

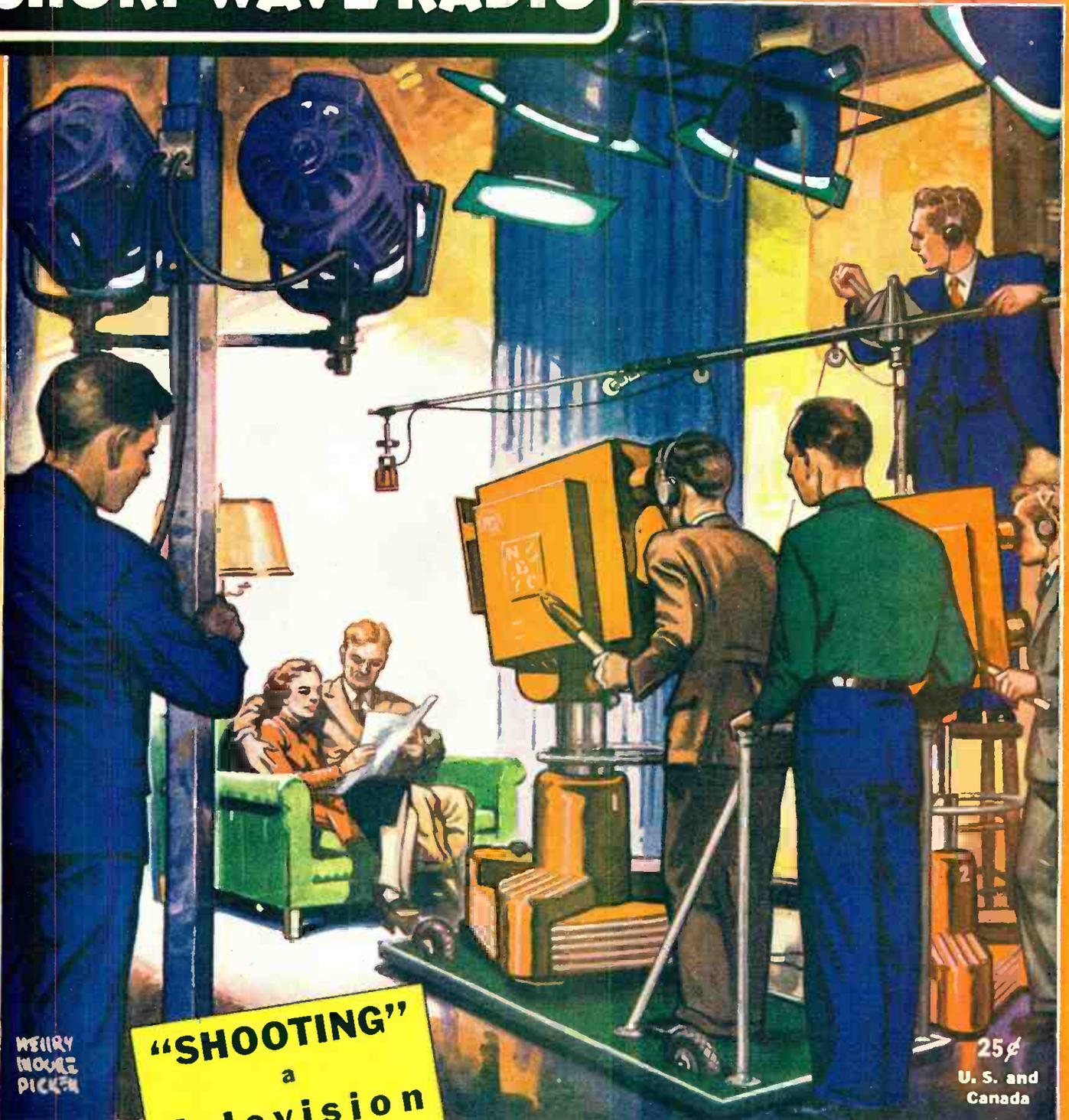
THE TELEVISION ERA STARTS

# RADIO NEWS

AND  
SHORT WAVE RADIO

SHORT  
WAVE  
TIME  
TABLE

FEBRUARY



WERRY  
MOORE  
PICKER

**"SHOOTING"**  
a  
**Television  
Scene at NBC**

25¢  
U. S. and  
Canada



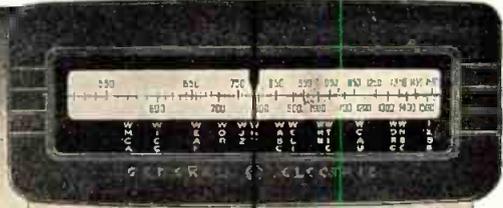
# Automatic Color Tuning

## ASSURES FOCUSED TONE

**YOU CAN SEE IT!**

**YOU CAN HEAR IT!**

*..... as it brings you Perfect Tuning . . Perfect Tone*



The new 1937 General Electric Automatic Color Tuning Radio instantly corrects your tuning errors — in dramatic and amazing fashion. Set the dial the slightest bit off the mark and PRESTO! — it shifts itself into hair-line tuning. And, in the twinkling of an eye, the remarkable new Colorama Dial changes from red to green. When the dial glows green you can be sure your program is in perfect Focused Tone. Music and speech gain a new realism that must be heard to be believed.

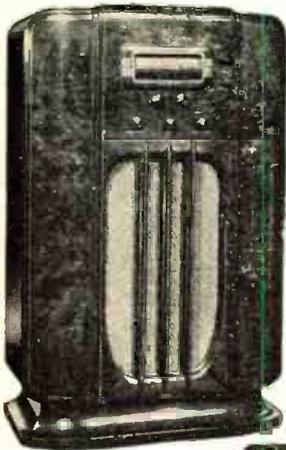
Focused Tone means much more than perfect tuning. It brings you the first Personalized Radio — with a custom-tailored, personalized dial. Your local station letters flash on when you tune in. No more hunting up kilocycle numbers — because your favorite stations are marked by letters as well as kilocycles. And the new G-E brings you silent tuning. You can switch programs, at will, without a single squeal, squawk, or screech.

