THE "CAPATRON" SERVICER

RADIO NEWS AND SHORT WAVE RADIO

SHORT WAVE TIME TABLE

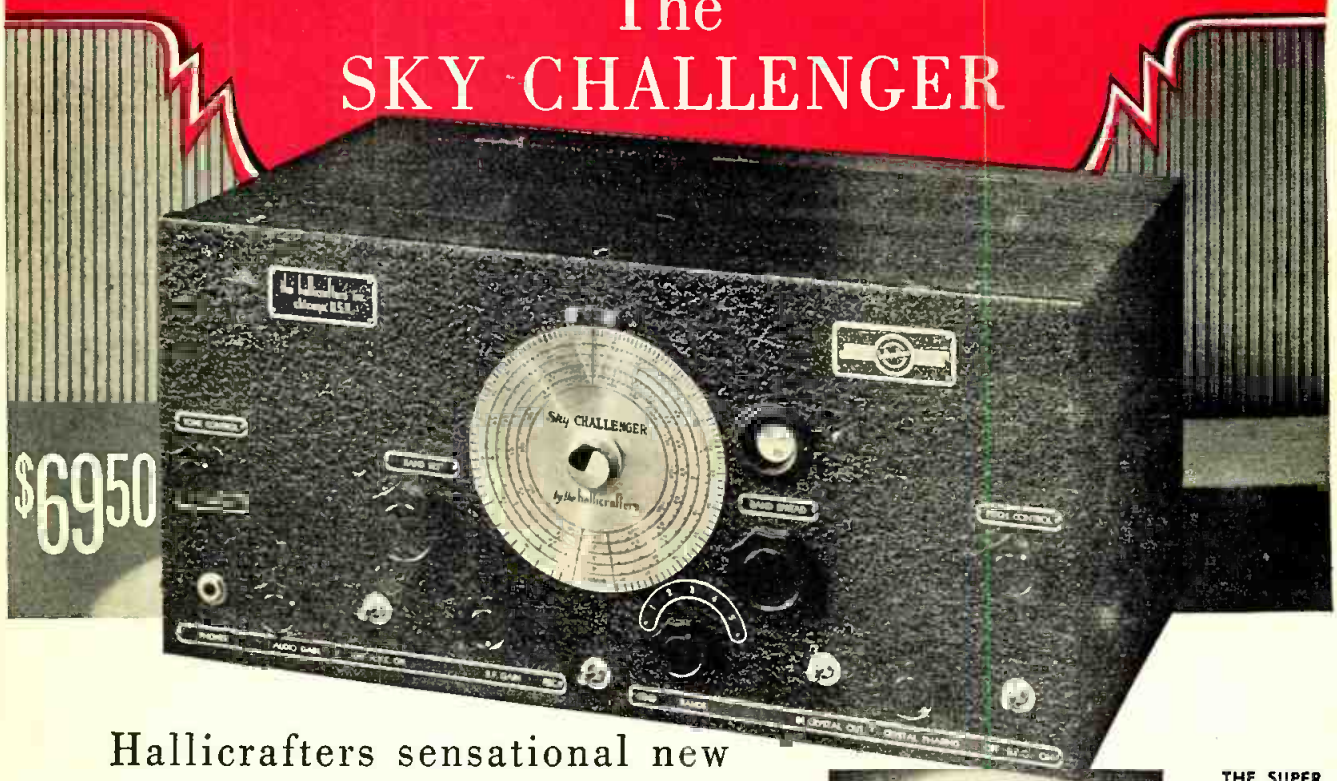
APRIL

25c
U. S. AND CANADA

"Sure Fire" TWO TUBE M.O.P.A. WITH 6L6's

A NEW MEMBER OF AN ILLUSTRIOUS FAMILY!

The SKY CHALLENGER



Hallicrafters sensational new Communications Receiver

The SKY CHALLENGER takes its place among the famous Hallicrafters' Communications Receivers, representing a new high in amateur radio values! It offers everything needed for precise, accurate tuning—greater sensitivity and selectivity, a tuning range from 38 M.C. to 535 K.C. (7.9 to 540 meters) with no gaps, covering all active amateur bands including the 10 meter band.

It's new, modern, a precision-engineered quality-built receiver that every amateur or short wave listener will be proud to own and operate.

See it at your dealer's or write for full information today. With the new Hallicrafters' Time Payment Plan you can purchase the SKY CHALLENGER for as little as $5.33 per month.

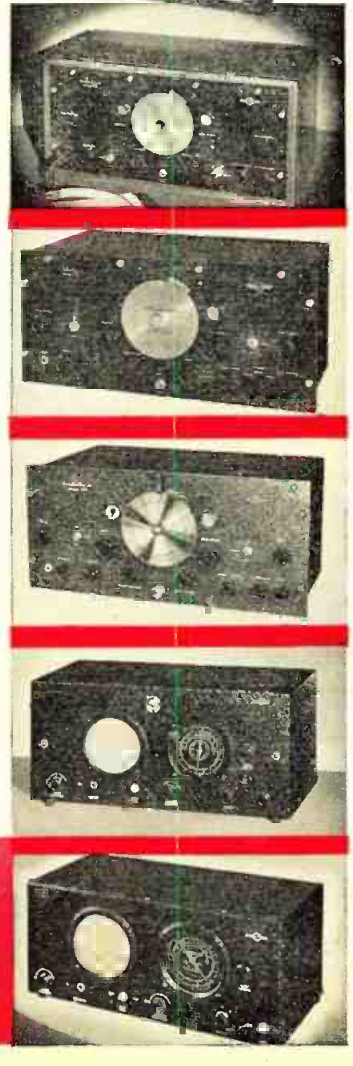
- 9 Tubes—6 metal—3 glass.
- 38 M.C. to 535 K.C. (7.9 to 540 meters).
- 5 Band 338° Main Tuning Dial
- Electrical Band Spread.
- Iron Core I. F. Transformers. Direct Calibration Tuning—No Charts or Tables.
- Automatic Volume Control.
- Single Signal Crystal Control.
- Beat Frequency Oscillator.

Congratulations, Amateurs!

Amateur Radio has covered itself with glory! The recent flood disaster proved that amateurs can be depended upon in an emergency. They gave unstintingly of their time and skill when other communications were destroyed. The thanks of a grateful nation are theirs.

At left, W9NLP, Chicago, one of many amateurs who kept communications alive during the flood.

ALL HALLICRAFTERS RECEIVERS NOW AVAILABLE ON NEW MORE FAVORABLE TIME PAYMENT PLAN



THE SUPER SKY RIDER

An 11-Tube 5 Band Superheterodyne, tuning from 40 M.C. to 535 K.C. in 5 bands. America's most outstanding communications receiver.

★

THE ULTRA SKY RIDER

A 10-Tube 4 Band Superheterodyne designed especially for Ultra High Frequency reception. Tunes from 3.76 to 53 meters.

★

THE SKY RIDER COMMERCIAL

An 11-Tube Super tuning from 20 to 3000 meters. With the "Ultra" this "professional" type receiver provides complete coverage.

★

THE SKY CHIEF

A new 7 Tube Super with all the latest features, tuning from 17.6 M.C. to 540 K.C. in 3 bands.

★

THE SKY BUDDY

Hallicrafters' 5 Tube Junior Communications Receiver—amazing sensitivity and selectivity. Tunes from 18 M.C. to 544 K.C.

the hallicrafters inc.

2603 Indiana Ave., Chicago, Ill.

Cable Address: "Hallicraft" Chicago

J. E. SMITH
President
National Radio Institute

The man who has directed the home study training of more men for the Radio industry than any other man in America.

I WILL TRAIN YOU

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

Do you want to make more money? The world-wide use of Radio has made many opportunities for you to have a spare time or full time Radio service business of your own. Three out of every four homes in the United States have Radio sets which regularly require repairs, servicing, new tubes, etc. Many sets are old and will soon be replaced by new models. I will train you at home in your spare time to sell, install, service, all types of Radio sets—to start your own Radio business and build it up on money you make in your spare time while learning. Mail coupon for my 64-page book. It's Free—it shows what I have done for others.

Many Make $5, $10, $15 a Week Extra In Spare Time While Learning

Practically every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs that you can cash in on quickly. Throughout your training I send you plans and ideas that have made good spare time money—from $200 to $500 a year—for hundreds of fellows. My Training is famous as "the Course that pays for itself."

There's a Real Future in Radio for Well Trained Men

Radio already gives jobs to more than 300,000 people. In 1935 over $300,000,000 worth of sets, tubes and parts were sold—an increase of 20% over 1934! Over 1,100,000 auto Radios were sold in 1935, 25% more than in 1934! 22,000,000 homes are today equipped with Radios, and every year millions of these sets go out of date and are replaced with newer models. Millions more need servicing, new tubes, repairs, etc. Broadcasting stations pay their employees (exclusive of artists) more than $23,000,000 a year! And Radio is a new industry, still growing fast! A few hundred $30, $50, $75-a-week jobs have grown to thousands in less than 20 years.

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

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers, as much as $30, $50, $75 a week. Many Radio Experts own and operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay and see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I have trained are holding good jobs in these branches of Radio. Read their statements in my 64-page book. Mail the coupon.

I Send You Special Radio Equipment To Give You Practical Experience

My Course is not all book training. I send you special Radio equipment and show you how to conduct experiments and build circuits which illustrate important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. You work out with your hands the things you read in the lesson books. My Free Book tells you about this 50-50 method of training—how it makes learning at home interesting, quick, fascinating, practical. Mail coupon.

Save Money—Learn At Home Money Back Agreement Protects You

I am so sure that I can train you at home successfully that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish my Course. I'll send you a copy of this agreement with my Book.

Find Out What Radio Offers You Get My 64 Page Book Free Now

Act Today. Mail the coupon now for my Free Lesson and my book. "Rich Rewards in Radio." Both are free to anyone over 16 years old. My book describes Radio's spare time and full time opportunities and those coming in Television; tells about my Training in Radio and Television; shows you actual letters from men I have trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny post card—NOW!

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

EARNED $50 FIRST MONTH IN SPARE TIME

"I knew nothing about Radio. After four lessons I began servicing Radios, earning $50 the first month. Last winter I made as high as $100 a month in spare time."—G. F. WALTON, 808 West Olney Road, Norfolk, Va.

OWN BUSINESS PAYS $300 A MONTH

"I now have my own Radio business which shows three hundred dollars a month profit—thanks again to National Radio."—FRANK T. REESE, 39 N. Felton St., Philadelphia, Penna.

CHIEF OPERATOR BROADCASTING STATION

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator."—HOLLIS F. HAYES, 85 Madison St., Lapeer, Mich.

Get My LESSON on Radio Servicing Tips FREE

I'll prove that my Training gives practical, money-making information, that it is easy to understand—that it is just *what you need* to master Radio. My sample lesson text, "Radio Receiver Troubles—Their Cause and Remedy" covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T. R. F., super-heterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing and testing. Get this lesson *Free*. No obligation.

MAIL COUPON NOW

The Tested WAY to BETTER PAY

THIS FREE BOOK HAS HELPED HUNDREDS OF MEN MAKE MORE MONEY

J. E. SMITH, President
National Radio Institute,
Dept. 7DR,
Washington, D. C.

GOOD FOR BOTH 64 PAGE BOOK SAMPLE LESSON FREE

J. E. SMITH, President, National Radio Institute,
Dept. 7DR, Washington, D. C.

Without obligating me, send your service manual "Radio Receiver Troubles—Their Cause and Remedy" and free book about spare time and full time Radio opportunities and how I can train for them at home in my spare time. I am particularly interested in the branch of Radio checked below.

- ☐ Radio Service Business of My Own
- ☐ Spare Time Radio Service Work
- ☐ Retail Sales of Radio Sets and Equipment
- ☐ Service Expert for Retail Stores
- ☐ Broadcasting Station Operator
- ☐ Aviation Radio Operator
- ☐ Ship Radio Operator
- ☐ Loud Speaker Systems, Installation and Service
- ☐ Auto Radio Installation and Service
- ☐ Television Station Operator
- ☐ Designing and Constructing Testing Equipment
- ☐ Service Expert with Radio Factory
- ☐ Commercial Radio Station Operator
- ☐ All-around Servicing Expert

(If you have not decided which branch you prefer—mail coupon now, for information to help you decide.)

NAME..... AGE.....

ADDRESS..... 14X-1

RADIO NEWS

Vol. XVIII April, 1937

Edited by LAURENCE MARSHAM COCKADAY

S. GORDON TAYLOR, *Managing Editor*
WILLIAM C. DORF, *Associate Editor*
JOHN M. BORST, *Technical Editor*
JOHN H. POTTS, *Assoc. Tech. Editor*
WESLEY G. HILLS, *Art Editor*

No. 10

Reading Guide to this Issue—

AMATEURS—2, 3, 4, 9, 14, 15, 16, 17, 18, 19, 21, 22, 25, 26
BROADCAST FANS—3, 10, 11, 12, 13, 19, 20, 22, 26
DEALERS—1, 3, 6, 7, 8, 14, 17, 18, 19, 22, 25, 26
DESIGNERS—3, 5, 6, 8, 14, 15, 16, 17, 18, 25, 26
DX FANS—3, 10, 12, 13, 19, 22, 26
ENGINEERS—3, 5, 6, 8, 11, 17, 25, 26
EXPERIMENTERS—3, 4, 5, 6, 8, 9, 14, 18, 20, 25, 26
MANUFACTURERS—6, 8, 26
OPERATORS—2, 4, 17, 24, 26
SERVICEMEN—1, 3, 4, 6, 7, 8, 9, 19, 25, 26
SET BUILDERS—3, 4, 5, 6, 8, 9, 14, 18, 20, 25, 26
SHORT-WAVE FANS—2, 3, 11, 12, 18, 19, 21, 22, 26
STUDENTS—1, 3, 4, 6, 7, 8, 9, 14, 15, 16, 17, 18, 20, 23, 25, 26
TECHNICIANS—1, 3, 4, 5, 6, 7, 8, 9, 25, 26

Coming Next Month

THE first complete constructional article on a modern television receiver which can be built at home by the average radio experimenter. Designed by the Television Staff of the Don Lee Broadcasting System—men who are actually working at television—the receiver is entirely practical for the reception of present-day, cathode-ray television. Here's a chance for the forward-looking experimenter to "beat the gun" so far as home television is concerned!

Also reports covering demonstrations of the latest television developments of Philco and Farnsworth, using the newly proposed standard of 441 lines.

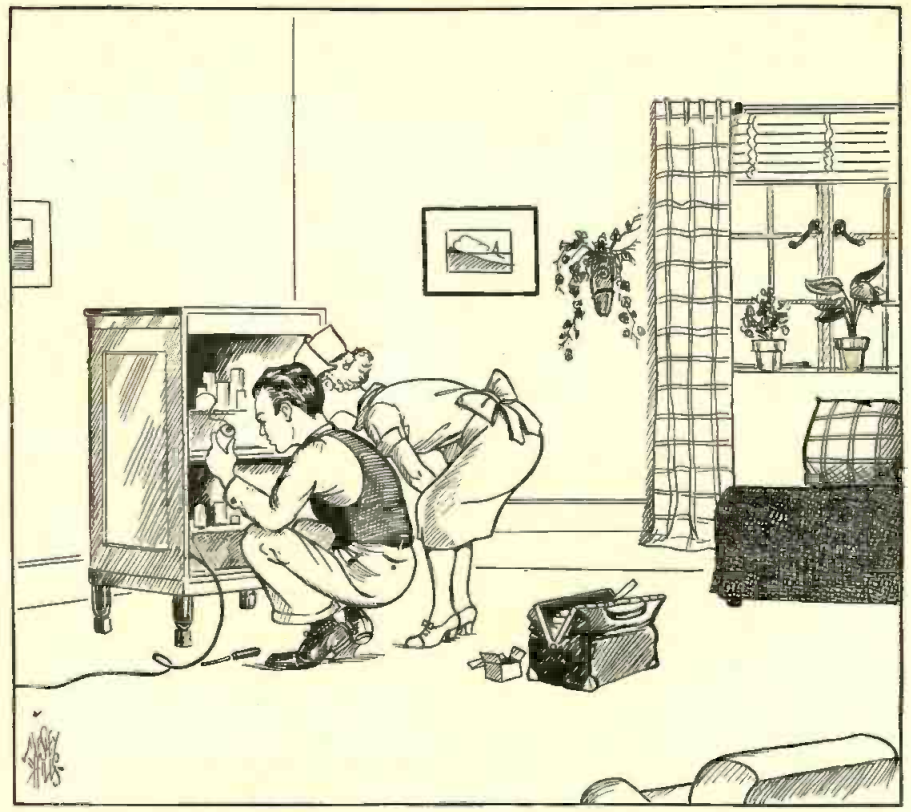
Published Monthly by Teck Publications, Inc., *Washington and South Avenues, Dunellen, N. J.*

EDITORIAL AND EXECUTIVE OFFICES
461 EIGHTH AVENUE, NEW YORK CITY, N. Y.

Lee Ellmaker, *President and Treas.*
B. Holcepl, *Secretary*
H. D. Crippen W. P. Jeffery, *Advertising Management*
Virgil Malcher, 205 W. Wacker Dr., Chicago, *Western Representative*

25c a copy. Subscriptions, $2.50 a year, $4.00 for two years; in Canada and Foreign Countries $3.00 a year, $5.00 for two years. Subscribers are notified that change of address must reach us five weeks in advance of the next date of issue.

Pages From A Serviceman's DIARY



WAS SHE INTERESTED? I'LL SAY! HER HAIR GOT IN MY EAR

Our serviceman explains the intricacies and inner workings of the new radio set in a rather intriguing interview. Some customers are gruff, some are peevish and some curt. Others are very friendly. The serviceman must know how to handle all kinds of situations.

TUESDAY—I don't like to start off a day with installations. A fellow is bound to get mussed up, dirty and tired, so if service calls are sandwiched in, it is hard to make a good impression on the customer. (Come to think of it, installations are a nuisance at noon, afternoon, and night, too. However, they're all part of the day's work and have got to be done.) Every set sold and installed is a future subject for service, so the more the better.

"We got rid of that old Radiola 86 trade-in last night," said Jerry, "and it has to be installed this a.m., pronto! The pick-up arm trips the automatic stop a little too soon, so you'd better go over it first."

Tried it a few times. Seemed to be okay on some records, but it did cut off on others. Removed the turn-table and found the automatic stop had already been moved over to the limit of its adjustment. Took it off and reset the entire mechanism. Readjusted again. Now okay. Sometimes these can be fixed by bending the trip post, but this is dangerous practice. The post may break off and, as it takes a 6-40 thread, it is hard to replace with stock brass rod.

"Who gets the set?" I asked.

"A nurse in a sanatorium about ten miles out," he replied.

"I didn't know there were any health resorts in this county," I commented, "but, after all, why shouldn't there be? The climate is ideal. The temperature seldom goes below zero in winter or above 100 in summer."

Jerry looked disgusted. "Oh, yeah?" he said. "This sanatorium isn't any health resort. It's a nut house and you're taking Bill along as a bodyguard to make sure they don't keep you there."

There seemed to be no point in further discussion, so we loaded the set in the truck, strapped in the extension ladders and got going.

Off to the "Nut" House

"What sort of nurses do they have in this joint we're going to?" I asked Bill, who knows about everything in these parts.

"Big, husky fellows," he replied. "Most of the patients are men."

I stepped on the gas. Might as well get the job over with as soon as possible. We pulled up alongside a place in the woods, the roadway leading through a high stone wall. It looked like a prison.

Inquired where the set was to be installed and was referred to a small building apart from the main sanatorium. The windows were all heavily screened. Apparently once in this place, you stayed put.

Went over and knocked. A *very* lovely nurse in white uniform opened the door.

"Oh, I'm so glad you came early," she cooed. "I'm on the night shift and I waited up for you. Everyone is asleep, so don't make any more noise than you can help."

We hauled the set up a winding staircase, which was no easy job, and came to a neatly furnished little apartment. Bill left to get out the ladders and aerial equipment and I set the outfit in place.

She seemed *very* friendly. Got interested in the operation of the set right away and wanted to see the works from the back. I turned the set around and started to explain how the signal travels. She came very close and some strands of her hair got in my ear. It tickled, but I could take it under the circumstances. Then Bill came in. (Gosh!)

"Waiting for you to hold the ladders," he growled. "We gotta step on it if we are going to be on time for the next job."

Back to work. Finished up the job quickly and made an appointment with the young lady so I could give more detailed instructions—*privately!*

Moved on to the next stop, pick up a P.A. rental outfit which the fellows left at 4 a.m. at a night club (locked up, of course). That's the worst of such jobs, but it pays. Twenty-five bucks for the night. This bunch will probably buy the whole job eventually, if we can drive into their heads just how it should be handled. The proprietor likes to grab the mike and hold it in front of the speaker, so we can't trust him alone with it yet. Returned to the shop and went out to lunch.

Started off the afternoon with a few shop jobs. Wanted to try out a new high-power r.f. oscillator which is supposed to make intermittent opens in by-pass condensers easy to find. The idea is that if you put heavy r.f., say about 5 or 10 watts, across a defective condenser it will burn the intermittent contact so that it stays open and may then be simply checked. Since we built the job, however, not a single intermittent case has been caused by a defective condenser. (I'd be just as happy if we never have to use it.)

Replacing Controls

Replaced the worn-out volume controls in a Stromberg 642, cleaned the condenser contacts, tightened the sockets and greased the dial drive. Checked the filter condenser bank and found one showing high leakage. Called up the customer and tried to get authority to replace the entire bank—the only proper repair—but no go, he *wouldn't spend the extra dough.* Patched it up with an 8 mfd. electrolytic and set it aside (operating O.K.).

Loaded up the truck and started off again, but nothing more of interest today.

THESE records from an anonymous serviceman's diary should be of decided interest to veteran servicemen, as well as to those whose experience in the service field is more limited. Written by a man who "knows his stuff," and shot with an occasional outcropping of humor, these items provide many hints not found in text books. More of these pages will appear from time to time.

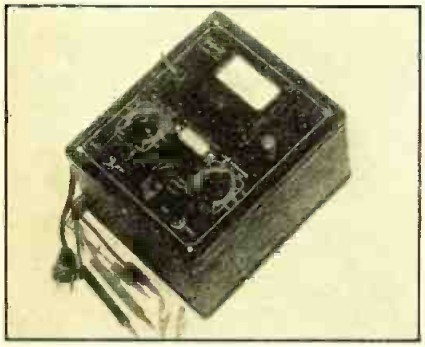
British Television Reduced To One System

LONDON, ENGLAND—The British Broadcasting Corporation will use the Marconia-EMI television system exclusively from now on. Until this time the BBC had been using the Baird system and the EMI system in alternate weeks in order to determine the most desirable system. The new system has a definition of 405 lines, interlaced, and a picture frequency of fifty per second.

New
Service Instruments

An Instrument of Wide Utility

The Triplett model 1240 condenser tester not only checks the capacity of condensers from .0001 to 10 microfarads but also provides breakdown, leakage, open and short circuit tests. The instrument incorporates a 3-inch meter on which all tests are read



directly. Both a.c. and d.c. voltages up to 1000 volts are available for breakdown tests. There is a "good-bad" reading scale for electrolytic type condensers. The metal case housing the instrument measures 7⅞ by 6⅝ by 4⅝ inches.

A Universal Instrument

The Powertone model 801 pocket volt-ohmmeter announced by the Try-Mo Radio Company can be employed in many different measuring and testing services. Its

specifications follow: d. c. volts 0 to 5, 50, 500 and 1,000 (1000 ohms per volt sensitivity); resistance ranges—½ to 500 and 200 to 500,000 ohms.

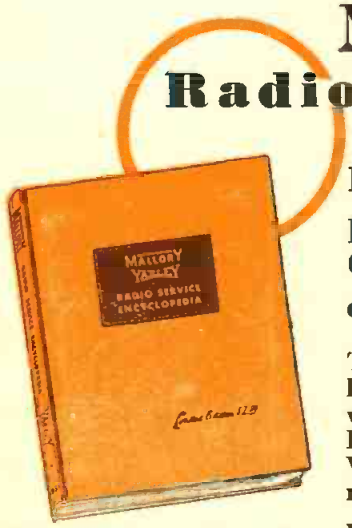
Features New Meter

The Supreme De Luxe model 505 tube tester is suitable for both counter use and service calls. The instrument employs the new Supreme "Quadrimeter" with bi-indicating needle and indirectly illuminated dual viewing windows. The top scale of the meter is divided into "good", "questionable" and "bad" sectors for the quality test of tubes and the bottom scale is divided into 100 divisions to indicate full scale deflection for closer comparison between tubes of similar types.

NO MORE incomplete data; no more worrying about inaccuracy; no more frenzied hunting for information you can't find; no more experimenting at your own expense; no more advice to buy from manufacturers long since out of business; no more cross listings that double cross your thinking. No more—

But what's the use! **It's just a case of no more guesswork, no more time wasting when you get your copy of the new—**

MALLORY-YAXLEY
Radio Service Encyclopedia



Over 200 pages of exact information. Bound in waterproof, washable cloth and printed on paper that stands the gaff... it is a permanent working reference.

Here for the first time—under one cover—is concise, complete, authoritative information on *all* repairing of *all* sets. Chuck-full of notes on tricky installations—*all* the references anyone can need—conveniently and simply arranged.

Thousands of servicemen who have bought their copies say "the book is a life saver"—the finest help they have ever had. They are tickled to death with this "All in One" Book—all the information on Circuits—Schematics, I. F. Peak Frequencies, Transformer Circuits, Condensers, Volume Controls, Vibrators and Tubes—in *one* book, on one page, on one line for any receiving set.

We have prepared this Encyclopedia for you. Your Mallory-Yaxley distributor has your copy ready for you to examine. Your share of the cost is a trifle. Buy the book—if in a week it does not pay its way, if you would part with it for twice what you paid for it—return the book and get your money back. But act today; the edition is limited.

Use P. R. MALLORY & CO. Inc. MALLORY REPLACEMENT CONDENSERS... VIBRATORS

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
Cable Address—PELMALLO

Use YAXLEY REPLACEMENT VOLUME CONTROLS

Radio News

April, 1937

Amateur Activities in the NAVY NET

How the U. S. Navy is training amateur radiomen in code and operation and at the same time giving them something worthwhile to do with their hobby is told in this interesting article. The fine work accomplished by the Naval Communication Reserve in national emergencies such as the recent flood is one example of how amateurs, organized systematically, can serve their country and their fellow-men

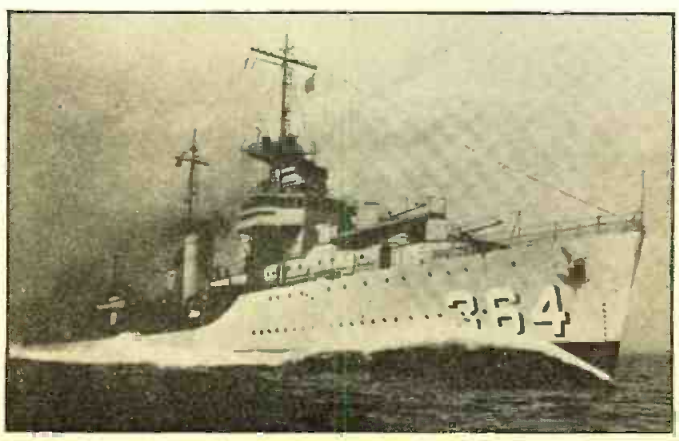
By **Lt. Comdr. Joseph D. R. Freed, U.S.N.R.**

THERE is no better radio way, for the studious radio amateur who wishes to receive systematic instruction in radio communication methods, than to become a member of the U. S. Naval Communication Reserve. The Communication Reserve is a part of the U. S. Naval Reserve which was authorized by an act of Congress in 1925. Service in the Communication Reserve is entirely on a voluntary basis and the advancement and progress made in this branch of the service can be largely ascribed to the unselfish time and effort given by the personnel and the unlimited co-operation and facilities afforded by the Navy Department.

Systematic instruction to amateur members of the Reserve in Naval Communication Procedure is afforded by the Navy Department in order to stimulate and sustain interest in Naval radio. Both Morse and Continental code instruction classes are maintained at various times and places for beginners and those who desire to increase their sending and receiving speeds. Also, sets of Navy Training Courses are supplied to reservists requesting them, in order that they may be fully cognizant of the duties of their rating or for advancement to the next higher rating. The extent to which any amateur partakes of the instruction available is, as stated before, entirely voluntary, and, like any other organization, training and benefits derived therefrom depend wholly upon the effort expended by the individual.

SUMMER CRUISES FOR TRAINING

Reservists are given the opportunity, if they desire, of two weeks' summer training cruises on ships such as this (the U.S.S. Mahan).



At the present time, there are about 600 officers and 5000 men in the Communication Reserve. It has been estimated that the personnel of this Reserve own and operate about 2600 amateur radio stations, the greater part of which is used regularly in one or more of the various regular radio drills. The government has equipped 32 control stations which are also used in period drills and for training purposes.

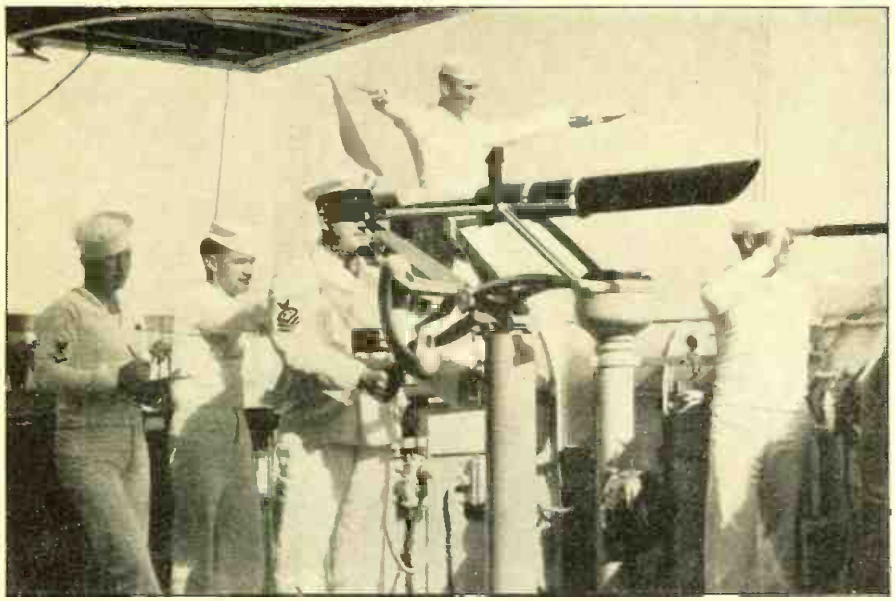
The purposes and aims of the Communication Reserve are best set forth in the Bureau of Navigation Manual: "The mission of the Naval Communication Reserve is to procure, organize, and train the officers and men necessary for the expansion and operation of the Naval Communication Service in time of national emergency."

Membership in the Reserve is open to U. S. citizens and first enlistments are available to those between the ages of 17 to 35 years. No duty is required of members of the Naval Communication Reserve. To provide training for those reservists who desire to undertake it, a communication organization is maintained in each Naval District.

Who May Join

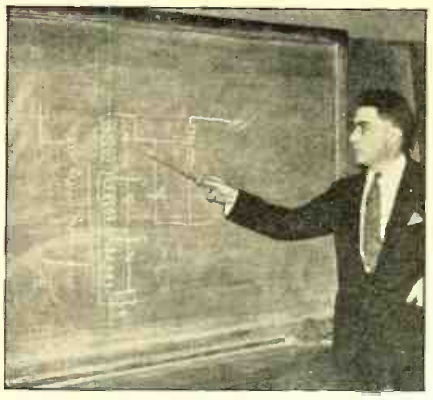
Among the sources from which officers and men come to join the Reserve, are

- Ex-Naval officers
- Ex-Naval Reserve officers
- Amateur radio operators
- Executive, personnel of commercial telegraph and cable companies,



TRAINING IN SIGNALING

Signal personnel of the U.S.S. Augusta, flagship of the U. S. Asiatic fleet: practice scene aboard the bridge of the flagship.



TECHNICAL TRAINING

The author points out some of the technical features of design in a receiver circuit.

commercial radio companies
Radio engineers and experts in traffic
Radio servicemen
Operating personnel of airplane and ship radio stations
Sound recording experts engaged in sound recording and reproduction
Personnel of telephone companies
Employees of electric power companies
Telegraph and radio operators employed by press associations
Communication personnel of scientific expeditions
Ex-Navy radiomen
College and high school students interested in radio or wire communications
Employees of radio manufacturing companies
Men interested in radio
Telegraphers

Reserve Activities

Activities of the Naval Communication Reserve, as enumerated in the Bureau of Navigation Manual, are stated below:

1. Officers of the Communication Reserve may, with their own consent and when authorized by proper authority, be utilized in time of peace for:
   Recruiting, organizing, administering, and training the Naval Communication Reserve.
   On temporary active training duty with or without pay at naval district headquarters, communication offices, shore radio stations, on coding boards, radio direction finder stations, and on shipboard for any duties for which they are qualified.
2. Enlisted men of the Communication Reserve may, with their own consent and when duly authorized, be utilized with or without pay for:
   Communication duties ashore.
   Communication duties afloat.
3. The Naval Communication Reserve as an organization can be utilized in time of peace for:
   Emergency radio communication.
   Disaster relief communication.
   Intra- and inter-district reserve communication.
   To furnish communication personnel for week-end or summer-training cruises (for eagle boats and destroyers).
   To provide receiving stations to cover special flights.
   To provide personnel and equipment for conducting special high-frequency tests with naval stations.
   To establish communication with and interest civilian radio personnel.
   To furnish personnel for scientific and exploring expeditions.
   To assist in radio instruction of members of the Fleet Naval Reserve.
   In general to co-operate in all possible ways with the Naval Communication Service, and other branches of the Naval Reserve.

Training Methods

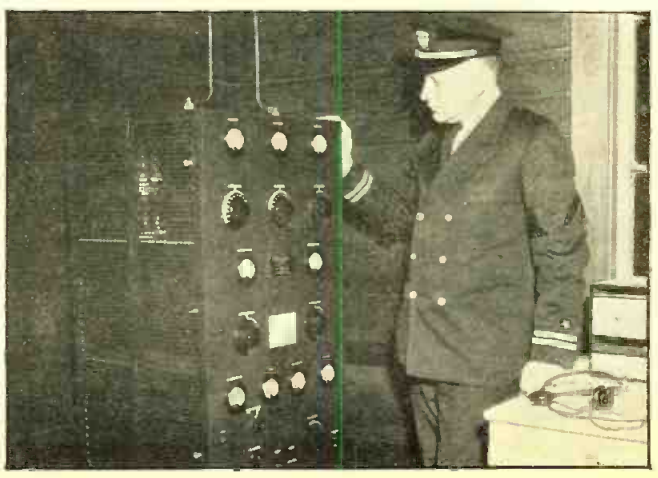
Training: For purposes of administration, the United States is divided into Naval districts. Enlistment of Naval Reservists in each District is in the hands of the Commandant of that District and requests for applications should be addressed to the Commandant of the District in which the applicant resides. The only procedure necessary is to fill out the (*Turn to page* 618)

TRANSMITTING AT A RESERVE STATION

Scattered around the United States are thousands of amateurs transmitting and receiving messages to and from other members of the Navy network.

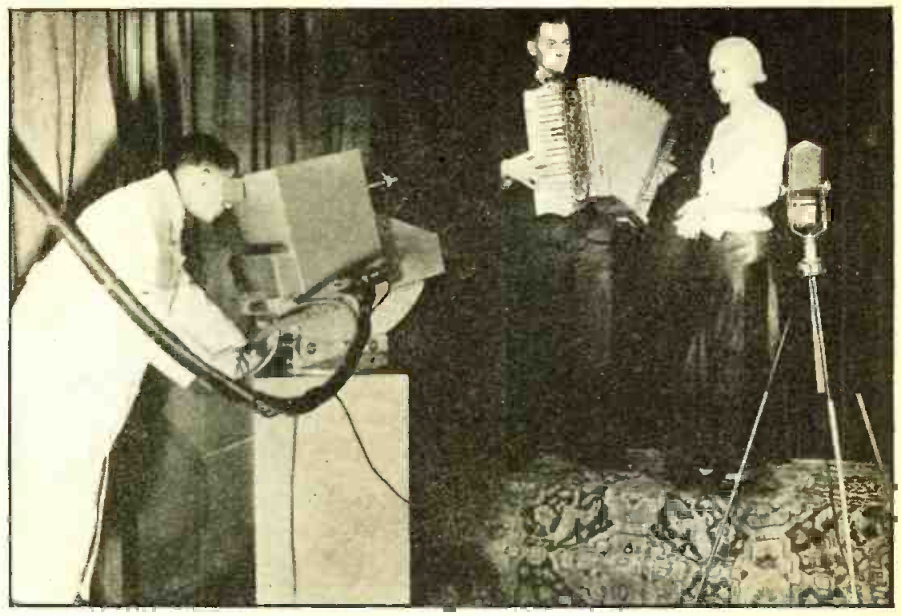
EQUIPMENT AT A CONTROL STATION

Lieut. Walter Freeman, U.S.N.R., officer in charge at NDB. New York, inspects the transmitter used at the control station for that district.



WHAT'S NEW in RADIO

By W. C. Dorf



CATHODE-RAY TELEVISION PROGRESSES IN HOLLAND

405-line television transmissions are now made possible through a development of the Phillips' television system, employing cathode-ray tubes for receiving and an "Iconoscope" for pick-up. Photo shows studio scene during a broadcast.

Midget Dry Electrolytics

The Sprague Products Company is manufacturing a new small-size dry-electrolytic condenser enclosed in an aluminum can. It is known as type PLS and is available in 4 and 8 mfd. capacities and in dual and triplet 8 mfd. units at 525 volts rating. An idea of their small size can be had from the fact that the 8 mfd. unit measures only 1 inch in diameter by 2¾ inches long.

Improved Recording Amplifier

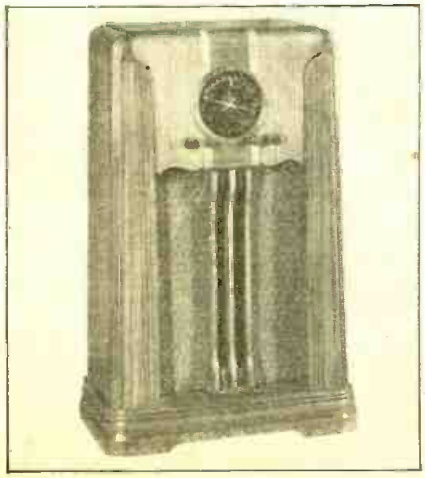
The Universal Microphone Company announces that their professional recording amplifier is now being supplied with high and low-pass filters which allows a continuous variable adjustment of the frequency characteristic. In the normal position, the frequency characteristic of the amplifier will be flat, while the rotation of the control knob in either direction gives the amplifier a rising or a falling characteristic as required in recording or reproducing.

New Automobile Tube

A new output tube for automobile receivers has been released by the Triad Manufacturing Company. The new tube, the 6AB6G, is one of the direct coupled triode series, similar to the 6B5, 6N6G, etc. The main advantage of this new type is in the lower filament current, .5 ampere, and the smaller ST-12 bulb. The base is of the octal type.

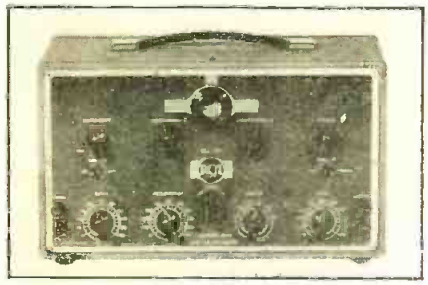
New Set Incorporates Several New Developments

The Howard model 118 console is a superheterodyne employing 11 tubes. The outstanding features of the receiver include a cathode-ray tuning indicator, rubber floated tuning condenser assembly, 12-inch auditorium dynamic speaker and a 6-inch, 3-color dial calibrated from 540 to 18,000 kilocycles. The tube equipment includes 3—6K7's, 1—6H6, 1—6A7, 1—6F5, 1—6C5, 2—6F's, 1—80 rectifier and 1—6G5.



New Service Tool

The RCA Manufacturing Company announces the model 151 oscillograph using the 913 miniature cathode-ray tube. This new instrument has special interest for the serviceman, as it can be employed in conjunction with the model 150 electronic sweep test oscillator for accurately aligning receivers, visually checking distortion, etc. In addition to radio servicing, this general purpose oscillograph has many invaluable applications in radio transmitter, sound equipment, industrial, and educational fields. Among its outstanding features are: high sensitivity, providing a full sized image from only 1.75 volts (RMS) input;



vertical and horizontal amplifiers with individual controls, rated flat over a range of from 30 to 10,000 cycles; and a linear timing axis in the same range. It utilizes five tubes including one 6A7, one 6F7, two 6C6s, and one 80 type rectifier.

Acoustic Standards

The American Standards Association in co-operation with representatives of science and industry has set up a standard terminology of acoustics which is destined to do away with misunderstanding of technical terms. The standards are of interest to the radio industry, the motion picture industry and musicians alike.

Several terms have been re-defined and some changes were made. There used to be two kinds of "bars" so in order to avoid confusion the unit of sound pressure is now a "dyne per square centimeter." "Noise" is now defined as "any undesired sound," while "unpitched sound" is used to denote sound of no definite frequency. The standard A has now been defined as 440 cycles per second. Copies of the standards are available from the American Standards Association, 29 W. 39th Street, New York City.

Portable Recorder

This new Universal portable recording machine contains a switching arrangement for headset monitoring, either from the playback or the cutting head. The standard Universal floating head is employed and by means of an anti-capacity switch the voice coil of the cutting head can be cut in or out of the circuit. The turntable is 16 inches in diameter. It is reported that the chief fault of small recording outfits has been overcome in this new unit by eliminating all waver at either 33⅓ or 78 r.p.m. transcription. It is driven by means of an endless belt running on the outside edge of the turntable and is connected to a two-step pulley mounted on the vertical countershaft of the synchronous motor.

Complete Line of New Amplifiers

The Montgomery Ward 1937 line of high-quality amplifiers designed to meet all sound reproducing requirements includes

(*Turn to page* 639)

GRADING RADIO LESSONS

View of the instruction department of the National Radio Institute with Joseph Kaufman, Supervisor of Education, on the right.

Choosing A RADIO

Having written several articles and a book on the problem of making a living in radio, the author has received hundreds of letters asking vocational guidance. The large majority of these letters have requested advice as to what schools to choose in training for radio jobs.

MOST of the prospective radio students with whom we have been in touch have found themselves confronted with the problem of whether to take a residence course, or to study by mail. Aside from personal considerations of finance, employment, geographical location, family ties, etc., this decision rests upon two things—the ability of the student to learn "on his own," and the "teachability" of the subject by correspondence. If mass psychology and the presence of a patient instructor are essential to the acquisition of knowledge, then the student's place is in a residence school. If, on the other hand, he finds he can learn much from reading books in the quiet of his own room, he will doubtless progress well in a correspondence course.

Correspondence schools sometimes have been laid open to deprecation and ridicule largely by "gyp" schools and the lack of teachability of the subjects they feature. It is, in the author's opinion, more than ridiculous—it is nothing short of fraud—to attempt to teach a person how to become a detective or an actor by mail. But one certainly can learn *radio* by mail. However, the element of teachability still enters the equation. While the choice of a residence or a correspondence school for most phases of radio will be determined by factors already discussed, the student desiring to become a radio operator should, if at all possible, take a residence course.

In the following brief resumés of the various well-known schools, we shall endeavor to stress their predominating feature or features—the manner in which they are different from other schools. In so doing, there is no deprecation or belittling of their other legitimate services or courses.

RESIDENT SCHOOLS

In thinking of residence schools, it is a personal matter that makes us put first the RCA Institutes. In our long association with radio, we first knew it as the Marconi School of Instruction, and were personally acquainted with many of its instructors.

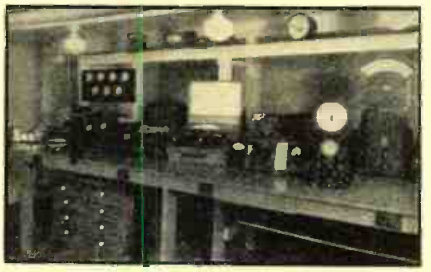
RCA Institutes

ORIGINALLY organized more than two decades ago for the training of marine operators and with RCA interests having a most definite finger in the pie of every kind of radio operating, RCA Institutes is pre-eminently fitted for the training of radio operators. There is no limit to the facilities available and while graduation from this school by no manner of means implies employment in one of the RCA operating subsidiaries, it is not illogical to suppose that his status as an RCA Institutes graduate may be looked upon favorably.

The Institutes' General Course will be of particular interest to those leaning toward the radio engineering profession. Code is taught and aside from theoretical and applied radio, the student is carried through college physics and reasonably advanced calculus. Courses in broadcast operating and radio service work are also taught. A preparatory course is available for students who

LABORATORY PROCEDURE

Some of the equipment used at the Sprayberry Academy of Radio for working out technical service problems.



MASS "SERVICE" INSTRUCTION

Servicing radios as taught by Coyne —about fifty up-to-date service shops rolled into one!

THE LOW-DOWN ON TUBES

Two residence students at the Capitol Radio Engineering Institute working out actual problems on tubes.

SCHOOL

By Zeh Bouck

cannot meet the entrance requirements of the General Course, and some subjects are covered in home study (correspondence) classes.

Students may attend night and day classes and RCA Institutes has schools in New York and Chicago.

