 300 volt peak.

C8—Solar tubular electrolytic condenser, 25 mfd., 35 volt peak.
C9—Solar tubular paper condenser, 0.006 mfd., 300 volt peak.
C10—Solar dry electrolytic condenser, 8 mfd., 300 volt peak.
C11, C12—Solar dry electrolytic dual condenser 16—16 mfd., 220 volt peak.
C13—Solar tubular paper condenser, 0.05 mfd., 175 volt peak.
R—Clarostat 250,000 ohm potentiometer with line switch.
R1—Micamold resistor, 300 ohms, ⅓ watt.
R2, R5—Micamold resistors, 0.5 megohms, ⅓ watt.
R3—Micamold resistor, 15,000 ohms, ⅓ watt.
R4—Micamold resistor 0.25 megohms, ⅓ watt.
R6—Micamold resistor, 0.1 megohms, ⅓ watt.
R7—Micamold resistor, 500 ohms, 2 watts.
R8—Micamold resistor, 2 megohms, ⅓ watt.
R9—Gavitt line cord with built-in resistor, 170 ohms, 20 watts.
R10—Electrad wire wound vitreous enameled resistor, 2000 ohms, 10 watts.
L1—Gen Ral C X 100 D preselector coil.
L2—Gen Ral RFB No. 4 interstage coil.
L3—Kenyon, 20 henry, 300 ohm, 60 milliampere choke.
S1—Arrow, Hart & Hegeman d.p.d.t. tumbler switch.
S2—Arrow, Hart & Hegeman d.p.s.t. tumbler switch.
4 Eby six-prong sockets.
1 type –78 tube.
1 type 6C6 tube.
1 type –43 tube.
1 type 25Z5 tube.
1 Beaudette dynamic reproducer, 5-inch diameter, field resistance 3000 ohms.
1 Insuline "Electralloy" chassis, 9 inches by 4½ inches by 1½ inch high.
1 Crowe plate for volume control.
1 Crowe plate for station selector.
2 Kurz-Kasch knobs for volume control and station selector.
1 tube shield.
2 grid caps.
1 antenna reel 25 feet long.
1 roll of solid hook-up wire.
1 cabinet.

INDEX TO ADVERTISERS

AMATEUR DEPARTMENT

This is the "Ham" licensing department of the Federal Communications Commission. These workers also answer technical questions of applicants

The "Ham" Shack

(*Continued from page* 214)

antenna current increases with the adding or decreasing of inductance, the point where this takes place is, of course, the correct setting to use. Another point, if not all of the coil is used, that section which is unused should be "dead-ended" or short-circuited. This avoids loss through absorption from an unconnected inductance in the radio-frequency field of the tank circuit.

When "hams" first began to change from spark to vacuum tubes, it was not uncommon for them to use two or more tubes in parallel in the oscillatory and radio-frequency amplifying circuits. With the advent of short-wave development, practice gave way to push-pull operation. Push-pull operation is accepted as the favorite. There is much to commend it, but the advantages inherent in parallel operation should not be overlooked. In r.f. amplifiers, the parallel idea provides a means of obtaining a higher plate efficiency, without sacrificing ease of driving, because of the fact it doubles the ratio of plate impedance to load impedance, with the result driving becomes easier. Also, by the fact that the plate impedance is halved, the mutual conductance is doubled, which accounts for the easier excitation of the amplifier stage. In connecting tubes in parallel, however, care must be taken to prevent parasitic oscillation which can be eliminated by the insertion of a 100-ohm non-inductive resistor in series with each grid of the tubes in parallel. Parallel operation is adaptable to frequencies lower than 4000 kc., but it is apt to cause some difficulties on higher frequencies because of the doubled capacity. In most cases, however, it is much easier to handle than push-pull and will provide greater output when operating properly.

While listening in recently on 80- and 160-meter phone bands we heard more than twelve stations, within two hours, broadcasting music in some form or another. In one instance the owner of the station had a number of children in his "studio" and was putting on a regular show. This is all very well, but, unfortunately, it is not permitted under the rules and regulations of the former Federal Radio Commission and the new Federal Communications Commission which has inherited all of the jurisdiction of the old board. Amateurs are allowed to "put on" music as a modulation test when in communication with another station, but they are not allowed to rebroadcast radio programs or "put on a show" for the benefit of listeners in the neighborhood. Besides being *against the regulations*, even the putting on of a "legal" modulation test during the evening hours when the amateur bands are most occupied is not fair to the other stations. It causes a lot of QRM, particularly in view of the fact most "hams" are using 100 percent modulation. Voice frequencies seldom push a "carrier" to full 100 percent, but a phonograph record causes extremely wide sidebands and, when over-modulated, results in interference that will practically blanket a band.