See — and hear — the radio sensation of the year. Stop in soon at your nearest G-E Radio dealer's. Compare the new G-E on tone — on performance — on beauty of design — and on price — with any and all other radios. Make this test and you'll buy the new G-E Automatic Color Tuning Radio.

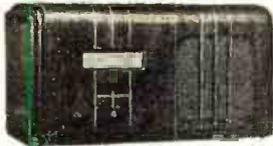
### WHAT IS FOCUSED TONE?

Focused Tone combines all the revolutionary new features described above, plus these new G-E Radio inventions and developments — G-E Metal Tubes; the G-E Sentry Box; G-E Stabilized Dynamic Speakers; G-E Sliding-rule Tuning Scale; G-E "V-doublet" All-wave Antenna. Focused Tone is G-E's greatest radio achievement. Only the new G-E gives it to you — **Automatically - Visibly - Instantly.**

The new G-E brings you every radio service on the air—Foreign Broadcasts over ALL short-wave bands; Domestic Short-wave Stations; Domestic Programs—heard with new tone perfection Police Calls and Amateur stations — day and night.



The new General Electric comes in 26 handsome models — priced from \$22.50 to \$750 (Eastern list — slightly higher west and south).



Lauritz Melchior — Distinguished artist of the opera and radio.

— Harsh, blurred, discordant tone. Nine out of ten people unknowingly tune in their radios off focus.

The new G-E Radio automatically shifts itself into hair-line tuning every time. And at the same instant the fascinating new G-E Automatic Color Tuning changes from red to green to tell you your program is in perfect Focused Tone.

— Harsh, blurred, discordant tone. Nine out of ten people unknowingly tune in their radios off focus.