New York Y. M. C. A. School

WHILE to some extent the courses offered by this school parallel those of the RCA Institutes, the New York Y. M. C. A. school, by virtue of its long experience in vocational training, is particularly well fitted to teach radio servicing. A course in electrical refrigeration is also available which should be of particular interest to the radio serviceman, as electrical refrigeration is a profitable sideline to radio servicing. The facilities of the Y. M. C. A. are available to all students, and the Y. M. C. A.'s appreciation of the problems confronting ambitious youth have made it possible for them to provide the highest class tuition at a very attractive figure.

Capitol Radio Engineering Institute

THE Capitol Radio Engineering Institute offers a concentrated nine months' course in radio engineering. It is genuinely an engineering course and carries the student through integral calculus—calculus being the tool that differentiates (no pun) between the technician and the engineer. This course will have special appeal to the student with a high-school education, or its equivalent, who seeks his future in radio engineering but whose financial resources are such that they cannot carry him through a long period of preparation.

CONSULTATION SERVICE

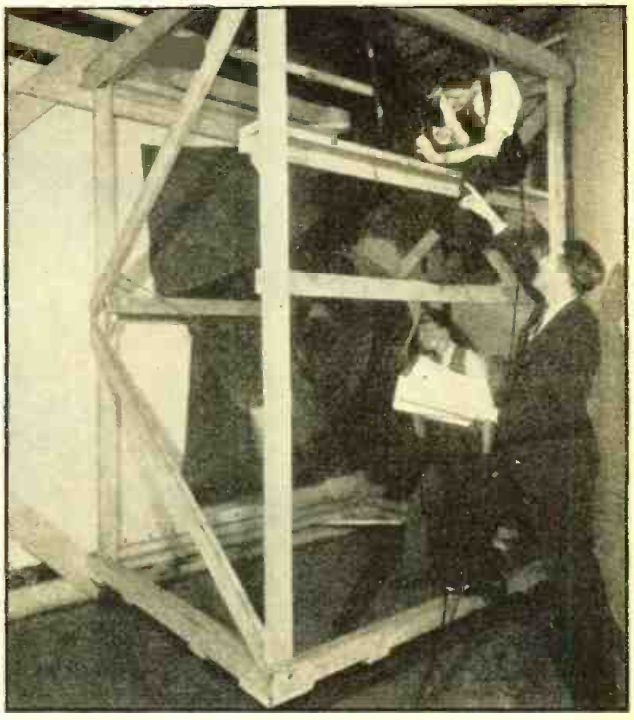
A personal letter and photostat diagram sent a student in reply to his letter to N.R.I. asking help on a radio service problem. Such service as this is extremely valuable to the student who may be situated somewhere way out in the "Sticks."

Dodge's Telegraph and Radio Institute

DODGE'S is located in Valparaiso, Ind. and teaches a more or less standard variety of courses. However, the possibility offered by Dodge's of combining courses is an outstanding feature, and is certainly the closest any school can come to job insurance. Our recommendation would be a combination of the Radio Broadcast Engineering course and the Radio Servicing course. The graduate of these two courses has an excellent chance of getting work, for practically every radio field is open to him, including marine and broadcast operating, servicing, laboratory and similar technical work leading in an engineering direction.

Coyne Electrical School

COYNE is an old and well established school. Concentration is the keynote of the Coyne courses—which are covered in 12 weeks—or 3 months. They naturally recommend themselves in particular to students who cannot take off more time from the important business of making a living. The Students do practical work in the Coyne shops.



"RESIDENCE" INSTRUCTION

Learning Servicing of theater sound equipment—one of the things taught thoroughly at R.C.A. Institutes in New York City.

Indiana Tech and Tri-State College

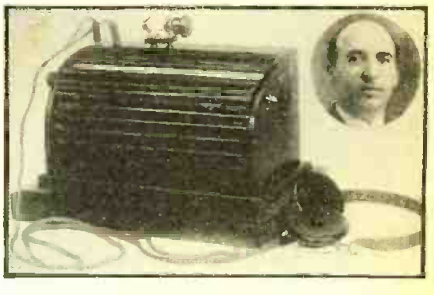
WE group these two institutions, as their courses run closely parallel. The matter of choice will be pretty much a geographical preference. Indiana Tech is located at Fort Wayne and Tri-State at Angola, Indiana. These colleges will appeal to students desiring to obtain engineering degrees in the minimum possible time—two years.

This saves the student considerable time in actual study hours.

(*Turn to page* 630)

New MARKET *for* Inventions

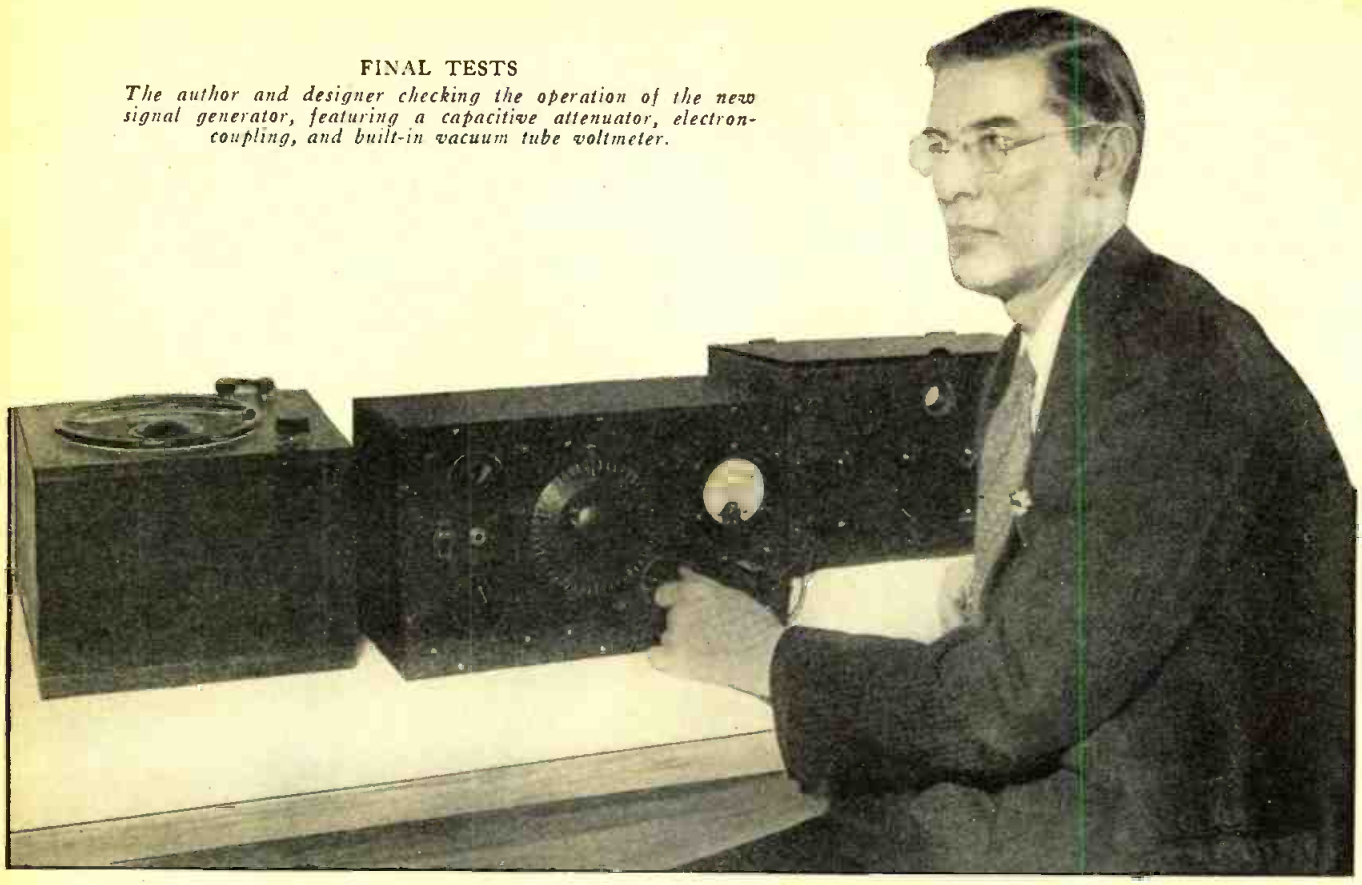
THE independent inventor's chief problem is to find a market for his ideas and inventions. An announcement just received should therefore be interesting to many among RADIO NEWS readers. It is quoted as follows: "The National Union Radio Corporation of N. Y. has appointed J. H. Robinson as Director of New Products Research. He has been assigned the task of seeking out and analyzing the marketability of new products, patents and ideas having to do with the radio, electronics, television and electrical industries.



INVENTS DX CRYSTAL SET

Professor Alberti Donadio of Genoa recently developed this new type crystal receiver capable of pulling in stations 1,000 miles away.

"Inventors are invited to correspond in strict confidence with Mr. Robinson, c/o National Union Radio Corporation, 570 Lexington Avenue, New York, N. Y. It is the belief of this company that an era of great development and advancement is at hand and they are prepared to encourage the promotion of new practicable ideas."



FINAL TESTS

The author and designer checking the operation of the new signal generator, featuring a capacitive attenuator, electron-coupling, and built-in vacuum tube voltmeter.

The Radio News

"CAPATRON"

Signal Generator

By **John H. Potts**

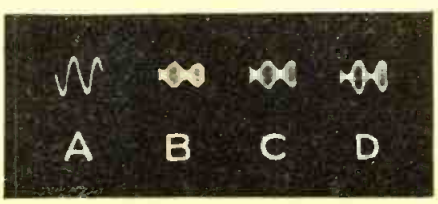
DURING the past few years many servicemen have gradually added to their shop equipment apparatus of distinctly laboratory character, such as bridges, beat-frequency oscillators and cathode-ray oscilloscopes. Each of these instruments has filled a definite need and has enabled a higher type of service to be efficiently performed. To fit in with work of such caliber, a standard signal generator capable of delivering to its output terminals a signal of excellent waveform, properly modulated and of known voltage, has been sorely needed. While the better grade test oscillators now on the market fulfill the requirements of general service work, the lack of any convenient provisions for determining the exact r.f. voltage or percentage modulation preclude their application to more complete receiver testing. Since the cost of strictly laboratory-type signal generators now available is prohibitive to most service organizations, the writer started work some time ago toward the development of a simpler and less expensive design which would still meet all ordinary requirements.

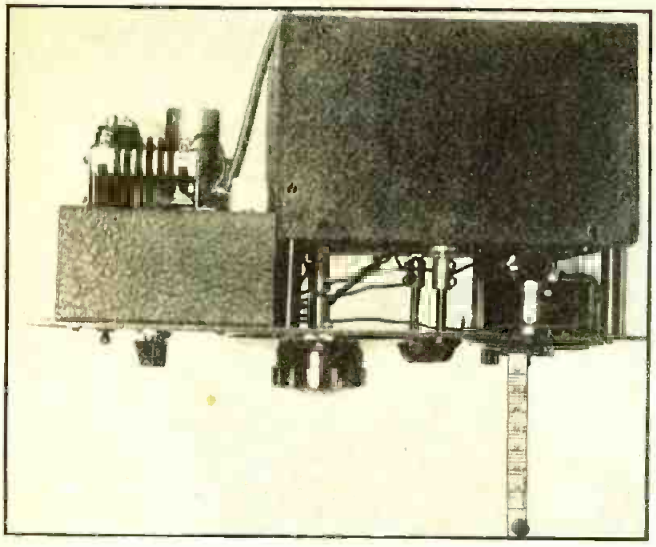
The all-wave signal generator to be described is the result of this work. It is a.c. line-operated and the frequency range extends from 80 to 25,000 kc. in eight overlapping bands. The r.f. oscillator is a 6J7, electron-coupled to a special piston capacitance-type attenuator, giving known and mathematically exact attenuation. A highly-sensitive tube voltmeter is built in to provide a constant indication of the r.f. output level on all ranges. Maximum outputs of up to 2 volts are obtainable on the i.f. and broadcast bands, where high output is necessary in servicing, and even at the highest frequencies the output is 200,000 microvolts.

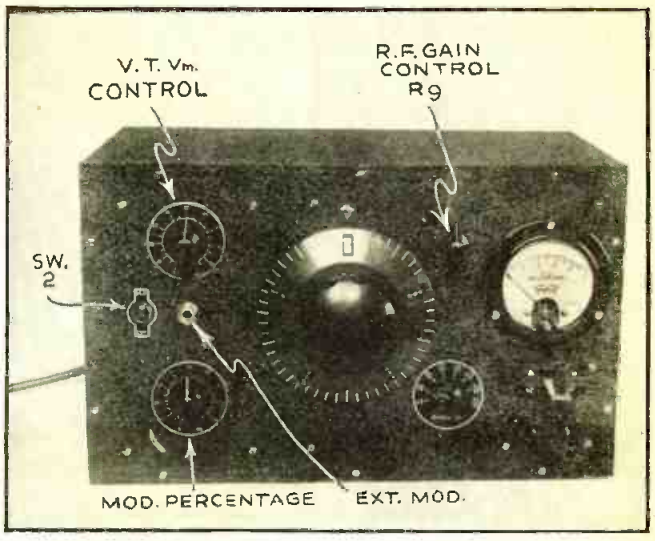
The built-in 400-cycle a.f. oscillator utilizes the negative conductance circuit described in the August, 1935, issue of RADIO NEWS. Provision is made for external modulation for overall receiver testing over a wide range of audio frequencies. Suppressor grid modulation is used, so designed that full 100 percent modulation may be obtained with excellent wave form. Several typical unretouched oscillograms are here reproduced. A represents the a.f. wave form above while B, C, and D show the r.f. output

EXCELLENT WAVE FORM SHOWN

These unretouched oscillograms illustrate the wave forms of the a.f. and the modulated r.f. output of the "Capatron," as they appeared on the new 913 miniature cathode-ray tube.







A PRECISION INSTRUMENT

As the new signal generator appears when removed from its case (left), showing the careful shielding and (right) the attractive panel layout and arrangement of controls.

at various modulation percentages.

Making an attenuator which is accurate at all frequencies is one of the greatest stumbling-blocks usually encountered in signal generator construction. While a resistance network is often most desirable, the job of compensating for reactance errors at very high frequencies may run the cost of such devices into hundreds of dollars.

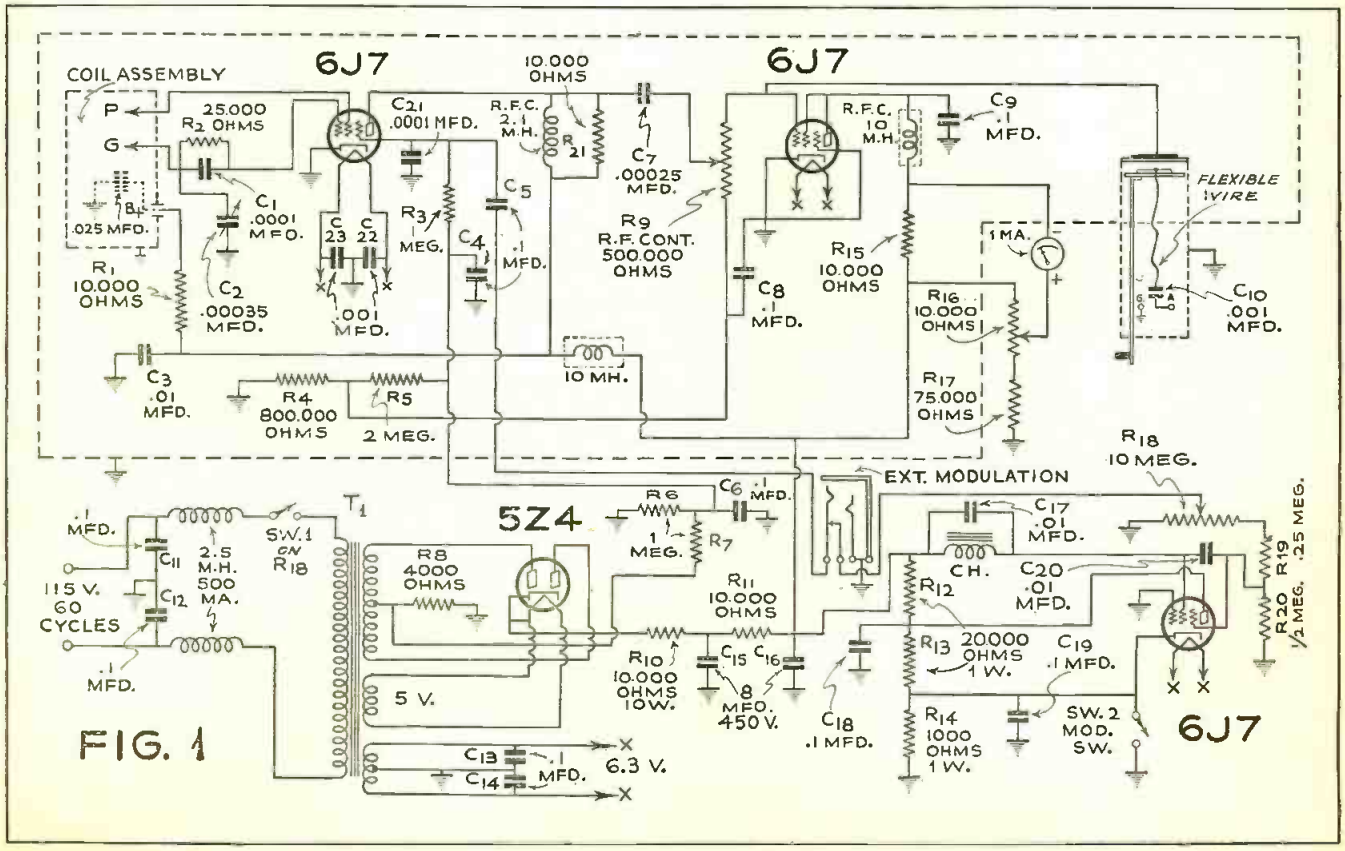
Simple Attenuator Used

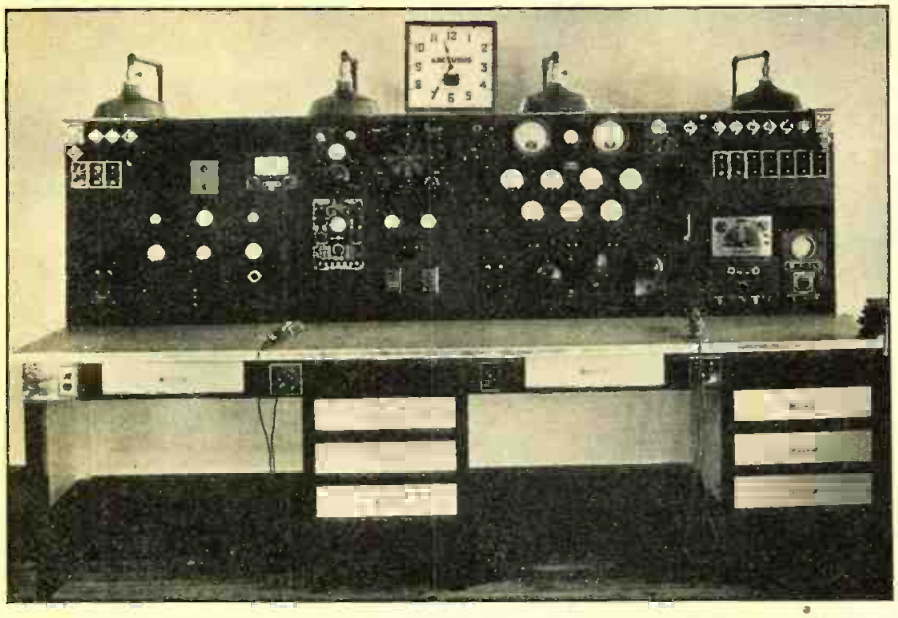
The utterly simple piston attenuator shown in Figure 2 is a modified version of a theoretical design described in the I.R.E. Proceedings for June, 1935. It is one of the very few types which really work at high frequencies and, as is evident from the constructional details, it may be constructed for less than the cost of an ordinary volume control. As shown, the high oscillator voltage is applied to the insulated copper disc A. The movable disc, B, may be set at any desired distance from A and will pick up and deliver to the output terminals a voltage which decreases in an exact logarithmic ratio with an increase in separation of the two discs. The formula for this rate of attenuation, derived by Harold A. Wheeler, is 20.9 db. per radius based on the internal radius of the copper cylinder. In our design, the output voltage at 2 inch disc separation is approximately 20 db. lower than at 1 inch separation. At 3 inch separation, the voltage will be down 40 db., etc. This corresponds to voltage reductions from 1 volt to .1 and .01 volts respectively.

The formula, Figure 3, shows that the actual output voltage is dependent upon the ratio of the capacity between the discs A and B and the output capacity, C2, which may consist of a shielded cable. Detailed information on the calibration will be given in the next article.

Coil Kit Employed

All the difficulties of oscillator coil design, construction, band-switching and coil shielding are eliminated by adapting our circuit, shown in Figure 1, to the RCA Conversion kit. (*Turn to page* 635)





A SERVICE BENCH WITH EVERY CONVENIENCE, INCLUDING PLENTY OF LIGHT AND ELBOW ROOM

THE SERVICE BENCH

Computing Service Charges—Service Shop DeLuxe—Watt-Hour Meter in Service Work—Noise—Service Kinks, Rural Sales and Advertising—SERVICING: Lyric, Philco and Cadillac . . .

Conducted by Zeh Bouck, *Service Editor*

HOW MUCH TO CHARGE FOR RADIO SERVICE WORK

THE fundamental problem in radio service business methods is not so much how to charge for radio service, but that of *how much* to charge. There are various ways of charging—list price of parts plus low labor charge, high labor charge with discount on parts, free examination, special inducements, etc., etc. But regardless of how the serviceman charges, the bill must be right! If too high, he will lose his customer—and eventually his business. If the bills are consistently too low, he will make no profit and lose his business anyway.

All too many servicemen make arbitrary charges—charges not based upon the cost of running his own business plus a reasonable profit. It is too often a case of blindly following a leader—charging what some other serviceman charges, or what some manufacturer suggests as a logical method and rate of billing. However, bills for radio service must be tailor-made to fit the individual serviceman. But even servicemen who realize this fact often are incapable of computing an intelligent basis of charges. Their most serious blunder is the overlooking of overhead—an all-important item that may well spell the difference between profit and loss!

It is really a very simple matter for each and every serviceman to determine exactly what he should charge for his work. We are considering now the one-man business. (When the serviceman has progressed to the point where he has employees, that fact in itself indicates that he is a good business man and is quite capable of computing costs and billing for a profit.)

Figure out approximately how many hours a month you actually work at radio servicing—perhaps five hours a day, six days a week or 120 hours per month. Your time is worth $1.00 an hour. (Oh, yes, it is undoubtedly worth more than that—and you will realize more than that if you will follow this system. Even so, $30.00 a week isn't bad by any means, and no serviceman should depend 100% upon radio servicing, unless he has built up a large, exclusive service organization. Sidelines do much to keep the cash register tinkling.) Now compute your overhead:

Depreciation of auto	$15.00
Depreciation of equipment plus fund for new	10.00
Rent	10.00
Electricity	3.00
Telephone	2.75
Heat (monthly average over the year)	3.00
Gas and oil	4.50
Miscellaneous (wire, solder, etc.)	2.00
Total monthly overhead	$50.75

Depreciation is easily figured. For instance, if your car is worth $410.00 now, and say $50.00 two years hence as a trade-in, the depreciation is at a rate of $15.00 per month.

Obviously, 120 hours of work must take care of this overhead. Dividing $50.75 by 120, we find that about $.42 must be charged against overhead for every hour of work. However, to be on the safe side, and for the ease of computation, we shall charge fifty cents an hour for overhead. Now let us see how this works out on a typical job—say the installation of a noise-reduction antenna system—assuming that the antenna kit lists for $6.75—your cost $4.05—and that it will take you two hours to effect the installation. We figure as follows:

Cost of kit	$4.05
Overhead on two hours' labor	1.00
Labor at $1.00 per hour	2.00
Total	$7.05

If you charge $7.05, all your expenses will be covered—and you will make two dollars on the job. *Under no circumstances should you charge less than this.* However there is no reason why your bill should not be in excess of this minimum amount. Here are four different ways in which you might bill your customer with greater but still fair profit to yourself.

List cost of antenna	$6.75
Labor—2 hours @ $1.50	3.00
Total	$9.75

There is nothing unreasonable about this bill, and customers in many service localities would consider it fair and square. Subtracting $7.05 (the minimum charge covering your salary and all expenses) leaves $2.07 as net profit to the company (your own one-man service business).

Another method of charging—using a discount as a bait:

Special price on antenna	$6.00
Labor—2 hours @ $1.50	3.00
Total	$9.00
Minimum	7.05
Net profit to company	$1.95

If it fits in with your scheme of things, you can charge the list price of the kit plus one dollar an hour for labor. This brings the total customer's bill to $8.75, with a net profit to the company of $1.70 (don't forget, your salary of $1.00 per hour has already been taken out—the $1.70 is a surplus). A still more attractive offer might be made of a special $6.00 price on the antenna and two dollars for labor—a total bill of $8.00, with a net profit to the company of $.95.

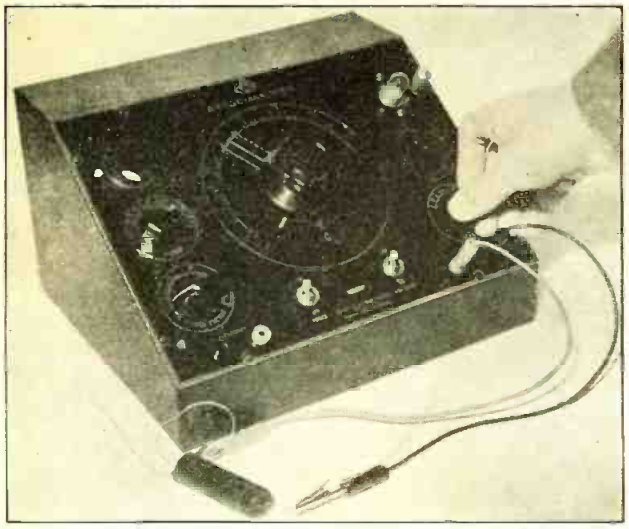
Net profits should be permitted to accumulate—preferably in the savings bank at interest. This fund can be used later for expansion and emergencies. As it exceeds a required minimum, of say $100.00, a dividend can be declared in your favor. This will be in addition to your salary of $30.00 per week.

It is obvious that the system, the fundamentals of which have been indicated above, can be applied by individual servicemen to fit their particular needs. If he is a good serviceman, and gets an average break so far as business conditions are concerned, he is bound to make a profit by following it.

THIS MONTH'S SERVICE SHOP

Our heading picture this month shows what would be the answer to most servicemen's dreams—a service shop *par excellence*. This was designed and constructed by L. F. Lyon, proprietor of the Lyon Radio Service, Syracuse, N. Y. The predominant features are its elaborateness, neatness, plenty of room and light. Much of the first-grade equipment will be recognized by the reader. A Wright-DeCoster Multitest speaker is in the upper center. There is a full complement of oscillators, including Weber, Philco and Clough-Brengle, as well as an oscilloscope made by the latter. Supreme and Jackson tube testers are in evidence, as is a Taco resonance indicator, a Tobe condenser checker, a Triplett Multi-test meter, a rebuilt Jewell test panel, with the usual incidental collection of meters. Voltages available are 110 a.c. and d.c., 32 volts d.c. (for farm radios) and 6 volts d.c. All power circuits are guarded with pilot lights. From the photograph it looks like a sheet metal top on the bench—an excellent idea from the point of view of serviceability and cleanliness, but not so hot from some radio considerations. Open-bottom chassis sets may show better stability when being tested on such a surface. A minor point, however, and we like the bench. (Don't forget, we pay for all photos of Service Benches published—as well as all other

(*Turn to page* 612)



JUST AS SIMPLE AS ABC

With this device the serviceman can immediately check suspected parts and save considerable time in solving set problems.

This BRIDGE Analyzer *Solves Elusive* SERVICE PROBLEMS

By Glenn Browning

RADIO servicing is becoming more and more, as the years go by, a technical problem. The serviceman now realizes he must have the proper equipment to quickly locate defects in parts and components of radio equipment.

CONDENSERS, both paper and electrolytic, form one of the serviceman's major problems today. Paper condensers of small capacity have a habit of becoming open-circuited, and if this occurs in r.f. by-pass circuits, the result is oscillations or loss of volume. Many of these open circuits, however, are of an intermittent nature and thus cause spasmodic operation which is very difficult to locate. The writer knows of numerous sets which operate satisfactorily for a short period of time whereupon the volume falls to practically zero and can only be brought back by snapping "off" and "on" the set or in some cases by turning "off" or "on" an electric light bulb. This type of fault is usually due to one of three causes: a defective condenser, a defective resistor, or a defective tube. In probably a majority of the cases the fault is due to intermittent condenser trouble. Some service shops replace all the condensers in the radio set rather than ferret out the faulty one.

A Complete Bridge

Practically every serviceman will find it almost essential to have in his workshop apparatus which will check quickly, completely and accurately all the component parts in the radio set. Typical of such apparatus is the Tobe Bridge Analyzer, shown schematically in Figure 1, and in the photograph, which is designed fundamentally for checking all types of condenser faults as well as checking values of resistance and performance of resistors under actual operating conditions. This bridge analyzer consists essentially of a capacity bridge (see Figure 3) which covers a range from 10 mmfd. to 100 mfd. It also determines the power factors of paper and electrolytic condensers from 0 to 50%. This determination of power factor, as will be taken up later on, is becoming more and more the criterion of the condition of both electrolytic and paper condensers. In many cases it will show that a capacitor which has not failed is nearing the end of its useful life. The bridge network is changed by the proper switch so that resistance may be measured from 1 ohm to 1 megohm. (The circuit then becomes like Figure 2.) All bridge measurements are made by means of a visual null indicator consisting of a 6G5 tube which gives a 90° shadow angle at balance. In order to obtain sufficient sensitivity for the eye to give an accurate power-factor balance, one stage of high-gain amplification is used ahead of the 6G5.

Unusual Defects

Some types of condenser faults may not readily be detected by bridge measurements. The writer has had condensers which show practically a short circuit at their operating voltage in the radio receiver, yet when they were measured on a bridge, although the power factor was considerably higher than normal, the capacitance was practically normal. These cases are few. The above phenomenon is probably due to the fact that the paper dielectric of the condenser had a small hole from one foil to the other which, at operating voltages, caused a spark to pass between the two condenser plates. However, the circuit in which this condenser was placed did not have sufficient power behind the voltage developed to carbonize the paper a great deal and, as a consequence, at low voltage the condenser acted in almost a normal manner.

(*Turn to page 628*)

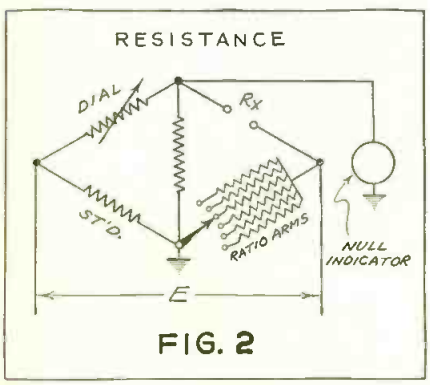


FIG. 2

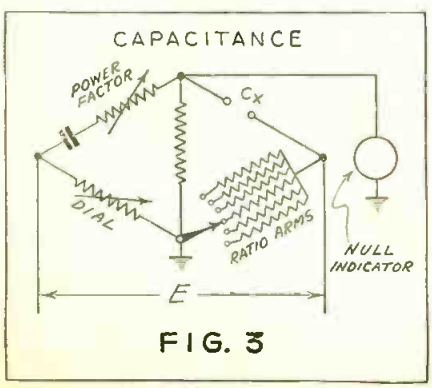


FIG. 3

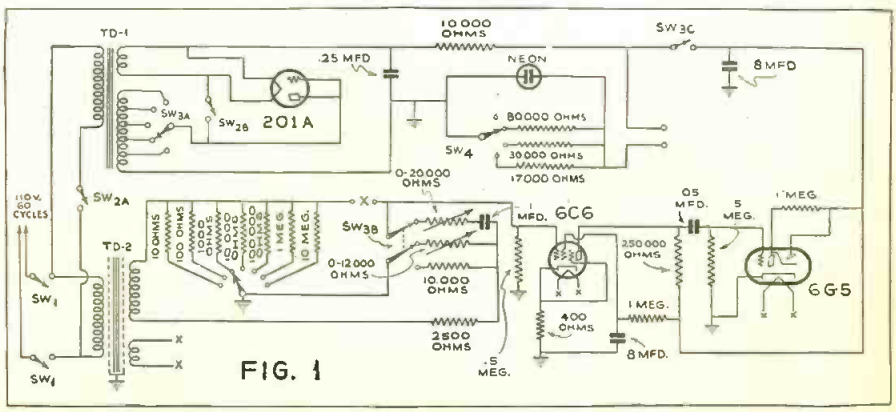


FIG. 1

The RADIO WORKSHOP

Items of interest for beginners, experimenters and radio constructors.

Conducted by The Associate Editor

A Decibel Meter

There are many occasions where the experimenter, the serviceman and the sound engineer desires to know the db. level at the output of an audio amplifier. He may wish to know the db. level of some sound installation that has to be run at a constant volume. After inspection of his measuring equipment he will probably find that while he has meters that may be used as output measuring devices none of them will be calibrated in decibels. Output meters used in service equipment are often nothing more than high-resistance

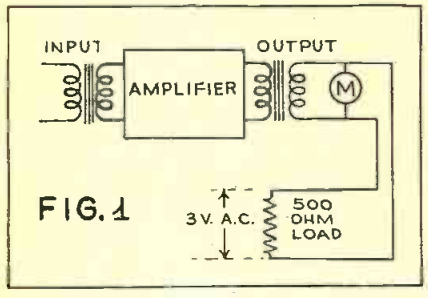


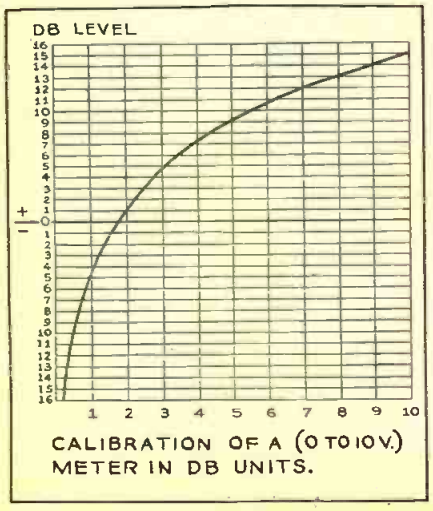
FIG. 1

a.c. meters, usually made by connecting a d.c. meter to a copper-oxide rectifier. These meters may be calibrated in decibels in a very simple manner.

Using an 0-10 voltmeter as an example and to calibrate it in db. the following formula is used.

(1) Above zero level, the db. level equals

$$10 \times \log \frac{\text{power in watts}}{.006}$$



CALIBRATION OF A (0 TO 10V.) METER IN DB UNITS.

(2) Below zero level, the db. level equals

$$-10 \times \log \frac{.006}{\text{power in watts}}$$

To determine the power level divide the square of the voltage by the resistance the meter is placed across, as in Figure 1 or in the example below. It is assumed, of course, that the measurements are made with a load connected of either a transformer or a resistance of 500 ohms.

$$\frac{3^2}{500} = \frac{9}{500} \text{ or } .018 \text{ Watts}$$

If you have an audio voltage of three volts developed across 500 ohms the power level equals .018 watts. To determine the db. level:

$$\frac{.018}{.006} = 3. \quad 10 \times \log 3 = 3.7 \text{ db.}$$

Since .006 watts is taken as our reference level, any power above this will give a positive db. level and any power less than this will give a reading below zero level. If we have an audio voltage of one volt developed across 500 ohms the db. level equals:

$$-10 \times \log \frac{.006}{.002} \text{ or } -4.78$$

as is shown by formula No. (2) as given above. Continuing this process we have the following table from which we may calibrate our meter.

.25 volts	minus	16.8 db.
.5 volts	minus	10.8 db
1.0 volts	minus	4.78 db
1.5 volts	minus	1.24 db.
1.73 volts	minus	0.00 db.
2.0 volts	plus	1.2 db.
2.5 volts	plus	3.8 db.
3.0 volts	plus	4.7 db.
3.5 volts	plus	6.00 db.
4.0 volts	plus	7.2 db.
4.5 volts	plus	8.3 db.
5.0 volts	plus	9.2 db.
6.0 volts	plus	10.7 db.
7.0 volts	plus	12.1 db.
8.0 volts	plus	13.00 db.
10.0 volts	plus	15.00 db.

This is the chart that would result when the meter is placed across a 500 ohm load. Should we wish to use the meter across lower loads, we may do so by recalibrating the meter, but unless a meter of very high sensitivity is used, results are unsatisfactory.

NOTE: *The figures above neglect the resistance load of the meter, but will be sufficiently accurate for all practical purposes.*

W. B. GIRKIN,
Port Arthur, Texas.

A Home Made Stand For Single Button Mikes

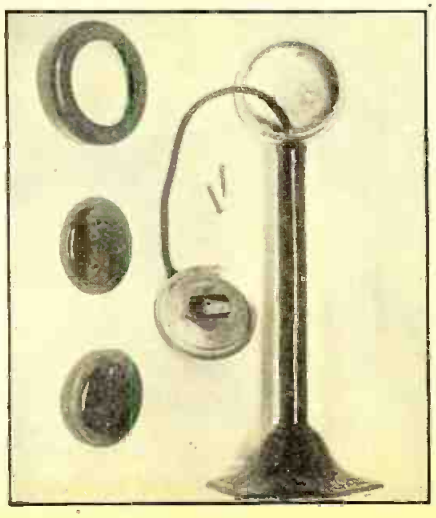
From all reports there are thousands of "Hams" using relatively inexpensive Western Electric single-button carbon microphones of the type shown in the illustration. Unfortunately, however, in many cases where this type of "mike" is used, the amateur is stumped for a neat and convenient mounting.

The accompanying photographs show the microphone mounted in a home-made desk-style stand of smart professional appearance. The features that will recommend this stand to "Hams" are its simplicity of construction and low cost.

The few parts required for the stand consist of a 1931 Chevrolet chrome-plated crank-hole cover (from a neighboring auto junk yard) which serves to house the microphone; a piece of brass pipe about 8 inches long with gasoline line compression fittings soldered into each end, and a metal base which can take any form desired from

an ornamental ash tray or a plain circular disk to whatever your junk pile or hardware dealer can supply. The case is made fast to one end of the brass pipe, serving as the upright by slipping the threaded end of the pipe through a hole previously made in the case and fastening it with a nut on the inside of the case as shown. The other end of the upright is passed through the base and secured in the same manner.

Figure 2 shows the completed stand and the disassembled microphone. The aluminum case of the microphone is fastened in the crank hole cover by means of two machine screws, inserted through two holes drilled in this cover in line with the two threaded holes which are originally and conveniently in the microphone case. When the "mike" case has been secured to the stand, the carbon button dust cover and



the cap are then replaced. Two coats of black enamel on the base and upright provide a finished appearance.

ROBERT WOYTISEK (W2HWH),
Jackson Heights, L. I., N. Y.

Try This on Your Next Construction Job

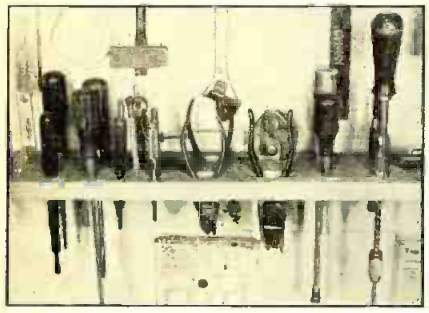
Aluminum radio panels can be given a very attractive machine surface providing a smart-looking background for the meters and black dials of a radio receiving or transmitting set. The only special equipment required consists of a round piece of wood (a section of broomstick will do) about 3 inches long, ½ to 1 inch in diameter. A short, thick nail is driven into the center of one end; and a piece of emery paper is placed over the other end with the rough side outward and held in position by a strong rubber band snapped around the wood.

The aluminum panel is placed on a flat surface and clamped down. The nail in the end of the wood is inserted in the chuck of a hand drill or electric drill; then with the emery-covered end of the wood pressed firmly against the surface of the panel, it is rotated rapidly over the entire face of the panel, replacing the shiny aluminum surface with overlapping circles. If the rows of circles are lined up carefully the result is a flat panel of fine appearance.

GEORGE F. MARK,
Los Angeles, Calif.

A Time-Saver

A piece of 4-inch soft pine shelving, cut the desired length, makes an excellent tool rack for the service or experimental shop. Bore holes for screwdrivers, spintite wrenches, scribers, etc., and cut slots for side-cutters, pliers, etc. Mount the shelf



above and in back of the workbench, so that it doesn't interfere with the latter.

This arrangement of a definite place for every commonly used tool saves time and promotes efficiency. It certainly is much better than the usual heap of mixed-up tools found on so many workbenches.

ROBERT HERTZBERG,
Jackson Heights, N. Y.

New Aids For The Radio Constructor

By Alex G. Heller

There are many set builders and experimenters who are progressive in adopting the latest tubes and circuits as quickly as they appear but who are surprisingly backward as far as new methods of mechanical construction and assembly are concerned. It is amusing and at the same time pitiful to see radiomen trying to chop out meter and socket holes with a cold chisel or using the tangs of old files as reamers and other unhandy construction methods. This article describes three new tools manufactured by the Insuline Corp. of America that are short cuts in radio assembly and what is important, produce a workmanlike job.

In these days of steel and alloy cabinets and chassis, it is no longer practicable to follow the old method of drilling a circle

FIGURE 2

of small holes and then cutting out the center with a chisel. This method could be used with fair results with light aluminum but any one who has tried it with ⅛-inch gauge steel, knows what a tough job it is.

The answer to this headache is a new set of self-aligning punches designed especially for making large holes in chassis, panels, etc., radio purposes. To make holes for electrolytic condensers or tube sockets, you merely center punch the desired hole, using the pointed stub of the tool, place the anvil section of the punch under the chassis and the male section on the top, and sock the head two or three times as illustrated in Figure 1. You pull out the punch and there is a perfectly clean, round hole without even a burr on it.

The two sections of the punch center themselves automatically, and cannot possibly shear. The only requirement for successful use is a solid table top. A whole string of socket holes is a matter of minutes, instead of hours.

The punch is available in five sizes, to make holes of the following diameter: ¾, ⅞, 1 3/16, 1⅜, and 1¼ inches.

How do you fasten the sockets in place, now that the holes are made? With small machine screws and nuts? Set manufacturers gave that method up years ago in favor of eyeletting. If you have the idea that a complicated machine is necessary you are mistaken. An eyeletting set that costs only about a dollar and consists of two parts will do a professional job on tube sockets, shield partitions, binding post strips and all the other small parts. One part of the tool is a cast iron anvil, the other a tool steel punch, both with specially formed points to close the eyelets or rivets. One tap of a hammer and you have a tight, permanent mounting. Figure 2 shows how it is done.

FIGURE 1

Service men as well as set builders will be interested in the tricky flexible screwdriver illustrated in action in Figure 3. It's a real aid when you have to reach into a tight corner to get at a screw that needs tightening or removal. The blade is a stiff coiled spring, and is readily bent at an angle of 90 degrees.

FIGURE 3

RADIO NEWS "Ear Aid"

In response to many requests, we are showing below the schematic and picture-wiring diagrams with brief building information of the popular RADIO NEWS vacuum-tube ear aid originally described in the January 1932 issue of RADIO NEWS. The numerous repeat orders on this particular number of RADIO NEWS have long since exhausted the issue, due, no doubt, to the unusual wide interest that the constructional article on this device, created.