The Technical Review

(*Continued from page* 243)

tenuators, center-tapped filament resistors, power (50-watt) rheostats and other Electrad resistor specialties.

6. *Line Voltage Control.* Characteristics and uses of a voltage regulator and chart showing the correct Amperite recommended by set manufacturers for their receivers.

7. *Rich Rewards in Radio.* Interesting information on the growth of radio and the opportunities existing in the field of radio manufacturing, radio servicing, broadcasting, talking pictures, television, public-address systems and commercial-station operation on land and sea, for men who are trained to fill the many jobs created by the radio and allied industries. The book also contains detailed information on the complete home-study courses in radio and allied subjects offered by the National Radio Institute. This book is available only to RADIO NEWS readers who are over 16 years of age and who are residents of the United States or Canada.

9. *Resistor Catalog.* Specifications of the International Resistance Co. 1934 line of metallized, wire-wound and precision wire-wound resistors, motor-radio suppressors, handy servicemen's kits, valuable technical data and list of free bulletins available on the building of servicemen's test equipment.

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34. *Serviceman's 1934 Replacement Volume-Control Guide.* A revised and enlarged list, in alphabetical order, of all old and new receivers showing model number, value of control in ohms and a recommended Electrad control for replacement purposes. It contains specifications and volume control circuits for over 2,000 receiver models and is more comprehensive than the 1933 edition.

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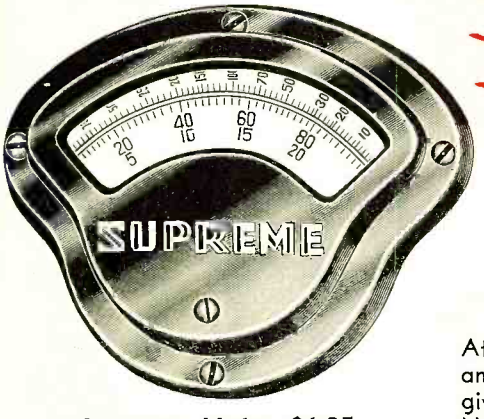

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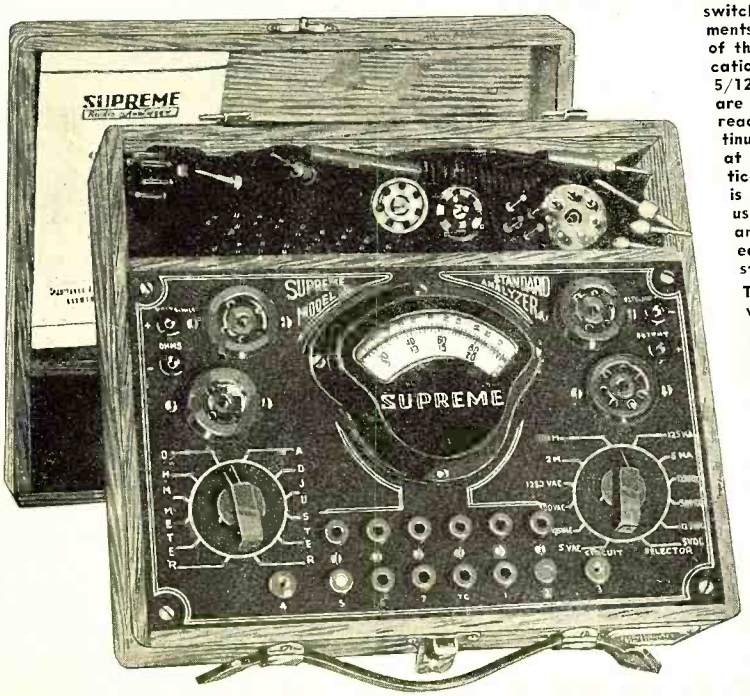

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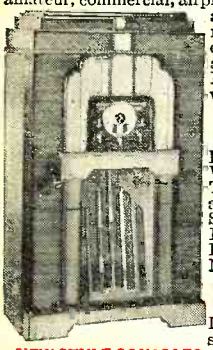

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