WHEN YOU REPLACE METAL TUBES, ALWAYS SPECIFY G-E

*You'll always be glad you bought a G-E*

# GENERAL ELECTRIC

# Radio

RESEARCH KEEPS GENERAL ELECTRIC YEARS AHEAD



# Be a Radio Expert

Many make **\$30 \$50 \$75** a week

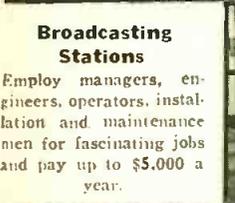
## I will train you at home for many Good Spare Time and Full Time Radio Jobs

**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.



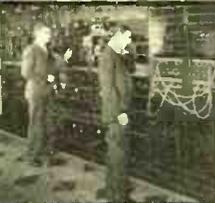
### Set Servicing

Spare time set servicing pays many \$5, \$10, \$15 a week extra while learning. Full time servicing pays as much as \$30, \$50, \$75 a week.



### Broadcasting Stations

Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to \$5,000 a year.



### Loud Speaker Systems

Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.



## HERE'S PROOF THAT MY TRAINING PAYS



### \$80 Monthly in Spare Time

"I work on Radio part time, still holding my regular job. Since enrolling five years ago, I have averaged around \$80 every month." JOHN B. MOTTISETTE, 773 Silver Street, Manchester, N. H.

### Makes \$50 to \$60 a Week

"I am making between \$50 and \$60 a week after all expenses are paid, and I am getting all the Radio work I can take care of, thanks to N. R. I." E. W. SPANGLER, 308 Walnut St., Knoxville, Tenn.



### Operates Public Address System

"I have a position with the Los Angeles Civil Service operating the Public Address System in the City Hall Council. My salary is \$153 a month." R. H. ROOD, R. 136, City Hall, Los Angeles, Calif.

### Lesson on Radio Servicing Tips—FREE

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, balance, retuning and testing. Get this lesson Free. No obligation. Just mail coupon.



Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. And you don't have to give up your present job or leave home and spend a lot of money to become a Radio Expert.

### Many Radio Experts Make \$30, \$50, \$75 a Week

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 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. Mail the coupon.

### 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!

### 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 that made good spare time money—\$200 to \$500 a year—for hundreds of fellows. My training is famous as "the Course that pays for itself."

### I 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. This \$0-50 method of training makes learning at home interesting, fascinating, practical.

### You Get a Money-Back Agreement

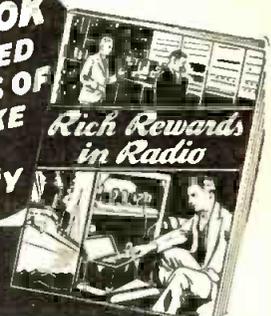
I am so sure that I can train you successfully that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send you a copy of this agreement with my Free Book.

### Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It 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 on a postcard—NOW!

J. E. SMITH, Pres., National Radio Institute  
Dept. 7BR, Washington, D. C.

**THIS FREE BOOK HAS HELPED HUNDREDS OF MEN MAKE MORE MONEY**



## This Coupon is Good for One FREE Copy of My Book

J. E. SMITH, President, National Radio Institute, Dept. 7BR, 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



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*Art Editor*

No. 8

Vol. XVIII February, 1937

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If your local newsstand dealer does not carry RADIO NEWS, please write the Circulation Dept., Radio News, 461 Eighth Avenue, New York, N. Y., giving his name and address. We will see that he is supplied with copies each month.