(*Turn to page* 630)

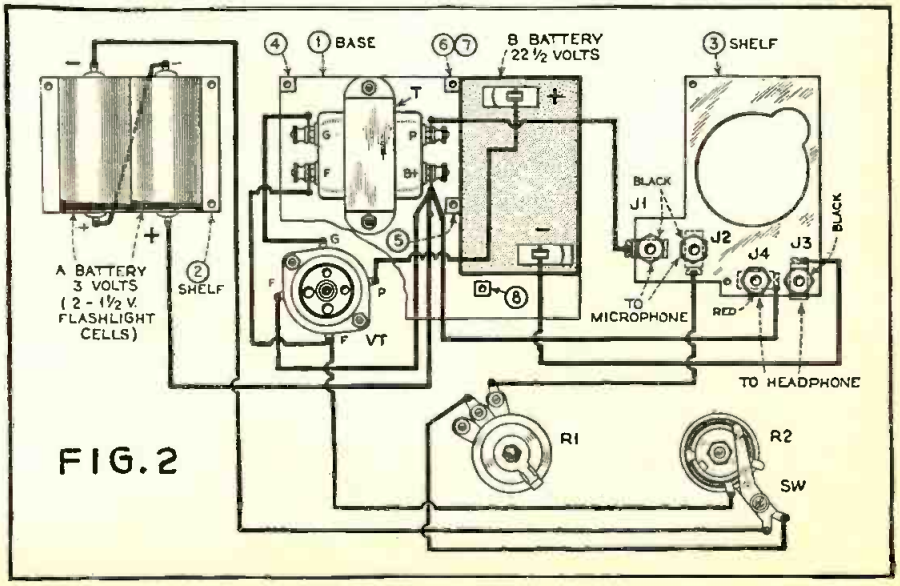
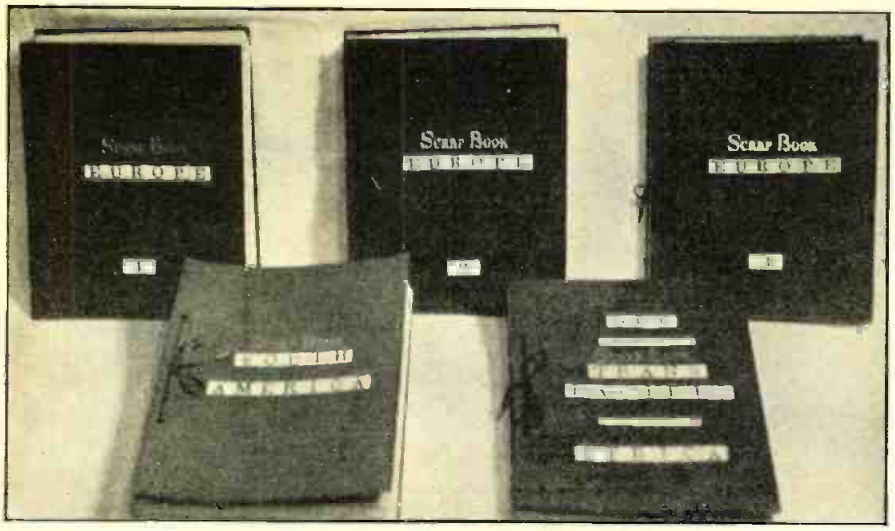


FIG. 2



THE DX CORNER

S. GORDON TAYLOR

(For Broadcast Waves)

The R. N. 1310 Kc. Frolic

Keep an ear peeled on 1310 kc. on the morning of March 13. As will be noted from the DX Calendar this month, there will be a series of 8 stations on this frequency who will dedicate their frequency check periods to RADIO NEWS Observers. Due to the widespread geographical distribution of these stations, it will prove an interesting game to try to report all of them. Think you can do it?

This schedule of broadcasts was arranged by Observer Clancy with the cooperation of Observer Atkins. Both are to be congratulated on a good job well done.

DX CALENDAR

Below are given lists of special DX broadcasts which are scheduled for March and April. The initials following an item indicate the organization to which the program is dedicated and where a RADIO NEWS special has been arranged for by an Observer, his name is given in the schedule.

Don't fail to tune in the RADIO NEWS specials on this list and as many others as possible—and above all, don't fail to report to each station tuned in, giving them as much information as you can concerning their signal strength, fading, quality, etc. Where verifications are desired it is always desirable to enclose return postage.

Hours shown are Eastern Standard Time and are all a.m. unless otherwise indicated.

Day	*Hour*	*Kc.*	*Call*	*State*	*Kw.*	*Club*
			MARCH			
3	6-6:15	1270	WASH	Mich.	.5	NNRC
	6:15-6:30	1270	WOOD	Mich.	.5	NNRC
4	2-3	1160	CMHJ	Cuba	.2	A.W.R.
7	2-4	1420	WJBO	La.	.1	R. News Golson
8	2-2:20	1420	WJBO	La.	.1	R. News Golson
	4:50-5:10	1370	KRE	Calif.	.1	R. News Atkins
	5:20-5:40	1420	KUMA	Ariz.	.1	R. News Atkins
	5:40-6	1320	KGMB	Hawaii	1	R. News Atkins
11	5-5:20	1310	WTRC	Ind.	.25	CDXR
13	2:30-2:50	1310	WTJS	Tenn.	.1	R. News
	2:50-3:10	1310	WROL	Tenn.	.1	R. News Clancy
	3:10-3:30	1310	WCLS	Ill.	.1	R. News Clancy
	3:30-3:50	1310	WAML	Miss.	.1	R. News Atkins-Clancy
	4:20-4:40	1310	KTSM	Texas	.1	R. News Atkins-Clancy
	5:00-5:20	1310	KIT	Wash.	.1	R. News Clancy
	5:20-5:40	1310	KGEZ	Mont.	.1	R. News Clancy
	5:40-6:00	1310	KXRO	Wash.	.1	R. News Atkins-Clancy
17	6-6:15	1270	WASH	Mich.	.5	NNRC
	6:15-6:30	1270	WOOD	Mich.	.5	NNRC
18	4:45-5:50	1160	CMHJ	Cuba	.2	CDXR
20	3:00-4:00	1360	KGER	Calif.	1	R. News Atkins
21	3-5	1300	WHAZ	New York	.5	ICCP
27	3-4	1370	KFRO	Texas	.1	NNRC
31	3-4	1400	KHBC	T. H.	.25	NNRC
			APRIL			
1	2-3	1160	CMHJ	Cuba	.2	NNRC
7	6-6:15	1270	WASH	Mich.	.5	NNRC

7	6:15-6:30	1270	WOOD	Mich.	.5	NNRC
10	4:30-5:30	1370	KVL	Wash.	.1	NNRC
12	2-2:20	1420	WJBO	La.	.1	R. News Golson
	4:50-5:10	1370	KRE	Calif.	.1	R. News Atkins
	5-6	1160	CMHJ	Cuba	.2	
15	4:45-5:50	1160	CMHJ	Cuba	.175	
21	6-6:15	1270	WASH	Mich.	.5	NNRC
	6:15-6:30	1270	WOOD	Mich.	.5	NNRC
28	3-4	1400	KHBC	T. H.	.25	NNRC

PERIODIC

Thursdays—
8:45-9 p.m., 1320 kc., WORK, York, Pa., 1 kw., (NRC)

Fridays—
5 a.m., 1000 kc., KFVD, Los Angeles, Calif., .25 kw., (R. News) (Atkins) (tips)
Midnight, 980 kc., KDKA, Pittsburgh, Pa., 50 kw., (Ed Lips)

Saturdays—
12-12:05 a.m., 690 kc., CFRB, Toronto, Ont., 10 kw., (Ed Hill) (tips)
2:55 a.m., 780 kc., KEHE, Los Angeles, Calif., .5 kw., (R. News) (Atkins) (tips)
1:15-1:30 p.m., 830 kc., WEEU, Reading, Pa., 1 kw.
7:15-7:30 p.m., 1310 kc., WRAW, Reading, Pa., .1 kw.

Sundays—
12-6 a.m., 1210 kc., TGW, Guatemala City, Gua., 10 kw.
1:30-1:45 a.m., 1360 kc., KGER, Long Beach Calif., 1 kw., (R. News) (Atkins) (tips)
12:45 a.m., 1470 kc., WLAC, Nashville, Tenn., 5 kw. (Cappie Hadley) (tips)
1:15 a.m., 640 kc., KFI, Los Angeles, Calif., 50 kw., (tips)
Until 3 a.m., 1220 kc., PRE3, Rio de Janeiro, 10 kw.

OBSERVER TOMLINSON'S LIBRARY OF "VERI'S"

When his living room wall became too small to accommodate his verifications Observer Tomlinson (New York) adopted this means of organizing them. Below "Tom" is shown in his DX Corner with the Scott Imperial which he uses for DX'ing, its selectivity enabling him to bring in many split-frequency foreigners.

CONSOLIDATED FOREIGN "BEST BETS"

FOLLOWING is a list of the foreign stations being heard by Official Observers in different sections of the U. S. and Canada. Wherever either an asterisk (*) or a number appears in a column it indicates that the station has been heard. Heavy numbers represent p.m. and light numbers a.m.

This list is made up from Observers' reports: Column 1—Observers Grabowski, Connecticut; Edlin, Massachusetts. Column 2—Observers Tomlinson, Forestieri, Kentzel and Lonis, New York; Horner, Gordon, Pennsylvania. Column 3—Observers Hunt, California; Clancy, Law, Alberta.

(NOTE: Official Observers and other readers are invited to send in a listing of foreign stations heard each month. In doing so it will facilitate matters if stations are reported in the same form as the list below, with the frequency, call, location, and hour [your own local time] when best heard.)

Kc.	*Call*	*Location*	*1*	*2*	*3*
546	HAL	Budapest, Hungary	..	1	..
556	Beromunster	Switzerland	..	12	..
565	Klaipeda	Lithuania	..	1	..
574	Stuttgart	Germany	2	1	..
583	Alpes-Grenoble	Grenoble, France	..	2	..
583	Riga	Latvia	..	1	..
592	Vienna	Austria	2	1	..
610	11FI	Florence, Italy	2	..	..
620	Brussels	Belgium	2	2	..
638	OKP	Prague, Czechoslovakia	1	1	..
648	Lyons	France	2	2	..
650	1YA	Auckland, New Zealand	..	..	*
658	Cologne	Germany	2	1	..
668	North Regional	Moorside Edge, England	6	..	..
670	LS4	Buenos Aires, Argentina	..	8	..
680	HJN	Bogota, Colombia	..	8	..
695	Paris	France	2	2	..
704	SBA	Stockholm, Sweden	2	2	..
713	Rome	Italy	2	2	..
740	Munich	Germany	2	1	..
749	Marseilles	France	2	2	..
750	KGU	Honolulu, Hawaii	3	2	1
758	Katowice	Poland	..	1	..
767	Scottish Reg.	Westergien, Scotland	6	5	..
770	JOHK	Sendai, Japan	..	..	*
776	Toulouse	France	2	2	..
785	Leipzig	Germany	..	12	..
790	4YA	Dunedin, New Zealand	5	..	..
795	EAJ1	Barcelona, Spain	3	..	..
795	Lwow	Poland	..	1	..
804	West Regional	Cardiff, England	6	6	..
814	1IMI	Milan, Italy	2	2	..
823	Bucharest	Rumania	..	5	..
830	LR5	Buenos Aires, Argentina	..	8	..
841	Berlin	Germany	2	1	..
850	Bodo	Norway	..	3	..
859	Radio-Strasbourg	Strasbourg, France	2	2	..
870	LR6	Buenos Aires, Argentina	..	7	..
877	London Reg.	London, England	6	5	..
886	Linz	Austria	..	1	..
895	OFA	Heisinki, Finland	..	1	..
900	KGBU	Ketchikan, Alaska	..	..	*
904	Hamburg	Germany	..	1	..
913	Radio-Toulouse	Toulouse, France	6	5	..
920	HHK	Port-au-Prince, Haiti	..	8	..
922	Brno	Czechoslovakia	2	1	..
932	Brussels	Belgium	2	2	..
950	LR3	Buenos Aires, Argentina	..	8	..
950	Breslau	Germany	2	1	..
959	Poste-Parisien	Paris, France	3	3	..

960	PRF3	Sao Paulo, Brazil	2	..	..
977	North Ireland Regional	Belfast, Ireland	2	5	..
986	I1GE	Genoa, Italy	..	2	..
986	Torun	Poland	..	1	..
990	LR4	Buenos Aires, Argentina	..	8	..
995	PFBI	Hilversum, Holland	..	3	..
1005	HJ3ABH	Bogota, Colombia	..	8	..
1013	Midland Reg.	Daventry, England	6	..	..
1031	Konigsberg	Germany	..	2	..
1040	Rennes	France	2	2	..
1050	Scottish Reg.	Falkirk, Scotland	6	..	..
1059	I1BA	Bari, Italy	2	2	..
1065	HJ4ABN	Armenia, Colombia	..	8	..
1068	Paris	France	..	2	..
1070	LR1	Buenos Aires, Argentina	2	8	11
1077	Bordeaux-Lafayette	Bordeaux, France	2	2	..
1095	EAJ7	Madrid, Spain	..	5	..
1104	Madona	Latvia	..	1	..
1113	OKK	Moravska, Czechoslovakia	..	1	..
1113	Radio-Normandie	Fecamp, France	3	2	..
1120	YV1RF	Maracaibo, Venezuela	..	9	..
1140	I1TO	Turin, Italy	2	2	..
1150	LR8	Buenos Aires, Argentina	..	9	..
1158	Kosice	Czechoslovakia	..	1	..
1160	4MK	Mackay, Australia	..	..	*
1176	Copenhagen	Denmark	2	1	..
1185	Nice-Cote d'Azur	Nice, France	2	2	..
1190	LS2	Buenos Aires, Argentina	9	9	..
1195	Frankfurt	Germany	2	1	..
1210	TGW	Guatemala City, Guat.	..	5	..
1213	Lille	France	2	2	..
1222	I1BO	Bologna, Italy	2	..	..
1230	LS8	Buenos Aires, Argentina	..	8	..
1231	Gleiwitz	Germany	..	1	..
1258	Kuldiga	Latvia	..	1	..
1267	Nurnburg	Germany	..	1	..
1276	Cote d'Azur	Juan-les-Pins	..	5	..
1285	Dresden	Germany	..	1	..
1290	WNEL	San Juan, Puerto Rico	5	6	..
1294	Klagenfurt	Austria	..	1	..
1320	KGMB	Honolulu, Hawaii	4	*	2
1330	Bremen	Germany	..	1	..
1348	Salzburg	Austria	..	1	..
1380	CB138	Santiago, Chile	..	9	..
1380	4BH	Brisbane, Australia	..	..	*
1393	Radio-Lyon	Lyons, France	..	2	..
1400	KHBC	Hilo, Hawaii	..	..	2
1411	Halmstad	Sweden	..	1	..
1429	Kaiserslautern	Germany	..	1	..
1450	TI4NRH	Heredia, Costa Rica	..	8	..
1465	ON4EB	Antwerp, Belgium	..	1	..

A DX Record?

In spite of the duties involved in the part he is playing in the reorganization of the Canadian DX Relay, and editing the bulletin of this organization, Charles Hesterman of Saskatoon, Sask., found time to write an extremely interesting letter to the

CDXR GRAND PRIZE—1936

This beautiful plaque was awarded to Observer Ker (Vancouver, B. C.) as winner of the first prize in the Canadian DX Relay's 1935-6 DX Contest. These prize plaques, one of which was also won by Observer Tomlinson, were donated to the club by Observer Randolph Hunt of Encinitas, California, an ardent DX'er himself, who is doing his mighty "bit" toward fostering clean, healthy competition among DX'ers.

I1FI, FLORENCE, ITALY

With its towers rearing high over the peaceful Italian countryside, I1FI employs 20 kw. to carry its message on 610 kc. to the listening world.

Editor. Unfortunately space does not permit quoting all of its interesting contents. One of its high lights however, is found in his statement that "DX is not so 'hot' here this season—possibly a little worse than last season and that surely was bad enough." His next comment is that so far this season he has only verified 1YA, 2YA, 3YA, 4YA, 2BL, 2NR and 4AK and has reports out to 2GZ, 2NC, 3AR, 3GI, 4BK, 5CL, 6WF, 7ZL, JOCK-1, PRF-3 and LR1. At this point in his letter the Editor began to wonder just what DX'er Hesterman could accomplish in a *good* season. Further along the answer was found which is partially quoted as follows:

"I am naturally quite proud of my total list of verified Foreign BCB stations, and every verification is a real one. I always try to shove it down people's throats willy-nilly, hi! And following that custom, will try it on innocent you! Well anyway, here is the list in full, every one verified beyond question, and many of them verified from two to twelve times, even some of the very small ones like 4AY (using 30 watts at the time) for instance, which was verified twice in three months! The ones in heavy print are the ones that state that I was the first one to send a correct report from either Canada or the entire American continent.

Australia

2AY, 2BL, 2CH, 2CO, 2FC, 2GB, 2HD, 2KO, 2MO, 2NC, 2NR, 2SM, 2UE, 2UW, 2WL, 2AW, 3AR, 3DB, 3GL, 3HA, 3GI, 3KZ, 3LO, 3MA, 3TR, 3UZ, 4AK, 4AY, 4BC, 4MK, 4TO, 6WF, 4BK, 4BH, 4QG, 5CL, 7NT, 4BU, 4RK, 5CK, 7UV, 4GR, 4RO, 5DN, 7ZL.

New Zealand

1YA, 2YA, 3YA, 4YA, 2YB, 2ZP.

Japan

JOAK-1, JOAK-2, JOBK-1, JOCK-1, JOCK-2, JODK-2, JOFK, JOGK, JOHK, JOIK, JOJK, JOLK, JONK, JOOK, JOPK, JOQK, JORK, JOSK, JOUK, JOXK, JOAG, JOBG, JOCG, JODG, JOFG, JQAK.

Miscellaneous

CP4, CPX, CX26, CE8S, TGW, HHK, LR1, LR5, LS2.

Europeans

Bukarest, Budapest, Brno, Cologne, Fecamp, Konigsberg, Leipzig, Moravska-Ostrava, Monte Ceneri, Madrid, IMI, Praha, PP, FPTT, Riga, Stuttgart, Stockholm, Vienna.

"That's the works, hi! 45 Australians—26 Japs—18 Europeans and 9 miscellaneous, a grand total of 98 BCB Foreigners. I have long wondered if my list of 45 Australian verifications is anything of a record for the American continent, I have made all sorts of inquiries but cannot get any dope on the subject, have you anything in that direction?"

This is a pertinent and interesting question which Hesterman brings up. Can anyone in the United States or Canada show a better verified record than this?

DX Club Honor Roll

The International 600-12,500 Mile DX Club submits the list below of members who have qualified for the various honor degrees awarded by this club. Club membership is open to short-wave listeners, broadcast band DX'ers and amateurs. The requirements for short-wave membership are verifications from five stations over 6000 miles distant; for broadcast band membership, five verifications from stations over 3500 miles distant. Amateurs must present at least ten verifications from stations over 6000 miles distant. The Honor Roll is as follows:

World Supreme Radio DX Expert (60 verifications).
Edward G. Schmeichel (S. W.). Illinois.
Robert Rossi (S. W.), Pennsylvania.

Doctor of Degrees (40 verifications).
Irving Cohen (S. W.), New York.
Captain Horace L. Hall (S. W.), New York.
Mrs. E. Salt (B. B.), New Zealand.
Eric Butcher (S. W.), Louisiana.
Loris C. G. Knapp (B. B.), New Zealand.
H. T. Johns (S. W.), New Zealand.
G. W. Gowen (B. B.), New Zealand.
H. L. Moles (B. B.), New Zealand.

Professional DX Ace (20 verifications).
Dorothy L. Hall (S. W.), New York.
L. R. Giddings (B. B.), Hawaii.
Victor Kozma (S. W.), New York.
Irving Goodeve (S. W.), Michigan.
Robert Botzum (B. B.), Pennsylvania.
Fred B. Heller, Jr., (S. W.), Pennsylvania.
Thomas F. Tynan (S. W.), New York.
Warren S. Taylor (Am.), Pennsylvania.

Official DX Ace (10 verifications).
George Zehner (S. W.), Pennsylvania.
John F. Deegan (S. W.), Pennsylvania.
Roy E. DeMent (S. W.), Texas.
Thaddeus Grabek (S. W.), New York.
T. Herbert Hyde (S. W.), Connecticut.
K. G. Schram (S. W.), Wisconsin.

Notes From Readers

Observer Watson (Christchurch, N. Z.) writes that the new 2YA, 60 kw. transmitter at Wellington is now on the air on a regular schedule. Also that: "This giant transmitter (the largest in the Southern Hemisphere) was made in Australia, and there is now talk of Australia securing a similar transmitter, as they are envious of ours. In fact, the engineers in Sydney were loathe to part with their new "toy"!

Observer Forestieri (New York City): "Belfast, Ireland, testing on Thursday on 977 kc. have been coming in R3-7. LR1, 1070 kc. during their Tuesday, Thursday and Saturday morning tests have many times been heard R9+."

Observer Kentzel (Averill Park, New York): According to announcements from the station all reports to WMFO, Decatur, Alabama, covering the FCC test periods, should be sent to the Newark News Radio Club. Reports sent to the station will not be answered."

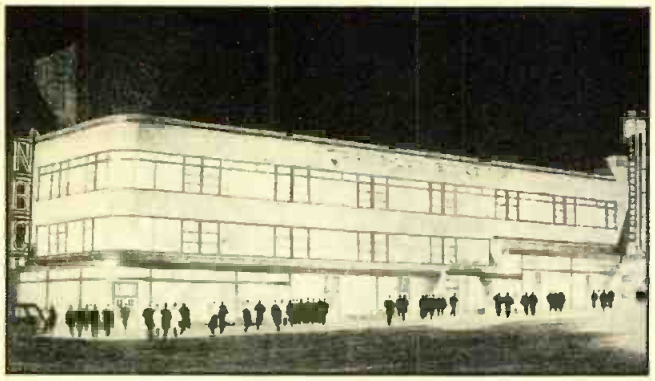
Observer Lonis (Hannibal, New York) has heard 59 stations in 16 countries, all on the broadcast band. These include 11 in Australia, 3 in New Zealand, 10 in South America and 1 in Hawaii.

Observer Horner (Elizabethtown, Pa.): "Since XELO moved to 580 from 1110 kc. Radio-Normandie has been coming in like a local on 1113 kc."

Observer Hunt (Encinitas, Calif.) "Recent verification card from JOGK at Kumamoto requests that the name Nippon be used instead of Japan. I now have 52 verifications from 29 of the JO's. Two new stations at Heija, Chosen, are JBBK-2 with 500 watts on 820 kc. and JBBK-1 using the same power on 1090 kc. JONK, Nagano has moved from 950 to 1040 kc. New stations in Nippon are JOLG, 500 watts, 890 kc., Tottori; JOOG, 500 watts, 950 kc., Obihiro; JOJG, 500 watts, 1080 kc., Yamagata."

Observer Clancy (Alberta, Canada): "The Canadian government is negotiating with the Republic of Mexico in an effort to clear up the

(*Turn to page* 638)



NBC'S NEW WASHINGTON, D. C., HEADQUARTERS

This is an architect's sketch of the new entertainment and studio building for stations WRC and WMAL. The building houses a complete theatre.

COLUMBIA'S REMODELED "MANHATTAN" THEATRE IN NEW YORK

CBS adds to its growing list of auditorium studios. A smaller studio was dropped.

New and Modernistic

NETWORK STUDIOS

By Samuel Kaufman

BOTH CBS and NBC have announced plans for elaborate new studios in American key cities as origin points for network programs. The most important of these newly announced structures is the New York building—a sort of second "Radio City"—that will serve as chief American CBS studios. A second CBS building is being erected in Hollywood, a growing national radio center. Washington is the newest city to be given a new suite of NBC studios.

It is expected that the new CBS New York building, at Park Avenue and Fifty-ninth Street, will not be ready for occupancy until 1938 or 1939. The elaborate Hollywood structure, however, on Sunset Boulevard, between Gower and El Centro streets, will be ready in the Fall of 1937.

According to Donald W. Thornburgh, CBS vice-president in charge of Pacific Coast operations, plans are also under way to extend San Francisco network facilities.

The new Hollywood CBS studio venture followed the chain's purchase of Station KNX. William Lescaze is the architect in charge of designing the new building, while Earle Heitschmidt will supervise actual construction. In accordance with the Hollywood scheme of things, deep, landscaped lawns and courts will add perspective and comeliness to the studio structure.

Both the New York and Hollywood studios will incorporate some television designs, although no details were available as to just what they would be.

NBC's decision to add a new Washington studio set-up to its facilities was intended as a move to give the Capital City a radio show place similar—although on a much smaller scale—to the chain's Radio City headquarters in New York. The new studios will house the personnel and facilities of Stations WRC and WMAL and will occupy the entire second floor of a theatre building being erected at the time of this writing on Fourteenth Street. It will be opened in May or June of 1937.

Facilities for the accommodation of large audiences will be incorporated in all the new studio structures.

In recent months, CBS also acquired a new large playhouse, the former Manhattan Theatre, in New York, to add to its list of auditorium studios. One of the smaller CBS theatres was dropped at the time of the new acquisition.

Antenna Coupler

KILLS NOISE

By Robert Ames

ANOTHER step forward in the radio engineer's constant fight against radio noise, especially as pertaining to short-wave reception, has been made in the development, by the Scott Research Laboratory, of a new antenna-coupling system for Scott all-wave sets. In an actual demonstration, made recently for the staff of RADIO NEWS, the new device actually cut out *all* interfering noises, allowing short-wave reception to come through one hundred percent without a single disturbing sound and in a location where short-wave reception heretofore had been considered impossible.

The new device, which is shown in an accompanying illustration, uses an antenna-coupling system in which electrostatic coupling is entirely eliminated between the

(*Turn to page* 628)

AMERICAN STATION LIST

NORTH AMERICA and the WEST INDIES

(Exclusive of the United States)

Compiled by **John M. Borst**

NORTH AMERICA

CANADA

Call	Location	kc.	kw.
CJRM	Winnipeg, Man.	540	1.0
CFNB	Fredericton, N. B.	550	0.5–1.0
CFPR	Prince Rupert, B. C.	580	0.05
CHRC	Quebec, Que.	580	0.1
CKCL	Toronto, Ont.	580	0.1
CKUA	Edmonton, Alta.	580	0.5
CFCF	Montreal, Que.	600	0.4
CJOR	Sea Island, B. C.	600	0.5
CRCW	Windsor, Ont.	600	0.5–1.0
CFCO	Chatham, Ont.	630	0.1
CFCY	Charlottetown, P. E. I.	630	1.0
CJRC	Winnipeg, Man.	630	1.0–0.5
CKOV	Kelowna, B. C.	630	0.1
CFRB	Toronto, Ont.	690	10.0
CJCJ	Calgary, Alta.	690	0 1
CFPL	London, Ont.	730	0.1
CJCA	Edmonton, Alta.	730	1.0
CKAC	Montreal, Que.	730	5.0
CKPR	Fort William, Ont.	730	0.1
CHWK	Chilliwack, B. C.	780	0 1
CKSO	Sudbury, Ont.	780	1.0
CFQC	Saskatoon, Sask.	840	1.0
CRCT	Toronto, Ont.	840	5.0
CFJC	Kamloops, B. C.	880	0.1
CRCO	Ottawa, Ont.	880	1.0
CJAT	Trail, B. C.	910	1 0
CKY	Winnipeg, Man.	910	15.0
CRCM	Montreal, Que.	910	5.0
CFAC	Calgary, Alta.	930	0.1
CFCH	North Bay, Ont.	930	0 1
CFLC	Prescott, Ont.	930	0.1
CHNS	Halifax, N. S.	930	1.0
CKPC	Brantford, Ont.	930	0.1
CJOC	Lethbridge, Alta.	950	0 1
CRCS	Chicoutimi, Que.	950	0.1
CFRN	Edmonton, Alta.	960	0.1
CHNC	New Carlisle, Que.	960	1.0
CHML	Hamilton, Ont.	1010	0.1
CKCD	Vancouver, B. C.	1010	0 1
CKCK	Regina, Sask.	1010	0.5
CKCO	Ottawa, Ont.	1010	0.1
CKIC	Wolfville, N. S.	1010	0.05
CKWX	Vancouver, B. C.	1010	0.1
CFCN	Calgary, Alta.	1030	10.0
CKLW	Windsor, Ont.	1030	5.0
CRCK	Quebec, Que.	1050	1.0
CRCU	Lulu Island, B. C.	1100	1.0
CHLP	Montreal, Que.	1120	0.1
CHSJ	Saint John, N. B.	1120	0.5–1.0
CKOC	Hamilton, Ont.	1120	0.5–1.0
CKX	Brandon, Man.	1120	0.1
CHAB	Moose Jaw, Sask.	1200	0.1
CKNX	Wingham, Ont.	1200	0.05
CKTB	St. Catharines, Ont.	1200	0.1
CJCS	Stratford, Ont.	1210	0.05
CJCU	Alklavik, N. W. T.	1210	0.05
CKBI	Prince Albert, Sask.	1210	0.1
CKCH	Hull, Que.	1210	0.1
CKMC	Cobalt, Ont.	1210	0.05
CJCB	Sydney, N. S.	1240	1.0
CHCK	Charlottetown, P. E. I.	1310	0.05
CJKL	Kirkland Lake, Ont.	1310	1.0
CJLS	Yarmouth, N. S.	1310	0.1
CKCV	Quebec, Que.	1310	0.1
CKCW	Moncton, N. B.	1370	0.1
CJGX	Winnipeg, Man.	1390	0.1
CKFC	Vancouver, B. C.	1410	0.05
CKMO	Vancouver, B. C.	1410	0 1
CKGB	Timmins, Ont.	1420	0.1
CFCT	Victoria, B. C.	1450	0.05
CHGS	Summerside, P. E. I.	1450	0.05
CJIC	Sault Ste. Marie, Ont.	1500	0.1
CFRC	Kingston, Ont.	1510	0.1
CKCR	Waterloo, Ont.	1510	0.1

Note: Where two powers are given, the larger one is used during daylight, the smaller one at night.

MEXICO

Call	Location	kc.	kw.
XEFC	Merida, Yuc.	550	0.1
XEAO	Mexicali, B. C.	560	0.25
XEPN	Piedras Negras, Coah.	580	100.0
	at present using		50.0
XEXM	Mexico, D. F.	610	0.5
XEYO	Mexico, D. F.	610	0.5
XEZ	Merida, Yuc.	630	0.5
XEBX	Saltillo, Coah.	640	0.25
XEAL	Mexico, D. F. (temp. suspended)	660	1.0
XET	Monterrey, N. L.	690	0.5
XEH	Monterrey, N. L.	720	0.25
	at present using		0.1
XEBC	Agua Caliente, B. C. (temp. suspended)	730	5.0
XEAM	Matamoros, Tams.	750	0.025
XEOK	Tijuana, B. C.	760	2.5
	at present using		0.2
XEN	Mexico, D. F.	780	1.0
XEXC	Aguascalientes, Ags. (temp. suspended)	810	0.35
XEBG	Tijuana, B. C.	820	1.0
XERA	Villa Acuna, Coah.	840	250.0
	at present using		180.0
XEFE	Nuevo Laredo, Tams.	850	0.25
	at present using		0.02
XEMO	Tijuana, B. C.	860	5.0
XENC	Mexico, D. F.	860	0.05
XEFB	Monterrey, N. L.	870	0.2
XEW	Mexico, D. F.	890	50.0
XENT	Nuevo Laredo, Tams.	910	150.0
	at present using		50.0
XEAA	Mexicali, B. C.	920	0.2
XEBH	Hermosillo, Son.	930	0.5
XEFO	Mexico, D. F.	940	5.0
XEAW	Reynosa, Tams.	960	50.0
XEAF	Nogales, Son.	990	0 75
XEK	Mexico, D. F.	990	0.1
XES	Tampico, Tams.	990	0.25
	at present using		0.1
XEBI	Aguascalientes, Ags.	1000	0.025
XEBK	Neuvo Laredo, Tams.	1000	0.1
XEU	Veracruz, Ver.	1010	0.25
XEJ	Ciudad Juarez, Chih.	1020	1.0
XEB	Mexico, D. F.	1030	10.0
XEA	Guadalajara, Jal.	1060	0.125
XEMG	Mexico, D. F.	1060	0.1
XEBA	Ciudad Guzman, Jal.	1080	0.02
XEAQ	Tijuana, B. C. (temp. suspended)	1090	1.0
XEL	Mexico, D. F.	1100	0.25
XELO	Piedras Negras, Coah.	1110	50.0
	at present using		10.0
XEJP	Mexico, D. F.	1130	0.1
XEC	Tijuana, B. C.	1150	0.1
XEDW	Minatitlan, Ver.	1150	0.02
XEAS	Saltillo, Coah.	1160	0.05
XEBJ	Merida, Yuc.	1160	0.02
XEBZ	Mexico, D. F.	1160	0.1
XED	Guadalajara, Jal.	1160	2.5
	at present using		0.5
XEP	Ciudad Juarez, Chih.	1160	0.5
XEAT	Hidalgo del Parral, Chih.	1210	0.25
XEE	Durango, Durango	1210	0.05
XEFV	Ciudad Juarez, Chih.	1210	0.1
XETH	Puebla, Pue.	1210	0.1
XEBL	Mazatlan, Sin.	1220	0.05
XEDA	Gral. Anaya, D. F	1220	0.2
XETF	Veracruz, Ver.	1220	0.012
XEFJ	Monterrey, N. L.	1230	0.1
XEAC	Tijuana, B. C.	1240	0.25
XEAY	Mexico, D. F.	1240	0.25
	at present using		0.1
XEKL	Leon, Gto.	1240	0.5
XELA	Saltillo, Coah. (temp. suspended)	1240	0.05
XEXH	San Luis Potosi, S. L. P.	1250	0.25
XEXB	Jalapa, Ver.	1270	0.25
XEMX	Mexico, D. F	1280	0.1
XEAG	Cordoba, Ver.	1310	0.01
XECW	Mexico, D. F. (temp. suspended)	1310	0.01
XEFW	Tampico, Tams.	1310	0.25
XETB	Torreon, Coah.	1310	0.125
XEX	Monterrey, N. L.	1310	0.125
XEXD	Jalapa, Ver.	1340	0.35
XECZ	San Luis Potosi, S. L. P.	1370	0.1
XEI	Morelia, Mich.	1370	0.125
XELZ	Mexico, D. F.	1370	0.1
XEFI	Chihuahua, Chih.	1440	0.25
XEF	Ciudad Juarez, Chih.	1450	0.1
XEFA	Tacuba, D. F. (temp. suspended)	....	0.5

MIQUELON

Call	Location	kc.	kw.
FQN	St. Pierre	609	2.5

NEWFOUNDLAND

Call	Location	kc.	kw.
VOWR	St. John's	700	0.5
VOGY	St. John's	840	0.1
VOAS	St. John's	900	0.1
VOCM	St. John's	1006	0.05
VOAC	St. John's	1100	0.025
VONF	St. John's	1195	0.5

WEST INDIES

CUBA

Call	Location	kc.	kw.
CMCX	Havana	570	0.15
CMW	Havana	600	1.4
CMBC	Havana	640	0.15
CMCG	Havana	680	0.15
CMK	Havana	730	3.0
CMCW	Havana	750	0.15
CMHX	Cienfuegos	760	0.2
CMBS	Havana	770	0.15
CMJK	Camaguey	780	0.15
CMGH	Matanzas	790	0.25
CMCF	Havana	810	0.25
CMHW	Cienfuegos	820	0.1
CMJX	Camaguey	830	0.15
CMBN	Havana	850	0.15
CMQ	Havana	880	0.5
CMX	Havana	920	1.0
CMCD	Havana	950	0.25
CMBY	Havana	970	0.25
CMBZ	Havana	1000	0.15
CMJA	Camaguey	1010	0.05
CMCY	Havana	1030	1.0
CMKD	Santiago de Cuba	1050	0.25
CMBX	Havana	1070	0.15
CMHA	S. la Grande	1070	0.05
CMCJ	Havana	1110	0.5
CMGF	Matanzas	1120	0.15
CMKM	Manzanillo	1120	0.05
CMJI	C. de Avila	1130	0.05
CMBG	Havana	1140	0.225
CMJF	Camaguey	1150	0.2
CMHJ	Cienfuegos	1160	0.1
CMBD	Havana	1170	0.15
CMJO	C. de Avila	1180	0.05
CMKX	Santiago de Cuba	1190	0.75
CMCO	Havana	1200	0.15
CMHI	Santa Clara	1210	0.15
CMJE	Camaguey	1220	0.05
CMCB	Havana	1230	0.15
CMHB	Sancti Spiritus	1240	0.05
CMKC	Santiago de Cuba	1250	0.15
CMHD	Caibarien	1270	0.25
CMCU	Havana	1280	0.15
CMOX	Havana	1320	0.2
CMHK	Cruces	1330	0.25
CMAB	P. del Rio	1340	0.1
CMJL	Camaguey	1340	0.075
CMCA	Havana	1350	0.25
CMKW	Santiago de Cuba	1350	0.2
CMJH	C. de Avila	1360	0.05
CMGE	Cardenas	1370	0.15
CMCR	Havana	1380	0.15
CMJC	Camaguey	1390	0.15
CMGC	Matanzas	1400	0.1
CMKR	Santiago de Cuba	1400	0.25
CMCQ	Havana	1410	0.25
CMJP	Moron	1430	0.075
CMOA	Havana	1440	0.25
CMHM	Cienfuegos	1450	0.15
CMKF	Holguin	1460	0.25
CMOK	Havana	1470	0.15
CMCN	Marianao	1500	0.25

DOMINICAN REPUBLIC

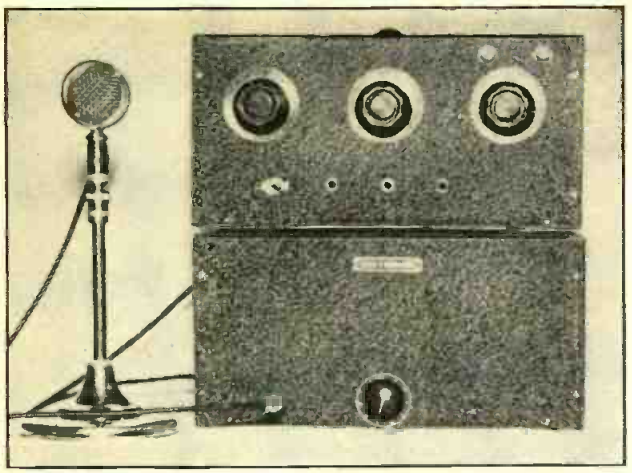
Call	Location	kc.	kw.
HIX	Trujillo	800	1.0
HIG	Trujillo	900	0.05
HI1J	San Pedro de Macoris	930	0.04
HI4D	Trujillo	1010	0.025
HIT	Trujillo	1050	0.1
HIL	Trujillo	1111	0.02
HI4M	Trujillo	1150	0.02
HIJ	Trujillo	1190	0.01
HIN	Trujillo	1220	0.04
HI5E	Trujillo	1220	0.02
HI7P	Trujillo	1300	0.025
HIZ	Trujillo	1370	0.1
HIH	San Pedro de Macoris	1391	0.075
HI6Y	Trujillo	1400	0.025
HI1A	Santiago de los Caballeros	1410	0.05
HI5N	Santiago de los Caballeros	1440	0.1
HI8Q	Trujillo	1475	0.025

HAITI

Call	Location	kc.	kw.
HHK	Port-au-Prince	920	1.0
HHV	Port-au-Prince	1120	0.2

Contest Winner Announced

More than ten thousand entries were received from this country and abroad, in a contest to select a name for the United Transformer Corporation's new transmitter kits (Variactor Carrier Control System). The winner, Mr. W. S. Cobb, whose call letters are W6KOB, of Santa Maria, California, submitted the chosen name, "UNITYPE". Our editor L. M. Cockaday and Frank Jones were the judges.



HERE IS THE COMPLETED RIG

This is the ship-shape job you will want to put out a 5-meter signal on phone and i.c.w. that will make your radio neighbors "sit up and take notice."

Five-Meter Amateurs

"SURE FIRE" Two-Tube

Amateurs on the ultra-high of hard luck with 6L6 tubes in hand, they know how well these conditions. Here is a transmitter worked out so that you can build than you expect in the way of an

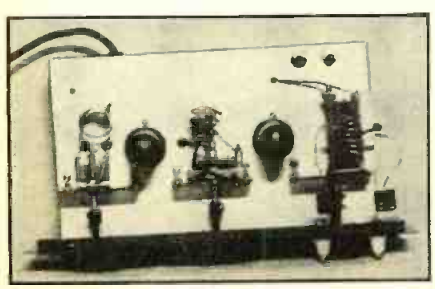
By E. M. Walker

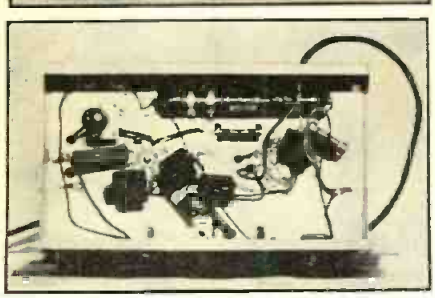
CONSTRUCTION of a 5-meter transmitter that meets all of the present-day requirements of this band was begun in one of the laboratories of RADIO NEWS more than six months ago. Since then three entirely different layouts and designs have been constructed and a countless number of variations tried before a unit was built that meets all of the requirements of simplicity, stability and efficiency, and, at the same time, can be duplicated by the average amateur without having to go through the "headaches" that are necessary to eliminate all of the "bugs" encountered in ultra-high-frequency equipment.

The "Sure Fire" transmitter that finally emerged was designed to provide: 1, stability of operation; 2, efficiency at moderate cost; 3, good quality, and 4, compactness. After considerable experimentation it was decided to build the unit around the 6L6 tube in an electron-coupled oscillator power-amplifier arrangement. This tube was selected because of its high output with comparatively low voltages and the ease with which it may be excited at high frequencies. Also, because, as an oscillator, it proved under test to be far more stable than other types of tubes that might have been used.

Before discussing the actual construction of the set it might be pointed out that stability of operation is a major feature of the transmitter. It will be noted that the radio-frequency portion of the unit consists only of a single 6L6 electron-coupled oscillator and another 6L6 as a modulated amplifier. It naturally might be supposed that by modulating the stage immediately following the oscillator there would be some frequency modulation, particularly in as much as a common power supply is used for the oscillator and amplifier. However, in actual operation, frequency modulation is negligible in this transmitter, providing not more than 30 watts input is used on the amplifier with, of course, not more than 100 percent modulation.

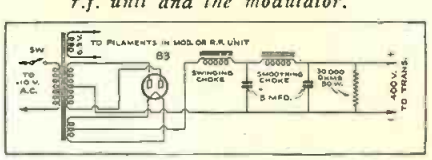
The signal has been received on a standard all-wave superheterodyne receiver using highly selective intermediate stages and the report was "comparable to crystal control." The transmitter represents the ideal for the amateur who cannot afford crystal control on 5 meters. It provides a means of getting away from the modulated oscillator type of transmitter commonly used on these bands. Undoubtedly when more stations are equipped with stable apparatus of this type it will be possible to use more selective receivers on this band. At the same time the possibilities for greater distance contacts will be increased.





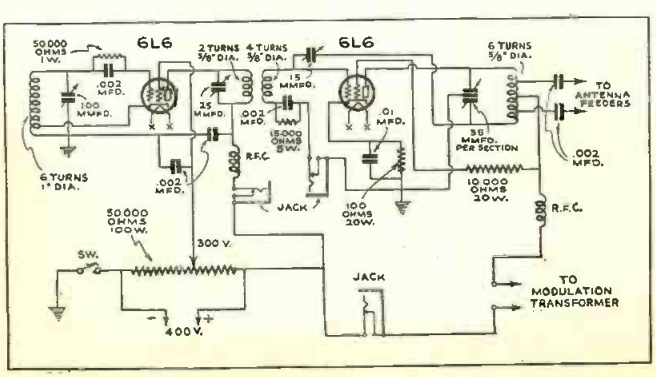
CONSTRUCTIONAL DETAILS

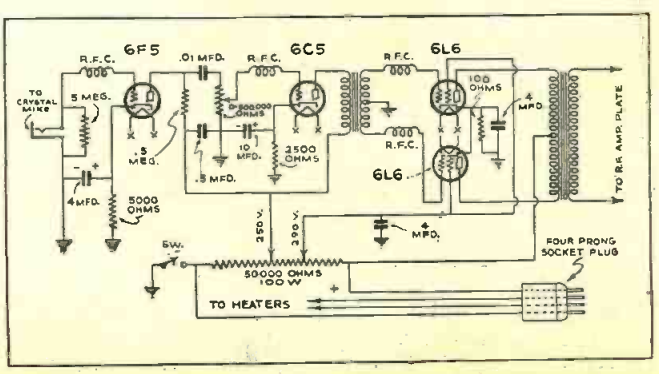
The two photographs at the left show the top and bottom views of the r.f. unit. The three diagrams below give the circuits for the power packs, the r.f. unit and the modulator.



Compact Construction

The transmitter itself is extremely compact. The radio-frequency portion of the unit is mounted in a standard cabinet 14 by 7 by 8 inches. The modulator and speech amplifier are mounted in a cabinet of the same size. The two, set one above the other, give the ap-





Are Waiting For This

FIRE"

M. O. P. A.

frequencies have heard many tales
M.O.P.A. circuits, but, on the other
tubes perform under proper working
in which all the "bugs" have been
it with assurance. It will do more
ideal 5-meter phone transmitter

(Radio W2MW)

THE AUTHOR "CHECKS" OPERATION

The designer of this rig has worked with it through a number of models for over a six months' period before he was satisfied that everything was strictly "according to Hoyle."

pearance of a rack-and-panel job. This provides a convenient layout and at the same time excellent shielding between the r.f. unit and the modulator—an essential precaution when using 6L6 type tubes at high frequencies. Without this adequate shielding it is almost impossible to eliminate feed-back between the modulator and r.f. amplifier.

Parts for the oscillator-amplifier are laid out to follow the schematic diagram practically as it is drawn. All components are mounted on a metal chassis 7 by 12 by 3 inches, designed to fit inside the cabinet. There are three tuning controls: the oscillator grid, the oscillator plate and the amplifier plate. At the left of the chassis is the oscillator tube and its associated apparatus. In the center is the oscillator plate-tuning coil and its condenser, and (at the right) the amplifier tuning control. All coils are mounted directly on the condensers which tune them with the exception of the grid coil of the amplifier. This is mounted on two porcelain bushings which provide leads through the chassis. The condensers themselves are mounted on 1- by 3-inch Victron strips.

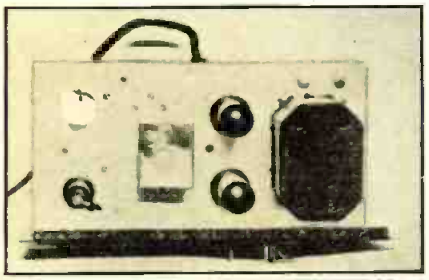
Most of the wiring is concealed below the chassis. The only components, above, are the tuning controls and, of course, the tubes. Rubber grommets are used to pass the wires through the chassis. The tube sockets, by-pass condenser, resistors and radio-frequency choke coils are mounted underneath.