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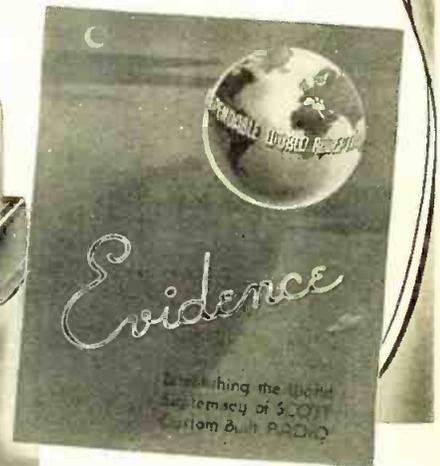
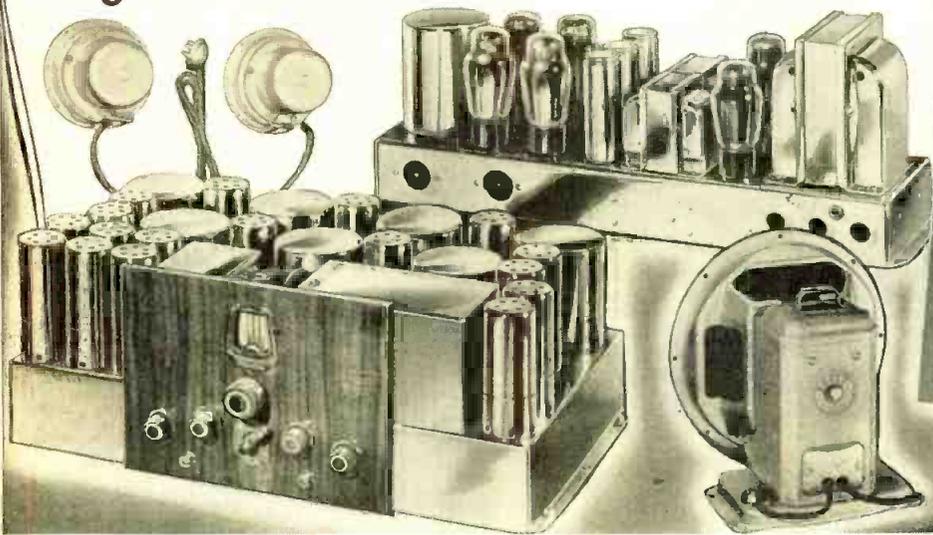
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# Get this Conclusive Evidence of **WORLD SUPREMACY** of 23 tube **SCOTT!**



**S**TORY after story—page after page—of unique and exciting experiences—written by SCOTT owners—makes this 24-page Brochure unquestionably the most fascinating book of its kind ever written:—It tells of a side by side performance comparison test of the SCOTT and other radio receivers in a large, interference-crowded New York apartment building! Of unprecedented reception piercing a network of static in the iron-ore hills of Washington State!

How the SCOTT "CAME THRU" in the moisture-soaked, stifling heat of the Panama Canal Zone. What the celebrated Jean Marie Robinault discovered when exploring with the SCOTT in the blizzard-swept Swiss Alps.

Read about the experiences of New Englanders tuning in far away Japan—of Californians dancing to European "swing." Here's an amazing book you ought to have—filled with sensational experiences of SCOTT owners themselves, from Florida to Washington, from California to Maine!

There's a story of reception of U. S. A. Stations from H. L. Davis written from the battleship U.S.S. Oklahoma, tied up in the Portsmouth, England navy yard! Oboe player James B. Spear put SCOTT high fidelity tone to an "acid" test—read how he did it!

Learn what the exclusive SCOTT Volume Range Expander did not only for Radio Programs but to old phonograph records!

This is but a fragmentary sketch of the fascinating adventures SCOTT owners unfold in this mountain of EVIDENCE—conclusively establishing the world supremacy of the SCOTT.

Every tone—every silvery harmonic of the flute—every thundering thrill of organ bass—you hear them *all* in their inspiring and exquisite truth of tone on a SCOTT.

Clear, dependable, foreign reception, with ample volume, from practically every country on the face of the earth!

Every radio enthusiast will want this brochure, for its the first of its kind. Your sending for it obligates you in no way. Your copy will be mailed to you FREE at once upon receipt of the coupon below. Fill it out and mail it now!

### MAKE A SIDE BY SIDE COMPARISON TEST

Cultural interests have in many ways long since burst land and sea boundaries. Thousands have searched for years without *real* success for a radio that would bring in the endless procession of world music and news free from distortion of tone.

SCOTT receivers cannot be sold through dealers because each SCOTT is strictly custombuilt in my laboratory to meet each purchaser's special reception requirements. Only in this manner can any radio guarantee its owner the world-supreme performance for which SCOTT receivers are famous. In New York and Los Angeles I have direct branch Studios as well as a Studio at the Laboratories in Chicago; all are owned and operated by me. If you live near any of the studios call, and see and hear an actual living room demonstration of the SCOTT. Your order placed at any of the studios will receive the same immediate attention as though you had mailed it to Chicago. Studio addresses are below.

In the new 23-Tube Full Range High Fidelity SCOTT you will find, for the first time, a glorious and perfect musical instrument that finally satisfies that deep and lasting pride of ownership that comes only from the knowledge that you have the best.

If, in addition to the book "EVIDENCE" you want complete information on the Custom Built SCOTT Radio itself, or want a "living room" demonstration in our New York, Los Angeles or Chicago Salon, simply place a check mark in the space provided for this purpose on the coupon.

## E. H. SCOTT RADIO LABORATORIES

Laboratory and Demonstration Salon

4440 RAVENSWOOD AVENUE · DEPT. 5B7 CHICAGO

Demonstration Salon

630 Fifth Avenue, New York, N. Y.

Demonstration Salon

115 N. Robertson Blvd., Los Angeles, Calif.

1 1/4 Blocks North of Third

### Get "Evidence" . . . Mail Coupon NOW

E. H. Scott Radio Laboratories, Inc.  
4440 Ravenswood Ave., Dept. 5B7, Chicago, Ill.

Send me:

- Free book "EVIDENCE Establishing World Supremacy of 23-Tube SCOTT".
- Complete facts and prices on the SCOTT.
- Details of "living room" demonstration.

Name .....

Address .....

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

# SCOTT Custom Built RADIO

# Pages From A Serviceman's DIARY

**SATURDAY**—Business is picking up fast. We took on another serviceman today, so I am spending some time this morning showing him around the shop, where parts are kept, etc. He had taken and passed an examination for another job with one of the large radio chain-store companies, but gave it up to join us in the suburbs, nearer his home. The other gang sure gives a tough exam. First, he says, a long, written test covering more than three typewritten sheets. The questions went over the theoretical side and also the types of trouble particularly likely to turn up with certain receiver models. This test was followed by a practical one, fixing a "doctored" set. Wrong tube types were installed, the a.v.c. system jumbled up, audio coupling condenser open-circuited and the high voltage grounded. A particularly fiendish stunt, removing mica from an oscillator trimmer condenser and grounding the stator plates, was reserved for a chosen few. He made the grade, though, after some hours of hard work. Most of the jobs we get will be pie compared to that one.

## A "Noise" Complaint

Away on calls. Started off with a noise complaint on a large Fada. We had installed a good noise-reducing antenna during the summer, so it was up to me to check up on the job "pronto." Had to hang it between high trees and was a little afraid it might have come down during a windstorm. Checked the antenna before I went in. All okay. Entered and checked the set—nothing wrong. Inquired and found the trouble had occurred during the evening, when the oil burner had been turned on. I adjusted the thermostat until the burner started and, sure enough, a strong buzz came from the radio, lasting several seconds. Went down to the cellar and checked over the oil-burner installation. All okay as far as I could tell, but noticed that the noise occurred as soon as the oil pump started. Recommended a choke and condenser-type line filter, making certain they had not already contracted for service from the oil-burner concern. We have to watch our step, because under some service contracts oil-burner companies install filters at a very low rate—less than our cost—and if we take such a job people think that we have overcharged, forgetting that they pay a high flat rate to the oil-burner company for which they may get little service.

## Bedroom "Midgets"

Moved on to a tube replacement job, taking an order for a bedroom a.c.-d.c. midget to make a youngster happy while he was laid up with mumps. Hope I don't catch it! We ran a small ad, suggesting rentals of such sets for two-fifty a week, the first week's rental to apply on the purchase price if kept. We've sold a bunch of sets this way.

Off again. Pulled the chassis and speaker of a Radiola R10 which had developed intermittent fading. When replacing the



## RENTING OR SELLING "MIDGETS" FOR CONVALESCENTS

*Servicemen can make a continuing year-around profit from good midget radio receivers if they will contact hospitals and doctors in the neighborhood as well as keeping a supply on hand for rental or sale in the case of families in which there is a member temporarily bedridden.*

a.v.c. tube restores normal operation temporarily, there is generally an open cathode by-pass condenser. Sometimes it will operate normally for weeks before the trouble recurs, making call-backs necessary, but most of us are on the lookout for such troubles now. These people can't kick about the set—four years' operation with no trouble except tube replacements.