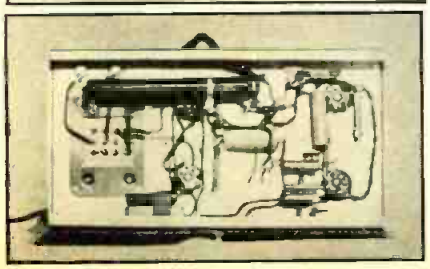
A high-capacity condenser in the oscillator grid circuit provides better stability than a smaller one. One of 100 micromicrofarads capacity is used. A 25-micromicrofarad condenser is used in the oscillator plate circuit and a split-stator condenser having 35 mmfds. per section is used in the amplifier plate circuit. The split-stator condenser was used because neutralization was necessary and this method permanently neutralizes the amplifier regardless of frequency.

The one thing that is important in laying out the transmitter is the placement of the parts to facilitate short leads. The by-pass condensers should be mounted directly on the sockets and the radio-frequency choke coils as near as possible to the point where the r.f. is to be choked off. Also, it is desirable to keep the (*Turn to page* 622)

COMPACT MODULATOR

The chassis views for the amplifier-modulator, shown below, indicate its simple construction.





The

806 Tube

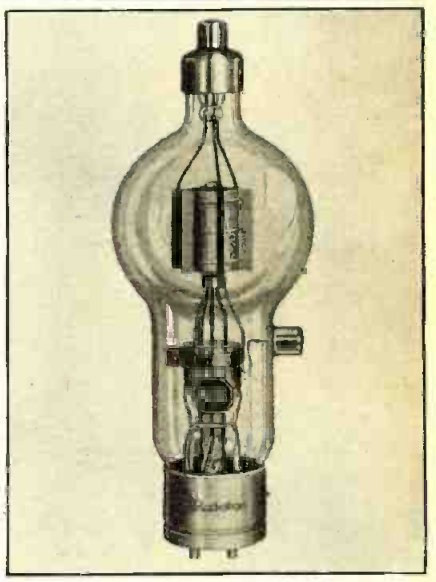
By J. Van Lienden

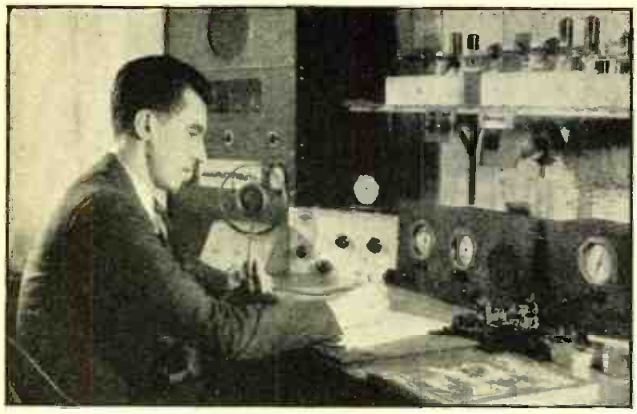
A NEW triode transmitting tube, designated type 806, has been announced by R. C. A. The tube can be used as a Class B audio- or radio-frequency amplifier, as oscillator or Class C radio-frequency amplifier; it will work at radio frequencies as high as 30 megacycles.

The tube construction is such as to minimize interelectrode capacitances and provide high insulation. The plate comes out at the top of the tube and the grid passes through a seal near the base. The base fits the Jumbo 4-prong socket, but the filament prongs are the only ones used, the other two prongs have no connection.

The tube should be installed vertically with the base down and should be protected from vibrations. The bulb gets very hot during operation; forced air-cooling is needed under certain conditions. An electric fan directed at the middle and upper section of the tube is satisfactory. The tube should not be allowed to touch any metal objects and should not be exposed to drops or sprays of liquid.

(*Turn to page* 624)





WELL KNOWN ON 5 and 10
This is the amateur station of Melvin Lewis, W2HEJ of Jersey City heard regularly DXing on the 5 and 10-meter bands.

The "HAM" Shack

Conducted by
Everett M. Walker
Editor for Amateur Activities

PUSH to TALK

LAST month we discussed at some length a proposal for reducing side bands through the use of audio filters as a means of cutting down the amount of interference on amateur phone bands. Wide adoption of this method of transmission would cut interference to a large degree. But this is not the only means available for reducing interference! Another and highly desirable practice that would help the situation is the "push-to-talk" method of communication. The widespread adoption of this practice would eliminate a lot of unnecessary words and would materially cut down interference by reducing the number of QRM'ed transmissions that not alone effect one contact but two and sometimes more.

MOST amateurs are acquainted with "push-to-talk" methods, but few are equipped to use them. The system has many advantages over the talk and stand-by method of carrying on a QSO that now is universally used on all amateur phone bands. It is comparable to the "break-in" system used on the c.w. bands which is proving so effective. However, unlike c.w., it is practically impossible to use break-in with a phone transmitter due to the fact that the carrier is continuously on the air during a transmission and the receiver usually is located within a short distance of the transmitter. In locations where it is possible to separate the transmitter by considerable distance from the receiver and something less than the legal maximum amount of power is used, break-in is possible with phone, but only a small percentage of amateurs are fortunate enough to have the space available. They are so few in number that likely 99 percent of their QSO's would be with stations not so equipped—so it would be practically useless from the standpoint of reducing interference.

The next best thing to break-in for phone is "push-to-talk." This practice has been used commercially for many years. It is universally used on airway communication channels and seems to have solved the interference problem for them.

How It Is Done

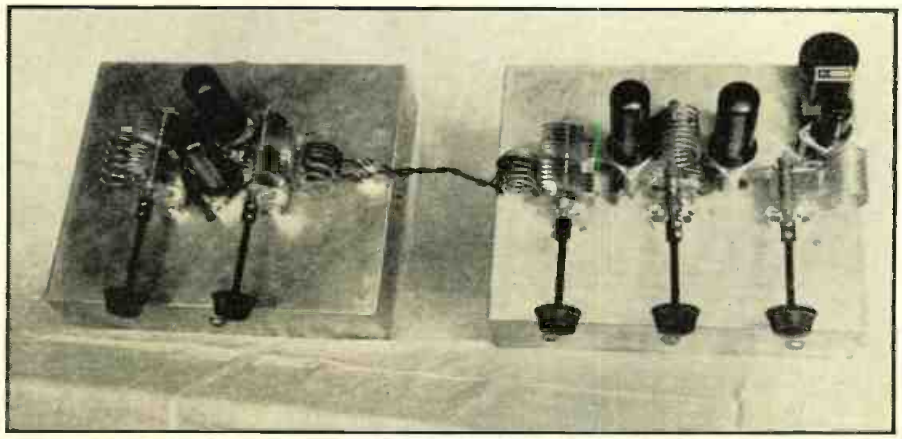
Essentially "push-to-talk" consists of applying the carrier only while the voice is on the air. There are many elaborate schemes that might be devised, such as the use of sensitive vacuum-tube relays that automatically cut out the receiver and turn on the transmitter the moment a sound is uttered (with provision for some time delay in order that the carrier might not be cut off between words), but these more or less are too complicated for the average amateur.

A simple "push-to-talk" arrangement facilitating quick stand-bys and reducing air conversation to a minimum may be devised through the use of relays. The primary essential of such a system is to have one unit or switch to control the complete change-over from transmission to reception and vice versa in one quick operation. The faster the action of the switch, the faster the change-over. Such a system is not complicated and may be installed in almost any amateur station with little effort and at small cost.

Utilizing Relays

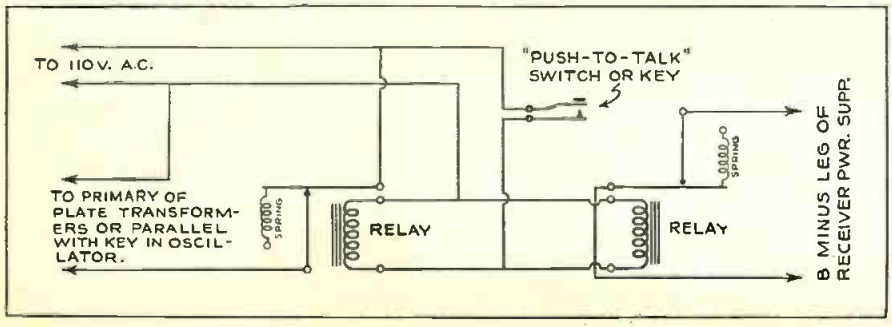
Essentially such a system consists of a relay to turn on the plate power of the transmitter and simultaneously cut off the receiver. This may be accomplished with as few as two single-pole units. The simple schematic diagram for such an arrangement is shown elsewhere in this department. The purpose of the receiver relay is to cut off the plate power on the receiving tubes. It is connected in the minus plate lead and the relay is one that opens the circuit when power is supplied to the solenoid. The second relay is of the closed-circuit type and turns on the plate power of the transmitter when current is applied.

There are many variations of this arrangement that may be worked out. For



W2HEJ's TRANSMITTER
Above, at right, is the crystal oscillator, on 40 meters, utilizing a 6C5 tube in a Lestet circuit, coupled to its 6L6 quadrupler, followed by a 6L6 doubler to 5 meters. This, in turn, is link coupled to a pair of 6L6's working push-pull on 5 meters. The doubler is on the left-hand chassis. This is the same circuit as developed by Frank Lester and described in recent issues of RADIO NEWS.

CIRCUIT FOR PUSH-TO-TALK
The simple use of relays and a switch or key to control the transmitter and receiver provides an excellent method for amateur station operation.



¶ A Department for the amateur operator to help him keep up-to-date

instance: the "push-to-talk" switch may be a telegraph key—the same as used for c.w. operation. Like the c.w. transmitter, of course, the tubes should be properly biased so that no plate current flows on any of the r.f. tubes when the key is open. Obviously, the keying should be done in the oscillator circuit, as the presence of any r.f. would cause interference in the receiver. A keying relay also should be used so the key may perform the dual function of cutting off the receiver at the same time.

If this system is used, however, there are a number of factors to be considered. In the first place, some provision should be made for cutting out the microphone during the stand-by intervals. If this is not done it might endanger the modulator components. This is true particularly where Class B modulation is used. Naturally, the sounds from the loudspeaker will feed back through the microphone and through the modulator. Without the modulated amplifier drawing plate current, there will be no load on the output of the modulator. Passing audio through the circuit under such conditions eventually would result in a breakdown in the secondary of the modulation transformer—a rather costly item. Therefore, it would be advisable to include an additional relay to either cut out the microphone or the plate power on the speech amplifier or modulator tubes.

Advantages of System

This method of "push-to-talk" is cited, however, because it has a number of advantages. Unfortunately, when the plate power is turned on on a Class C amplifier, it causes a loud "pang" on the air. This "pang" would be annoying to the operator on the other end of the "push-to-talk" QSO. By using the keying method, however, this is eliminated.

A number of the more modern receivers are now being made with provision for connecting a relay in the plate circuit to facilitate this practice. Also, in addition to cutting out the plate current in the receiver, there are other methods of preventing a receiver from blocking which is the purpose of cutting it out during transmission periods. The relay may be connected to short-circuit the antenna and ground terminals at the point where they enter the set. In this case a closed-circuit relay should be used. Also, if the receiver is one not subject to blocking the first detector circuit from the r.f. power of the transmitter, the relay may be used to either short-circuit or cut out one leg of the loudspeaker or earphones. Blocking further may be eliminated by connecting a small (1 watt) neon bulb across the antenna and ground terminals of the set.

The practicability of such a system of communication is obvious. Every phone operator knows the sinking feeling he gets after a five-minute transmission that he feels has been particularly good when the operator on the other end comes back with a "Sorry, old man, QRM got you down. There were three or four heterodynes on you all the way through. Better try again. I'll see if your channel is clear." And so it goes. But, on the other hand, with "push-to-talk," a QSO might run something like this:

"Hello, W8—! This is W2— calling.

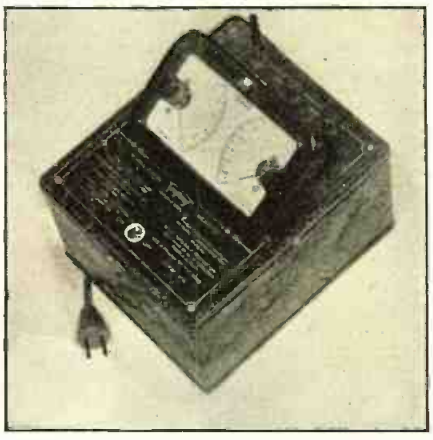
(*Turn to page 632*)

USING THE MODULATION METER AT W2JCY

Handy MODULATION METER

Modulation Indicator

KNOWING the percentage of modulation of an amateur phone transmitter is one of the most important factors in the successful operation of a station. Despite Federal regulations requiring that all stations be equipped with some means of determining over-modulation, there are many in operation today that are not.



The importance of the proper amount of modulation is often overlooked. Too often inaccurate means of determining modulation percentage are used, such as using the antenna current increase of 22 percent as indicative of 100-percent modulation.

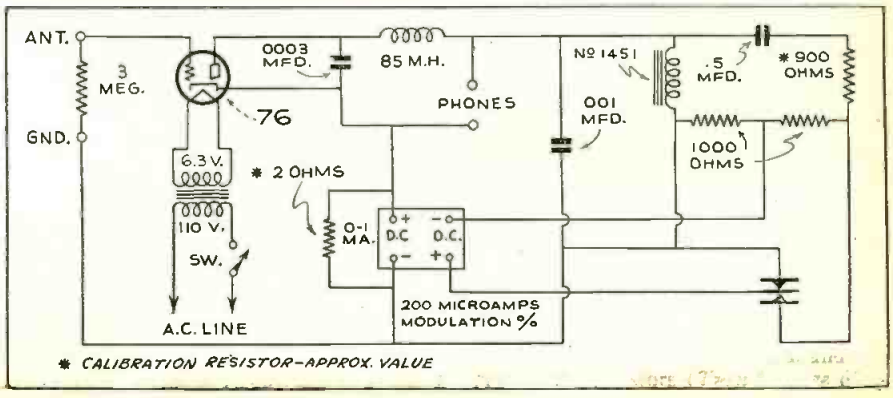
Modulation Important

Under-modulation causes as much waste of power as over-modulation causes interference. Every one knows an over-modulated transmitter causes "buckshot" interference and other forms of disturbances on the amateur bands. But, conversely, while under-modulation does not cause any interference, it does constitute a waste of power, and therefore it is only logical that an amateur station should be equipped with some means of determining reasonably accurately the percentage of modulation at a given interval. A phone signal is no more effective than the amount of audio power available for modulation.

(*Turn to page 633*)

DETAILS OF INSTRUMENT

At left is the new modulation meter and below circuit diagram of the new instrument.



TAKING THE QRM AND QRN OUT OF 5-METER RADIOPHONE QSO's

In metropolitan locations, such as that of W2JCR shown here, where interference and noise are more than plentiful, the "Quartet" provides a tremendous advantage in its ability to minimize both of these evils and bring in weak signals.

Meeting Today's Outstanding Receiver Need

The "QUARTET" for

5-and 10-Meter Reception

By

Chester Watzel
Willard Bohlen
S. Gordon Taylor
Laurence M. Cockaday

Part Two

LAST month the complete constructional information on the "Quartet" 5- and 10-meter receiver was presented, including photographs, schematic diagrams, parts lists, and instructions. It is the purpose of the present article to provide data on the operating characteristics, suggestions, and general discussion.

All of the "on the air" tests of this receiver have indicated a high degree of sensitivity and the greatest selectivity that would still permit reception of the great majority of frequency-modulated, self-excited oscillators. However, it was considered desirable to make actual laboratory measurements of these characteristics so far as possible. Unfortunately, it is next to impossible to make dependable measurements at 5 meters, and these measurements were therefore confined to the 10-meter band, as this would permit the use of standard laboratory equipment.

Measured Sensitivity

Through the courtesy of the Hammarlund Company, the measurements were made in their laboratory under the supervision of D. K. Oram, chief engineer and designer of the well-known "Comet Pro" and "Super-Pro" receivers. It was felt that the modern equipment and the wide experience of this laboratory would provide the double advantage of measurements by an outside and unprejudiced source, and insure a high degree of accuracy.

The sensitivity measurements made under standard conditions (400-cycle, 30-percent modulation and an output of 50 milliwatts) were for the purpose, not of determining absolute sensitivity, but rather the sensitivity at a favorable ratio of signal to noise. The sensitivity at 30 megacycles was shown to be 2 microvolts *at a signal-to-noise ratio of 2 to 1.* This is actually a degree of sensitivity which relatively few receivers, even those designed for operation on the lower frequencies, can boast. For an ultra-high frequency receiver it is unusually good, inasmuch as it represents sensitivity of better than 1 microvolt if noise were not considered.

The sensitivity at 60 megacycles is probably somewhat less than this figure, but the difference should be relatively small. Due to the fact that a 954 acorn r.f. tube is employed, and also regeneration in the first detector, the gain of these two circuits is well maintained even at 60 megacycles and higher. The i.f. gain is of course the same regardless of signal frequencies. Perhaps the effective sensitivity on 5 meters can be best summed up by saying that even in a quiet location the receiver was capable of going down to the noise level.

Selectivity

The selectivity measurements (made in accordance with standard practice) were made after the i.f. transformers had been adjusted, in both coupling and frequency, to provide the best compromise between maximum possible

selectivity and the necessary band width to permit intelligible reception of all but the very worst of the modulation oscillator transmitters. This adjustment was one which would permit the reception of understandable speech from 90 percent or more of the transmitters working in the 5-meter band.

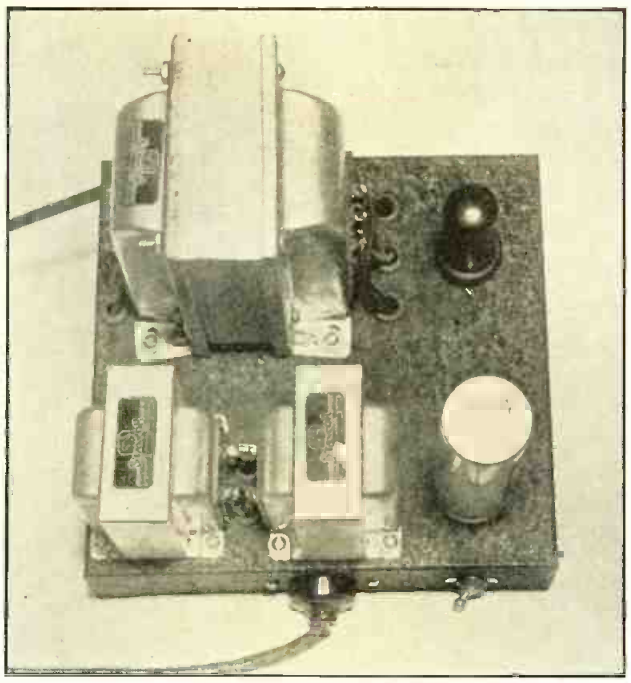
No "Image" Trouble

The measured selectivity at this adjustment of the i.f. is shown in the curve of Figure 1. At first glance this would seem to indicate a rather broad tuning receiver and, of course, it is, as compared with superheterodynes designed for operation on the lower frequency bands, where transmitters are crystal controlled. But for operation on the 5-meter band the selectivity as shown here is very good indeed. This is amply demonstrated when actually using the receiver. Time and time again it has been successful in bringing in weak signals when stations in the same locality, equipped with super-regenerative receivers or resistance-coupled superhets were, due to QRM, unsuccessful in bringing in the same signals.

The use of an intermediate frequency in the vicinity of 4000 kilocycles is necessary in order to provide band width adequate for reception of unstable signals, unless one were to resort to the use of complicated band-pass filters. But even if a conventional frequency of 465 kc. were used with the necessary filters, it would still result in image interference and this would indeed be a serious disadvantage.

Loudspeaker Output

The third set of measurements was made to determine the undistorted output. Using a good choke in the output circuit of the 6F6 power tube, this was found to be slightly under 2 watts. As the output is increased beyond this point, some harmonic distortion begins to show and the oscillograph also begins to show indications of overloading in the 6F6 tube. In this connection it is important that the output choke or transformer be one which is capable of handling the plate current of the 6F6 and one which also provides a suitable match for this tube. Many speakers are equipped with transformers intended to work out of push-pull circuits, but such transformers will not provide a suitable match when working out of a single tube because the current balance for which their primaries were designed is not attained and as a result they do not provide the impedance for which they are rated. This explanation is given here primarily for the benefit of constructors who require a high output level. In normal amateur operation such levels are not needed and to obtain the necessary 1 watt (or thereabouts) an ordinary transformer or choke will serve the purpose. But in no event should any of these be of the cheapest variety—and it might be added here that this applies to any receiver using a single output tube. In fact, actual measurements made when using a small choke, such as those obtainable in many radio stores for 30 or 40 cents, actually resulted in obtaining only .1 watt undistorted output. Above this level appreciable overload and harmonic distortion were experienced.



THE POWER SUPPLY

A good, husky unit which makes a good "general utility" supply, in addition to its use with the "Quartet." The circuit appears in Figure 2, below.

The Power Supply

The power supply used with this model receiver is a general-purpose one capable of providing much more power than called for. The circuit is shown in Figure 2. It will be noticed that it uses choke input to the filter and with this is capable of delivering about 250 volts at 125 ma. With condenser input it will deliver 300 volts or more at the same current. If used with this receiver, it actually delivers 265 volts, of which approximately 35 volts is lost across the resistors R20 and R21 in the noise-suppressor circuit. It might be well to point out that this 35-volt difference also exists between the power-supply chassis and the receiver chassis and therefore the two should never be connected together nor should they both be grounded. No damage would be done, but the receiver would not work.

Any power supply capable of delivering 250-275 volts at approximately 75 ma. will be suitable for use with this receiver. For constructors who desire to duplicate the general-purpose unit illustrated in Figure 2 and in the photograph, the parts list will be found at the end of this article.

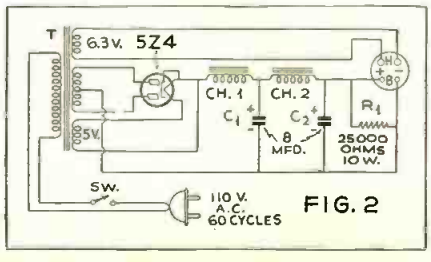


FIG. 2

Operation

There are a number of operating suggestions which will be helpful to anyone using this receiver. The regenerative circuit of the first detector contributes a good deal of gain and, surprisingly, a good additional measure of selectivity. When receiving stable signals, more regeneration can be used than when receiving "wobbulated" signals. The reason for this seems to be that over-modulation or frequency modulation shock excite the detector into oscillation if regeneration is set too close to the critical point. With stable signals, on the other hand, regeneration can be shoved right up to the point of oscillation.

In the reception of unstable signals a slight reduction of regeneration will aid materially in clearing up speech. Where the frequency modulation is rather bad, it will be necessary to tune the oscillator dial a little to the high-frequency side of signal resonance. The reason for this is that the greater part of the modulation of such a signal appears to be not on the normal carrier but at some point which represents the average over which the carrier shifts as it is frequency modulated. Evidently the carrier of an unstable transmitter shifts upward with modulation because the critical point for clearing up speech is found above the normal carrier frequency when tuning in such signals. Usually this point, which provides greatest intelligibility, is quite critical and is found within a fraction of a degree of the normal carrier frequency.

Adjustable I.F.

In sections of the country where 5-meter transmitters are practically all of the modulated oscillator type it will probably be found desirable to adjust the intermediate amplifier for greater band width, as this will provide better quality on unstable signals. In a locality which is blessed with a large proportion of stable signals or where the listener desires particularly to obtain best selectivity in the reception of stable signals, the i.f. selectivity can be increased either by tuning the intermediate amplifier to a lower frequency or reducing the coupling adjustment.

The a.v.c. system is capable of preventing overload even on extremely strong stations and for that reason the i.f. gain control may be left at the maximum setting at all times while a.v.c. is in use. The regeneration control may be left adjusted just below the point of oscillation, although (*Turn to page* 634)

New Receiver "I.A.C." Nightly

(The Super Skyrider)

By S. Gordon Taylor
and Laurence M. Cockaday

THEY BOTH AGREED ON ITS EFFICIENCY
A well-known amateur and an experienced short-wave listener both sat in together on many hours of test on this new receiver and expressed themselves as more than satisfied with its performance on all bands.

WHEN an amateur or short-wave listener of experience starts to discuss what he wants in a new receiver, we hear him mention all the latest developments, rolled into one, including every new application to make his hypothetical new receiver complete in every detail. But when he starts to purchase, we usually find that the receiver is minus "crystal," minus "this and that," etc., due to price considerations. But here is a receiver which has "everything" and yet falls within the cost range that the average reader can afford.

THE new 1937 Super-Skyrider arrived at the Westchester Listening Post for tests about two months ago. Since that time it has been used nightly for amateur communication and for short-wave listening. From the angles of sensitivity, selectivity and general usability for DX work in general, it has proven entirely satisfactory. In general make-up, it follows the communications type layout, as can be seen from the accompanying photograph. It is an eleven-tube receiver with a 6K7 utilized as an r.f. amplifier, a 6L7 as the first detector mixer, two 6K7's as the intermediate amplifiers, a 6R7 as a second detector, a.v.c. and first audio stage, two 6L6's as the second audio stage and a 6C5 as the signal-frequency oscillator. Besides this, it utilizes a 6K7 as the beat-frequency oscillator, a 6G5 as the tuning indicator and a 5Z3 as a full-wave rectifier in the power amplifier.

The receiver has five band positions and separate coils are used to cover each band. All unused coils are short-circuited. The intermediate-frequency amplifier operates on 465 kc.

"Lab" Measurements

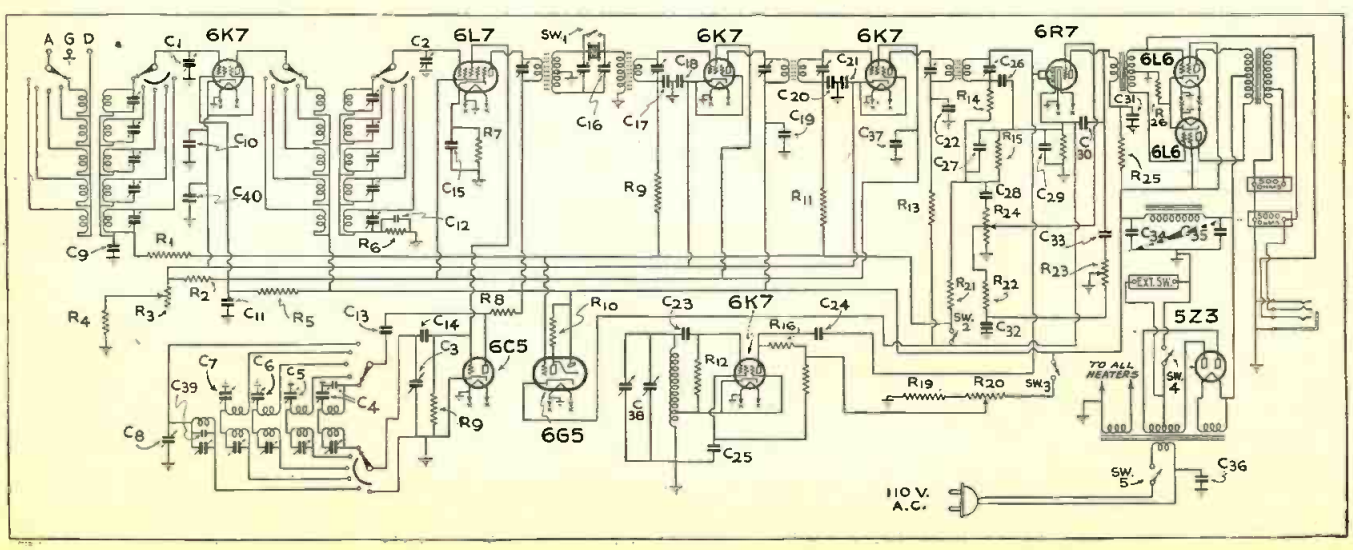
In actual tests by an independent laboratory, the band ranges cover the following frequencies: Band one, 544 to 1255 kc.; band two, 1.2 to 2.85 mc.; band three, 2.72 to 6.82 mc.; band four, 6.8 to 16.7 mc.; band five, 15.4 to 38 mc. The sensitivity of the receiver on band one runs from .6 microvolts at 550 kc. down to .1 microvolt at 600 kc. and flattens out to approximately .3 up to 1200 kc. On band two, the sensitivity runs from .2 microvolt at 1200 kc. down to .1 at 1600 kc. and up again to .2 at 2600 kc. On band three, it runs from .6 microvolt at 2800 kc. to .3 at 6 mc. One band four, it runs from .6 mircovolt at 7 mc. down to .3 microvolt at 12 mc. and up again to .6 at 16 mc. On band five, the sensitivity is 1 from 16 to 30 mc. and changes slope down to .5 microvolt at 38 mc. These laboratory measurements were made with an output of 50 milliwatts into a 500-ohm load, with a 400-cycle tone 30% modulation.

To give an idea of the high order of selectivity the receiver has, we find that the measurements show the band width equals 1.5 kc. at 1000 cycles, two times down. At ten times down, the band width is 4 kc. At one hundred times down, it equals 8 kc. At 1000 times down, it equals 12 kc. At 10,000 times down, it equals only 20 kc.

The overall fidelity runs from 60% at 60 cycles to a maximum of 100% at 400 cycles and drops off at about 2000 cycles to 48%, at 3000 cycles to 22% and at 5000 cycles to only 5%. This cut-off in the high frequencies is, of course, due to the extreme selectivity, but, as the receiver is designed primarily for communication purposes, the selectivity is worth much more than the fidelity. The fidelity of the audio system itself is plus or minus two decibels from 50 to 8000 cycles.

C. W. and Phone Features

The crystal circuit on this receiver operates well when extreme selectivity is required and the novel arrangement of the beat-frequency, oscillator-injector to control the magnitude of the beat-frequency oscillator (*Turn to page* 631)



The RADIO Beginner

This series is presented for beginners who desire to obtain a working knowledge of radio and those who have some theoretical knowledge but lack practical experience

ADDING A.V.C. TO A RECEIVER

A half hour's work and the t.r.f. receiver described in Part Nine (last month) of this series is provided with automatic volume (sensitivity) control.

Part Ten—Automatic Volume Control

By John M. Borst

THIS installment is devoted to an explanation of automatic volume control circuits and the newly acquired knowledge is put to work at once by changing the t.r.f. receiver of last month so as to include this new feature.

The so-called "automatic volume control" circuit is a scheme for obtaining approximately the same carrier amplitude at the detector tube on all signals, weak and strong. In other words, the strength of the signal *when it is unmodulated* is kept approximately the same. The actual volume coming from the loudspeaker depends on the audio amplification after the detector, the setting of the manual volume control and the percentage of modulation at the transmitter.

A receiver equipped with perfect "automatic volume control" would still not give equal volume on all stations at all times, even if the manual volume control were not moved, because the station may send out loud or soft audio signals, and the average may vary between stations. We would not want to eliminate these volume variations, since they are a part of the program. Therefore "automatic volume control" is not really the correct name; it should be "automatic sensitivity control." However, the wrong name has caught the public's fancy and it is now too late for a change.

It has been explained in Part 6 that the sensitivity of a radio-frequency amplifier stage can be reduced in the case of a variable-mu tube by increasing the negative voltage at the control grid. In fact, this is being done manually in the receiver described last month. It can be done automatically when a detector is employed which develops a negative voltage (d.c.) with respect to the chassis when a signal comes in. This negative voltage should be proportional to the strength of the signal.

Choice of Detector

The detector of last month is not suitable for the purpose, but the diode detector will do the work nicely. Figure 1 shows the diode detector circuit with the a.v.c. circuit incorporated in the t.r.f. receiver. The same tube is used as a diode by connecting plate and grid together. During the positive half of each cycle, the plate and grid become positive and some current flows through the circuit in the direction indicated by the arrows. This is pulsating d.c. and it is of such a direction as to make point A negative with respect to the chassis. Across resistor R8, then, there are several voltages: d.c., radio frequency and audio frequency. The radio-frequency current is by-passed by the condenser C11 and the audio-frequency current is fed to the audio amplifier through C10. The negative voltage at A must now be fed back to the grid returns of the amplifier stages, but we must take care that the audio-frequency fluctuations are filtered out because they would cause distortion. Precautions should also be taken to insure against feedback between stages, as this would cause oscillation. The network of resistors and condensers fulfills all these requirements.

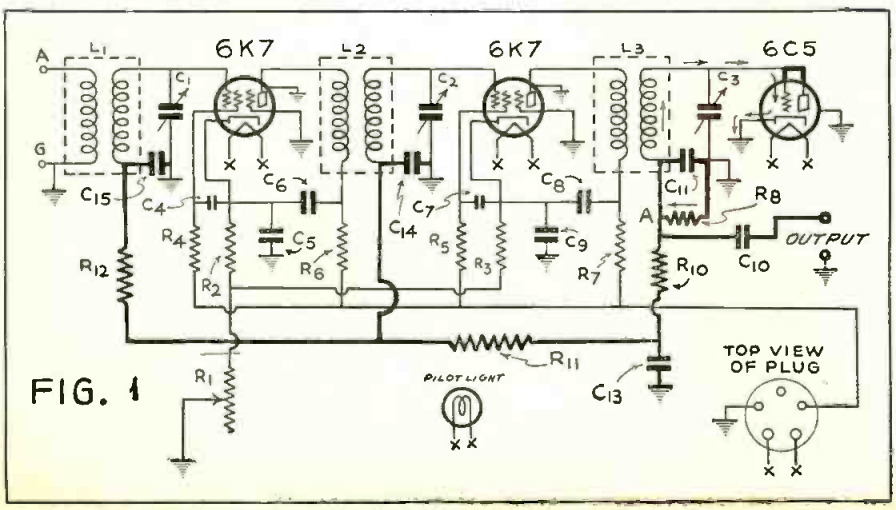


FIG. 1

Special Filters

As soon as a negative voltage appears across the diode load resistor R8, the condenser C13 is charged through the resistor R10; it takes considerable time to charge this condenser, because the resistor limits the rate of charge. After C13 is charged, the condensers C14 and C15 are charged through the other resistors. This delays the action still more. The result is that the circuit is too slow to follow the audio-frequency variations at A and the steady voltage across C14 and C15 which is applied to the grids is free from audio-frequency variations.

The speed of such resistance-capacity filters is indicated by their "time constant." This is the time in seconds it would take to charge the condenser completely if it kept on charging at the initial rate. The rate varies and the condenser charges to 63 percent of its full charge in the time indicated. The time constant in seconds is equal to the product of R in megohms and C in microfarads. In this case, where there are several sections, we must first take the sum of the resistors and the sum of the capacitances. The total capacity of C13 + C14 + C15 = .04 mfd. and the sum of the resistors (*Turn to page 635*)

HOW ABOUT THIS ONE?

Observer Sahlbach pulled in this one from the Brazilian short-wave station as a verification of reception of the Brazilian hour. Have you got one?

The DX for the

Conducted by Laurence

THE forty-ninth installment of the DX Corner for Short Waves contains the World Short-Wave Time-Table for 24-hour use all over the world and Official Observers' reports of stations heard this month. Consult these two items regularly and make your all-wave set pay big dividends!

Credit Where It Is Due

While the reports from all of our Listening Posts have been of a higher standard during the last year than ever before, for which fact the Editor now expresses his grateful thanks, it is fitting that we acknowledge the outstanding efforts of five of our leading Listening Post Observers. Their reports are noted for: 1, accuracy; 2, first data on new stations; 3, carefully prepared; 4, concise; 5, prompt. They are Observers Partner, Alfred, Shamleffer, Ralat and Gallagher. Let us all give them a big hand, in spirit, even if we cannot greet them personally.

Last Call for Reappointments for 1937

Again reminding Listening Post Observers who have not already applied for reappointment for 1937, your Editor asks for separate cards requesting such enrollment as soon as you read this item. No observers will be carried over into this year unless this request is received. Don't forget, it is important!

Newly interested enthusiasts who want to qualify as Official Observers should make application immediately. State your experience, the type of equipment you use, and its antenna. In the last issue of RADIO NEWS will be found a one-page article outlining the aims of this organization of Listening Posts. Everyone really interested in this work is cordially invited to apply if they will send in monthly reports.

Reports of Listening Post Observers and Other Short-Wave Readers of the DX Corner

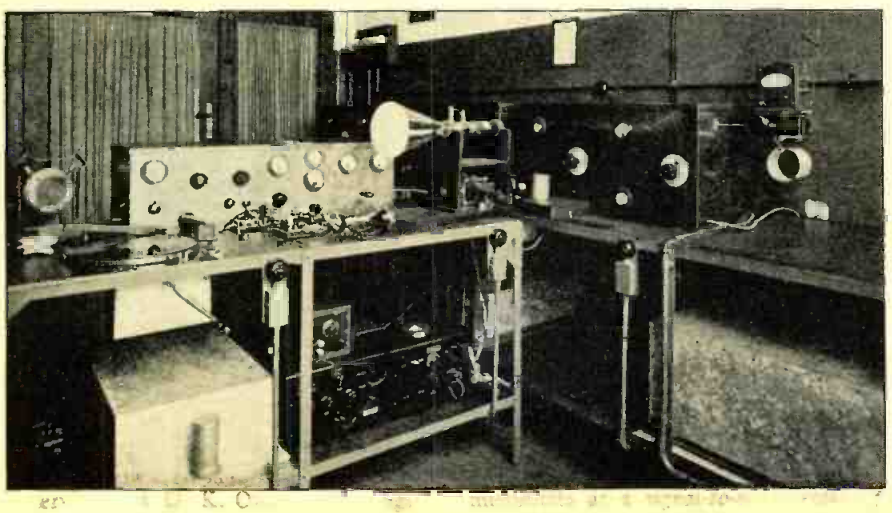
LISTED in the following columns is this month's consolidated reports of short-wave stations heard by our wide-world listening posts. Each item is credited with the Observer's surname. This allows our Readers to note who obtained the information. If any of our Readers can supply Actual Time Schedules, Correct Wavelengths, Correct Frequencies and any other Important Information (in paragraphs as recommended), the DX Editor, as well as our Readers, will be grateful for the information. On the other hand, Readers seeing these reports can try their skill in pulling in the stations logged and in trying to get complete information on these transmissions. The report for this month, containing the best information available to date, follows:

EUROPE

DZH, Berlin, Germany, 14460 kc. (Shamleffer, Smith).

DUTCH SCHOOL STATION

This is the transmitting equipment of PHJ, Dordrecht, Holland, reported heard by a number of American Observers. The photo was sent in for publication by Hugo Richter of Zurich, Switzerland.



DZE, Berlin, Germany, 12130 kc. (Shamleffer).

DJP, Zeesen, Germany, 11855 kc. (Shamleffer); daily 9 a.m.-12:30 p.m. (Partner, Kemp).

DZC, Berlin, Germany, 10290 kc. (Shamleffer); almost daily 4-6 p.m. (Stabler).

DZA, Berlin, Germany, 9670 kc. (Shamleffer).

DZB, Zeesen, Germany, 10420 kc. (Alfred, Shamleffer, Smith); 10042 kc., irregular (Ralat); 4-5 p.m. (Stabler).

DJO, Zeesen, Germany, 11795 kc., heard Sunday (Alfred, Shamleffer); heard 3-4 p.m. (Stabler, Atherton); daily 9 a.m.-12:30 (Partner, Sahlbach, Kemp).

DJQ, Zeesen, Germany. 196 meters; heard 12 midnight (Coover); 15280 kc. (Shamleffer).

DGG, Nauen, Germany, 13180 kc., 3-3:30 p.m. (Rudolph).

GSA, London, England, 6050 kc., 7-8 p.m. (Howald); 6-8:45 p.m. (Shamleffer, Stabler, Partner, Kemp).

GSP, Daventry, England, 15310 kc. (Shamleffer).

GSO, Daventry, England, 15180 kc. (Shamleffer, Kemp).

HBO, Geneva, Switzerland, 11400 kc., daily at 1:30 a.m. (Partner).

HBJ, Geneva, Switzerland, 14535 kc. (Shamleffer, Kemp).

HBL, Geneva, Switzerland, 9595 kc. (Shamleffer); 7-7:30 p.m. (Dressler); every Saturday 6:45-7:35 p.m. (Kure, Zarn); 9345 kc., announced frequency, reports desired (Stabler, Bower, Kemp).

HBP, Geneva, Switzerland, 7797 kc. (Shamleffer); 7-7:30 p.m. (Dressler); every Saturday 6:45-7:35 p.m. (Kure, Lawton, Bower, Ralat, Kemp).

I2RO4, Rome, Italy, 11810 kc., daily at 6 p.m. (Ralat, Coover, Zarn, Shamleffer); until 12:30 p.m. on 11810 kc.; after 12:30 p.m. on 9635 kc. (from veri.). Using bird call (Ruppert, Rudolph, Kemp). Address: 5 Via Montello, Rome.

HVJ, Vatican City, 15120 kc., daily except Sunday 10:30-10:45 a.m. (Ralat); 5960 kc. (Shamleffer, Kemp).

PHI, Huizen, Holland, 17775 kc.; heard irregular around 9 p.m. (Ralat, Shamleffer, Atherton).

PCJ, Eindhoven, Holland, 9590 kc., Thursday 7-10 p.m. (Alfred); Sunday 7-8 p.m. (Ralat, Coover, Shamleffer); 15220 kc., 9:30-11 a.m. (Howald, Dressler, Zarn).

HAT4, Budapest, Hungary, 9125 kc., 6:30-6:53 p.m., Sunday 6-6:50 p.m. (Shamleffer); Sunday 6-7 p.m. (Partner); ends with V's in code (Dressler, Kemp).

HAS3, Budapest, Hungary, 15370 kc., Sunday 9-10 a.m. (Smith, Kemp).

TFJ, Reykjavik, Iceland, 12235 kc.,

Corner SHORT WAVES

M. Cockaday

Sunday 1:40-2:30 p.m. (Alfred, Shamleffer, Smith, Kemp).

SPW, Warsaw, Poland, 13050 kc., Thursday on harmonic 12:30-1:40 p.m. (Alfred); 7 p.m. (Coover), (from veri.) (Atherton); 13635 kc. (from veri.) (Partner); schedule Monday, Wednesday and Friday, 12:30-1:30 a.m. (Foshay, Bird). Address: Polskie Radio, 5 Mazowiecka St.

ORK, Ruysselede, Belgium, 10330 kc. (Shamleffer, Markuson); 2:30 p.m. daily (Kemp).

OER2, Vienna, Austria, 6070 kc., 5-6 p.m. Saturday (Croston); 11780 kc. (Partner).

SM5SX, Stockholm, Sweden, 11710 kc., Saturday and Sunday; 11 a.m.-5 p.m. (Partner).

EAQ, Madrid, Spain, 30.43 meters, 8 p.m. (Coover); 9860 kc. (Shamleffer); signed at 9:30 p.m. on Sunday (Wirtz, Vassallo, Markuson, Zarn, Partner, Ralat, Styles, Rudolph); daily 5:15-9:30 p.m. (Dressler, Kemp).

UGT, Madrid, Spain, 9560 kc. (Ruiz); 7 a.m. and 4 p.m. (Styles).

ESU, Barcelona, Spain, daily at 3 p.m. (Vassallo).

Radio Sevilla, 7000 kc. (Ruiz).

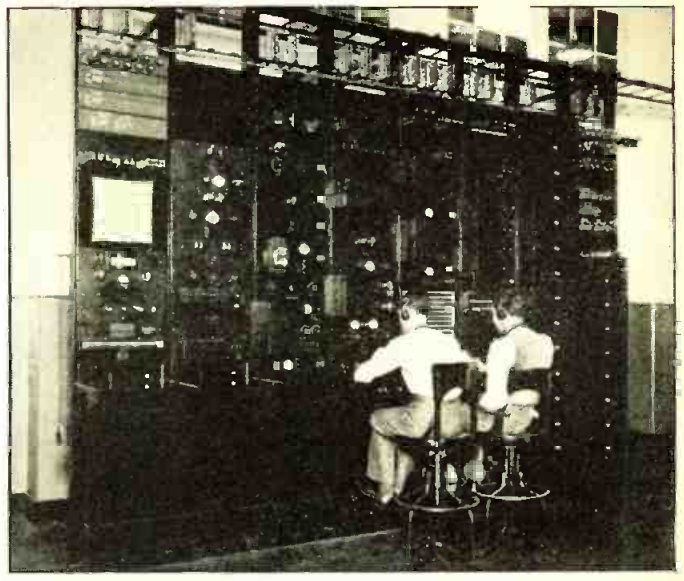
Radio Barcelona, 7020 kc. (Ruiz).

ECNI, Barcelona, Spain, 7220 kc., Tuesday and Saturday 4 p.m. (Styles).

CSW, Lisbon, Portugal, 9940 kc., schedule daily 4-7 p.m. (Alfred, Ralat, Coover); heard 10:35 p.m. (Sindner, Shamleffer, Howald, Sahlbach); clock chimes the hour (Turner, Dodge, Jordan, Stabler, Rheiner, Croston, Zarn, Atherton, Partner, Jensen, Smith, Kosynsky, Rudolph, Dressler, Bird, Anca). Address: National Broadcasting Co.

CT1AA, Lisbon, Portugal, 9650 kc., Tuesday, Thursday and Saturday 4-7 p.m. (Ralat, Coover, Shamleffer); interval signal is three cuckoo calls (from veri.) (Bishop, DeLaet, Beck, Lawton, Smith, Ralat, Dressler). Address: Av. Antonio Augusto d'Aguiar 144.