Next—Picked up an old Majestic B eliminator with a blown filter condenser. After all these years, the customer still uses his old Stromberg with a storage battery and 201A tubes feeding a Stromberg cone speaker. He can well afford a new set but, being a traveling salesman, he is seldom home, so he doesn't listen often to programs. Took it right back to the shop, fixed it up and returned it without delay. He's a good fellow, pays cash but demands extra attention. His greatest interest is in college football games and his favorite team plays this afternoon. I'd like to listen, too, but can't. Saturdays are always busy days.

Out for lunch. Killed two birds with one stone by dropping into a nearby restaurant and installing a table model RCA in a nook behind the bar. Had an appetizer—no charge—with one foot on the rail, then sat down to a hearty lunch. Didn't feel much like working afterward, but that will wear off.

Made a short run over the hill and replaced a pentagrid converter, which had

short-circuited, in a Philco 16X. A nice set (we sold it) and the customer seems well satisfied. He has a good location for short-wave reception, far away from street-car lines, etc., and has collected a fine log of foreign stations.

## False Alarm!

Next—A Stromberg 12. Complaint, noise. Found nothing wrong except a slightly-worn volume control, which probably did not cause the trouble. Several young girls were gathered in the room, apparently a sorority party, and they told me to go ahead and replace it. Thought it best to wait until I got authorization from the owner, and told them so. Youngsters sometimes run up bills which parents won't pay. While we were talking, the noise came on, definitely external to the set. Asked about the electrical appliances in the house. Found there was nothing in operation that could cause the trouble. Ran upstairs and heard smothered giggling from a bedroom. Tiptoed over to the room and peeked in. A young boy was adjusting the bulb in a bridge lamp until it arced in the socket causing the racket in the radio. I stepped in and asked him if he was prepared to pay for the service call. Said he just did it for fun and not to tell on him. Got his promise not to do it again, returned downstairs and told the girls they'd have no more trouble. They are good customers, so we won't lose anything.

## A New Home Study School

Newark, New Jersey—The new "School of Communication Engineering" offers a two-year Home Study Course in Radio Engineering and Electrical Engineering to high school graduates. These courses are of college grade and require about 14 hours of study per week. A resident post-graduate laboratory course is available for students who wish to gain experience in practical work. Among the instructors are: G. Den Braven, Electrical Engineering; C. E. Falcone, Mathematics and Mechanics; E. N. Guisewood, Physics and Acoustics; W. R. McLaughlin, Radio Engineering.

**T**HESSE 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.

# Train at Home...Under Factory Engineers for GOOD PAY Spare-Time and Full-Time Jobs in RADIO



## APPOINTED BY RADIO MANUFACTURERS TO SUPERVISE R-T-I TRAINING

This is the R-T-I Advisory Board—Engineers and Executives of large Radio firms—appointed by these firms to supervise and direct R-T-I Training. Put your future in their hands. 50 great radio manufacturers now endorse this Training.

- Kendall Clough, Chief Engineer, Clough-Brengle Co.
- E. E. Gramer, Chief Engineer, Standard Transformer Corp.
- Karl E. Hassell, Chief Engineer, Zenith Radio Corp.
- F. H. Schnell, Radio Engineer, General Household Utilities (Grunow).
- Dr. C. M. Blackburn, Asst. Factory Mgr., P. R. Mallory & Co., Mfrs. of Radio Apparatus.

### Trained Men Needed in All Branches

If you're dissatisfied with small pay—lay-offs and an uncertain future—here's an opportunity that's too good to miss. At the cost of only the time it takes you to mail the coupon, you can get my big FREE book, "RADIO'S FUTURE AND YOUR OPPORTUNITY." This book tells how you can learn at home under the supervision of factory engineers, to make more money almost at once in Radio—whether you want to make Radio your life's work, or use it to pick up an extra \$5 to \$20 a week in your spare time.