LZA, Sofia, Bulgaria, 14970 kc., no given schedule (Atherton); four gong note call (Smith); daily from 6 a.m. on (Partner); 1:40 a.m. (Eder).



AT THE CONTROL TERMINAL
This is the control board of the Cia. Radio Internacional de Brazil through which the broadcasts described on the card on the opposite page originate.

Belgrade, Yugoslavia, 6100 kc., 1-3 a.m., 6:30-8 a.m. and 12-5 p.m., Sunday 4-6 a.m. (from veri.) (Self).

LCJ1, Jeloy, Norway (Brown), 9530 kc.; 5-7 a.m. (Brian).

OLR, Prague, Czechoslovakia, 15230 kc. (Shamleffer); 11760 kc., 3 p.m. (Sahlbach); 6030 kc. (from ann.), 3:30-4:15 p.m. (Stabler); 14840 kc., daily 9 a.m.-3 p.m. (Kentzel); 9550 kc. (Bower).

RV59, Moscow, U.S.S.R., 5980 kc., 10 a.m. (Gallagher).

RNE, Moscow, U.S.S.R., 25 meters, schedule Sunday 6-7, 10-11 a.m. and 4-5 p.m., Monday and Friday 4-5 p.m., Wednesday 6-7 a.m., 4-5 p.m. (from veri.) (Atherton, Alfred, Coover); 12000 kc. (Shamleffer, Mochrie, Zarn, Ralat, Kemp).

RAN, Moscow, U.S.S.R., 31.25 meters, schedule daily 7-8 p.m. (from veri.) (Atherton); 9595 kc. (Shamleffer). Announced frequency, 9600 kc. (Wilkinson, Dressler, Bower, Black, DeLaet).

AFRICA

VQ7LO, Nairobi, Kenya, 6083 kc., 5:45-6:15 a.m. (Brian).

EAJ43, Tenerife, Canary Islands, 10450 kc. (Ruiz); 7:30 p.m. (Ralat) (EHZ); 10370 kc., heard as late as 9:20 p.m. on Saturday (Kentzel) (from veri.) (Orickx). Address: Apartado de Correos, No. 225, Santa Cruz de Tenerife.

Radio Tetuan (EA9AH), Spanish Morocco, 6600 kc., 4:15 (Ralat, Ruiz); heard irregular around 9:30-10 p.m. (Scala); (from veri.) (Scala, Betances, Orickx, Kosynsky). Address: Apartado, No. 124, Tetuan, Spanish Morocco, N. Africa.

IUD, Addis Ababa, Italian Africa (Brown).

IUG, Addis Ababa, Italian Africa, 15450 kc., 8:40 a.m. (Owen); daily 9-10 a.m. (Partner). Address: Ministero Della Marina, Direzione Centro R. T. Autonomo R. Marina, Rome, Italy.

IUS, Addis Ababa, Italian Africa (Brown).

FROM PENN. TO SEATTLE
At left: Meet Observer Thomas Walckaz of Ellwood City, Pa. At right: The Listening Post of Anthony C. Tarr, Official Observer located at Seattle, Wash., who names his Listening Post "The Ear of Puget Sound".

IUC, Addis Ababa, Italian Africa, 11990 kc., 12:15 p.m. (Owen); nightly 1 a.m. and on (Partner). Address: Ministero Della Marina, Direzione Centro R. T., Autonomo R. Marina, Rome, Italy.

CNR, Rabat Morocco, 12830 kc. and 8035 kc. (Mochrie).

FVA, Alger, Algeria, 8960 kc., "Radio Algiers" (from veri.), (Partner). Address: Service Algerian des Postes, Telegraphes, et des Telephones, 137 Rue de Constantine, Alger.

OCEANIA

FO8AA, Papeete, Tahiti, 7080 kc., 10-12 p.m. (Howald, Beck), 7100 kc., Tuesdays and Friday, 11-12 p.m. only (Scala), "Radio Oceanic" (from veri.), Marseillaise played.

KKH, Kahuku, Hawaii, 7520 kc., Monday 11 p.m. (Sahlbach, Partner); 1:30 a.m. (Rudolph), Tuesday 12:30-1 a.m. (Gallagher).

VPD2, Suva, Fiji Islands, 9540 kc. (Leutenberg, Atherton).

ASIA

PLV, Bandoeng, Java, 9420 kc., 10 a.m. (Gallagher).

YOC, Bandoeng, Java, 44.64 meters (Street). Address: Same as YDA.

(*Turn to page* 610)

WORLD SHORT WAVE TIME-TABLE

Compiled by LAURENCE M. COCKADAY

Hours of transmission for the World's Short Wave Broadcast Stations

FILL IN LOCAL TIME											
8	9	10	11	M	1	2	3	4	5	6	7
EASTERN STANDARD TIME											
01	02	03	04	05	06	07	08	09	10	11	12
GREENWICH MEAN TIME											

HOURS OF TRANSMISSION											
8	9	10	11	M	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12

Wave-length Meters	Call Letters	Frequency Kc.	City Country
13.93	W8XK	21540	Pittsburgh, Pa.
13.94	W2XE	21520	New York, N. Y.
13.97	GSH	21470	Daventry, England
16.86	GSG	17790	Daventry, England
16.87	W3XAL	17780	Bound Brook, N. J.
16.89	DJE	17760	Zeesen, Germany
19.56	DIR	15340	Zeesen, Germany
19.57	W2XAD	15330	Schenectady, N. Y.
19.62	LRU	15290	Buenos Aires, Arg.
19.63	DJQ	15280	Zeesen, Germany
19.65	W2XE	15270	New York, N. Y.
19.66	GSI	15260	Daventry, England
19.68	TPA2	15243	Pontoise, France
19.71	PCJ	15220	Eindhoven, Holland
19.72	W8XK	15210	Pittsburgh, Pa.
19.74	DJB	15200	Zeesen, Germany
19.75	ZBW4	15190	Hong Kong, China
19.76	GSO	15180	Daventry, England
19.82	GSF	15140	Daventry, England
19.84	HVJ	15121	Vatican City
19.85	DJL	15110	Zeesen, Germany
20.04	LZA	14970	Sofia, Bulgaria
20.55	JVH	14600	Nazaki, Japan
22.16	SPW	13653	Warsaw, Poland
22.95	VPD	13075	Suva, Fiji Islands
24.52	TFJ	12235	Reykjavik, Iceland
25.00	RV59(RNE)	12000	Moscow, U. S. S. R.
25.24	TPA3	11885	Pontoise, France
25.27	W8XK	11870	Pittsburgh, Pa.
25.34	OLR	11840	Podebrady, Czech.
25.36	W2XE	11830	New York, N. Y.
25.36	W9XAA	11830	Chicago, Ill.
25.40	I2RO	11810	Rome, Italy
25.42	JZJ	11800	Nazaki, Japan
25.49	DJD	11770	Zeesen, Germany
25.53	GSD	11750	Daventry, England
25.58	PHI	11730	Huizen, Holland
25.58	CJRX	11730	Winnipeg, Canada
25.60	TPA4	11720	Pontoise, France
25.62	HJ4ABA	11710	Medellin, Colombia
26.24	COCX	11435	Havana, Cuba
26.60	HIN	11280	Trujillo, D. R.
27.35	HS8PJ	10955	Bangkok, Siam
27.93	JVM	10740	Nazaki, Japan
28.14	JVN	10660	Nazaki, Japan
29.04	ORK	10330	Ruysselede, Belgium
30.43	EAQ	9860	Madrid, Spain
30.75	COCQ	9750	Havana, Cuba
31.00	CON	9677	Macao, Asia
31.07	YNLF	9655	Managua, Nicaragua
31.09	CT1AA	9650	Lisbon, Portugal
31.10	HH3W	9645	Port-au-Prince, Haiti
31.14	I2RO	9635	Rome, Italy
31.25	RAN	9600	Moscow, U. S. S. R.
31.25	HJ1ABP	9600	Cartagena, Colombia
31.27	HBL	9595	Geneva, Switzerland
31.28	W3XAU	9590	Philadelphia, Pa.
31.28	VK2ME	9590	Sydney, Australia
31.28	PCJ	9590	Eindhoven, Holland
31.28	HP5J	9590	Panama City, Pana.
31.32	VK3LR	9580	Lyndhurst, Australia
31.32	GSC	9580	Daventry, England
31.33	HJ2ABC	9575	Cucuta, Colombia
31.35	W1XK	9570	Millis, Mass.
31.38	DJA	9560	Zeesen, Germany
31.40	TIPG	9559	San Jose, C. R.
31.45	DJN	9540	Zeesen, Germany
31.48	W2XAF	9530	Schenectady, N. Y.
31.48	LKJI	9530	Jeloy, Norway
31.49	ZBW3	9525	Hong Kong, China
31.55	GSB	9510	Daventry, England
31.55	HJU	9510	Buenaventura, Colom.
31.55	VK3ME	9510	Melbourne, Australia
31.56	XEFT	9505	Veracruz, Mex.
31.58	PRF5	9500	Rio de Janeiro, Brazil
31.58	HJ1ABE	9500	Cartagena, Colombia
31.75	TGWA	9450	Guatemala City
31.82	COCH	9428	Havana, Cuba
31.35	HS8PJ	9350	Bangkok, Siam
32.88	HAT4	9125	Budapest, Hungary
33.53	HCJB	8948	Quito, Ecuador
34.62	CO9JQ	8665	Camaguey, Cuba
38.48	HBP	7797	Geneva, Switzerland
39.95	JVP	7510	Nazaki, Japan
42.80	EA8AB	7010	Tenerife, Canary Is.
43.48	H13C	6900	La Romana, D. R.
43.99	XGOX	6820	Nanking, China
44.14	HIH	6796	San Pedro, D. R.
44.44	JVT	6750	Nazaki, Japan
44.71	TIEP	6710	San Jose, Costa Rica
45.00	HC2RL	6667	Guayaquil, Ecuador
45.25	HIT	6630	Trujillo, D. R.
45.34	PRADO	6618	Riobamba, Ecuador
45.38	RV72	6611	Moscow, U. S. S. R.

HOURS OF TRANSMISSION											
8	9	10	11	N	1	2	3	4	5	6	7
13	14	15	16	17	18	19	20	21	22	23	00

WORLD SHORT WAVE TIME-TABLE

(Continued from the Previous Page)

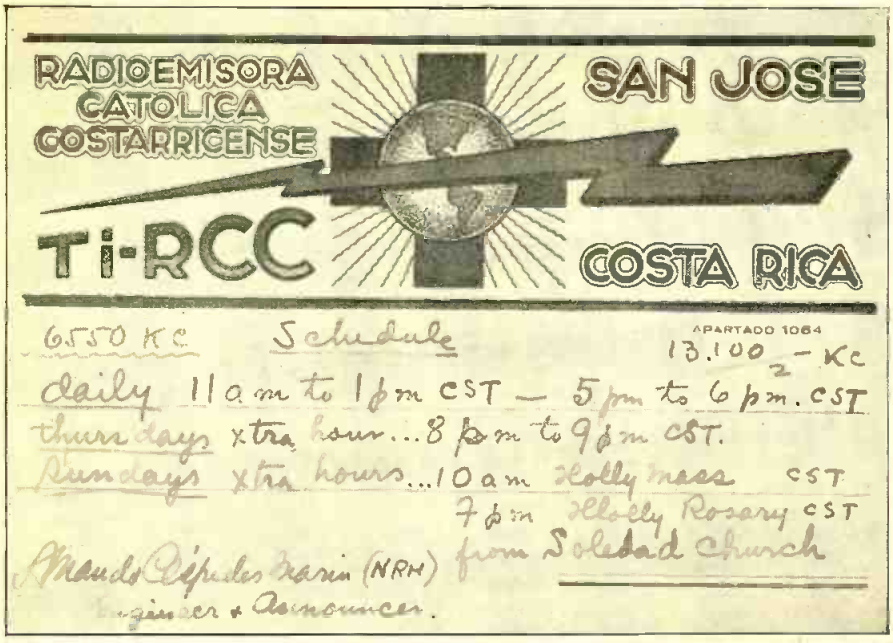
Hours of transmission for the World's Short Wave Broadcast Stations

HOURS OF TRANSMISSION												FILL IN LOCAL TIME	HOURS OF TRANSMISSION											
8	9	10	11	M	1	2	3	4	5	6	7	EASTERN STANDARD TIME	8	9	10	11	N	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12	GREENWICH MEAN TIME	13	14	15	16	17	18	19	20	21	22	23	00

Wave-length Meters	Call Letters	Frequency Kc.	City Country
45.80	HI4D	6550	Trujillo, D. R.
46.01	YV4RA	6520	Valencia, Venezuela
46.08	HIL	6510	Trujillo, D. R.
46.66	HI1S	6430	Puerto Plata, D. R.
46.91	HI8Q	6395	Trujillo, D. R.
47.06	YV5RF	6375	Caracas, Venezuela
47.12	YV1RH	6360	Maracaibo, Ven.
47.24	HRP1	6350	San Pedro Sula, Honduras
47.54	HIZ	6310	Trujillo, D. R.
47.62	YV4RD	6300	Maracay, Venezuela
47.77	HIG	6280	Trujillo, D. R.
47.77	COHB	6280	Sancti Spiritus, Cuba
48.05	HIN	6243	Trujillo, D. R.
48.11	HRD	6235	La Ceiba, Honduras
48.15	OAX4G	6230	Lima, Peru
48.19	HJ1ABH	6225	Cienaga, Colombia
48.50	HIJA	6185	Santiago, D. R.
48.54	COKG	6180	Santiago, Cuba
48.70	XEXA	6160	Mexico, D. F.
48.70	VPB	6160	Colombo, Ceylon
48.70	CJRO	6160	Winnipeg, Canada
48.78	VE9CL	6150	Winnipeg, Canada
48.78	HJ2ABA	6150	Tunja, Colombia
48.78	YV5RD	6150	Caracas, Venezuela
48.78	HJ5ABC	6150	Cali, Colombia
48.86	W8XK	6140	Pittsburgh, Pa.
48.88	CR7AA	6137	Lourenzo Marques, A.
48.94	VE9HX	6130	Halifax, N. S.
48.94	COCD	6130	Havana, Cuba
48.96	HJ3ABX	6128	Bogota, Colombia
49.02	HJ1ABB	6120	Barranquilla, Colom.
49.02	W2XE	6120	New York, N. Y.
49.10	XECW	6110	Xantocam, Mexico
49.18	"Beograd"	6100	Belgrade, Yugoslavia
49.18	W3XAL	6100	Bound Brook, N. J.
49.18	W9XF	6100	Chicago, Ill.
49.20	ZTJ (JB)	6098	Johannesburg, Africa
49.22	HJ4ABE	6095	Medellin, Colombia
49.26	ZBW2	6090	Hong Kong, China
49.26	CRCX	6090	Toronto, Canada
49.30	HJ5ABD	6085	Cali, Colombia
49.31	HJ3ABF	6084	Bogota, Colombia
49.32	VQ7LO	6083	Nairobi, Kenya, Afr.
49.34	HP5F	6080	Colon, Panama
49.34	W9XAA	6080	Chicago, Ill.
49.34	ZHJ	6080	Penang, S. S.
49.40	OER2	6073	Vienna, Austria
49.42	YV1RE	6070	Maracaibo, Venez.
49.50	W8XAL	6060	Cincinnati, Ohio
49.50	W3XAU	6060	Philadelphia, Pa.
49.50	OXY	6060	Skamlebaek, Denmark
49.59	HJ3ABD	6050	Bogota, Colombia
49.59	HI9B	6050	Trujillo, D. R.
49.63	HJ3ABI	6045	Bogota, Colombia
49.65	HJ1ABG	6042	Barranquilla, Colom.
49.67	YDA	6040	Tandjong Priok, Java
49.67	W1XAL	6040	Boston, Mass.
49.75	HP5B	6030	Panama City, Panama
49.83	DJC	6020	Zeesen, Germany
49.83	XEUW	6020	Veracruz, Mexico
49.85	ZHI	6018	Singapore, Malaya
49.88	XEWI	6015	Mexico, D. F. Mexico
49.90	HJ3ABH	6012	Bogota, Colombia
49.92	COCO	6010	Havana, Cuba
49.95	HJ1ABJ	6006	Santa Marta, Colom.
49.96	CFCX	6005	Montreal, Can.
49.96	HP5K	6005	Colon, Panama
49.96	VE9DN	6005	Montreal, Canada
50.00	XEBT	6000	Mexico City, Mexico
50.00	RV59	6000	Moscow, U. S. S. R.
50.17	HIX	5980	Trujillo, D. R.
50.25	HJN	5970	Bogota, Colombia
50.26	HVJ	5969	Vatican City
50.50	TG2X	5940	Guatemala City
50.72	HH2S	5915	Port-au-Prince, Haiti
50.76	HRN	5910	Tegucigalpa, Hond.
50.85	YV3RA	5900	Barquisimeto, Venez.
51.15	HIIJ	5865	San Pedro, D. R.
51.46	TIGPH	5830	Alma Tica, Costa Rica
51.72	YV5RC	5800	Caracas, Venezuela
51.90	OAX4D	5780	Lima, Peru

List of Symbols

A—Thursday, Sunday
C—Monday, Wednesday, Friday
D—Daily
E—Tuesday, Thursday
F—Friday
H—Sunday, Monday, Wednesday, Friday
G—Tuesday, Thursday, Saturday
I—Irregularly
J—Tuesday, Thursday, Friday, Sunday
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
N—Monday, Wednesday, Thursday
O—Monday, Tuesday, Wednesday, Friday
P—Except Tuesday, Wednesday
S—Sunday
T—Tuesday
Th—Thursday
U—Sunday, Monday, Thursday
V—Sunday, Wednesday
W—Wednesday
Z—Tuesday, Friday
AC—Monday, Thursday, Saturday
AG—Tuesday, Sunday
AH—Monday, Wednesday, Saturday
AL—Except Monday, Sunday
AM—Monday, Thursday
AN—Tuesday, Saturday
Sa—Saturday
XA—Except Saturday, Sunday
XH—Except Tuesday, Thursday
XC—Except Tuesday, Thursday, Sunday
XM—Except Monday
XS—Except Sunday
XY—Except Tuesday, Sunday
XSa—Except Saturday



A FAMOUS SOUTH AMERICAN

This is the verification card from the Costa Rican station TIRCC, which is engineered and announced by our old friend Amando Cespedes Marin, famous as the owner of "little" NRH of earlier days.

The DX Corner
(Short Waves)

(Continued from page 607)

YDB, Sourabaya, Java, 31.09 meters (Street); 1750 kc., 10 a.m. (Gallagher). Address: Reports as in YDA.

PLP, Bandoeng, Java, 11,000 kc., 6-10 a.m., except Saturday (Mochrie, Street).

PLE, Bandoeng, Java, 18,830 kc. (Brown); 10 a.m. (Gallagher).

YDA, Tandjong Priok, Batavia, Java, 98.68 meters (Street). Address: N.I.R.O.M. Koningsplein West 5, Batavia C., Java.

"Philco Radio," Saigon, Indo China, 11.710 kc., daily 5:30-9:30 a.m. (Craston); 10 a.m. (Gallagher).

ZBW5, Hong Kong, China, 17,755 kc., daily 4-10 a.m. (from veri.) (Street, Huene). Address: Postmaster General, Hong Kong.

XOJ, China, 15,800 kc. (Kemp).

XQAK, China, 6480 kc., 2 a.m. (Gallagher).

XGW, Shanghai, China, 10,420 kc., alternates with XGM (Brown); 10 a.m. (Gallagher).

XGM, Shanghai, 17,000 kc., 7:30 p.m. (Brown).

CQN, Macao, Portuguese China, 7-8:30 a.m., Monday and Friday (from veri.) (Scala, Brown). Address: Government Broadcasting Station, Macao, Portuguese China.

XGOX, Nanking, China, 6820 kc., 5:30-7 a.m. (Brown, Immicke).

ZHI, Singapore, Straits Settlements, 6018 kc., Tuesday 2-3 a.m. (Brian); wants reports.

RKR, Novosibirsk, U.S.S.R., 1:27 a.m. (Craston).

HSP, Bangkok, Siam, 17,740 kc., excellent signal (Brown).

HS8PJ, Bangkok, Siam, 19,020 kc. (Self); Monday 8-10 a.m., Thursday, 9350 kc., 8-10 a.m. (Craston).

JFZC, T.K.K. Steamer Chichibu-Maru, 6650 kc., 9 p.m. (Gallagher).

JZJ, Nazaki, Japan, 11,800 kc., 4:55 a.m. (Vincent); daily 4-5 p.m. (Alfred); 12-1 a.m. (Gallagher); tests Monday and Thursday 4-5 p.m. (Brian), ending with series of gongs. Address: Overseas Section, Broadcasting Corp. of Japan, Atagoyama, Chiba Ken, Tokyo.

JVN, Nazaki, Japan, 10,660 kc. (Vincent, Brown, Shamleffer); Saturday, Sunday, Monday, 4-5 p.m. (Dressler, Lorvig, Kemp). Address: Same as JVH.

JVJ, Nazaki, 11,800 kc., Saturday, Sunday, Monday 4-5 p.m. (Dressler, Chimes, Shamleffer).

JVT, Nazaki, Japan, 6750 kc., 4:10-7:40 a.m. (Alfred, Ralat, Brown, Kemp).

JVH, Tokio, Japan, 14,640 kc., 12-1 a.m. (Alfred); 9:30 p.m. (Brown, Shamleffer, Howald, Zarn, Jensen); 5:30-6 p.m. (Dodge, Atherton, Kentzel); (from veri.) (Lorvig, Kemp, Gallagher). Address: Broadcasting Corp., Tokio.

JVE, Tokio, Japan, 15,660 kc., 9-10 p.m. (Brown).

JVF, Nazaki, Japan, 15,620 kc., daily 6-7 p.m. (Kemp).

GREETING FROM ILLINOIS

Edward F. Woodmansee of Springfield, Illinois, sends greeting to the great fraternity of short-wave listeners and members of the DX Corner. He is a great DXer and an "Ace" among his friends.

JVM, Nazaki, Japan, 10,770 kc., 12:45 a.m. (Rudolph).

JVD, Nazaki, Japan, 15,860 kc. (Black, Brown); 6-7 p.m. (Kemp); frequently (Gallagher).

JZK, Tokio, Japan, 15,160 kc., Monday and Thursday 4-5 p.m. (Partner); Wednesday and Saturday 3-4 p.m. (Lorvig, Brian).

JZI, Tokio, Japan, 9535 kc., Monday and Thursday 4-5 p.m. (Partner); Wednesday and Saturday 3-4 p.m. (from veri.) (Lorvig, Styles, Brian). Address: Same as JVH.

WEST INDIES

Radio Fort-de-France, Martinique, French West Indies, 9435 kc., daily 11:30 a.m.-12:30 p.m. and 6-7 p.m. (Betances).

HIG, Trujillo City, Dominican Republic, 6280 kc., 7:30-9 a.m., 1-2:30 p.m., 8:30-10 p.m. (from veri.) (Alfred, Ralat).

HI8Q, Trujillo City, Dominican Republic, 6240 kc., 10 p.m. (Alfred); 5206 kc. (from ann.) (Betances).

HI2D, Trujillo, Dominican Republic, 6900 kc., 8:30-9 p.m. (Beck); 6:15 p.m. (Ralat, Kentzel).

HIX, Trujillo, Dominican Republic, 6330 kc. (Shamleffer); 6350 kc., daily 7-10 p.m. (from ann.) (Anca).

HI8A, Ciudad Trujillo, Dominican Republic, 6630 kc., irregular (Ralat); 9:45 p.m., 6479 kc. (from veri.) (Atherton). Address: P. O. Box 1312.

HI4V (?), Ciudad Trujillo, Dominican Republic, 6477 kc., 5:15-9:40 p.m. (Ralat).

HI4D, Ciudad Trujillo, Dominican Republic, 6558 kc., 11:55 a.m.-1:40 p.m. (Ralat).

HIL, Ciudad Trujillo, 6500 kc., 5:40-7:40 p.m. (from veri.) (Ralat).

ZFB, Hamilton, Bermuda, 10.055 kc., 6:14 p.m. (Alfred).

HIH, San Pedro de Macoris, Dominican Republic, 6780 kc., daily 7:30-9 p.m. (from veri.) (Ralat).

HI9B, Santiago de los Caballeros, D.R., 5880 kc., evenings (Bower, Betances).

HI5N, Santiago de Los Caballeros, D.R., 48.78 meters, 10 p.m. (Street); wants reports.

COCE, La Corona, Havana, Cuba, 8823 kc., 12,250 kc., 11 p.m.-5 a.m. (Styles).

COKG, Santiago, Cuba, 6147 kc., 10-11 p.m. (Ralat, Brown, Leutenberg, Shamleffer); 6200 kc. (Partner, Gallagher).

COCQ, Havana, Cuba, 9750 kc., evenings (Ralat, Brown, Coover, Shamleffer); daily 8 a.m.-midnight (Dressler); 1 p.m. (Immicke); (from veri.) (Atherton, Gallagher). Address: Calle 445.

CO9JQ, Camaguey, Cuba, 8665 kc., as late as 11:30 p.m. (Alfred); 8-9 p.m. and 7:30 p.m. (Shamleffer).

VP4TC, Port-of-Spain, Trinidad, Saturday 4:30-4:50 p.m. (Kantzel). Address: 1 Broome Street.

NORTH AMERICA

KEJ, Bolinas, Calif., Saturday 11-12 p.m. (Alfred); 9-10 p.m. (Sahlbach); 9010 kc. (Owen, Kemp).

KEE, Bolinas, Calif., 7700 kc., Tuesday 12-1 a.m. (Jensen).

WON, Lawrenceville, N. J., 9870 kc., 6 p.m. (Alfred, Shamleffer).

WNC, Hialeah, Fla., 15055 kc., Sunday 1:30-3 p.m. (Kentzel).

VE9BK, Vancouver, Canada, B. C., 4790 kc., 8-8:15 p.m. (Samson).

VE9AS, Fredrieton, New Brunswick, Canada, 6425 kc., Saturday 4:30-5 p.m. (Kentzel).

XEBT, Mexico, D. F., Mexico, as late as 2:15 a.m. (Smith).

XERE, Mexico, D. F., Mexico, 11800 kc., 1-3 p.m. (Howald).

XEWI, Mexico, D. F., Mexico, 11900 kc., 10:15 p.m. (Sahlbach, Shamleffer); 6015 kc., daily except Sunday 8-11 p.m. and Monday, Wednesday and Friday 3-4 p.m., 6:30-8 p.m. on Tuesday and Thursday (Partner); (from veri.) (Rudolph, Foshay, Anca). Slogan: "My Voice to the World from Mexico." Address: P. O. Box 2874.

XEXA, Mexico, D. F., Mexico, 6180 kc. (Shamleffer).

XECR, Mexico, D. F., Mexico, 7380 kc., Sunday 6-7 p.m. (Ralat, Shamleffer, Samson, Sahlbach); 11820 kc. (Markuson, Anca).

XEPT, Mexico, D. F., Mexico, 6000 kc., Saturday at midnight (Sahlbach).

XETU, XECU, Mexico, D. F., Mexico, 6120 kc., until 11 p.m. (Gallagher). Slogan: "Radio Nacional."

XEDQ, Guadalajara, Jalisco, Mexico, 9520 kc., evenings (Markuson); 7-12 midnight (Gallagher, Partner). Address: Calle 16 de Septiembre No. 64.

XELO, Piedras Negras, Mexico, 580 kc. (Dahm).

(Turn to page 620)

RADIO DEVELOPMENTS ANNOUNCED MONTHS AHEAD!

in ALLIED'S New Spring CATALOG

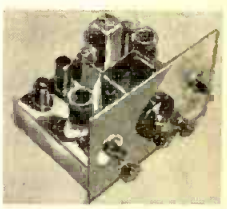
RADIO SCOOPS OF THE YEAR

Ready Now!

156 PAGES OF REAL INTEREST FOR EVERY SERVICEMAN, DEALER, AMATEUR & BUILDER

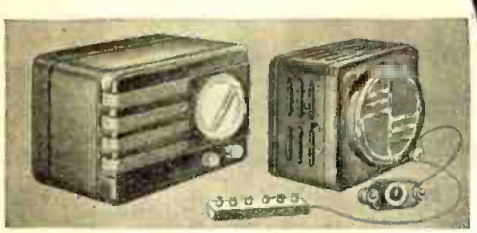
Send for the new months-ahead 1937 Spring ALLIED Radio Catalog! 156 big pages packed with radio's newest developments. Everything in radio that's new, worthwhile and important! More than 10,000 parts; 50 new Knight radios—5 to 19 tubes—for AC, AC-DC, 6-volt, 32-volt, battery and auto operation; complete lines of Amateur transmitting and receiving gear; new Public Address systems; latest test instruments; dozens of Build-Your-Own kits; Rurlpower Generators and Windchargers; books, tools, etc. Everything in Radio for Everyone in Radio—at new low prices!

See the new Knight 11 Tube AC Superhet—Radio's wonder Receiver! Features Automatic Dialing, Tone Expansion, Automatic Frequency Control, metal tubes, world-wide range, beautiful new cabinet, etc.—at an amazingly low price!



"BUILD-YOUR-OWN" KITS

Write for FREE parts lists! We can supply matched kits for building any radio circuit described in this or any other magazine or Handbook. You'll achieve best results when you use ALLIED matched, approved parts. Also—see pages 123-4-5 of the new ALLIED Catalog for other new, low-priced kits, including the "Knight Volume Expander" described in "Radio News" for February 1937.

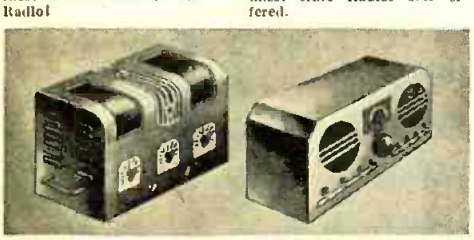


BAKELITE MODELS!

The new ALLIED Catalog features several new plastic receivers—ideal for "companion" or "spare" sets. Available in various attractive colors, they offer real profit-making possibilities. Handsome appearance, strong reception, and fine tone quality make these the outstanding sets in Radio!

NEW AUTO RADIOS

Powerful, sensitive, selective, incorporating the latest improvements in auto radio design, the new Knight Auto Radios offer more for your money than ever before! 6, 7 and 8 tube models, featuring push-button "touch-o-matic" tuning, metal tubes, with 1937 dash mounting panels. The finest Auto Radios ever offered.



NEW SOUND SYSTEMS

See the newly designed Knight Sound Systems—8 to 60 watts—permanent, portable and mobile, for 110 volt, 6 volt and universal operation. Featuring the exclusive "Calibrated Output Indicator", higher fidelity, greater dependability, and beautiful new cases—at new low prices. Here are tremendous money-saving, profit-making opportunities!

NEW AMATEUR GEAR

Join the Daily Hamfest!—see the greater Amateur section in the new ALLIED Catalog! Complete lines of Amateur transmitters, receivers, and transceivers, in factory-built and kit form. See the new RCA-ACR 155, "Sky-Challenger", Utah Add-A-Unit X-mitter, National Oscilloscope, I. P. S. "Rubber Crystal" and many others. Make ALLIED your Amateur Headquarters.

MORE THAN 10,000 PARTS!

The new ALLIED Catalog lists more than 10,000 exact duplicate and replacement parts for repairing or constructing any radio circuit. For standard or special equipment, for every-day or hard-to-get parts you'll find that ALLIED is your "Silent Partner"—ready to serve you faster and better in every way! Every part shown in the ALLIED Catalog is standard, highest quality, tested merchandise, built to deliver long, dependable, customer pleasing service.

FREE

FASTEST SERVICE! LOWEST PRICES

You can buy with confidence at ALLIED—Radios' Leading Supply House! You get what you want when you want it. Our tremendous stocks, our central location, our economical merchandising methods, our super-efficient shipping department mean greater values, faster service and lowest prices for you! Thousands of Radio Dealers, Servicemen, Amateurs and Builders find that they save more time and make more money by ordering from ALLIED. Why shop skimpy, incomplete "radio pamphlets"?—fill ALL your radio needs from the new 156-page ALLIED Catalog—Radio's *Complete* Supply Guide!

SEND FOR YOUR COPY FREE!

ALLIED RADIO CORPORATION

833 W. JACKSON BLVD. CHICAGO

ALLIED Radio Corporation
833 W. Jackson Blvd., Dept. 1-D
Chicago, Ill.

Rush me your new Spring 1937 ALLIED Radio Catalog—Radio's *Complete* Supply Guide.

Name .....

Address .....

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

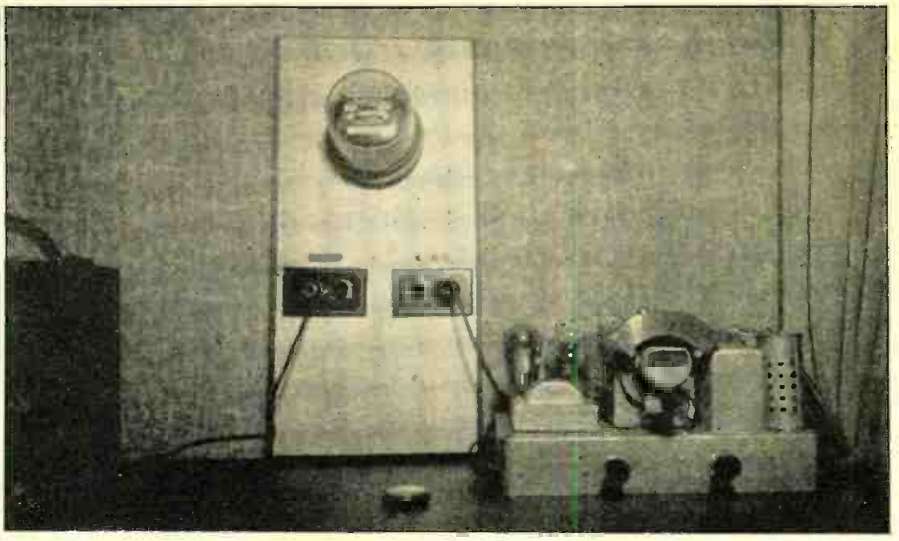


FIGURE 1

The watt-hour meter as a service instrument provides many a short-cut to an accurate diagnosis.

THE SERVICE BENCH

(*Continued from page* 590)

items. We figure it's part of our job to pass these good things on to other servicemen. Let us hear from YOU!)

THE DAY'S WORK

Something a bit novel, but darn sound—and sent to us by Howard J. Surbey of North Canton, Ohio:

Watt-Hour Meter Used as a Service Instrument

"The ordinary watt-hour meter, such as is used to register the current consumption in one's residence, may be used for many tests on radio equipment and other appliances. As the majority of radio sets, and other electrical apparatus, have the power consumed marked in watts on the nameplate, it is a simple matter to arrive at reasonably correct conclusions as to defective equipment by comparing the actual wattage consumption with the nameplate rating. In the case of a radio it is most convenient that this can be accomplished without removing the set from the cabinet.

"By arranging a watt-hour meter on a test board, as suggested in the photograph of Figure 1, and timing one or more revolutions of the meter disk, a simple equation can be applied which will indicate the watts consumed by the radio. Of course, the same results would be obtained with an indicating wattmeter, but the watt-hour meter is much cheaper and will withstand considerable overloads for short periods of time. In the case of the meter illustrated, the left-hand receptacle connects to the line terminals of the meter, and the other to the load, or set. The meter is rated at 10 amperes, 115 volts, 2-wire and 60 cycles.

"Its use in radio servicing is best demonstrated with an actual case. A 7-tube radio, having a nameplate rating of 75 watts, was brought to the laboratory with the complaint of weak reception. After the necessary connections had been made, the radio was turned on, and one revolution of the meter disk was timed with the second hand of a watch. (A black mark is painted on all meter disks for counting revolutions.)

"The equation for any type watt-hour meter to determine wattage is $W = 3600 \times K \times R/S$, where K is the meter constant, R the number of revolutions and S the number of seconds. In using the meter the only matter to predetermine is the disk constant. It is marked on the nameplate of some meters, and on the disk of others. It is designed by the letter K.

"In the case under consideration, $K = 2/3$, and $S = 21$. Substituting in the equation, $3600 \times .66 \times 1/21$ equals approximately 114 watts against a normal consumption of 75 watts. It is logical to suspect a leaky condenser, or some other partial short-circuit in the power circuit. However, before checking for defects, we removed all tubes and repeated the test. The meter disk barely moved—almost too slow to time, which indicated that the power transformer was not at fault. Upon replacing the rectifying tube only, considerably more wattage was consumed than was indicated by the type of circuit. Upon test with an ohmmeter, a filter condenser was found to have a resistance of only 1500 ohms. This was replaced.

"All tubes were replaced, and the wattage again measured, the time for one revolution now being 33 seconds. Using the same equation we have $3600 \times .66 \times 1/33$, or 73 watts, which is close to normal.

"In defective receivers showing less than normal consumption, it was usually discovered that an open-circuit existed somewhere in the power supply—such as a bleeder resistor.

"In cases of intermittent reception, where it is necessary to allow the receiver to operate for some time before the trouble manifests itself, checking the wattage, before and reception stops, will often furnish a clue as to the trouble. That is, the radio is plugged through the watt-hour meter, and when the trouble becomes apparent, the power taken by the receiver may be read without touching the set. This is a highly desirable feature, for the least movement of the receiver will often restore normal reception in these baffling cases.

"One of the chief advantages in this method of testing is that of being able to make a quick and fairly accurate diagnosis without removing the chassis or connecting analyzers. After the watt-hour test, the other test equipment, if necessary, can be applied more intelligently. Another

(*Turn to page* 632)

RCA ALL THE WAY

RCA Radio News

RCA Manufacturing Company, Inc. · Camden, New Jersey
A Service of the Radio Corporation of America

EVERYTHING IN RADIO—MICROPHONE TO LOUDSPEAKER

To the consumer, RCA means high quality performance at low cost . . . To the radio man, RCA means easier selling, higher profits

NEW STREAMLINED "MIKE"!

RCA "Aerodynamic" Microphone combines small size with fine performance!

SPECIFICATIONS:

Type . . . Pressure Operated.
Frequency Range . . . 100 to 6000 cycles.
Impedance . . . 250 ohms.
Average Operating Level —68 db (10 bar signal across open circuit).
Dimensions . . . 2⅝" wide, 3" high, 3⅜" deep.
Net weight . . . 1¼ pounds.
Finish . . . polished chromium.
Cable . . . 6 feet shielded cable.
Stand Fitting Size . . . ⅜" pipe thread.

RCA's new Aerodynamic Microphone, MI-6226 —the pressure operated dynamic type—is small enough to fit the hand, light enough to carry easily, and offers outstanding performance! It is ideal for normal public address work and particularly suited for close talking.

This new "mike", handsomely streamlined, gives excellent frequency response, insuring truly natural tone reproduction and clarity of speech. Its new Alnico permanent metal magnet provides maximum sensitivity and extra long magnet life. In addition, it makes the use of external excitation or power unnecessary.

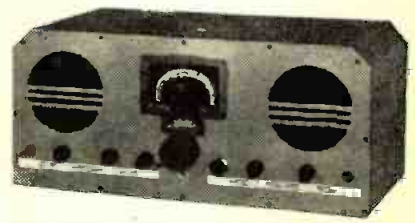
Besides these features, the RCA Aerodynamic Microphone also offers many others, listed below for your convenience. Look them over. They'll convince you that there's plenty of microphone quality packed beneath the attractive chrome covering!

NOTE THESE FEATURES!

• Small size • Light Weight • High Sensitivity • No external excitation of power supply required • Rugged construction—insensitive to mechanical vibration.

• Unaffected by changes in temperature, humidity or barometric pressure • May be operated at distances up to 1000 feet from amplifier • Excellent for close talking • Practically non-directional when faced vertically • Minimum response to wind • New Alnico metal magnet—retains magnetism indefinitely.

List Price, $26.50



ACR-155 . . . New, Low-Cost General Purpose Communications Receiver
Amateur's Net $74.50 f.o.b. factory

2 RCA Amateur Receivers Answer Price and Performance Problems!

This receiver brings superior performance under modern operating conditions—yet sells at exceptionally modest cost! A number of its features are not to be found in other receivers costing so little. The outstanding features include continuous frequency coverage from 520 to 22,000 kcs . . . 9 Metal RCA Radiotrons for improved high-frequency performance . . . improved, large tuning knob with crank handle for easy tuning . . . 100 to 1 band spread tuning drive . . . improved, adjustable, air-dielectric trimming capacitors . . . magnetite-core i-f transformers . . . calibration-spread dial for accurate logging . . . electrically stabilized oscillators.

ACR-175 . . . New, Multi-Feature Communications Receiver . . . An Outstanding Value!
Amateur's Net $119.50 f.o.b. factory

This excellent instrument presents a combination of advanced features not even found in receivers selling at much higher prices!

Its keen selectivity, plus a specially designed crystal filter, makes separation of interfering stations easy—even in the most crowded amateur bands.

Among its 32 performance features is an unusual tuning range—500 to 60,000 kcs.—giving coverage of many services unreached by other communications receivers. Has 11 tubes, two stages of high-gain i-f amplification and a smooth-handling, single control band spread system for easy tuning and accurate logging without use of reference points.

Convert Your Radio Into Phonograph-Radio at Low Cost!

You can do it with the smart RCA Victor Record Player illustrated here! This fine instrument easily and quickly attaches to any electrically operated radio and in a jiffy turns it into an electric phonograph-radio combination! With it, you can hear all your favorite radio programs PLUS recorded music!

Its small size means you can conveniently place it in any small place. And it's yours for less than $20, in a fine walnut finish. Or you can get it in red, black or ivory for just a few dollars more.

RCA Victor also offers great values in new, 1937 radios! There are many new models and prices, plus a fine array of performance features including Magic Voice, Magic Brain, Magic Eye, Metal Tubes. And in addition—with an RCA Victor set you enjoy the extras of radio that's RCA ALL THE WAY—instruments created by the same men who build big broadcasting studios! Hear these new radios today. Their beautiful cabinets will more than please you. Easy C. I. T. time payments.

LATE NEWS FLASH!

1936 RCA Metal Tubes Sales Double Those of 1935!

Extra quality of RCA Tubes boosted 1936 sales to double the millions sold in 1935.

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 61—Filters

A SIMPLE type of high-pass filter is shown in (A) of Figure 1. The high-frequency current passing through the circuit encounters very little impedance from the series condenser, but encounters a high impedance in the inductance, so not much is shunted. The low-frequency currents attempting to pass through, however, encounter high impedance in the condenser and are easily short-circuited out by the inductance—none of them, therefore, getting through. The action of this type of filter is shown at (B). Notice that the low frequencies are cut off and the high frequencies are passed through. At (C) is shown a single section T-type high-pass filter.

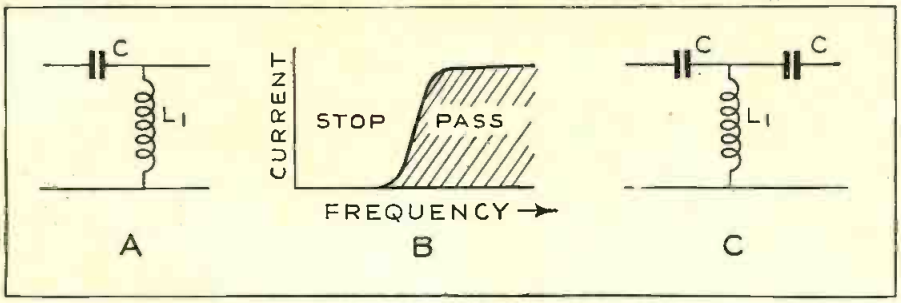


Figure 1. (A) A single section high-pass filter. (B) Transmission characteristic of a high-pass filter. (C) Single section T-type high-pass filter.

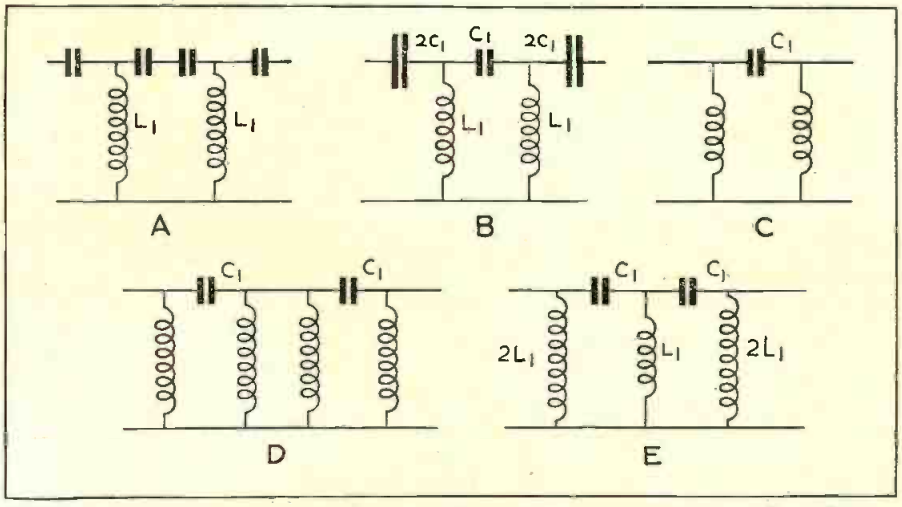


Figure 2. Various arrangements of T and "Pi" section high-pass filters. (A) and (B) 2-section T-filters; (C) single section "Pi" filter; (D) and (E) 2-section "Pi" filter

condenser notations in accordance with those used in discussing low-pass filters, the equivalent inside condenser is called C_1. Each outside condenser then has a value of $2C_1$ as shown at (B). Therefore in T-type high-pass filters, the end capacitances are *each twice* the capacitance used in the repeating sections, since the latter is the sum of two section-capacitances in series.

At (C) is shown a "pi" type single-section high-pass filter. When two or more such sections are joined together as at (D), we have two similar inductances in parallel with each other at the center. These may be considered as being replaced by a single inductor L_1 having half the inductance of either one. Therefore the outside inductors are each equal to $2L_1$.

At (A) of Figure 2 we have two single-section T-type filters joined to make a 2-section unit. The part of the circuit between the two chokes has two similar condensers in series. They may be replaced by a single condenser C_1 having half the capacitance of either one. To keep our Thus in a multi-section "pi" type high-pass filter, each end inductance is twice the inductance used in the repeating sections, since the latter is the sum of two section inductances in parallel. Here again, the larger the number of sections, the more perfect is the cut-off.

The 25L6 Tube

NEW YORK, N. Y.—A 25-volt beam-power amplifier tube, suitable for a.c.-d.c. sets has been announced by RCA. This tube has the customary filament drain of .3 ampere. Its maximum output in Class A service is 2.2 watts with 110 volts applied to plate and screen.

The 6A5G

Sylvania has announced a new glass tube with octal base, type 6A5G. The tube is similar in characteristics to a 2A3, but it has a 63-volt heater and a cathode. The cathode is connected to the center of the filament inside the tube and is also connected to a base pin.

MALLORY-YAXLEY

Precision Radio Replacement Parts Cost No More Than Ordinary Products

Is this a SURPRISING STATEMENT to you? Well, it's true and you can prove it for yourself!

"Mallory-Yaxley leadership", said a service man some time ago, "has certainly done more for the man in my profession. It has given him universal replacement with dependable products—easier, surer methods of installation—smaller stocks—and accurate service and replacement information. I'd like to use more Mallory-Yaxley products but *I have to watch my prices!*"

Yet the very thing he said he *had to do* was the very thing he *hadn't done!* He hadn't watched his prices—he hadn't made comparisons—he didn't know that Mallory-Yaxley Precision Radio Replacement Parts with all their quality, with all their prestige, *cost no more than ordinary products.*

But he proved it for himself—just as you can prove it for yourself! He got out his catalogs and checked condensers price for price! He turned to vibrators and checked them price for price! He did the same with volume controls!

Perhaps *you* think that a company big enough to publish the Mallory-Yaxley Radio Service Encyclopedia charges more for its parts than you can afford to pay. Perhaps you feel that a company big enough to provide all the help that Mallory-Yaxley has provided, does provide and will continue to provide must charge at least a little more than ordinary replacement parts can be purchased for. If so—check prices and make comparisons. You'll be surprised and pleased!

And after you've used Mallory-Yaxley Replacement Parts awhile you'll find they insure customer satisfaction to such an extent that they actually *cost less in the long run.*

The Biggest Help A Service Man Ever Had

Ask the Mallory-Yaxley distributor about *your* copy of the MALLORY-YAXLEY RADIO SERVICE ENCYCLOPEDIA which gives complete, authoritative information on *all* repairing of *all* sets!

Use P. R. MALLORY & CO. Inc. MALLORY REPLACEMENT CONDENSERS...VIBRATORS

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
CABLE ADDRESS—PELMALLO

Use YAXLEY REPLACEMENT VOLUME CONTROLS

QRD? QRD? QRD?

CONDUCTED BY GY

WELL, gentlemen of the glass wrist, ye scribe has been at the scene of all the commotion going on out on this coast west of the Rockies. The seamens' strike filtered into the ranks of the radiops and the echo actually became action, with the results you already know.

THE general strike which was called a few months ago was aided by intermittent sympathy strikes on the East Coast and gulf ports as the ARTA was one of seven unions forming the Maritime Federation of the Pacific. They went out on strike when it was called by Mr. Bridges, who is well known in shipping circles out on this coast, but we have not been able to find any operator who was asked whether he favored the strike or not. Of course, being members of a closed federation, it goes without saying that the will of the majority will be done as against the few who may decide otherwise.

ARTA, in line with other organizations, is making some demands—a wage of $125 per month on lumber schooners instead of the $100 now being received. In regards to benefits, there are the usual demands, with nothing drastic added and there is no doubt but the demands will be met. Much padding and hullabaloo has been written by publicists in regards to the strike movement—scandal—speeches from both sides are obscuring the real issues and at the present writing there have been many meetings of delegates and arbitrators for both sides and the sum total has been nil.

Merv Rathborne of the San Francisco local of the ARTA is also secretary of the San Francisco local of the Maritime Federation. Jordan of the San Pedro local is also secretary of the same local for the Maritime Federation and both of these men have been receiving salaries from each during the strike. No so bad, eh what! We cannot suggest that these men drop their ARTA salary as they *are* doing both jobs and should be paid accordingly. Or is the workman worthy of his hire? But we can and do advise that some one but put in an acting capacity until either of these men come back to their former duties with clear minds on one job.

Jordan and Rathborne are being quoted by the press as working towards a *vertical union* on the order of CIO and for these same tactics Lewis was suspended by the American Federation of Labor and Harry Bridges was let go by Ryan. ARTA is a *craft union* and the legitimacy of paying a man out of craft funds when he is an advocate of a vertical industrial union is, to say the least, questionable. We will not enter into a controversy over the merits of craft versus industrial unions, as both have their individual merits. Perhaps in other fields of work one may fit more perfectly into the scheme of things than the other. We simply record the facts and developments and let the "radiop" reader judge as he will. The fact does remain that ARTA members in Marine employment favor a vertical union on the order of Maritime Federation, which comprises all seamen and dockworkers. If this should happen, the ARTA then would handle only the land jobs and may lose the bulk of their roster to the seamen's union. This situation is really worthy of deep thought, for it marks the cleavage of opinion and work that has been going on for the past six years.

In 1936 Rathborne and Jordan said an operator must make up his mind as to whether he desired sea duty or shore duty, because he couldn't do both. This strike has done some real good, as it has made the radiops question their leadership and policy. And when radiomen start in to talk and discuss and "cuss," there may be progress. Right now the boys are discussing the Peoples Press as their voice and the assignment lists could use a bit of thought, as mediocre men are placed on the same level as the capable, and we do know that some are better and more intelligent than others.

Our buddies may wonder what a picture of a golf game is doing in our heading this month. The answer is, it shows operators of the Marconi Television, London, broadcasting a television version of a golf game to London's lookers and listeners-in. A new field for "ops."

Steamship companies are rushing the purchase and installation of equipment to comply with the radio laws of the Federal Communications Commission in remodernizing old Xmtrs and receivers and in putting in complete new jobs so as to be able to pass inspection. This, of course, will create more jobs and with this influx of work radiops should be getting real wages because of the new openings. We expect this to continue for quite a few years and from present observation, the depression is something of the past.

And now we have the ACBT, or, in

language more easily understood, the Associated Columbia Broadcast Technicians. The WABC local of this organization recently wrote us about its election of officers. To quote from our good friend Charley Kleinman, who is secretary of the organization, "This group is the local of the ACBT which was formed some three years ago in desperation when it was realized that there was at that time no organization which filled the bill for broadcast engineers. Although at the present time only CBS men are eligible for membership, it is in no sense a company union and has gained a great deal for the membership. While the plans for future activity in the field are still quite nebulous, we are keeping a careful ear to the door and will hardly be left behind in any new developments within the broadcast industry." And may we say "Good luck!" to the organization and its new officers and we hope to be hearing from you again for the benefit of all broadcasters.

Through the courtesy of the CREI, we quote the following: "C. T. Lingo, Eastern Airlines Chicago station, recently resigned to accept another position in Savannah, Ga. Passed through Jacksonville on a night plane and said 'howdy' to me (Delery Freret). The joke is on him! Effective Nov. 1st EAL operators get the following pay scale: $125 for three months probation and then $135 with corresponding increases for other than junior operators. Service is counted at $5 extra for each year up to four years. Maximum possible pay is about $180. EAL needs several 35 WPM operators."

Across our desk comes one from far-off Siam—that spot that was put on the map sometime ago by the King and Queen of that distant country who came here for an operation on the King's eyes. S'funny the great distances that this RADIO NEWS mag. does travel and is read from cover to cover by those now-foreigners who were former American radiops but who now have soft billets with American concerns in far-off lands. And it is more than fitting that we should make an effort to locate an old buddy of our correspondent, Allen Bassett, who, he says, has been sailing out of New York for some years past. His name is William Leipert, and if any of you boys and girls can find him, kindly have him get in touch with this department. Bassett has entrusted to our care a letter to be forwarded to Leipert and we shall hold the same in safekeeping until we locate him. And as this is our good deed for the day, we'll blow off with a 73 . . . ge . . . GY.

Radio Parts Trade Show

NEW YORK, N. Y.—The first exhibition of the Radio Parts Manufacturers National Trade Show will take place at the Stevens Hotel in Chicago, June 10 to 13 of this year. The management of the show announced that a total of 100 booths has already been reserved and that the facilities of the hall might prove inadequate to accommodate all participants.

Treasure Island 1939

SAN FRANCISCO, CALIF.—In 1939 the Golden Gate International Exposition will be held at San Francisco, the exposition is to stress communication, transportation and recreation. Where Chicago and New York went to the trouble of erecting several buildings for the purpose, California goes them one better and will create an artificial island in San Francisco Bay. A series of broadcast programs in this connection is being sponsored by the Owl Drug Company; the title of the series will be "Treasure Island."

The Navy Net

(*Continued from page* 584)

application form and take a physical examination at District Headquarters, any Naval Recruiting Station, or regular Navy establishment to which a medical officer is attached.

The Naval Communication Reserve is administered by the Commandant of each Naval District, subject to the rules and regulations of the Bureau of Navigation.

To provide training for those reservists who desire to undertake it, a communication organization is maintained, in each Naval District, and a reserve officer is designated as Naval Communication Reserve Commander. The District is divided into Sections, and the Section further divided into Units. After an application has been received, the applicant will be notified when and where to report for physical examination.

Each Naval District has a Master Control Station with naval call letters. Many Section Headquarters are equipped with radio transmitters and the organization contemplates that all Section Headquarters will have such transmitters. Regular drill in naval procedure is carried on through the use of these transmitters. and those members of the Communication Reserve who volunteer for this training receive this drill with their own receiving sets. In localities where a number of Communication Reservists are available, it is practicable to form Units for instruction and drill. This has been accomplished in several instances and the results have been most gratifying. Unit and Section Commanders are appointed who possess high-frequency transmitters and receivers (for the 80- and 5-meter bands) in order that Units may be drilled by their own Commanders.

Active Duty: If the total allowed quota of reservists for training on a pay status in any Naval District is not filled, the Commandant may, upon the request of individual Naval Reservists, after the approval of the Bureau of Navigation has been obtained, order them to active duty with pay for fifteen days either on a naval vessel or at other designated naval establishments such as naval radio stations, direction-finder stations, aviation bases, etc. During the summer months whenever the appropriation permits, periods of training duty for fifteen days with pay are authorized for a limited number of members of the Naval Communication Reserve, and such duty is assigned to those applicants requesting it who are considered the most deserving by the District Communication Officer from their interest and activity in Naval Communication Reserve matters. When this annual training duty is available, all members are notified. The Commandant is further authorized to grant active duty without pay throughout the year to those reservists who request such duty. All duty, whether with or without pay, is assigned only at the request of the individual reservist in each case. It is in no sense obligatory but, on the contrary, a distinct privilege.

Requirements after Enlistment: Volunteer Reservists are not required to take training cruises or to attend drills or to perform any duty whatever in time of peace. Their interest in such activities must be of their own volition, and for this reason the *esprit de corps* is necessarily of the highest type. Discharge from the Reserve prior to the expiration of the four-year enlistment period will be granted by the Commandant at any time upon request, as described above. The only obligation is to obey the call of the President of the United States in time of war or national emergency.

RADIO COMPASS BEARINGS

Lt. Comdr. A. L. Wyckoff, U.S.N.R., of the Third Naval District, shows how radio compass bearings are used to accurately locate the position of a ship at sea

Pay: Volunteer Reservists receive no pay in time of peace unless ordered to duty in accordance with their own request, as described above. In that event, they receive the same pay and allowances of the officers and men of the same rank or rating in the regular Navy. If ordered to active duty, transportation is paid from home to ship or station, and return.

The Navy Department sends regularly printed matter on communication subjects which are of especial interest to all Communication Reservists.

Among the many benefits, privileges and opportunities enjoyed by members of the U. S. Naval Communication Reserve are the following:

1. Identification with the United States Naval Service.
2. Temporary training duty of two weeks yearly with pay at a Naval Radio shore station or aviation base, or a two week's cruise if and when funds permit.
3. The opportunity to learn Navy Radio Procedure and communication methods.
4. Interesting weekly drills by radio.
5. Advancement in rating when properly qualified.
6. A certificate from the Secretary of the Navy for those officers and men who own amateur radio stations, which certificate authorizes participation in the Naval Reserve radio drills.
7. Copies of the following publications are supplied:
   - Monthly bulletins of the Navy Department.
   - Monthly Naval Communication Reserve Bulletin of the Naval District in which located.
   - Weekly Drill Reports.
   - Communication Instructions, U. S. Navy.
   - U. S. Navy Handbooks, boat books, manuals, etc.
8. The opportunity to acquire scientific knowledge along the lines of a hobby which can be followed at home.
9. The opportunity to learn Morse Telegraphy for those whose locations permit their attendance at evening classes at Headquarters.
10. The opportunity through liaison with the American Red Cross as well as the Navy and Naval Reserve communication systems to perform valuable service in time of local emergency.
11. New friendships and new contacts with men interested in the communication field.

Applications for membership and requests

for any further information should be sent to the Commandant of the district in which the applicant lives as shown in the table below:

No. of District	States and Counties	Headquarters
1	Maine, New Hampshire, Massachusetts, Rhode Island (including Block Island and Nantucket Light).	Boston
3	Vermont, Connecticut, New York, northern part of New Jersey, including counties of Mercer, Monmouth, and all counties north thereof.	New York
4	Pennsylvania, southern part of New Jersey, including counties of Burlington, Ocean, and all counties south thereof; Delaware, including Winter Quarter Shoal Light Vessel.	Philadelphia
5	Maryland, West Virginia, North Carolina, Virginia.	Naval base, Hampton Roads.
6	South Carolina, including Frying Pan Shoals Light Vessel, Georgia.	Charleston, S. C.
7	Florida, except counties west of Apalachicola River.	Charleston, S. C.
8	Florida, counties west of Apalachicola River, Alabama, Tennessee, Louisiana, Mississippi, Arkansas, Oklahoma, Texas.	Charleston, S. C.
9	Ohio, Michigan, Kentucky, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas.	Great Lakes, Ill.
11	New Mexico, Arizona, southern part of California, including counties of Santa Barbara, Ventura, Los Angeles and San Bernardino and all counties south thereof.	San Diego
12	Colorado, Utah, Nevada, northern part of California, including counties of San Luis Obispo, Kern, Inyo, and all counties north thereof	San Francisco
13	Washington, Oregon, Idaho, Montana, Wyoming, Alaska.	Seattle
14	Hawaiian Islands, and islands to westward, including Midway.	Pearl Harbor
15	Panama Canal Zone.	Canal Zone
16	Philippine Islands.	Cavite

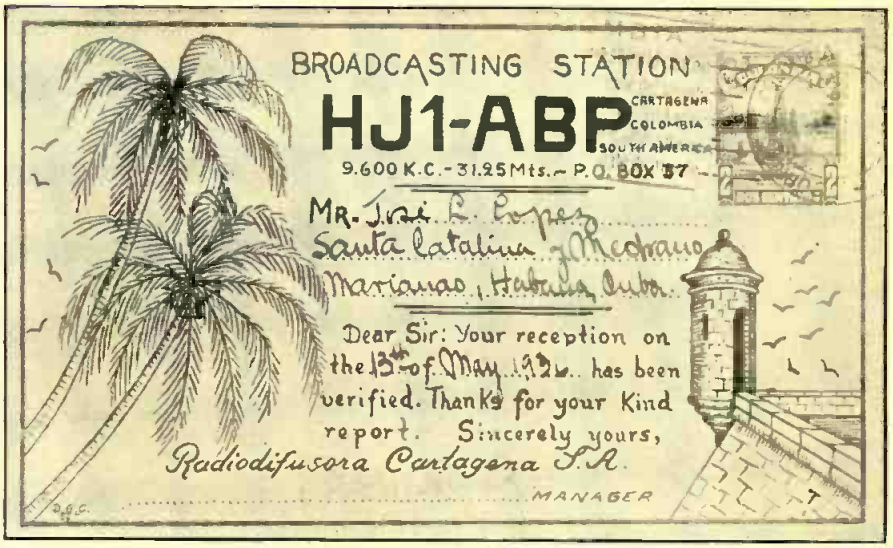
REFERENCES:

1 "Instructions and notes for guidance in Organization, Administration, and Training of the United States Naval Communication Reserve"

2 Remarks by Lieut. Cmdr. W. J. Lee, U. S. Naval Reserve, Bureau of Navigation Conferences, Nov., 1936.

3. General information regarding Navigation Communication Reserve, issued at the Third Naval District.

4. Navy regulations, Chapter 41.



The DX Corner (Short Waves)

(*Continued from page 610*)

XEPM, Piedras Negras, Mexico, 740 kc. (Dahm).

XEUW, Vera Cruz, Mexico, 6020 kc., until 11:30 p.m. (Alfred).

XEFT, Vera Cruz, Mexico, 6120 kc., Saturday at midnight (Bower, Gallagher). Slogan: "La Voz de Vera Cruz."

ZEBN, Mazatlan, Mexico. 15360 kc., frequently (Gallagher).

XBA, Tacubaya, Mexico, 6990 kc., until 11 p.m. (Gallagher).

CENTRAL AMERICA

TGWA, Guatemala City, Guatemala, 9450 kc., schedule 11 a.m.-2 p.m., 8-12 p.m., Sunday 1-6 a.m. (Alfred, Markuson, Shamleffer, Bird). Slogan: "Radiofusora Nacional."

TG2X, Guatemala City, Guatemala, 5940 kc., irregularly (Alfred, Shamleffer, Gallagher).

TGW, Guatemala City, Guatemala, 9540 kc. (Leutenberg).

TG1X (?), Guatemala City, Guatemala, 9430 kc., 6-9 p.m. (Gallagher).

TI4NRH, Heredia, Costa Rica, 9670 kc., signs at 10:02 p.m. (Dressler, Shamleffer).

TIPG, San Jose, Costa Rica, 6410 kc., Thursday 10 p.m. (Sahlbach); daily 7-11 p.m. (from ann.) (Anca). Slogan: "La Voz del Radio Victor." Address: P. O. Box No. 255.

TI8WS, Puntarenas, Costa Rica, 7550 kc., nights at 7 p.m. (Sahlbach).

YNVA, Managua, Nicaragua, 8590 kc., schedule 12-1:30 p.m., 6:30-9 p.m.; call changed to YNLG (from veri.) (Alfred).

YNOPB, Managua, Nicaragua, 5760 kc., daily 7-10:30 p.m. (from ann.) (Alfred).

YNOP, Managua, Nicaragua, 5760 kc., as late as 10 p.m. (Partner, Ralat).

YN1GG, Managua, Nicaragua, 6580 kc., amateur and broadcast (Leutenberg); (from ann.) (Betances). Slogan: "Voice of the Lakes."

YNAN, Managua, Nicaragua, 7200 kc., evenings (Owen); 7350 kc., 9 p.m. (Ralat).

YNLF, Managua, Nicaragua, 9650 kc. (Jensen); heard best 7-8:15 p.m. (Sahlbach).

HP5J, Panama City, Panama, 9605 kc., 6-10 p.m. (Ralat, Leutenberg, Shamleffer).

HP5B, Panama City, Panama, 49.75 meters, 8 p.m. (Coover); 9590 kc. (DeLaet); eight-note chime and roar of motor (Beck); 6030 kc. (Kemp).

HP5K, Colon, Panama, 6000 kc., 7 a.m. (Eder).

SOUTH AMERICA

HJ3ABD, Bogota, Colombia, 6050 kc., 7-11 p.m., Sunday 5-9 p.m. (Ralat, Shamleffer, Gallagher).

HJ3ABX, Bogota, Colombia, 6122 kc., 6-11 p.m. (Ralat, Shamleffer); daily except Sunday 10:30 a.m.-2 p.m., 5:30 p.m.-11 p.m., Sunday 6-11 p.m. (Rudolph, Foshay). Slogan: "The Voice of Columbia." Address: Box No. 2665.

HJN, Bogota, Colombia, 6080 kc., signed at 11 p.m. with organ selection (Alfred, Hartman, Shamleffer, Beck); 5970 kc. (Sahlbach); 7-10 p.m. (Kemp).

HKE, Bogota, Colombia, 7405 kc. (Zarn).

HJ4ABH, Armenia, Colombia, 9525 kc., 7 p.m. (Ralat); 8-9 p.m. (Stabler); 7-10:30 p.m. daily (Dressler, Bower, Atherton); daily 8-11 a.m. (Markuson, Shamleffer, Rudolph, Sahlbach, Gallagher). Slogan: "La Voz de Colombia," "The Voice of Armen."

HJ4ABL, Manizales, Colombia, 6065 kc. (Leutenberg).

CARTAGENA VERIFIES!

This is the friendly verification of HJ1APB, received by Jose Lopez of Habana, Cuba, and submitted to RADIO NEWS *for publication.*

HJ4ABB, Manizales, Colombia, 6110 kc., 7-9 p.m. (Shamleffer, Sahlbach, Styles, Gallagher). Slogan: "La Voz de Manizales."

HJ4ABD, Medellin, Colombia, 5900 kc. (Leutenberg).

HJ4ABP, Medellin, Colombia, 6030 kc., schedule 8 a.m.-9 p.m. (from veri.) (Bower, Shamleffer). Slogan: "Emisora Philco."

HJ4ABQ, Medellin, Colombia, 1320 kc. (from veri.) (Bower).

HJ4ABA, Medellin, Colombia, 9520 kc. (Shamleffer); 11810 kc., 6:30-10:30 p.m.

HJ1ABB, Barranquilla, Colombia, 9555 kc., 4:30-10 p.m. (Ralat, Shamleffer).

HJ1ABG, Barranquilla, Colombia, 6042 kc. (Alfred, Shamleffer, Gallagher). Slogan: "Emisora Atlantico." Address: P. O. Box No. 445.

HJ1ABA, Barranquilla, Colombia, 9550 kc., with HJ1ABB (Shamleffer).

HJ1ABE, Colombia, 31.58 meters, 7:15 p.m. (Wideman, Coover); 6-10:30 p.m. daily (Dressler, Leutenberg); 9500 kc., daily 11:30 a.m.-1 p.m. (from veri.) (Shamleffer, Partner, Jensen, Foshay, Ralat, Atherton, Gallagher). Address: P. O. Box No. 31.

HJ1ABJ, Santa Marta, Colombia, 6025 kc., daily except Wednesday 6:30-10:30 p.m. (Ralat).

HJ1ABH, Cienaga, Colombia, 6275 kc. (Leutenberg).

HJU, Buenaventure, Colombia, 9510 kc., Saturday 8:10 p.m. (Dressler, Kemp).

HJ2ABC, Cucuta, Colombia, 31.30 meters, 7 p.m. (Coover); 9570 kc. (Stabler); daily 11 a.m. to noon, 6:30 p.m.-9:30 p.m. (Dressler, Gallagher).

Pereira, Colombia, 9520 kc., strong signals (Shamleffer).

HE'S ON HIS TOES!

Yes sir! Herman Ruppert, Official Observer for New York, keeps the old phones busy with short-wave reception from all over the world.

VP3MR, Georgetown, British Guiana, 5990 kc. (Shamleffer); Monday 5-6 p.m., Tuesday 8-9 p.m. (Stabler); 6010 kc., Sunday 7:45-10:15 p.m., week days 4:45-8:45 p.m. (from veri.) (Arickx). Slogan: "The Voice of Guiana."

VP3BG, Georgetown, British Guiana, 6140 kc., signing at 6:10 p.m. (Shamleffer); working 20-meter amateurs (Atherton, Bird).

CB710, Santiago, Chile, 12400 kc., daily 6-9 p.m. (Gallagher).

PZ1AA, Paramaribo, Dutch Guiana, amateur and broadcasting, 14000 kc. (Leutenberg).

PSH, Rio de Janeiro, Brazil, 10220 kc. (Jensen).

CP6, La Paz, Bolivia, 9120 kc., 6:30 p.m. (Gallagher).

YV1RH, Maracaibo, Venezuela, 6360 kc. (Alfred, Ralat, Leutenberg, Bower, Shamleffer); relays YV1RF, "Radio Philco" (Partner, Atherton); off air on Sunday, sign at 10:40 p.m., clock strikes hours (from veri.) (Horwath, Sahlbach, Kentzel, McDowell, Atherton); relays YV1RG (Kilton, Kemp, Gallagher); daily 7-11:15 p.m. (from veri.) (Anca, McDowell). Slogan: "Waves of the Lake." Address: P. O. Box No. 261.

YV15RV, Maracaibo, Venezuela, 5775 kc., 12:30 a.m.-2 p.m., desires reports (Alfred, Craston).

YV1FRA, Maracaibo, Venezuela, 6360 kc. (from ann.) (Klaassen). Address: P. O. Box No. 461.

YV7RMO, Maracaibo, Venezuela, 6070 kc., call changed to YV1RP (Gallagher).

YV1RS, Maracaibo, Venezuela, 1120 kc. (Horwath). Address: P. O. Box No. 261.

YV5RMO, Maracaibo, Venezuela, 5850 kc., daily until 10 p.m. (Markuson); announced as YV1RA and YV1RB (Foshay, Anca, Kemp, Gallagher). Slogan: "Ecos de Zulia."

YV4RC, Caracas, Venezuela, 6375 kc., testing 11:15 p.m.-12:40 a.m. (Alfred, Shamleffer); desires reports (Ralat, Atherton, Foshay). Slogan: "Ecos del Caribe." Address: P. O. Box No. 982.

YV3RA, Caracas, Venezuela, 50.5 meters, Saturday 8-9 p.m. (Smith).

YV5RV, Caracas, Venezuela, 6270 kc., 6:30 p.m. (Shamleffer, Eder). Address: P. O. Box No. 508.

YV5RP, Caracas, Venezuela, 6270 kc. asked for reports (Leuth); until 7 p.m. (Piorko, Gallagher). Address: P. O. Box No. 508.

YV5RT, Caracas, Venezuela, 6270 kc., 6:15-8:30 p.m. (Dressler). Address: P. O. Box No. 508.

YV9RC, Caracas, Venezuela, 6400 kc., 7-9 p.m. (Ralat); no schedule on veri. (Atherton).

YV1ORSC, San Cristobal, Venezuela, 5720 kc., 6-11:30 p.m. (Ralat); 5710 kc. (from veri.) (Foshay); call changed to YV2RA (Gallagher). Slogan: "La Voz del Tachira."

YV1RG, Valera, Venezuela, 6350 kc., until 7 p.m. (Partner). Slogan: "Radio Valera."

YV15RV, Valencia, Venezuela, 50.76 meters, 8:30 p.m. (Smith).

YV12RM, Maracay, Venezuela, 7300 kc. (Leutenberg); 6300 kc. (Shamleffer, Atherton); 8-10 p.m. (Ralat); call changed to YV4RD (Gallagher).

Radio Valencia, Valencia, Venezuela, 5930 kc., no English announcements (Alfred).

LSY3, Monte Grande, Argentina, 18110 kc., testing with music (Lawton).

LSN2, Buenos Aires, Argentina, 9890 kc., desires reports, 8:25-9:10 p.m. (Alfred, Black); 10350 kc. (Bower, Shamleffer).

HC2JSB, Guayaquil, Ecuador, 7850 kc., 7-11 p.m. (Alfred); 8754 kc. (Ralat, Dressler, Kemp).

HC2RL, Guayaquil, Ecuador, 45 meters, 8 p.m. (Coover, Shamleffer); 6638 kc., Sunday 7:45 p.m., Tuesday 9-11 p.m. (Ralat, Kemp).

HC2CW, Guayaquil, Ecuador, 8404 kc. (Leutenberg), daily 11:30 a.m.-12:30 p.m., 7-11 p.m., Sunday 3-5 p.m. (Foshay). Slogan: "Ondas del Pacifico."

HCJB, Quito, Ecuador, 4107 kc. (Leutenberg); 8948 kc., on both frequencies at 10 p.m. (Kentzel).

OAX4D, Lima, Peru, 5780 kc., schedule Wednesday and Saturday 9-11:30 p.m. (Alfred).

OAX4J, Lima, Peru, 9300 kc., daily 6-11:30 p.m. (Kentzel). Slogan: "Radio National."

OAX0A, Lima, Peru, 9650 kc., week days 6:30-11:30 p.m., Sunday 7:30-11:30 p.m.; three-note chime used (Sahlbach). Address: Box No. 116.

OAX1A, Peru, 6170 kc., 8-11 p.m. (Gallagher). Address: P. O. Box No. 9.

OAX5A, Oci, Peru, 11800 kc., irregularly 7-9 p.m. (Partner). Slogan: "Radio Oci."

Readers Who Are Awarded "Honorable Mention" for Their Work in Connection with This Month's Short-Wave Report

Eddie C. Zarn, Earl G. Marshall, Howard G. Kemp, Ray W. Sahlbach, Manuel Betances, Harry E. Kentzel, Keith Kilton, Walter Lorvig, Harry Lueth, L. C. Styles, Jorge Ralat, Augusto Anca, Ben B. McDowell, Paul C. Bird, Edgar J. Vassallo, Arthur Leutenberg, Werner Howald, Li Chiang, Peyton Black, M. J. Mackuson, Fred W. Alfred, Harold J. Seif, Edward De Laet, Walter Bishop, E. W. Turner, Caleb Wilkinson, Fred Smith, Elmer Samson, Ralph Dahm, A. M. Rheiner, Paul Wirtz, Morton D. Meehan, Fred W. Alfred, Bill Klaassen, Arthur B. Coover, Robert Vincent, Anderson F. Foosa,

A. Kosynsky, Thomas P. Jordan, Bill McNeill, W. H. Ison, Floyd M. Murphy, National Radio Service, G. C. Gallagher, Richard V. Brian, Rene Arickx, Joseph Rudolph, Arthur Immicke, Morgan Foshay, Clair Van Meter, George R. Lang, Gordon Schulze, W. J. Stillman, James Walsh, Jr., W. W. Wise, Dalton J. Downing, Don Parsons, James J. Clancy, R. Willmott, Virgil L. Gossett, Ephraim E. Orrell, Jr., Glenn Hehner, Wm. S. Brannan, Fred Atherton, Kenneth Dressler, R. F. Shamleffer, Caleb Wilkinson, Leon Stabler, P. Piorko, N. C. Smith, Louis J. Horwath, Fletcher W. Hartman, J. Wendell Partner, M. J. Karkuson, Harold W. Bower, Rudolph Kure, L. M. Jensen, E. Scala, Jr., Frank Andrews, Elmer Duncan, James J. Doyle, Jr., Donald B. Drynan, Paul Ridenour, Robert Wetmore, A. Blakebrough, W. Beard, Renato Brossa, H. Sargent, Roy Pickens, Dewey Fowler, Peter D. Masganas, Jack Quintrell, Peter Bojarski, Andrew J. Maroncy, Jr., Arvel Harris, Milton Horstman, Philip S. Cincelett, William Homer Wesley, Morris Harwood, Gerold W. Brown, J. S. Chokan, Jr., Elmer C. Chandler, Marvin Pylute, Wm. T. Murray, James Doyle, Lee Chaney, Fred Karpen, Jack H. Brown, D. Skipworth, H. R. Butters, Grace M. Beck, Wilbur Croston, Kenneth Mochrie, William M. Neill, Abraham Sutker, F. W. Dodge, Morgan Foshay, Erroll R. Birnie, C. R. Wilson, Albert Emerson, Joe Novak, Reene Owen, Lionel White, Thomas Hose, John P. Gawel, M. C. Bostick, George B. Flint, C. Rogers Wells, Jr., James Rubard, James Fitzwilliam, Michael Hedgeland, R. J. Abbott, Albert Brogle, Jr., A. Petitjean, Carl & Anne Eder, Joseph E. Soos, Lloyd Davenport, Jack Young, Harry J. Potthoff, Arthur J. Plouff, John L. Tate, John J. Stoika, Jr., Richau Lent, Norman E. Weshman, Doc Davis, George C. Atkins, Dick Stevenson, Joseph Daeger, Billinghurst, Robert G. E. M. O. Godee, Dale Strong, E. J. Wacker, J. Ruiz, Joseph Brown, Jr., W. E. Widerman, Harold E. Lindner, Manfred Johnson, Bob Davis, Ruben M. G. Garcia.

OBSERVER FOR NEW JERSEY

Hello fellows! I am serious in wishing you all "Best DX on the short-waves" but I am not always as serious looking as this picture would seem to indicate.

Sure-Fire M.O.P.A.

(*Continued from page* 599)

components which are not a part of the r.f. circuit as far from the "hot" parts as possible.

Jacks for reading the plate current of the oscillator, the grid current of the amplifier and the plate current of the amplifier are mounted on the front panel. A switch for cutting off the plate circuit is mounted at the left of the front panel. The two porcelain bushings at the rear of the chassis provide connections for the modulation transformer secondary.

Coils for the transmitter are very important. Their size and location were found to make a tremendous difference in the efficiency of its operation. The oscillator grid coil has 6 turns of No. 12 tinned copper wire and is 1 inch in diameter. The cathode tap is brought off exactly 1 turn from the grounded end of the coil. The position of this tap is rather critical. It is suggested it be varied until the greatest output is obtained in the plate circuit. It may be necessary to use as much as 2 turns, its position having been found contingent on the placement of the oscillator parts. The plate coil of the oscillator consists of 2 turns of No. 12 "push-back" wire and is interwound with the grid coil of the amplifier, which has 4 turns. Both coils are ⅝ inch in diameter. The plate coil of the modulated amplifier consists of 7 turns of No. 10 wire, wound in ⅝-inch diameter form.

Some experimentation may be necessary with each of these coils. It was found in the several transmitters constructed, different-sized coils were necessary for each, the difference being accounted for by the location of the parts in the circuit.

It will be noted in the schematic wiring diagram that a voltage divider is used to obtain the screen voltage for the oscillator tube while in the amplifier a series-dropping resistor is used. This was done in order to insure greater stability in the oscillator and provide for modulation of the screen of the amplifier tube. It was *not* found absolutely necessary to by-pass the dropping resistor.

A combination of cathode and grid-leak bias is used in the amplifier. The grid leak is 15,000 ohms and the cathode-bias resistor is 100 ohms. In contrast, a 50,000-ohm grid leak is used in the electron-coupled oscillator circuit. This value seemed to provide the greatest output for the oscillator. All by-pass condensers are .002 mfd.

The speech amplifier modulation is conventional in design. It provides more than sufficient gain to permit the use of a crystal type microphone to modulate a 30-watt input. A 6F5 type tube is used in a resistance-coupled circuit to provide high gain. This is followed by a 6C5 which is transformer-coupled to a pair of 6L6 tubes in push-pull as modulators. The amplifier-modulator is mounted on the same size chassis and in the same size cabinet as the r.f. unit.

The 6F5 tube is mounted at the left front of the chassis. The 6C6 is immediately behind it; the 6L6 input transformer is in the middle of the chassis; the 6L6 tubes to the right of the input transformer and the output transformer at the extreme right. Porcelain bushings are used for the output terminals. The whole arrangement gives a rather pleasingly symmetrical appearance.

On the front panel is a jack for the microphone and a gain control which of course is in the input circuit of the 6C5. A 5-megohm resistor is connected across the input jack. One important feature in the construction of the modulator is the use of "high-frequency" radio-frequency choke coils in the grid circuits of each of the tubes. This was found necessary to eliminate feedback in the earlier models constructed and therefore was incorporated in this unit. A voltage divider is used to obtain the reduced voltages for the plates of the 6F5, and the 6C5 and the screens of the 6L6's.

Shielding is used in the grid lead of the 6F5 to minimize any tendency to pick up r.f. in the input circuit. Also it was found desirable to use a shielded plug for the microphone. Most of the small parts are mounted on either the tube sockets or insulated mounting brackets fastened under the chassis. This method of construction insures rigidity. All of the a.c. heater leads are brought around the corners of

the chassis to minimize hum pick-up. Cathode bias is used throughout.

This unit is capable of delivering 24 watts of audio power, with 400 volts on the plates of the 6L6's and 290 volts on the screens. This is sufficient to modulate 48 watts of Class C input. More audio power might be obtained from this unit by using a larger driving tube, but for the transmitter it was designed to modulate, the output of 24 watts was more than adequate. If two 6C5's are used as drivers and battery or some other form of fixed bias is used in the 6L6 grid circuits it is possible to obtain as much as 60 watts of audio power from this unit.

One interesting feature of the modulator is the output transformer used. This is a United Varimatch (VM-1), which may be connected to accurately match almost any modulator tube impedance to the Class C load. The output impedance of the 6L6's in this arrangement is 6600 ohms. If battery bias is used and more grid drive, the impedance will be lower. The output impedance taps were set to match a 4000-ohm load, which is a close match for the 400 volts at 90 milliamperes used in the plate and screen of the modulated 6L6 amplifier.

Two power supplies are used with the complete unit, one for the amplifier and one for the r.f. unit. Both are identical and supply 400 volts at 200 milliamperes, which is adequate for both units. Type 83 rectifier tubes are used. In each a swinging choke input is used which provides good modulation and probably accounts somewhat for the stability of the signal. Electrolytic filter condensers capable of withstanding 475 volts are used. A 30,000-ohm "bleeder" is employed as insurance against blowing condensers when the plate load is taken off during stand-by periods. A smoothing choke provides additional filtration. Each power supply is mounted on a metal chassis 7 by 10 by 2½ inches. All connections, including both filament and plate voltages, are brought to the terminals of a four-prong socket. Two socket plugs and 4-wire cables are used to connect the power supplies to their respective units.

After all construction is completed, each unit should be tested separately. An excellent way to test the amplifier is to use a phonograph pick-up and a loudspeaker. A good idea of the quality may be had in this way. However, before the actual test, it is a good plan to measure the voltages on each of the tube plates and grids and the plate current on the modulator tubes. They should agree with the specifications recommended by the manufacturers of the tubes.

If all the recommended resistor values are used there should not be any trouble from this source. It will be necessary only to adjust the voltage divider until the correct plate and screen voltages are obtained. Incidentally, the static plate current on each of the 6L6's should be about 40 milliamperes. It will swing upward slightly when driven hard, but under normal operating conditions, with the amount of power needed to modulate the amplifier, the meter needle will remain stationary.

Putting the r.f. section in operation is no more difficult than the average transmitter. The one thing that is important is to be sure the correct harmonic is used to excite the amplifier. The grid tuning condenser controls the frequency. An excellent way to adjust the oscillator is to use a 10-meter receiver with a heterodyne oscillator as a frequency meter. Usually the calibration on such receivers is quite accurate and of course exceptionally accurate when used in conjunction with a good frequency meter. The receiver should be tuned to one-half the 5-meter band frequency it is desired to operate on; i.e., for 56 megacycles it should be set for 28 megacycles. Plate voltage should not be applied to the amplifier. The grid tuning control should be rotated until the signal emitted is at zero beat in the 10-meter receiver. If nothing is heard, the oscillator first should be checked to determine whether or not it is oscillating. A neon bulb (1-watt size) held near the grid coil will indicate the presence of radio-frequency energy. If the oscillator oscillates but no signal is heard on the 10-meter receiver, obviously it is not operating at the proper frequency. If the coil specifications are followed, however, this condition is not likely. When the grid control is set it should not be changed unless it is desired to change frequency later on (it might be regarded as a variable crystal). Of course, while the oscillator is being adjusted, the meter should be plugged into the oscillator plate jack.

Next the plate circuit of the oscillator should be adjusted to resonance. As resonance is passed there will be a decided dip in the plate current. Next the meter should be plugged in the grid circuit jack of the amplifier and the compression condenser across the grid coil adjusted until the rectified grid current is at a peak. It will be found, due to the tight coupling between the plate and grid coils, one condenser will react slightly on the other. Therefore it is necessary to find the combination of the two that will give the greatest grid current. This probably will occur with the compression condenser about half-way compressed. The grid current should be between four and six milliamperes. Four will be sufficient, but the best output may be obtained with somewhere between 4 and 6 milliamperes. When resonance in these two circuits is obtained, the plate current on the oscillator should be between 50 and 60 milliamperes.

After these circuits are adjusted, the amplifier then should be neutralized. The simplest method is to use a 3-turn loop, 1 inch in diameter, connected across a 6-volt pilot light as a resonance indicator. This may be held near the amplifier plate tank coil. Unless the amplifier is accidentally neutralized, when the plate tank is tuned in resonance with the oscillator frequency the bulb will light faintly (of course, there should not be any plate voltage applied to the amplifier plate during this test). At this point the neutralizing condenser should be adjusted until there is no indication of r.f. in the amplifier plate tank *without plate voltage applied!* As a further neutralizing check, the grid current should remain absolutely stable as the plate tank condenser is rotated past the resonant point. If it dips, this is an indication of improper neutralization.

After neutralization, plate voltage may be applied to the amplifier. This may be done (during the tuning process) by short-circuiting the modulation transformer leads. When the amplifier is tuned to resonance there should be a husky amount of r.f. in the tank coil; enough to make a neon bulb glow brightly. The plate current (without antenna load) should be between 20 and 30 milliamperes. (It will be found the plate current will vary somewhat with different tubes).

The next step is to couple the antenna and connect the modulator to the r.f. unit. As the best type of antenna for 5-meter work uses untuned feeders of between 400 and 600 ohms, the simplest method of coupling is to tap directly on the tank coil through .002 mfd. condensers. These leads are brought to porcelain bushings mounted on the front panel. The taps should be adjusted to match the impedance of the

line, which will be indicated by the highest minimum current setting with the antenna connected. The plate current, when the transmitter is coupled to the antenna, should be about 70 to 80 milliamperes. Higher plate currents may be used, but naturally they will shorten the life of the tubes. In no case allow it to go over 100 milliamperes for more than an instant during the tuning-up process.

After the r.f. unit is connected to the antenna and properly tuned, the modulator may be connected. This simply requires taking off the short-circuiting connection across the porcelain bushings on the r.f. unit and connecting these to the porcelain bushings on the output of the modulator. It virtually means detouring the plate voltage for the amplifier through the secondary of the modulation transformer in order that the audio voltage might be superimposed on the d.c. plate voltage. It is desirable to use shielded wire for connecting these two units. Grounding also may be necessary. After this the transmitter is ready for a test on the air.

Results with this "Sure Fire" transmitter obtained at W2MW were rather surprising. In the month and a half the transmitter was on the air before this article was written, more than 50 stations were worked and some rather excellent reports received. The transmitter frequently was used for communicating between the Editor, Laurence M. Cockaday, W2JCY, at North Pelham, N. Y., and the writer in Bloomfield, N. J. Numerous tests were made between these two points with different adjustments and arrangements. The signal was consistently an R9 in North Pelham, which is about 20 miles airline from Bloomfield. The input never exceeded 30 watts and it was found there was little difference when the power was reduced to 20 watts. Other stations using selective all-wave superheterodyne receivers reported the signals as being very steady and without frequency modulation. All in all, it is a very satisfactory signal producer with excellent quality on voice and its wide use will do much to "clean up" the 5-meter band.

Parts List for R.F. Unit

1 I.C.A. 7- by 14- by 8-inch cabinet
1 I.C.A. 7- by 12- by 2½-inch chassis
1 I.C.A. 100 mmfd. variable condenser
1 I.C.A. 25 mmfd. variable condenser
1 Hammarlund split-stator variable condenser, 35 mmfd. per section
6 Aerovox .002 fixed mica condensers, 1000-watt rating
1 Cardwell 15 mmfd. midget variable condenser (for neutralizing)
1 Ohmite 50,000-ohm, 1-watt resistor
1 Ohmite 50,000-ohm, 100-watt resistor (voltage divider)
1 I.R.C. 15,000-ohm, 2-watt resistor
1 Ohmite 10,000-ohm, 20-watt resistor
1 Ohmite 100-ohm, 20-watt resistor
1 Hammarlund midget compression condenser
2 I.C.A. ceramic metal tube sockets
1 Triplett 0-100 milliampere meter
1 I.C.A. switch

Parts List for Amplifier-Modulator Unit

1 I.C.A. 7- by 14- by 8-inch cabinet
1 I.C.A. 2- by 12- by 2-inch chassis
1 United VM-1 output transformer
1 United push-pull input transformer
1 I.R.C. 5-megohm resistor, ½ watt
1 I.R.C. .5-megohm resistor, ½ watt
1 Electrad 0- to 500,000-ohm variable resistor
1 I.R.C. 5000-ohm resistor, 1 watt
1 I.R.C. 2500-ohm resistor, 1 watt
1 Ohmite 100-ohm resistor, 20 watts
1 Ohmite 100,000-ohm resistor, 100 watts
1 Aerovox 2 mfd. electrolytic audio by-pass condenser
1 Aerovox 10 mfd. electrolytic condenser
2 Aerovox 4 mfd. electrolytic condensers
1 Aerovox .5 mfd. paper condenser
1 Aerovox .01 mfd. mica condenser
4 Ohmite high-frequency choke coils (for grids)
4 I.C.A. metal tube sockets
1 I.C.A. input jack
Necessary hardware, wire, etc.

Parts List for Power Supplies

(Two separate units are used: One for the r.f. unit, one for modulator)

2 7- by 10- by 2-inch chassis
2 United UH-5 power transformers
2 United CS-42 input swinging chokes
2 United CS-40 smoothing chokes
4 Aerovox 8 mfd. electrolytic filter condensers
2 I.C.A. power switches
2 I.C.A. pilot light sockets
2 Ohmite 30,000-ohm, 50-watt resistors
4 I.C.A. 4-prong tube sockets

The 806 Tube

(Continued from page 599)

The filament can be heated by a.c. or d.c. It is recommended to keep the filament voltage within 5 percent of its rated value and to keep the filament at full voltage during "standbys" if the tube is idle for less than two hours. Maximum plate dissipation should not be exceeded; it can be detected by a dull red color on the plate.

Characteristics of Type 806

Filament voltage (a.c. or d.c.)	5.0 volts
Filament current	10 amperes
Amplification factor	12.6
Direct interelectrode capacitances:	
Grid-plate	3.4 mmfd.
Grid-filament	6.1 mmfd.
Plate-filament	1.1 mmfd.
Bulb	GT-30
Base	Jumbo 4—large pin

Cooling: Air. Forced ventilation is required for continuous key-down conditions in Class C telegraph service and for all classes of service on 30 mc. or higher.

Maximum Ratings and Typical Operating Conditions

As A.F. Power Amplifier and Modulator—Class B

Plate voltage (d.c.)	3000 max. volts
Plate current at max. signal	200 max. ma.
Plate input at max. signal	500 max. watts
Plate dissipation	150 max. watts

Typical operation:

(Values for 2 tubes)		
Plate voltage (d.c.)	2000	3000 volts
Grid voltage (d.c.)	—150	—240 volts
Peak a.f. volt'ge grid-to-grid	340	405 volts
Plate current, zero signal	20	20 ma.
Plate current, max. signal	390	330 ma.
Loud resistance, per tube	2875	5375 ohms
Effective load resistance plate-to-plate	11500	21500 ohms
Max. driving power, approx.	14	10 watts
Max. power output	500	660 watts

As R.F. Power Amplifier—Class B Telephony

Carrier conditions per tube for use with 100% modulation

Plate voltage	3000 max. volts
Plate current	150 max. ma.
Plate input	225 max. watts
Plate dissipation	150 max. watts

Typical operation:

Plate voltage (d.c.)	2000	3000 volts
Grid voltage (d.c.)	—150	—240 volts
Peak r.f. grid voltage	180	200 volts
Plate current (d.c.)	110	70 ma.
Grid current (d.c.), approx.	1	0 ma.
Driving power, at peak of audio cycle with 100% mod.	8	5 watts
Power output, approx.	70	70 watts

As Plate-modulated R.F. Power Amplifier—Class C Telephony

Carrier conditions per tube for use with 100% modulation

Plate voltage (d.c.)	2500 max. volts
Grid voltage (d.c.)	1000 max. volts
Plate current (d.c.)	200 max. ma.
Grid current (d.c.)	50 max. ma.
Plate input	500 max. watts
Plate dissipation	110 max. watts

Typical operation:

Plate voltage (d.c.)	2000	3000 volts
Grid voltage (d.c.)	—500	—600 volts
Peak r.f. grid voltage	790	890 volts

Plate current (d.c.)	195	195 ma.
Grid current (d.c.)	40	40 ma.
Driving power, approx.	28	32 watts
Power output, approx.	300	390 watts

As R.F. Power Amplifier and Oscillator—Class C Telegraphy

Key-down conditions per tube, unmodulated

Plate voltage (d.c.)	3000 max. volts
Grid voltage (d.c.)	—1000 max. volts
Plate current (d.c.)	200 max. ma.
Grid current (d.c.)	50 max. ma.
Plate input	600 max. watts
Plate dissipation	150 max. watts

Typical operation:

Plate voltage (d.c.)	2000	2500	3000 volts
Grid voltage (d.c.)	—400	—500	—600 volts
Peak r.f. grid voltage	640	755	870 volts
Plate current (d.c.)	195	195	195 ma.
Grid current (d.c.), approx.	25	25	25 ma.
Driving power, approx.	15	17	20 watts
Power output, approx.	280	370	450 watts

The tube should be supplied with battery bias when it is used as a Class B audio- or radio-frequency amplifier. As a plate-modulated Class C r.f. amplifier a grid leak of 1500 ohms, 50-watt, can be employed or the grid leak can be combined with other biasing methods. When used as oscillator or Class C r.f. amplifier for c.w., a grid leak of 20,000 ohms can be used or any of the other methods is satisfactory.

Two 806 tubes with 3000 volts or the plate as Class B modulator will provide 100 percent modulation to a Class C amplifier with a plate input of 1185 watts.

If the tube is used for higher frequencies than 30 mc., the max. rated plate voltage and the plate input must be reduced to 75 percent of the values in the table for frequencies up to 50 mc. and to 50 percent of these values for frequencies up to 100 mc. When two or more 806 tubes are operated in parallel a non-inductive resistance of 10-100 ohms should be connected in each grid lead close to the tube so as to prevent parasitic oscillations. Information for this article was supplied by R. C. A. engineers.

Chicago Hamfest

CHICAGO, ILL.—Mr. Louis Poncher, president of the Mid-West Radio Mart, will organize a Hamfest at the Congress Hotel in Chicago on April 17. For the last five years an annual "ham" show has been given by this concern and last year 3500 amateurs attended the show. Hundreds of prizes will be given away, among them a 500-watt Gen-Ral transmitter. Admission is free and all "hams" are invited.

160 and 80 M Band Reserved for Flood Relief

WASHINGTON, D. C.—The Federal Communications Commission has ordered that "no transmissions except those relating to relief work or other emergencies be made within any of the authorized amateur bands below 4000 kc. until the Commission determines that the present emergency no longer exists."

TELEVISION NUMBER

Be sure to reserve a copy of the May issue at your newsdealer's if you are interested in Television.

THE TECHNICAL REVIEW

CONDUCTED BY THE TECHNICAL EDITOR

Perpetual Trouble Shooter's Manual, Volume VII, by John F. Rider, published by John F. Rider. The seventh of the well-known manual contains over 1000 pages of diagrams and service data on commercial radio receivers which appeared during the last year or were not included in previous volumes. These volumes have become the standard reference book for circuit diagrams of manufactured receivers, values of resistors and condensers, aligning data and other important facts for servicemen. This volume does not differ greatly from the previous ones in the manner of presentation. There are a considerable number of double pages for large receivers and the amount of service notes other than diagrams has been increased. So, for instance, on one of the late Philco models all the connections to the coils are numbered and details of coils are shown identifying the terminals. Then on the latest RCA phonograph model there is some useful information on the adjustment of the volume expander. As usual, the volume is accompanied by a complete index listing all models which appeared in the seven volumes.

RCA Receiving Tube Manual, published by RCA Radiotron Division of RCA Manufacturing Company. A new tube manual containing data on all the new and old receiving tubes. This edition has been revised and contains much additional information on tubes and their circuits. It begins with several chapters on tubes in general, how they function and showing typical circuits. Then follows a collection of tube characteristics, arranged alphabetically and numerically by type numbers. Characteristics and some curves are given for each type; here and there special circuits are shown. There is a chapter on tube testing charts showing equivalent metal, and octal glass tubes, a socket connection chart, design data on resistance-coupled amplifiers and typical circuits of complete receivers and amplifiers.

Technical Manual, published by Hygrade Sylvania Corporation. This is a new tube manual containing data on all receiving tubes made by Sylvania. The tubes described are the standard metal tubes and glass tubes, but also several specials made by this company such as the replacements for the Majestic types and many ballast tubes. The information on each tube consists of base diagram, characteristics and circuit application data, the socket layout being on the same page. In addition there are curves on the ballast tubes and curves of the performance of all rectifiers. These latter curves are very valuable, since they show for each tube the output voltage for different current drains with choke input and with condenser input. Then here is a bias resistor chart showing the proper bias resistor for most tubes under specified conditions. The usual circuits and general information are included.

Electron Tubes in Industry, by Keith Henney, Second Edition, McGraw-Hill Book Co. 1937. This book describes the application of vacuum tubes, gas-filled tubes, photo-tubes, and other electronic devices to non-communication industries. The text first discusses the properties of each type of tube and then follows it up with numerous examples of circuits showing applications of these tubes in industrial use. These circuits with their descriptions have been collected from scientific and engineering literature of the last few years. Thus, this book contains a collection of useful tube application data, which heretofore could only be found scattered in numerous publications. Sufficient data are given in most cases for construction of the equipment by a man skilled in the arts. Even those who are not primarily interested in industrial applications will find that the book gives them new ideas. The new edition has been brought up to date by the addition of new material.

One might consider the book divided in three parts; the first is devoted to vacuum tubes, the second to gaseous tubes, the third to light-sensitive tubes. In each case there is first a chapter on the properties of the tubes followed by a chapter on its applications.

Mallory-Yaxley Radio Service Encyclopedia, published by P. R. Mallory & Co. The aim of the editor of this book has been to gather all the necessary information a serviceman needs in one volume. It has been prepared from practical experience with the aid of many servicemen.

The main part of the book consists of a table of all makes and models of receivers. Within the scope of a few lines, the reader is told all he needs to know to successfully replace volume controls, condensers, vibrators, power transformers, tubes, and to align the receiver. The table tells what type of volume control is needed, what taper and what type of switch, and there is a reference to a detail diagram showing how that volume control is hooked up. The same applies to the condenser replacements. The references to vibrator diagrams shows the connections to sockets of any vibrator in any set. There are also diagrams of all transformer hook-ups. Besides this main table there are chapters on these parts. The chapter on volume controls tells all about tapers, the circuits of volume controls and typical values used. The condenser action explains the circuits wherein condensers are used. Similar data are given on vibrators.

In addition there are chapters of general interest, one chapter on aligning, one on automatic frequency control, one on

measurements with a home-made bridge. Tube charts, resistance charts, color codes, and miscellaneous tables are included.

Review of the Proceedings of the Institute of Radio Engineers, January, 1937

Partial Suppression of One Side-Band in Television Reception, by W. J. Poch and D. W. Epstein. A study to determine whether side-band suppression is advisable in television reception. Results indicated that distortion due to operation with the carrier at the edge of the selectivity curve produced no noticeable detrimental effects on picture quality.

Ultra-High-Frequency Wave Propagation Over Plane Earth and Fresh Water, by R. C. Colwell and A. W. Friend. The authors present an empirical equation for the field strength over plane earth and fresh water for 59-98 mc. waves.

Simplified Methods for Computing Performance of Transmitting Tubes, by W. G. Wagener. Simplified methods are given for quickly computing with reasonable accuracy the performance of transmitting tubes in the usual radio-frequency and audio-frequency applications.

Note: This number of the "Proceedings" is accompanied by a separate volume containing an index of all articles from 1909 to 1936. The articles are indexed three times: chronologically, by subject, and by author.

Review of Contemporary Literature

The following are reviews of articles appearing in recent issues of technical magazines; the name of the magazine and its date are given after the title of each article. Copies of these articles are not included under the "Free Booklets"—they are available from your book-dealer or direct from the publishers. Addresses of publishers will be furnished on request.

A Simple Directive Antenna, by Manfred Asson; QST, February, 1937. A directive antenna employing a radiator and reflector which is simple and effective. The direction can be reversed very simply while the equipment is in operation.

Harmonic Method of Intercomparing the Oscillators of the National Standard of Frequencies, by E. G. Lapham, Journal of Research of the National Bureau of Standards, October, 1936. Also available singly as Research Paper RP925. A precision method of comparing frequencies which are nearly equal by employing the *n*th harmonic of one and the (n-1)th harmonic of the other. The resulting beat is equal to the first frequency plus *n* times the difference between the two. This multiplied difference is then determined in the normal way.

A New Polar Co-ordinate Cathode-Ray Oscillograph, by Manfred von Ardenne; The Wireless Engineer, January, 1937. The author describes a system whereby the sweep circuit makes the spot trace a circle or a spiral. Test voltages are deflected radially. Advantages are linearity, a lack of backstroke, and longer base length (4 meters in the case of a spiral.

Variable Fidelity Control, by A. W. Barber; Radio Engineering, January, 1937. A review of the various methods, both manual and automatic.

Feedback Amplifiers, by F. E. Terman; Electronics, January, 1937. Theoretical and practical information on negative feedback for the purposes of reducing distortion. Single and multi-stage circuits are described and explained.

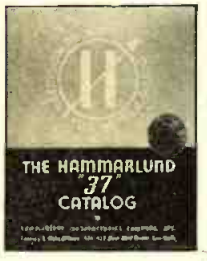
T-Pad Ken-o-Graf, Kenyon Engineering News, Volume I, No. 2. A graph showing the proper sizes of resistors in H-pads and T-pads for attenuations between 2 and 32 decibels and for 200- and 500-ohm lines.

An Audio-Frequency Schering Bridge. General Radio Experimenter, December, 1936. Description of a direct-reading bridge for the measurement of capacitance and power factor up to 1 mfd. and up to 6 percent power factor. All measurements are made at 1 kc.

FREE BULLETINS

56-Page Catalog

Every serviceman, experimenter and dealer will be desirous of obtaining a copy of the 1937 Montgomery Ward radio catalog. It features a complete line of P. A. equipment, service instruments, amateur transmitters and accessories, the latest in communication receivers, auto sets and parts. To obtain a free copy send your request to RADIO NEWS, 461 Eighth Avenue, New York City.



DeLuxe 1937 Catalog

The Hammarlund Catalog for 1937, just off the presses, is a de luxe printing, celebrating the company's twenty-fifth anniversary. Because of the unusually high grade make up and print job the catalog will be of special interest as the photographic illustrations of each item show every detail clearly. In addition various items are generously illustrated with drawings giving all dimensions, characteristic curves, etc. A large number of brand-new items are shown, including transmitting condensers, ultra-midget receiving variable condensers, 2¼-inch diameter transmitter coil forms, Isolantite octal tube and coil sockets, plug-in coil shields, i.f. transformers of both the air-core and iron-core types, etc. This catalog may be obtained free by addressing a request to RADIO NEWS, 461 Eighth Avenue, New York, N. Y.

Radio Text Book Catalog

Our readers will be pleased to know that they can secure a free copy of the latest McGraw-Hill general catalog listing all their publications, covering over 131 subjects. There is a special section devoted to radio, with descriptions of well known books as Henney's Radio Engineering Handbook and Everitt's Communication Engineering. Requests should be addressed to RADIO NEWS, 461 Eighth Avenue, New York City.

RADIO NEWS Booklet Offers Repeated

For the benefit of our readers, we are repeating below a list of valuable technical booklets and manufacturers' catalog offers, which were described in detail in the November, December, 1936, January, February and March, 1937, issues. The majority of these booklets are still available to our readers free of cost. Simply ask for them by their code designations and send your requests to RADIO NEWS, 461 Eighth Avenue, New York, N. Y. The list follows:

N2—Free tube Base Chart. Weston Electrical Instrument Corp.

D1—Latest Radio Parts Catalog of Allied Radio Corp. Free.

D2—Catalog on Replacement Volume Controls, Switches, Vibrators, etc. Yaxley Mfg. Company. Free to servicemen and dealers.

D3—Resistor Catalog, Free. Atlas Resistor Company.

D4—Public Address Bulletin of United Sound Engineering Co. Free.

Ja1—1937 Radio Parts Catalog of Wholesale Radio Service Co. Free.

(*Turn to page* 629)

Antenna Coupler Kills Noise

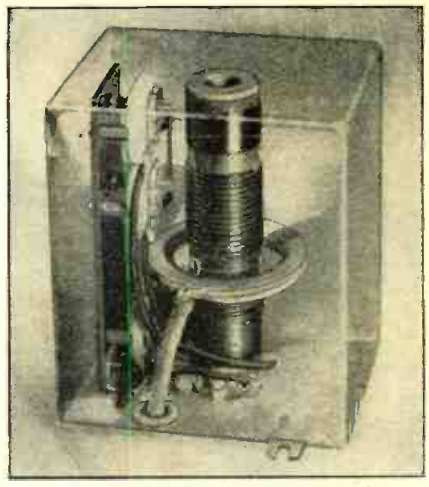
(*Continued from page* 596)

antenna and receiver circuits. This system also gives accurate magnetic balance for eliminating any possibility of interfering longitudinal waves in the feeders getting into the set. It also affords a perfect impedance match between the feeders and the coupler and between the coupler and the input circuits to the receiver.

The engineers who developed this system point out that, to be ideal, such a system must have the foregoing characteristics in order to provide maximum signal energy from the antenna to the grid of the first tube and automatically eliminate unwanted noise signals in the grid circuit. The device incorporates, as will be noted in the illustration, automatic switching for the various wave-band operation.

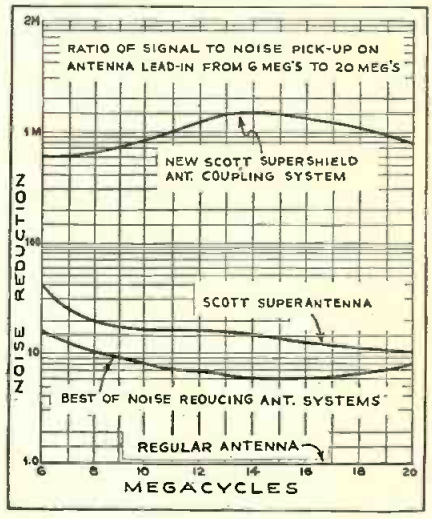
In developing the system, the engineers made many tests with standard signal generators measuring the signal-to-noise ratio of a large number of radio receivers, tested with special antenna systems, and the conclusion was: that the ordinary noise-reducing antennas did not do a perfect job and that a coupling arrangement had to be developed to work in conjunction with a noise-reducing antenna. During these tests it was found that the best noise-reducing antenna system gave an average discrimination of approximately 10 to 1 in favor of the desired signal, whereas another "super" antenna system produced a discrimination averaging 15 to 1 over the same frequency range. However, the new Supershield antenna-coupling arrangement that they developed, produced an average discrimination of *1000 to 1 against noise!* The curves for coverage from 6 to 20 megacycles are shown in the accompanying chart.

In the demonstration for RADIO NEWS engineers, two exactly similar sets were set side by side, as shown in the heading photograph. One was equipped with the Supershield antenna and the other was a standard job working on a regular noise-reducing antenna system that comes with the set. Violet-ray machines, buzzer-modulated apparatus, vacuum cleaners and the like were then started one at a time and later in multiple while both receivers were tuned to a short-wave broadcasting station. Reception on the standard set was totally obscured by the interference produced by the noise makers, but the receiver equipped with the new coupler reproduced the program without interference of any kind



COUPLER CONSTRUCTION

This cutaway view of the new antenna-coupling system shows the arrangement of coils that eliminates capacity coupling, provides impedance match on all bands and correctly balances the feeders.



and such reception had previously been considered out of the question in that location!

Scott engineers tell us that the device will be incorporated in the models now being manufactured, but the device can also be installed into all present sets of this make.

As interference of the noise variety is picked up on the vertical lead-ins that connect the antenna to the set for the greatest part, the installation of this device in present receivers is to be highly recommended.

Bridge Analyzer Solves Problems

(*Continued from page* 591)

With this type of fault in view, an analyzer section was incorporated in the condenser tester so that d.c. voltages from 35 to 550 volts could be placed on the condenser under test and the leakage at any of these voltages determined. Instead of using a meter to determine the amount of d.c. leakage of the condenser under test, a neon tube is used which, in the case of paper condensers, will show a charging flash and flashes thereafter at various rates per second, which give an indication of the leakage resistance of the condenser.

Higher leakage resistance values give proportionately fewer flashes per second on the neon tube. The same device is used for impressing d.c. voltages on electrolytic condensers and determining whether the leakage is 1, 3 or 5 milliamperes, the circuit arrangement of the neon tube being such that the tube will extinguish if the leakage drops below a value indicated by a switch.

Electrolytic condensers with a voltage rating of from 200 to 500 volts usually having a d.c. leakage of less than .5 milliampere per mfd. Consequently the serviceman is able to judge the condition of a condenser under operating voltages by means of the bridge analyzer. He has no arbitrary scale saying that the condenser is good, bad, or deteriorated. The scientific facts governing the condition of the condenser are given him and he may use his judgment accordingly. However, the d.c. leakage characteristics, even under nor-

mal voltage operating conditions, do not tell the whole story, for in the case of electrolytic condensers the power factor may be considerably higher than normal due to the change in the structure of the electrolyte used in the condenser. Normal power factors of electrolytic condensers vary materially, due to the fact that different resistance electrolytes are used by various manufacturers. In general, the lower the resistance of the electrolyte, the lower the power factor. Too low resistance electrolytes, however, have certain disadvantages and, as a consequence, are not generally used. Electrolytic condensers of good quality usually have a power factor between 3 and 8 percent. For the serviceman to intelligently determine from power-factor measurements whether or not a condenser is considerably deteriorated, he should know the approximate power factor of a new condenser of a similar type or similar electrolyte.

Many times, higher than normal power factors in electrolytic condensers are a forerunner either of breakdown or of failure of the condenser to perform the function for which it was placed in the circuit. Consequently, the serviceman will find accurate knowledge of the power factor very valuable in forestalling possible repeat calls at his own expense.

Paper condensers should have very low power factors, initially, varying from about 2% to possibly 1%. Higher values than this indicate that either the condenser originally was not properly made or that moisture has started to enter the condenser. If moisture is entering the condenser it is a definite forerunner to failure. The start of moisture trouble may be detected by a power-factor measurement before it enters the other layers. Naturally as soon as the moisture penetrates all the layers of paper, breakdown occurs.

Intermittent paper or electrolytic condensers may be determined by obtaining a balance and manipulating the leads of the condenser. If the condenser is intermittently open, the null indicator of the bridge will immediately indicate this condition, for the electronic eye will completely close.

Servicemen are finding a considerable amount of trouble with intermittent resistors, resistors which are only intermittent under actual operating voltage conditions. Such resistances measure substantially their appropriate value after the receiver is turned off, but when heated up under operating conditions, may be noisy or even substantially open-circuits. The d.c. voltage on the analyzer gives an excellent opportunity for checking these conditions for the normal voltage to which the resistor is subjected may be placed upon it with a milliammeter in series. As a consequence, the resistor will heat up as much as it does in the radio set and as it becomes intermittent or open the milliammeter will give immediate indications of its condition.

All in all, this analyzer presents to the serviceman or manufacturer a useful tool, not only for determining the condition of condensers under practically all types of operating conditions, but also for locating intermittent resistors, volume controls, speaker fields, audio transformers, and a host of other faults commonly encountered in radio servicing.

The Technical Review

(*Continued from page 627*)

Ja2—Free. Monthly booklet "Brush Strokes" published by Brush Development Co. Send request in on letterhead.

F1—Special "Bargain Flyer" catalog. Wholesale Radio Service Co. Free.

F2—Speaker Bulletin. Free. Wright-DeCoster, Inc.

F3—Instrument Catalog of Weston Electrical Instrument Corp. Free to servicemen, dealers and engineers.

F4—Free Condenser and Resistor Catalog. Aerovox Corp.

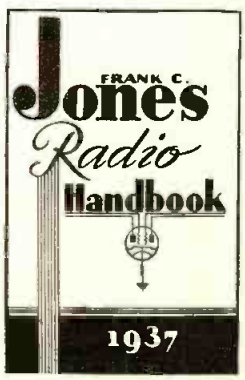
F5—New Centralab Parts Catalog. Free.

F6—Triad Tube Manual. Free to servicemen, dealers and engineers.

Mh1—Parts Catalog. Tobe Deutchmann Corp. Free.

Mh2—Free Test Equipment Catalog. Clough Brengle Co.

Mh3—Engineering Bulletin on 6L6 Tube. Ken-Rad Tube and Lamp Corp. Free to engineers and servicemen.



New Reference Manual For Amateurs and Experimenters

The 1937 "Radio Handbook," by Frank C. Jones, well-known writer of amateur and experimental radio developments, contains over 400 pages of instructive information not only for the amateur but also for the short-wave enthusiast and anyone interested in radio. Its contents are refreshingly new, with chapters devoted to television and diathermy equipment. The latest beam-power transmitters are described, also new 5-, 2½- and 1¼-meter rigs. For the constructor complete "how-to-build" information is given on 12 new receivers. The fundamentals of radio are explained and there are chapters on antennas, code instruction, etc.

The price of the book in this country is $1.50; foreign cost, $1.75. Page 1 of each Handbook includes a coupon which entitles the owner to a free copy of a 228-page supplement with the latest data, which is to be issued in May. Address your request with money order or check to RADIO NEWS, 461 Eighth Avenue, New York City.

Antenna Handbook

The Pacific Radio Publishing Company announces a new 64-page book by Frank C. Jones, devoted entirely to antennas. This information on all kinds of antenna systems was taken from the new "Jones Radio Handbook" and contained in a separate manual with the idea in mind that there will be many radio amateurs and experimenters especially interested in this subject and who may not desire, at this time, the wealth of other instructive information included in the large Handbook. It treats the subject in a comprehensive manner and is a practical guide in the selection and construction of transmitting or receiving antennas best suited for a specified purpose and location. The charge is 50 cents in the U. S. A., 60 cents elsewhere, and all requests should be sent to RADIO NEWS, 461 Eighth Avenue, New York City.

The Radio Workshop

(*Continued from page 593*)

Many readers have written in that they are desirous of building it on the recommendation of others who have tried it.

The Radio News "Ear Aid" consists of a one-stage, vacuum-tube amplifier assembled in a case which provides space for the amplifier equipment, batteries and microphone, as well as for the headphone, when not in use.

The schematic circuit is shown in Figure 1. The microphone, M, works through a microphone transformer, T, into the grid circuit of a type -30 vacuum tube. In the output of this tube a single headphone, P, is connected in series with the 22½-volt B battery. A single pair of flashlight cells, A, provides both the microphone current and the tube-filament current. There are separate rheostats (R1 and R2) to control the current to each of these circuits. R1 serves to control the volume of sound and R2 permits regulating the tube current to the lowest value consistent with proper results, thus providing for battery economy.

The chassis type of construction is employed, with everything except the rheostats, headphone and microphone mounted on an aluminum sub-base. All parts are mounted and the wiring is completed before this chassis is dropped into place in the case. After putting it in place, the rheostat shafts are slipped through the proper holes in the front of the case, the mounting nuts tightened and the knobs attached.

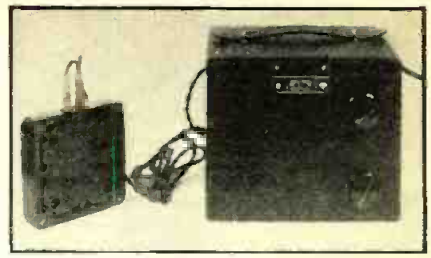
The picture-wiring diagram, Figure 2, shows all necessary connections. Those who buy the parts ready for assembly will have no difficulty in wiring the set if they follow the diagrams. In wiring the rheostats and switch, make each wire an inch longer than necessary and make the wires to the tip jacks at least two inches overlength. This will facilitate installing the rheostats and will permit the shelf to be lifted out when replacing the B battery.

The Ear Aid was designed primarily for use by individuals but will also provide excellent results for group service. It is sufficiently powerful to operate several headphones, as in church, for instance, where it may be desired to provide facilities to enable several hard-of-hearing persons to listen in.

The Ear Aid also makes an excellent "detective-phone." The microphone may be placed in one room, with an extension cord leading to another room where the amplifier and headphones are located. Conversation in the first room will then be clearly audible at the headphones.

Parts List

A—Two Eveready flashlight batteries, type No. 950
B—Eveready type No. 763 midget B battery, 22½ volts
J1, J2, J3, J4—Yaxley insulated tip-jacks, type 422. 3 black, 1 red
M—De Forest type US special pick-up microphone with sound-correction chamber, with special 36-inch flexible extension cord.
P—Headphone, either Western Electric type 509W, 1100 ohms, single, or Trimm "Featherweight", 2000 ohms, single. The latter is equipped with headband and cord. The former is without headband or cord. Requires special headband and cord (see items X and Y below)
R1—Carter 400-ohm "Imp" potentiometer, type IR-400, with small knob
R2—Carter 50-ohm "midget" rheostat, with switch, type M-50-S, with small knob
T—Thordarson microphone transformer, type T-2357
VT—Eveready type 230 vacuum tube and Pilot sub-panel mounting socket No. 216
SW—(See R2, above)
Case—Broderick special carrying case, as illustrated
Fittings—Broderick kit of fittings, including aluminum sub-base, bakelite shelves, brass mounting posts, battery clips and miscellaneous nuts, screws, wire, etc.
X—Special light-weight metal headband for headphone
Y—Special cord for headphone, 46-inch



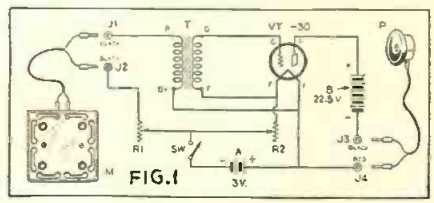


FIG. 1

Radio Schools

(*Continued from page 587*)

First National Television

THE emphasis of First National is on television, and this school owns and operates its own television transmitter—WoXAL. (It should be mentioned that all residence courses consider television even though the subject may not be featured. Optics, photo cells, etc., form a part of any well-balanced radio course. However, to the best of our knowledge, First National is the only school to have its own television transmitter, though several schools have complete experimental set-ups which are quite adequate for instruction and development work.) The average student completes the course in five months with a good knowledge of radio servicing and a first class radio-telephone operator's license.

University of Wisconsin Extension

THIS institution in Milwaukee offers a comprehensive course in one school year, preparing the student for marine and broadcast operating, radio servicing and technical work leaning toward engineering direction. Day and evening courses.

National Schools

LOCATED in Los Angeles, this school features a composite course in radio operating, servicing, television, talking pictures, broadcasting and electricity. A good electrical and general radio background is provided in from six to seven months.

CORRESPONDENCE SCHOOLS

Correspondence schools have progressed far in recent years, and the modern by-mail school succeeds in establishing a contact between instructors and student which at least approaches the intimacy achieved in a residence school.

As in the case of RCA Institutes as a residence school, in considering correspondence schools we necessarily think of the oldest of the strictly radio institutions—

National Radio Institute

WITH its long experience in teaching radio by mail, NRI is particularly well equipped to take the *average student*, regardless of previous training or education and make a good radio man of him. While the course is general, the emphasis is on radio service work. The course starts

with the abc's of electricity and radio, and carries the student, as fast as he can progress, through a comprehensive radio education. The business end of servicing receives adequate attention—and the subjects of salesmanship, accounting, etc., are taught. The course is written and handled in a manner calculated to eliminate any inferiority complex and to encourage the less aggressive student. The method of treatment is such as to facilitate the ready assimilation of knowledge by both the very young student and the older man who has, perhaps, forgotten how to study. Graduates of the National Radio Institute have made a familiar by-word of the term "Radiotrician."

C. R. E. I.

THE Capitol Radio Engineering Institute also conducts a correspondence course—of a definitely *engineering* nature. A ten-weeks post graduate, residence course is available to the correspondence students. A correspondence course has also been prepared for the *advanced* serviceman.

Sprayberry Academy of Radio

THE two courses offered by this institution are unique—the familiar Advanced Course in Radio Servicing and the "Complete Course," which also includes the Advanced Course. The advanced course is prepared especially for established servicemen, and offers a very economical method of acquiring the finer points of the game and keeping up-to-date. It is in the nature of a post-graduate course.

While the complete course progresses from the point of elementary electricity, it has been written for students of average high-school education—with the idea of taking students of high grade intelligence and making of them high grade servicemen. The student is equipped with a modern super-heterodyne receiver and analyzer, tube tester and all-wave oscillator, a complete set of tools, service manuals as well as other equipment that will be of actual use to him in the service field.

I. C. S.

THE International Correspondence Schools are perhaps the oldest institutions teaching by mail. They feature a wide variety of radio and associated courses, such as electrical engineering, refrigeration, air conditioning, invention, etc. Where desirable or necessary, texts from other fields are made available to radio students.

Radio Training Association of America

THE R. T. A. course is primarily one in radio service work, and the cost of training is in the medium-price field. Equipment is provided for experimental work, some of which will form a part of the serviceman's permanent test apparatus. The course is comprehensive and can be followed by the public school graduate.

Lincoln Engineering School

TWO courses are offered—one in electricity and one in radio. The costs are considerably lower than those for other complete courses.

The Candler School

THIS is strictly a school for code instruction, by means of the Candler System, which has developed some of the world's fastest operators. Various courses, in progressive order, are available for the beginner, the ten- to twenty-word-per-minute struggle and for the attainment of much higher speeds with accuracy.

Radio and Television Institute

R. T. I. is the only one of the correspondence schools to place special emphasis on television. However, as in the case of residence schools, it should be observed that some study is made of television in practically all courses. The training supplies an excellent general radio background with specific preparation for radio servicing.

It is hoped that the foregoing reviews will be of assistance to the prospective student. He should send for two—and preferably more—catalogues before making a definite choice. Read them carefully and check against the analyses given above and the personal elements referred to in our opening paragraph. Addresses of all schools mentioned will be found in the advertising columns of RADIO NEWS.

New Receiver "H.A.C." Nightly

(*Continued from page* 604)

signal as well as the separate control for pitch leaves nothing to be desired for c.w. reception. The a.v.c. action is nice and smooth and takes care of all ranges of signal strength.

The use of iron-core transformers for the intermediate frequencies gives a high order of gain with ultra selectivity.

The 6L6 push-pull stage gives as much as 14 watts Class A output without audio distortion.

The loudspeaker is not a portion of the receiver filter system so that the set can be operated satisfactorily without a speaker if headphones are desired. The receiver is equipped with a 5000-ohm and with a 500-ohm output circuit. The receiver draws about 125 watts in normal operation.

During the actual tests, the receiver was H.A.C. (Heard All Continents) on 10 and 20 meters a number of times during the two months *in the period of a single night!* When used for short-wave DX reception, it was often H.A.C. during a 24-hour period, short-wave stations in Europe, Africa, Asia, South America and Australia being tuned in and logged for a considerable time during each 24 hours.

Certainly, the receiver combines a great deal of practical utility both for the amateur operator and the short-wave DX listener for the price range it fits in. In concluding, we might state that it was also excellent for DXing on the Broadcast Band, due to its excellent selectivity and its ability to separate distant broadcast-band stations from the locals.

In the tests at the Listening Post, it was tested with vertical and horizontal doublets designed for particular wavelength ranges as well as with long-wire Hertz antennas for all-band operation. It can be used either with doublets or with single-wire feed antennas simply by changing a link on the antenna communication block.

Multi-Wave Coil Assembly

Radio set constructors will be interested in the new Meissner 5-band, multi-wave coil assembly. They are available in two designs, one covering a range of 7.5 to 2140 meters and the other from 3.8 to 555 meters. The assembly consists of the antenna, r.f. and oscillator sections. There are no leads, as all coils are mounted directly on the band switch, with the coil terminal lugs serving as the connection and the mounting support. The unit operates with a three-gang 410 mmfd. low minimum capacity condenser. The tubes recommended are: type 6K7 in the r.f., a 6L7 in the detector and a 6J7 in the oscillator circuit. The intermediate frequency to use with this assembly is 456 kilocycles.

The Service Bench

(*Continued from page 612*)

worth-while feature is the connection of the receiver through the meter, and noting if power is consumed with the switch off—making the test with the receiver plug in both receptacle positions. There have been numerous repair jobs where a ground in the power transformer has been overlooked until the customer received his next electric bill.

"We make it a practice to check every receiver on the watt-hour meter before returning it to the owner. The point to be emphasized is—*There is still something wrong with any set the consumption of which does not check closely to its rated wattage.*"

Two Cases of Noise

"Crackling and popping noises emanating from a model D Lyric can usually be traced to a noisy primary in the push-pull input transformer. This also is true of the Philco Model 20, as well as other Philco models. In some instances it may be the first audio—and in other cases the output transformer. Removing the tubes, starting with the detector, will usually indicate the stage and transformer. (Plugging in a tube with short-circuited plate and cathode prongs, and momentarily turning on the receiver, will occasionally cure the trouble or definitely open the circuit.—*Ed.*)

"Excessive motor noise in a 1935 Cadillac V-8 can be minimized by the use of a .25 mfd. condenser connected between the ignition switch and the ground. Shielding the leads to the switch will also help matters."—James L. Hoard, Providence, R. I.

THIS MONTH'S KINK

Edgar Hantz, of Alliance, Ohio, sends us the idea, shown in Figure 2—a combination tool fashioned from a discarded tooth-brush. The section holding the bristles is cut off, and the handle filed into a neutralizing screw-driver. The other end is sawed off, slightly on the diagonal, across

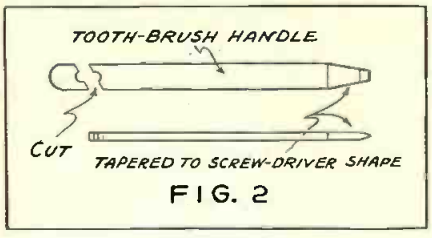


FIG. 2

FIGURE 2
A handy combination service tool quickly made from an old tooth-brush.

the center of the hanging hole, providing a handy tool for guiding a hot wire to its proper place in soldering. Cutting on the diagonal, instead of straight across, makes it possible to maneuver the wire in awkward positions.

SERVICE NOTES

Rural servicemen should investigate the possibilities of the Frigidaire "Flowing Cold Milk Cooler." This is definitely a boon to the farmer, and offers unusual sales possibilities to the serviceman operating in the country districts. Milk stations reject milk brought in by farmers if it is over a certain temperature—a costly factor to the producer during the late summer months, when the spring upon which he depends for cooling goes dry or his ice supply gives out. The milk cooler should more than pay for itself—a fact that can be used as a powerful sales argument. The milk is cooled to fifty degrees within an hour after immersion—providing the quick reduction of body heat which is highly desirable (another sales point). A particular feature is the self-leveling device which maintains the water uniformly around the necks of the cans, regardless of how many cans are immersed.

A GOOD AD

The advertisement shown in Figure 3 has attracted many an eye—not to mention customers—for the Radio Bargain Shop in Tampa, Florida. Everyone is interested in *rewards*, and the ad is invariably

FIGURE 3
An advertisement with a sound psychological appeal. Taking only one inch, one column space, it provides a good display at minimum cost.

read to find out what it is all about. Repeated insertions do the rest. A person with radio trouble, looking through the paper for a serviceman, remembers, and his eye seeks "the place that offered the ten-dollar reward."

The "Ham" Shack

(*Continued from page 601*)

How are you getting me tonight? Break in."

"O.K., W2—, this is W8— coming back. You are coming in R9 most of the time, but there are a couple of powerful stations on your channel that might cause some trouble. You better break in from time to time."

"Fine. I'm equipped to use 'push-to-talk' here, so let's go. You are putting in a fine signal here. No QRM whatsoever. How's tricks out there?"

"Everything is fine here. Just got a new speech amplifier going tonight. Do you notice any difference in my quality?"

"Well, it sounds about the same to me as the other one. But the quality of my receiver is not so good, so that may account for me not noticing any appreciable difference. How you getting me, any QRM? Break in."

"O.K., but W8— just broke in just as you told me to break in. Give me a short call and I'll see how you compete with him. Go ahead!"

"O.K. W2— calling W8—. Can you copy me through the QRM now?"

"Sorry, but nothing doing. You had better wait until W8— gets through. I'll break in and give you an O.K. Stand by!"

"O K. now W2—, W8— by"

"Fine," etc.

And so it might continue for an hour or more, with only one station on a channel at one time, thereby allowing the other fellow to continue his QSO without being QRM'ed too. Also another thing that is eliminated by this practice is the constant repetition of calls at both ends. Contrary to belief, it is not necessary to sign on for each transmission. The regulations provide that it is only necessary to announce call letters once every fifteen minutes during a single QSO.

ARMY NET STATION

This is the Army Reserve Net station of Ralph J. Eckert, W2IAG of the Bronx, New York. Ralph operates on 5 meters and has been successful in ultra-short-wave DX work.

CALLS HEARD

By David Brensilber, 1140 East Eighth Street, Brooklyn, N. Y., on 20-meter phone: PK1MX, VK7YL, VK2JU, VK2OG, VK2AZ, VK2AP, VK2UC, VK2MA, VK3KK, VK3ZZ, VK2BDA, K6NTV, K6JLV, K6JPD, K6KKP, K6LJB, K7PQ, SU1CH, EA1AZ, EA2BT, EA2BH, EA2BM, EA3DQ, EA3ER, EA3EG, EA4BM, EA5BC, EA7BA, PA01DW, PA0WD, F8PK, F8DW, F8MM, F8MG, F8II, F3JD, ON4VK, G5TZ, G6QS, G2DV, G6AG, G2KT, G6GO, G5WH, G6CW, G2XV, G6HW, LU7ET, LU6KE, LU9PA, LU8DR, LU8AB, LU4AH, LU5CZ, LU5ES, PY3AW, PY2BA, PY2EJ, JY2CN, PY2ET, PY2CK, PY1DK, CX2AK, PZ1AA, CE1AP, CE1AR, CE1BC, CE3CW, YV5AN, YV4AN, HK2RS, HK3JA, HK3JB, HK1Z, XE1LK, XE1BT, XE1FY, XE1LC, T12AE, T12DC, K4UG, K4DDH, HH2B, VE5DK, VE4HX, VE5GU, VE5KY, W7BQJ, W7CPY.

On 40-meter phone: CT1GJ, EA1BT, EA9AH, CT1ED, HH2G, EA8AF, HI2T, YV1AA, YV4AB, HI9L, CO2RW.

By J. V. McMinn, 12 Edge Hill, Wellington, c.3, New Zealand, on 20-meter c.w.: CE1AQ, CM8GF, CM8MC, D3CFH, D3BMP, D3BAP, D3AOK, D3CUR, D3SDK, D4BEN, D3GKR, D3DLC, D4MNL, D4ARR, D4XCG, D4SXR, D4CDM, D4QET, D4PAU, D4TKP, D4CSA, D4YWM, D4TFL, D4YEJ, D4HCF, D4LJM, D4BEC, D4MOL, D4DMC, D4RVC, D4BUF, D4SXN, D4LNM, D4GJC, D4ZMI, D4QFT, D4XQF, D4YCF, D4AEC, D4MJC, D4DOR, D4YTM, D4JTK, D4ORT, D4KRJ, D4OON, D4YBF, D4ANF, D4OUT, D4OAR, D4YUM, D4OWT, D4AEN, D4NJF, D4SNP, F3DN, F3AJ, F3AK, F8EF, F8EO, F8IG, F8NV, F8BS, F8YG, F8KJ, F8WK, F8OK, F8GR, F8PK, F8II, F8GG, F8NN, F8VP, F8OQ, F8NR, G5MA, G5MS, G8ZY, G6NJ, G5XN, G6RB, G2MR, G5BJ, G5OQ, G2TD, G6DL, G2AX, G5VN, G6XI, G5WP, HAF3D, HAF4K, HAF8C, HB9X, HB9Y, HB9AK, HB9AW, HB9A, HB9BD, HB9BG, HC2JM, HK2JB, HK3JB, HS1PJ, I1ZZ, I1TKM, I1IR, J2CN, J2CG, J2JJ, J2LU, J5CC, K5AA, K5AI, K5AM, K5AY, KA1AS, LY1J, LY1HB, LY1ZP, LU3HK, LU4DQ, LU8AD, OA4J, OE6DK, OE6AX, OE7EJ, OH3OI, OK1ZR, OK2PN, OK2DF, OK2AK, OK2LO, OK2RS, OK2RM, OK2HX, OK3VA, K3KF, ON4HM, ON4DX, ON4DM, ON4HC, ON4AU, ON4BDO, OZ2B, OZ2H, OZ5C, OZ7CC, PA0ZK, PA0VB, PA0NO, PA0DC, PA0AZ, PA0MX, PY2AR, PY2BX, PY3AW, SM6WL, SM7UC, SP1GE, SP1DC, SU5NK, U2NE, U3DI, U5KS, VE1IN, VE2DG, VE1CU, VE3ADM, VP5AB, XE1CM, XE1AD, XE1AA, XE1AK, XE2O, XE2C, YL2BB, YR5AP, YU7DX, YM4AA, YM4AD, YN1AA.

On 20-meter phone: CE3DW, CO8RQ, CX2AK, F8II, K6NTV, KA1ME, KA1BH, OA4AE, OA4AA, PK3RC, PK4AU, PY2BA, T12PG, VE1CR, W1SZ, W1CRW, W1BLO, 1CCZ, W1AXA, W2TP, W2HUQ, W2FOA, W3MD, W3EOZ, W3EWW, W3DQ, W3FRE, W4CPC, W4FM, W4CWX, W4UK, W4ESY, W5LWU, W5PH, W6BEE, W6RN, W6LIP, W6KM, W6CLS, W6MDX, W6RKY, W6GAL, W6BHO, W6EJC, W6CKJ, W8ANO, W8AAK, W8GOY, W8DQN, W8QDU, W9CVN.

On 40-meter c.w.: CT1EN, D3DXU, D3DFN, D4YJI, D4NXR, D4NAP, D4OFT, F8XH, I1EC, OE6AX, OE6DK, OE7HD, SP1FU, U3BX, U3BB, UK3AN, UK5AA, XE1BC, XE1DY, XE2DZ.

On 40-meter phone: FO8AA, LU1EB, LU4BH, T11AF, T12OFR.

Modulation Meter

(*Continued from page* 601)

There is no point in driving the Class C or modulated amplifier stage beyond the point of providing slightly less than 100 percent modulation. The effectiveness of the signal will be the same regardless of carrier power with a given amount of audio power, providing, of course, modulation does not exceed 100 percent.

Recently the Triplett Electrical Instrument Company, of Bluffton, Ohio, developed an interesting modulation meter designed to meet the requirements of the average amateur station. It is designed to give visual information on: Carrier reference level for modulation; the carrier shift during modulation; modulation percentage directly on a dial over a range from 40 to 120 percent. It also may be used as an aural monitor.

The unit was tested at the writer's station and found to do all of these things quite effectively. It was found, as suggested by the manufacturer, if the needle of the modulation indicator was kept in the neighborhood of 90 percent, modulation was maintained well within the bounds of 100 percent. On sustained or continuous modulation, however, it checked accurately with an oscilloscope: 100 percent modulation being equal to 100 percent modulation. This is because the meter is adjusted and calibrated for continuous modulation. Therefore, voice modulation will indicate approximately 10 percent less than the actual modulation due to the damping and response of the meter.

The principal units of the meter are a 0-to-1 milliammeter which is calibrated in 100 divisions and a 200-microammeter which indicates the modulation percentage. Its dial is calibrated directly in percent. The 0-1 milliammeter is designated as a carrier reference meter and indicates carrier shift. It also serves to adjust the signal input to the proper amount so the modulation percentage meter will read accurately. The mid-scale point (50 on the dial) is designated in red numerals. The carrier shift meter is adjusted to read at this point by varying the amount of pick-up or input to the meter.

A type 76 tube is used to rectify the power picked up from the transmitter. This current then flows through the cathode and the carrier reference meter which indicates the strength of the signal for the coupling used.

The percentage of modulation meter is electron coupled to the rectifier tube through a low-pass filter comprising a radio-frequency choke coil, a .0003 microfarad and .001 microfarad condensers. This permits the audio component to pass from the rectifier (76) through the filter, thus eliminating the radio-frequency in this component. The audio component then passes through a copper-oxide unit. This rectifies the audio wave. For operation of the meter, the amount of audio wave is indicated in percent of modulation as the monitor is adjusted to a definite radio-frequency input voltage (50 divisions) on the carrier-shift meter. Any audio that is superimposed on the r.f. will be shown on the percent of modulation meter (200 microampere unit) in direct relation to the percent.

As the monitor is connected it will read positive peaks. To read negative peaks, it would be necessary to reverse the low-pass filter by reversing the a.c. connections to the copper-oxide rectifier. However, if the negative peaks are not as high as the positive peaks, the transmitter would be erratic and would cause carrier shift.

The unit is extremely simple to operate. One of its features is that it may be operated continuously during the interval a station is on the air. It is provided with an a.c. plug for connecting to the light mains and an "on" and "off" switch for controlling the filament of the 76 tube. Two terminals are provided for aerial and ground connections.

To couple the meter to a transmitter, it

should be inductively coupled to the tank coil of the modulated amplifier. This is done by placing a 2- to 5-turn loop in the field of the tank coil. This should be link-coupled to the meter, the line being connected to the "ant" and "gnd" terminals. The size of the loop will depend to a large degree on the strength of the antenna field. It is important that the pick-up loop not pick up any radio frequency from the other stages of the transmitter. This, of course, will result in a false reading, showing too much carrier and under-modulation. It is more practical to use a smaller coil closely coupled to the transmitter than a larger one that will have to be placed too far away from the modulated amplifier tank circuit and, thus, in position to pick up r.f. from the preceding stages.

At the writer's station a 2-turn, 3-inch loop about 9 inches from the final amplifier tank circuit was used. The transmitter has an input of 400 watts on 20 meters. The coupling coil should be variable, as it is this that provides for adjusting the carrier indicator to the proper scale setting (50 divisions).

With the transmitter being modulated the meter will indicate the percentage of modulation. There should be no indication of carrier shift on the carrier meter when the percentage of modulation shows 100 percent. Such an indication will mean something is out of adjustment. It may mean too low exciting voltage; improper adjustment of the transmitter; improper voltage applied to the elements; oscillator drift or poor regulation of the power supply.

Terminals are provided for using the meter as an aural monitor. This arrangement makes use of the 76 tube as a diode detector.

The "Quartet"

(*Continued from page* 603)

it may be necessary to vary this very slightly in tuning through the range. The audio volume control can be left at one setting practically all of the time, due to the good a.v.c. action. The noise-squelch control will normally be left in the "off" position and advanced only after a signal has been tuned in and ignition noise is found to be troublesome. In a location where ignition noise is continuous this control can be left in an advanced position if desired.

The magic eye will be found very useful as a resonance indicator and also serves as a rather rough signal-strength indicator. Variation in the width of the dark wedge, with modulation, should not be interpreted as an indication of over-modulation. When using a milliammeter plugged into the jack in the plate circuit of the first i.f. tube, however, wobbulation of the pointer *does* indicate over-modulation or frequency modulation. On a crystal-controlled signal, modulated 100 percent or less, the needle will stand absolutely still and will give an accurate, relative indication of signal strength, except on signals at or below the noise level. The meter reading will be affected by noise on such weak signals.

It is interesting to note that when using a milliammeter as a signal-strength indicator in this manner, its range is by no means linear. For instance, if a given signal retards the meter, half-scale, a signal twice as great will retard it 66 percent, a signal four times as great, 78 percent, a signal six times as great, 83 percent and a signal ten times as great 87 percent. What this means is, that small variations in the signal strength of weak signals will show

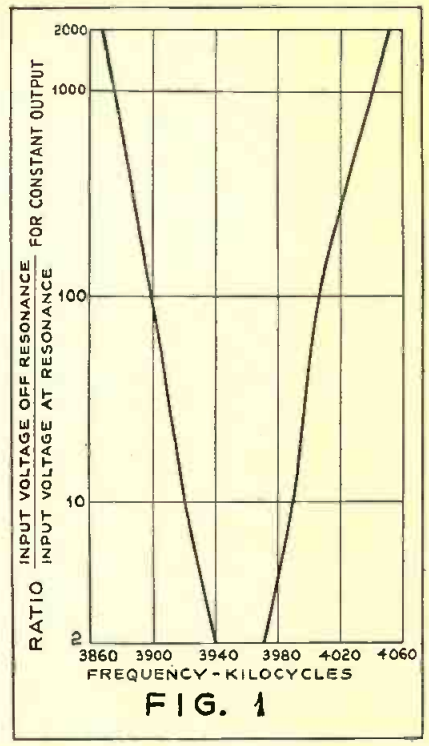


FIG. 1

rather wide differences on the meter, but signals strong enough to retard the meter more than 60 percent require large changes in signal voltage to show further appreciable changes on the meter. It might be added that few signals will be strong enough to retard the meter more than 85 percent, but on the other hand any signal that is audible will provide a small deflection. No "R" calibration is given here because such meters vary somewhat with different tubes, different i.f. alignment, etc. Perhaps the best plan is for each individual user to make his own calibration based on his own interpretation of the "R" scale.

One final word about the operation of the noise-squelch system. When a signal is tuned in with accompanying QRN, the noise-squelch control is advanced to a point where the noise is completely eliminated or reduced a marked degree. If this control is advanced beyond this rather critical point the signal strength will fall off rapidly. A few minutes' experimental operation of this control will prove highly instructive. It should be borne in mind that certain types of noise can't be eliminated with any squelch system but, in practical operating tests, it has been found effective with most of the types of noise encountered in city locations. It does a well-nigh perfect job on ignition noise and similar types of interference, but there are certain types of buzzing or humming noise on which it is somewhat less effective.

Little has been said specifically about 10-meter operation. Not because the receiver is less effective at these frequencies than on 5 meters, but because the receiver was especially designed to overcome the problems in 5-meter reception. For the ham who operates on both 5 and 10 meters the "Quartet" provides an excellent combination of desirable features.

Attention should be called to an unfinished line in the printed schematic diagram published last month. This line, extending from R17 to the right, should be jumped over the lead extending down from C31, and connected to the lead extending down from R24. This completes the B supply circuit to the 6F6 tube.

List of Parts for Power Supply

T—Stancor type XP3005 power transformer; 2.5 v., 10 a.; 6.3 v., 4 a.; 5 v., 3 a.; 360 v., 125 ma.

CH1, CH2—Stancor type XC1421 filter chokes. 25 henries, 140 ma.
C1, C2—Cornell-Dubilier type EB-8800, dual filter condensers. 8-8 mfd., 500 v.
R1—I.R.C. wire-wound resistor, 25,000 ohms, 10 watts
SW—Toggle switch
One octal wafer socket
One wafer socket, 4-prong
One RCA rectifier tube, type 5Z4
One black crackle-finished steel chassis, 8 by 8½ by 2 inches
One a.c. cord and plug
One 4-wire power cable with four-prong plugs for each end (cable of desired length)

The Radio Beginner

(*Continued from page 605*)

R10+R11+R12=1.2 megohm. Thus the time constant is 0.04×1.2=0.048 seconds (approximately 1/20 of a second).

The condensers C14 and C15 also serve the purpose of closing the tuned grid circuits of the amplifier tubes. They are in series with the tuning condenser.

The automatic volume control now works as follows. When no station is coming in there is no voltage across R8 and the grids of the 6K7 tubes are at ground potential. The tubes then have the bias determined by the resistors R2, R3 and R1. When a strong signal comes in, the point A will become negative and this negative voltage is applied to the grids, reducing the sensitivity. The circuit immediately adjusts itself for any change in signal strength, cutting down the strongest signals. It should not be expected that the action is perfect. Theoretically it can never be made so but a close approach is possible. Note also that the circuit can only reduce the sensitivity but cannot increase it. Therefore on weak signals there is nearly no a.v.c. action.

In large receivers where many stages can be controlled it is actually possible to regulate the signal strength at the detector very closely. The t.r.f. circuit is usually not so well adapted to it because it is hard to get enough control. The model used in the Radio News laboratory worked well enough to prevent overloading of the r.f. stages and to make adjustment of the sensitivity control unnecessary.

It was pointed out last month that the use of a diode detector will broaden the last circuit and less selectivity will be obtained. On the other hand the quality should be better.

One important by-product of a.v.c circuits is the tuning meter. If a milliammeter is placed in the plate circuit of one 6K7 tube (range 0-10 ma.) or in series with the plate circuits of both tubes (range 0-15 ma.), the correct point of resonance can be easily determined. The meter will show about 7 ma. per tube with no signal. As a signal is tuned in the meter reading goes down and the correct dial setting is indicated by the minimum meter reading. The meter reading is also an indication of the signal strength of the station and the merit of your antenna. The lower the meter reads on a given station the better it is coming in.

Automatic volume control has peculiarities which are common to all receivers in which it is employed. For instance, when the receiver is suddenly tuned from a strong station to a weak one, the background noise appears to increase. The reason for this is that the sensitivity is brought up to maximum as soon as one tunes off a carrier, and this brings in all the noise. The manual sensitivity control may be used to limit the maximum sensitivity and the maximum noise level.

For convenience, the circuit of Figure 1 shows the wiring changes in heavy lines. First the detector circuit is to be changed from the biased detector to the diode type. A special diode tube for this purpose is the 6H6 but the 6C5 will do the work as well if the grid and plate are joined. This makes the purchase of a new tube unnecessary.

Locate the grid return or grounded terminal of the secondary in all three coils. Disconnect it from the chassis, mount the terminal strips and wire as shown in the diagram. The wires should be kept as short as possible, especially those running from C14 and C15 to the chassis and to the coil.

A test to show that the automatic volume control circuit is working can be made by connecting a milliammeter in the plate circuit of a 6K7 tube. The current should decrease when a strong signal is tuned in.

The following additional parts are required.

C13—Cornell Dubilier, type DT-4S2 tubular paper condenser, .02 mfd., 400 volts.
C14, C15—Cornell Dubilier, type DT-4S1 tubular paper condensers, .01 mfd., 400 volts.
R10—IRC carbon resistor, 1 megohm. ½ watt.
R11, R12—IRC carbon resistors, 0.1 megohm. ½ watt.
2 insulated terminal strips: one 2-terminal, one 3-terminal.

The "Capatron"

(*Continued from page 589*)

This kit consists of an 8-band tickler-feedback oscillator coil assembly which is enclosed in a heavy copper shield. For clarity, the complicated coil and switch circuit is omitted in our diagram. It is included in the coil kit as supplied by the manufacturer.

In keeping with the general high character of this design, the National HRO Precision type straight-line-frequency variable condenser and dial are specified. This combination spreads out each range over 500 large scale divisions, making for ease in obtaining precise calibration.

Referring to Figure 1, the control-grid and screen-grid of the 6J7 oscillator connect to the leads emerging from the coil assembly can. The suppressor grid is biased about 18 volts negative through a high resistance-capacity filter network composed of R3, R6, R7, R4, R5 and the main biasing resistor R8. A blocking condenser prevents shorting out this bias when external modulation is used. Since less than 5 volts r.m.s. are required for 100 percent modulation and the input resistance is 1 megohm, negligible power is drawn from the a.f. source and good wave-form is maintained. The suppressor grid remains negative throughout the modulation cycle.

In the 6J7 plate circuit, a 2.1 m.h. r.f. choke, shunted by a 10,000 ohm resistor to flatten peaks, provide the output load. The choke keeps the a.f. component fed to the tube voltmeter at a negligible value so that substantially the entire output is modulated r.f.

The output voltage fed to the attenuator is controlled by the potentiometer, R9. The moving arm connects to the output coupling condenser, C7, rather than to the v.t. voltmeter grid so that the r.f. output may be set at minimum and enable the tube voltmeter to be used for external voltage measurements. The low end of R9 returns to the junction of R4 and R5 to provide a bias of approximately 5 volts for the v.t. voltmeter grid.

The negative conductance a.f. oscillator is a very simple design requiring only a midget a.c.-d.c. type choke as the inductance. The control grid required a high negative bias to give the wave form desired and shown in the oscillogram. Still higher bias would make it perfect but would result in somewhat "sticky" operation. With the present bias, oscillation

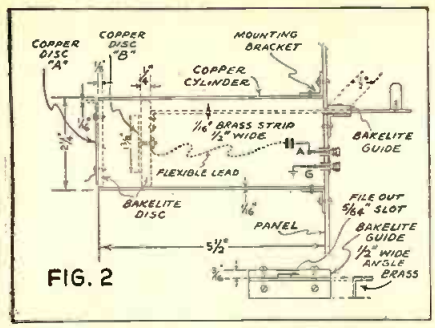


FIG. 2

does not start until Sw. 2 is momentarily closed and opened but thereafter it operates beautifully.

Since the total B current drain of all the tubes is only about 10 ma. no hum filter chokes were found necessary in the power supply. R10 and R11, by-passed by C15 and C16 give adequate filtration.

R.f. filters are plentifully used throughout. In the oscillator, the small mica condensers are employed across the heater, and at the power transformer larger tubu-

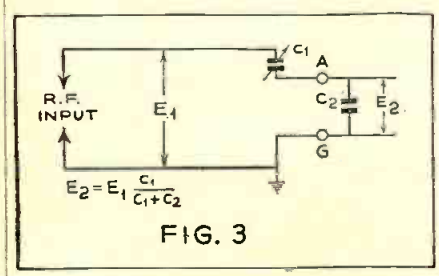


FIG. 3

lar condensers are added. In the transformer primary circuit, the transmitting type .5 amp. chokes in conjunction with by-pass condensers help to keep the little remaining r.f. from being conducted through the power cord. Electrostatic shielding should be employed in the power transformer.

Before describing the construction of this instrument, we want to say that signal generators are perhaps the most difficult of all test instruments to build. This job should not be undertaken by an inexperienced radioman. We have no blue-prints of the wiring, yet the placement of each wire is important to the proper operation of the instrument. Some wires are more important than others and we shall try to make the description as complete as possible and include sufficient general information to provide best results.

The chassis for the power supply and a.f. oscillator is formed by bending a piece of 18 gauge sheet steel to give the shape shown in the photograph. The dimensions are 4⅞ x 7⅛ x 2½ inches. No specifications are given for drilling since no critical positions are involved.

The panel and r.f. unit specifications are given. The r.f. shield-box unit is made in two sections, not counting the top and bottom covers. Aluminum is employed for both units as well as the cabinet. The panel is of ⅛th inch sheet and the other parts of 1/16th inch stock.

Full size working drawings should first be laid out, preferably on tissue drawing paper. When finished, place the r.f. unit drawing under the panel drawing and make certain that all shaft holes coincide. The slot for the attenuator strip had best wait until the attenuator is completed to make certain it will correspond to minor variations which may be found necessary. After these are complete, it will be best to let the job of construction of these parts to some metal worker in your neighborhood. The specifications given in this article call for a slightly larger panel and cabinet than was actually used in this instrument so that somewhat greater tolerance in the construction of the r.f. unit shields is permitted and it will not be necessary to hold closer than 1/16th inch on any overall dimension.

When the shielding is completed, if you make it yourself, an attractive crackle-lacquer finish can be obtained by going over all external surfaces with General Cement Rul-Coat, using a soft brush and applying a moderately thick coat. This was used on our panel.

The location of the various parts is obvious from the photographs. The variable condenser is separately mounted on a piece of 4 by 4 inch bakelite, ¼ inch thick since no part of either the rotor or stator must touch the shield save at a single point. The sockets are mounted on stand-

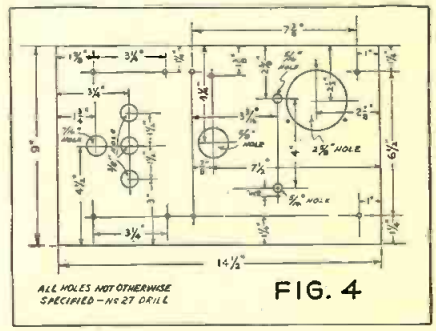


FIG. 4

off supports ½ inch high. Preferably the shielded r.f. chokes should likewise be insulated from the r.f. box, using thin bakelite washers. The coil assembly can may not be conveniently isolated from the aluminum box since the switch shaft is short.

All the above precautions are necessary in order to provide as far as possible for a single point ground. It should be remembered that the purpose of the shielding is to confine radio frequency currents and it is most effective when it carries the least possible amount of current. Openings in the shield, when properly located, reduce the effectiveness but little, but utilizing the surfaces for the conduction of return currents changes the potential at different points and causes radiation. All wiring in the r.f. unit is grounded to a point on the r.f. coil can where the shielded wire emerges. This point gives extremely short connections to the heavy oscillator currents, and though those from the chokes will of necessity be much longer, the currents to be by-passed are considerably smaller.

When the r.f. and power supply units have been wired, they are mounted on the front panel. The r.f. unit is spaced 2 inches back by ½ inch diameter bakelite rods, drilled and tapped for ¾ inch 8/32 screws at each end. The smaller chassis and attenuator are mounted directly on the panel, but neither must touch the r.f. unit. A single heavy wire is now run from the grounding point of the r.f. can to the nearest attenuator mounting bracket. A

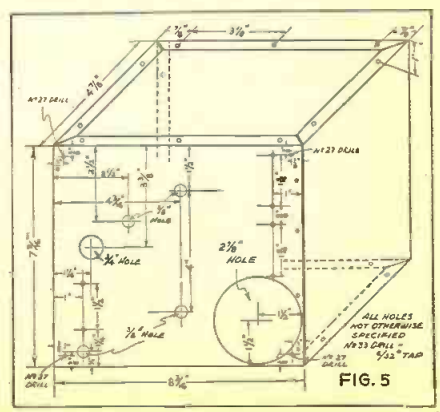


FIG. 5

similar lead is brought from the output ground terminal post to a lug under this bracket.

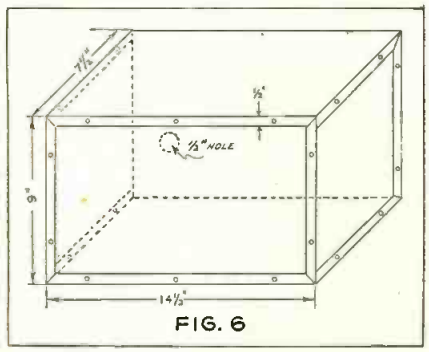


FIG. 6

The shafts from the coil switch and r.f. control potentiometer are fitted with ¼-inch brass couplings joined to ¼-inch bakelite extension shafts which protrude through the panel. The variable condenser shaft requires special care. The shaft will not fit a standard brass coupling so one will have to be made. Drill out one to fit snugly to the shaft, slightly over 5/16th inches, and couple to a short piece of 3/8-inch bakelite rod. The condenser shaft will have to be cut off until it is about 1 inch long. For the dial side, a piece of 5/8th brass rod should be drilled at one end to take the 3/8 bakelite rod and turned down in a lathe to fit the dial shaft bushing at the other end. This work must be precisely done or the dial will wobble. The dial itself should be mounted as specified by the manufacturer in order to function properly.

Detailed instructions on calibration, operation and other information will follow in another article.

Parts List—Signal Generator

C1, C21—Aerovox fixed mica condensers, type 1467, .0001 mfd.
C2—National Precision condenser and dial assembly, single gang, type PW-1, .00035 mfd.
C3, C17, C20—Aerovox tubular coudensers, type 284, .01 mfd., 200 volts
C4, C5, C6, C8, C9, C18, C19—Aerovox tubular condensers, type 284, .1 mfd.
C7—Aerovox fixed condenser, type 1467, .00025 mfd.
C10—Aerovox fixed mica condenser, type 1467, .001 mfd.
C11, C12, C13, C14—Aerovox fixed paper condensers, type 460, metal cased, dual .1—.1 mfd., 400 volts
C15, C16—Aerovox electrolytic condensers, type 2GL, dual 8-8 mfd., 450 volts
R1, R15—I. R. C. insulated carbon resistors. 10,000 ohms, ½ watt.
R2—I.R.C. insulated carbon resistor, 25,000 ohms, ½ watt
R3, R6, R7—I. R. C. insulated carbon resistors, 1 megohm, ½ watt
R4—I. R. C. insulated carbon resistor, 800,000 ohms, ½ watt
R5—I. R. C. insulated carbon resistor, 2 megohms, ½ watt
R8—I. R. C. insulated carbon resistor, 4,000 ohms, 1 watt
R9—I. R. C. volume control, 500,000 ohms, type 11-133, taper A
R10, R11—I. R. C. wire-wound resistors, 10,000 ohms, 10 watt
R12, R13—I. R. C. insulated carbon resistors, 20,000 ohms, 1 watt
R14—I. R. C. insulated carbon resistor, 1000 ohms, ½ watt
R16—I. R. C. volume control, 10,000 ohms, type 11-116, taper A
R17—I. R. C. insulated carbon resistor, 75,000 ohms, 1 watt
R18—I. R. C. volume control, type 11-143, linear taper, 10 megohms
R19—I. R. C. insulated carbon resistor, 250,000 ohms, ½ watt
R20—I. R. C. insulated carbon resistor, 500,000 ohms, ½ watt
SW1—I. R. C. volume control switch
SW2—S. P. D. T. toggle switch (included with RCA coil kit)
1 Hammarlund midget r.f. choke, type Ch-X, 2.1 m.h.
2 Hammarlund shielded r.f. chokes, type Ch-10S 10 m.h.
2 Hammarlund r.f. chokes, transmitting type, Ch-500, 2.5 m.h., 500 m.a.
1 RCA conversion kit, stock No. 9559, including all-wave oscillator coils band switch, tog-

gle switch, indicator plates and resistors
1 Stancor power transformer type 2751, 115 volts, 60 cycles, 650 v.—c.t. @ 40 ma., 5v. @ 2A, 6.3v. c.t. @ 1.6A.
1 Stancor filter choke, type C-1080, a.c.-d.c., 200 ohms
1 Triplett O-1 milliammeter, model 321, bakelite case
1 Yaxley midget 2 circuit jack
¼ inch bakelite rod, 6 inch length
⅜ inch bakelite rod 1 inch length
½ inch bakelite rod, 1 foot length
1 piece bakelite 4 by 4 by ¼ inches
2 ¼ to ¼-inch brass couplings
1 special 5/16 to ⅜ coupling (see text)
1 ⅜ to 5/16 shaft coupling (see text)
3 6J7 metal tubes
1 5Z4 metal tube
4 octal sockets
4 ½ inch socket supports
4 small pointer knobs
1 output binding post assembly (marked A-G)
1 copper tube 5½ inches long, 2¼ inches O.D., 1/16 inch wall
Cabinet and shield box, 1/16 inch aluminum (see text)
Panel, ⅛ inch aluminum (see text)
Screws, nuts, rubber grommets and terminal strips

The DX Corner (Broadcast Band)

(*Continued from page* 595)

Mexican-Canadian radio interference problem. The Canadian Broadcasting Corporation will construct a high powered broadcasting transmitter (probably 50 kw.) on Sea Island, seven miles south of Vancouver."

Observer Meade (Kansas City, Mo.): "In checking up I find there are 882 broadcast band stations in United States, Canada, Mexico, Cuba, Porto Rico, Alaska and Hawaii. My log shows only 571 active stations heard. A small matter of 311 still to get."

C. Roman (Chicago, Ill.): "WCFL, 970 kc., 5 kw., has permit to increase power to 50 kw. and will soon have a cleared channel on either 970 or 1020 kc. Its s.w. station, W9XAA, will boost power to 20 kw. Both stations are scheduled for completion in 1938."

Anne & Carl Eder (Willmar, Minn.): "Mystery station on 820 kc. has verified on record time. It is XEBG, Tijuana, Mexico, and is on the air from 5 a. m. to 11 p. m., P. S. T. English broadcast 10-11 p.m., P. S. T."

Observer Tucker (Bluff, Alaska): "Reception from States fair during December. Best reception 4-9 p.m. Foreign reception very poor. Trans-Pacific stations heard very weakly 9-12 P.M. No European stations heard as yet."

Observer Crawford (Seneca, Nebr.): "DX here best about daylight. T. P.'s, when they come through at all, are best at this time. The V. K.'s sometimes come through after sun-up."

DX Convention

With the object of creating greater fellowship among DX'ers throughout the world, an International DX Convention will be held in San Francisco during the month of July, 1939. Although originated and sponsored by the International DX'ers Alliance, all DX Clubs and other organizations interested in radio are being asked to participate.

The Convention will be replete with all the customary trimmings, including banquet, talks by prominent DX'ers and radiomen, contests, prizes, visits to local radio stations, recreations, etc. The programme will also include special demonstrations of the latest radio and television apparatus.

The most outstanding attraction will be the Golden Gate International Exposition —A Pageant of the Pacific! This $40,000,000 World's Fair will mark the completion of the world's two largest bridges across San Francisco Bay. Its theme will be modern developments in transportation and communication as symbolized by the bridges, by the trans-oceanic air services and the progress in radio and television. The Exposition has been accorded official United States Government recognition.

In sponsoring this Convention, the International DX'ers Alliance offers equal credit and honors to all participating organizations. This meeting is being planned in the spirit of good fellowship for the mutual advancement of all concerned and for the promotion of the DX'ing spirit in particular. All clubs and organizations wishing to cooperate should write immediately to George C. Sholin, Director, Golden Gate International DX Convention, 55 Lapidge St., San Francisco, California, United States of America.

Radio listeners and DX'ers! Support the 1939 Convention; tell your friends about it; and lay your plans *NOW* to attend!

INDEX TO ADVERTISERS

Read Classified Advertising—It Pays

Advertisements in this section sixteen cents a word for each insertion. Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisements for less than 10 words accepted. Objectionable or misleading advertisements not accepted. Advertisements for these columns should reach us not later than 3rd of 2d month preceding issue.

TECK PUBLICATIONS, INC.
461 Eighth Ave. New York, N. Y.

Correspondence Courses

USED Correspondence Courses and Educational Books sold or rented. Inexpensive. Money-back guarantee. Write for Free Catalog listing 4000 bargains. (Courses Bought.) Lee Mountain, Pisgah, Alabama.

BIG BARGAIN Catalogue Courses 10c. Handling. P-799 Broadway, New York.

Patent Attorneys

PATENTS. Instruction "How to Establish Your Rights" and form. "Evidence of Conception" sent Free! Lancaster, Allwine & Rommel, 414 Bowen Building, Washington, D. C.

PATENTS—Advice and booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 9th Street, Washington, D. C.

Patents and Inventions Wanted

INVENTIONS COMMERCIALIZED. Patented or unpatented. Write Adam Fisher Company, 278 Enright, St. Louis, Missouri.

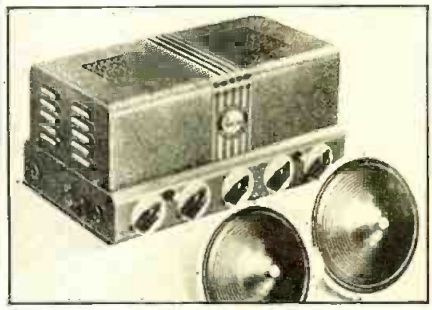
Radio Instruction

AMATEUR RADIO, Commercial Radiotelephone and Radiotelegraph licenses, complete training, resident and correspondence courses. Every graduate a licensed operator. N. Y. Wireless School, 1123 Broadway, New York.

What's New in Radio

(Continued from page 585)

the 15-tube, 45 watt, sturdily constructed unit illustrated below with dual speakers. This amplifier is equipped with a volume-range expander, input arrangements for two crystal or velocity mikes, high-impedance phonograph pick-up and a double



button carbon microphone. Other technical specifications include 130 db. gain and frequency response to vary less than ½ db. from 40 to 10,000 cycles.

Service Hints Indexed

Aids to servicemen in shooting trouble on a large and comprehensive list of receivers are neatly and concisely compiled in the new "Kink-Aid" card index system just introduced by the Akrad Products

Company. The time saved on just one or two of the 900 cases described should more than repay the cost of this valuable guide.

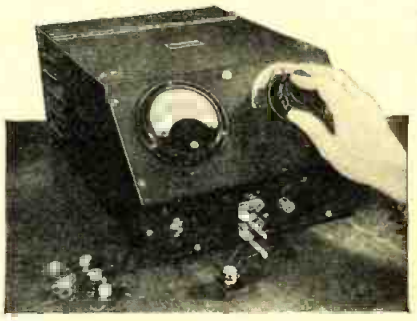
Special P. A. Speaker

Particular attention has been given to exacting public address requirements in the new model 1984 twelve-inch permanent-magnet speaker just introduced by Wright

De Coster. A brass cup affords protection for both the magnet and transformer against bad weather conditions, while the solid center spider keeps out dirt, dust and filings. High power handling ability of 15 watts is provided.

New Unit for Coil and Condenser Testing.

A precision instrument for production test of coils and condensers at frequencies ranging from 100 kc. to 25 m.c. has been



announced by the Boonton Radio Corporation. The "QX-Checker," as it is termed, provides a simple, dependable method of comparing Q and L or C in a single operation and is designed to give greater accuracy in less time than could be obtained with previous test equipment.

Latest Signal Generator

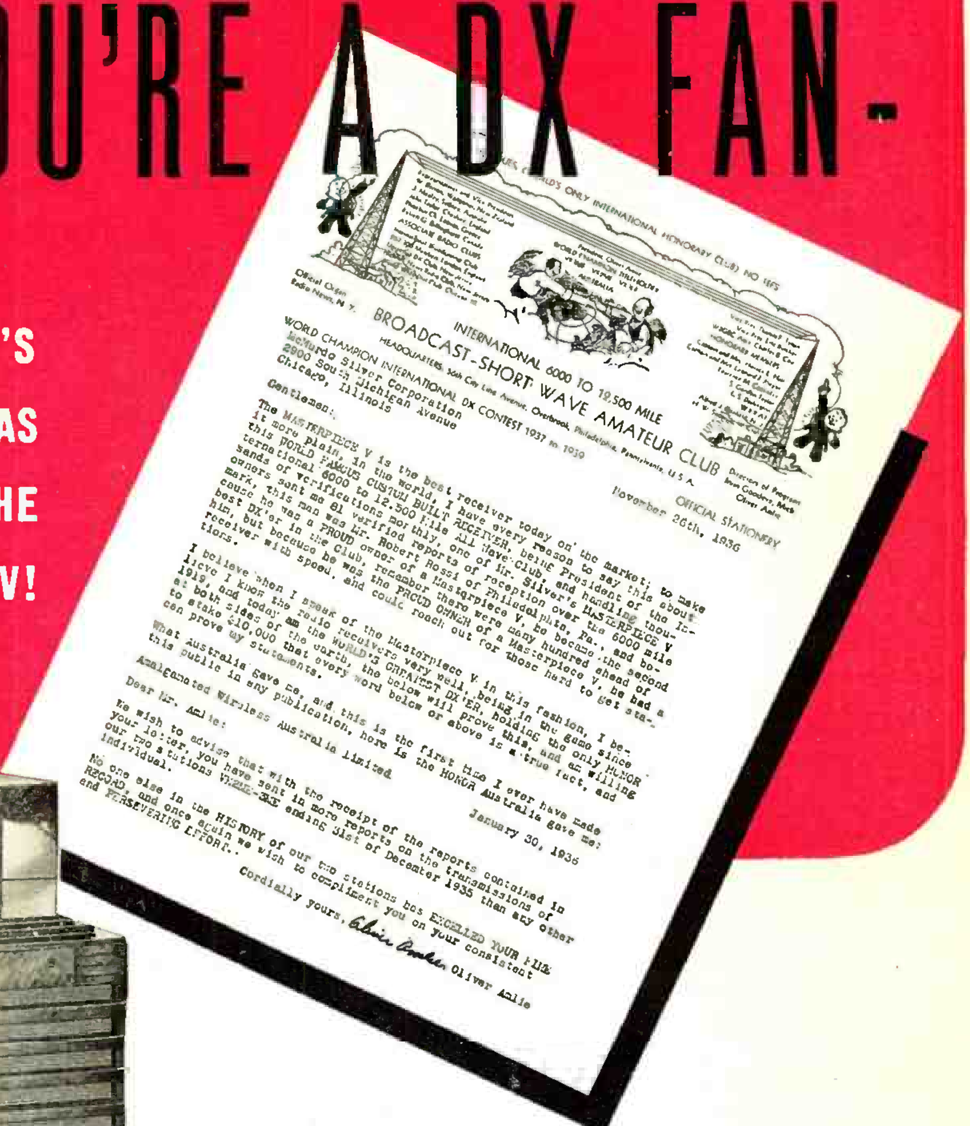
The Clough-Brengle model OC-A signal generator offers sturdy construction, compactness, eye appeal and the following engineering advances: a range from 100 kc. to 30 megacycles with each band hand-calibrated to a guaranteed frequency accuracy of ½ of 1%, tuning dial length of 25 inches, stepless dual attenuator for both r.f. and a.f. output voltages, and other features. Other models with the same general characteristics are available for universal a.c.-d.c. and battery operation.

Circuit Breaker Protects Tubes

The "Re-Cirk-It" breaker produced by the Heinemann Electric Company is a fully-magnetic, non-thermal device available in capacities from 50 milliamperes to 35 amperes. There are two types: instantaneous trip and time-delay action. It is a practical safeguard against accidental overloads or short-circuits.

IF YOU'RE A DX FAN—

READ WHAT A WORLD'S DX CHAMPION HAS TO SAY ABOUT THE MASTERPIECE V!



INTERNATIONAL 6000 TO 12,500 MILE
BROADCAST-SHORT WAVE AMATEUR CLUB
HEADQUARTERS 56th City Line Avenue, Overbrook, Philadelphia, Pennsylvania, U.S.A.
WORLD CHAMPION INTERNATIONAL DX CONTEST 1937 to 1939
OFFICIAL STATIONERY

November 26th, 1936

McMurdo Silver Corporation
2900 South Michigan Avenue
Chicago, Illinois

Gentlemen:

The MASTERPIECE V is the best receiver today on the market; to make it more plain, in the world, I have every reason to say this about this WORLD FAMOUS CUSTOM BUILT RECEIVER, being President of the International 6000 to 12,500 Mile All Wave Club, and handling thousands of verifications monthly, one of Mr. Silver's MASTERPIECE V owners sent me 81 verified reports of reception over the 6000 mile mark, this man was Mr. Robert Rossi of Philadelphia, Pa., and because he was a PROUD owner of a Masterpiece V, he became the second best DX'er in the Club, remember there were many hundred ahead of him, but because he was the PROUD OWNER of a Masterpiece V, he had a receiver with speed, and could reach out for those hard to get stations.

I believe when I speak of the Masterpiece V in this fashion, I believe I know the radio receivers very well, being in the game since 1919, and today am the WORLD'S GREATEST DX'ER, holding the only HONOR at both sides of the earth, the below will prove this, and am willing to stake $10,000 that every word below or above is a true fact, and can prove my statements.

What Australia gave me, and this is the first time I ever have made this public in any publication, here is the HONOR Australia gave me:

Amalgamated Wireless Australia Limited

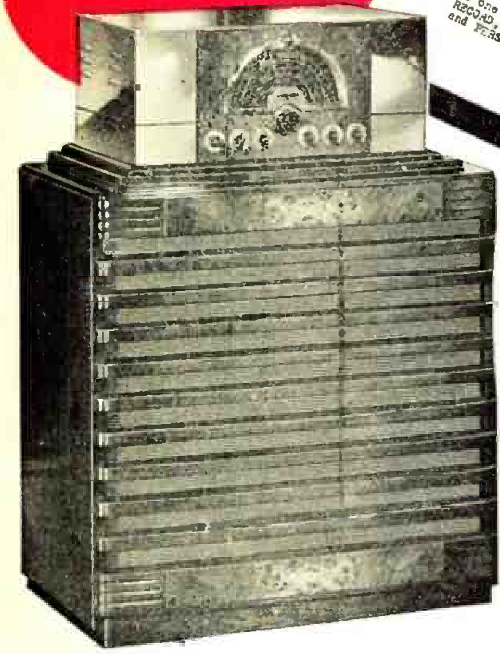
January 30, 1936

Dear Mr. Amlie:

We wish to advise that with the receipt of the reports contained in your letter, you have sent in more reports on the transmissions of our two stations VK2ME-3ME ending 31st of December 1935 than any other individual.

No one else in the HISTORY of our two stations has EXCELLED YOUR FINE RECORD, and once again we wish to compliment you on your consistent and PERSEVERING EFFORT.

Cordially yours, Oliver Amlie



MASTERPIECE V IS SELECTED AS FIRST PRIZE FOR WORLD'S CHAMPION DX CONTEST OF THE INTERNATIONAL 6000 TO 12,500 MILE BROADCAST-SHORT WAVE AMATEUR CLUB.

The selection of the MASTERPIECE V as first prize in this International DX Contest is a splendid tribute to the outstanding performance of this finest of receivers. It is recognition by experts of advanced engineering that employs 14 new developments never before used on any receiver—of the unmatched tone attained with the new McMurdo Silver Baffle that permits full range sound reproduction (30-9000 cycles) for the first time.
The winner will become one of that enthusiastic fraternity of MASTERPIECE owners who are experiencing perfect radio reception with a receiver that's "5 years ahead".

THE WORLD'S ONLY TRULY CUSTOM BUILT RADIO

McMURDO SILVER MASTERPIECE V

FREE SUBSCRIPTION TO SILVER TIMES

MAIL THIS COUPON TO
McMURDO SILVER CORP.
2900 South Michigan Blvd., Chicago, Illinois

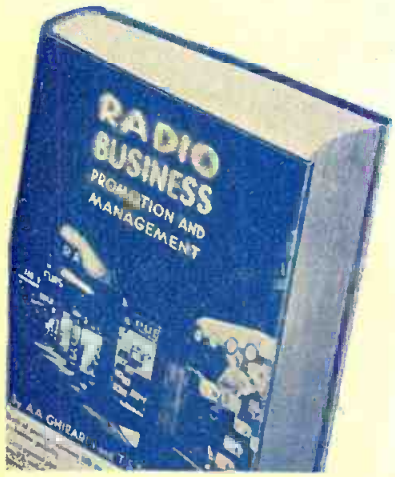
Please enter my FREE subscription to your interesting radio magazine, Silver Times.

Name ....

Address ....

City .... State ....

2,199 ways to GET OUT OF A RUT!



Service Men:

HERE IS A BOOK THAT WILL TURN YOUR SHOP INTO A GOOD-PAYING BUSINESS

We all get into ruts. But we don't all get out of them. Those who get out are successes. Those who don't are failures. That is the blunt truth about the radio servicing business and we might as well face it honestly.

To make a real success in business today the radio service man must keep out of the ruts. He must be alive, alert, on his toes every second, one step ahead of the other fellow. He must be just as good a business man as he is a service man.

A book about YOUR business

Up to the present it has not been easy for the technically-trained radio man to master the essentials of modern business. But now—any service man can easily learn the most effective and economical ways to build up volume and profits, to make money quickly in his own radio business. These are the very plans, ideas and methods used by the most successful radio organizations today—ideas that have produced thousands of dollars worth of business before, that will produce many thousands more for those who use them in the future.

What this book will DO for YOU

These ideas, plans and methods—2,199 of them in all—2,199 ways to get out of a rut—they're all put together in one big book. A book of business information obtained from practical men by practical men for practical men. A book that tells you EVERYTHING you want to know about the business side of your profession—WHAT to do and HOW to do it! Complete . . . Authoritative . . . Up-to-date . . . a typical Ghirardi book. And it's all made so clear and simple that you can put it to work making money for you the very day you get the book!

Just picture to yourself the effect this invaluable knowledge will have on your own business! Let's all get out of the ruts and get that business we should have. Mail the coupon—or postcard—today for a FREE CIRCULAR telling you all about it!

With over 400 pages and 200 illustrations this great book tells you just exactly what to do to build up your business—how to advertise, how to sell, how to get free publicity, how to "merchandise", how to run a business profitably. It gives actual examples of order-pulling ads, sales letters, postcards, etc., which you can use for yourself. It applies to the sale of radio servicing, new sets, Auto Radio, P. A. work, home electrical and radio appliances, etc.

It's positively the first and only book of its kind!

RADIO BUSINESS
Promotion and Management

by A. A. Ghirardi and T. S. Ruggles

OVER 400 PAGES—OVER 200 ILLUS.

FREE Check up on your own business with this unique Check-chart that shows you at a glance the strong points and weaknesses in your present set-up. It's free!

"The Radio BUSINESS BAROMETER"

CLIP and MAIL Today

Radio & Technical Publ. Co., Dept. RN-47
45 Astor Pl., N. Y. C.

Please send me free circular BB, describing the book in full. Also the free "Radio Business Barometer."

Name.....

Address.....

.....

Occupation.....

Free Circular

FOR DEALERS AND SERVICE MEN

With all these **PRE-TESTED IDEAS** you can't help **MAKING MONEY!**

HOW TO SELL

Why people buy. Market analysis. How to get leads and prospects. How to get people into your store. Principles of selling. Demonstrations. Store selling. Selling by phone. Outside selling—how to get by the door—following up leads. Selling talks. Sales resistances and how to break them down. Making business contacts.

HOW TO ADVERTISE

How to plan your promotional program. How much to spend. Costs. How to write your advertising. Tested appeals. How to get action. Preparation and production. Forms of advertising. Display—Direct Mail—Newspaper—Broadcast—Phone Book—Other media. Publicity. Merchandising. Premiums, Logs, Contests, etc., Follow-ups.

BUSINESS METHODS

How to set yourself up in business. Shop equipment. Store layout. Managing the business. Employee and customer relations. Financial data. Bookkeeping and accounting. Instalment financing. Collections. Sales and service forms and records. House policies. Sidelines.

A Million Dollars' Worth of Ideas and Experience For You!

Everything ABOUT RADIO Servicing IN 2 BIG BOOKS

Ghirardi's famous MODERN RADIO SERVICING, together with the companion book, RADIO FIELD SERVICE DATA, give you a permanently up-to-date reference library for practical radio service work. MODERN RADIO SERVICING (1300 pages—706 illus.) gives you a thorough instruction course in radio servicing as it is most successfully practised today. RADIO FIELD SERVICE DATA (436 pages—107 illus.) gives you all the essential job data you need for shop and field use, and is kept up to date with Supplements issued twice a year. Here's a small part of what these 2 great books will give you:

TEST INSTRUMENTS

Complete explanation of all kinds of radio test equipment. Principles of operation and design. Description of latest commercial models, with circuit diagrams. Construction data.

SERVICING METHODS

Latest test and repair methods. Receiver analysis. Individual components. Aligning sets with test oscillators and by latest Cathode-Ray Oscilloscope methods. AVC and QAVC circuits. All clearly explained in detail with copious diagrams, etc.

SPECIAL SERVICING PROBLEMS

Auto Radio installation and servicing. Location and elimination of noise and interference in All-Wave sets. High Fidelity sets. Servicing Marine receivers, etc.

FIELD DATA

"Case Histories" of over 1500 receivers, with trouble symptoms and remedies for each. I. F.'s for 5,424 superhets. Automobile electrical wiring diagrams and ignition interference data. Trouble-shooting chart. RMA Color Codes, wire tables, etc.

A Double-Barrelled Combination!

MODERN RADIO Servicing $4 alone

Together with 436 p RADIO FIELD SERVICE DATA $6

MAIL TODAY!

TO:
Radio & Technical Publ. Co.
Dept. RN-47
45 Astor Place
New York City

☐ Enclosed find $6 for Combination Offer, including Jan. & June 1937 Supplements to DATA BOOK

☐ Please send free circular "S"

Name.....

Address.....

.....

Also—RADIO PHYSICS COURSE—$4