### More Opportunities Than Ever Before

Radio is still forging ahead. 1936 beats all other years. Over 6 million new sets sold. Over 30 million dollars paid for service alone this year. Where only a few hundred men were employed a short time ago, thousands are employed today. And where a hundred jobs paid up to \$75 a week—there are thousands of such jobs today—many paying even more. And new jobs are being created all the time—full time jobs and spare time jobs. Get my book and see how easy it is to learn at home for this good-pay work.

### "Shop Training" for the Home

R-T-I Training is different than any training you ever heard about. It comes to you right from the heart of the Radio industry—right out of the factories where Radio sets and other vacuum tube devices are made. It was planned and prepared and is supervised by big radio engineers IN these factories—by men appointed for the purpose. This means that trained the R-T-I way, you'll be trained as the Radio Industry wants you trained—just as the Radio Industry, itself, would train you if it was doing the job.

### Television, Photo Electric Cells, Public Address Systems Included

Radio service work is only the starting point in R-T-I Training. From there it will take you through the whole field of Radio and Electronics. You will learn about every new development, including Television so you'll be ready when Television breaks. You'll also learn the big money subjects such as Aviation and Auto Radio; Public Address Systems; how to handle Photo Cells; Sound Picture Recording, Etc.

### 4 Working Outfits Furnished

Start almost at once doing part time radio work. I furnish 4 outfits of apparatus that you build into test equipment with which you can do actual jobs and earn extra money. My Training pays its own way and you get your money back if not satisfied.

### Age or Lack of Experience No Handicap

You don't have to be a high school graduate, nor even have finished the grades. My Training is so simple, easy, and practical, that the average man, regardless of age, education, or previous experience can master it. It offers the chance you have wanted to get out of a small-pay, no-future job, into good pay work with a future, in Radio and all its branches.

### Get My Free Book

INVESTIGATE! Learn why R-T-I Training is different. Find out why R-T-I Trained men get "Quick Results" and "Big Results." Send for your copy of "Radio's Future and Your Opportunity" today. It tells you about Radio's amazing opportunities. It describes my approved training. It tells what R-T-I students are doing and making. It gives the names of my Advisory Board and 50 endorsing manufacturers. It's FREE. Clip, sign and mail coupon RIGHT NOW!

RAY D. SMITH, President



RAY D. SMITH  
President R-T-I.

who has directed training of 100,000 men. Read what a few students say.

"Made my first spare time money after finishing four lessons. Over \$500 spare time money in 10 months. R-T-I is O.K."  
Delmer Grote,  
Route 5, Greenville, Ohio.

"I made \$14.25 in first 11 days of my training following your instructions."  
C. E. Head, 431 Third St., Alexandria, La.

"Before finishing my training I was made Manager of a Department Store's radio section."  
Howard N. Lentz,  
123 W. Alexander St., Buchanan, Mich.

"My job paid me \$18 a week before taking your training. Shortly after starting was averaging \$60 a week. Have made as high as \$250 in single week."  
Wm. T. Ridd, 3452 Evelyn St., Verdun, P.Q., Canada.

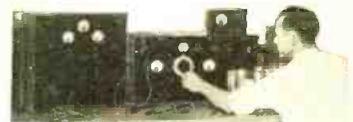
LEARN TO EARN UP TO \$75 A WEEK

MANY R-T-I TRAINED MEN EARN MORE MAIL COUPON BELOW



### Big Money in Auto and Police Radio Work

W. H. Carr, 402 N. 16th St., Kansas City, Kansas, an R-T-I student, has charge of 35 radio equipped cars for the Kansas City Police and Fire Departments. His salary is \$230.00 a month and he is furnished with an automobile, gas, oil, etc. He says, "If I had not taken your course I would not be able to hold this job."



### Makes \$600 in One Month

Herbert B. Thomson, Gorman, Texas, formerly an oil well driller, borrowed \$170.00 to start a spare time radio business after completing 12 R-T-I lessons. He made money from the start. In two years his shop was worth \$3500. He says, "Because of my R-T-I Training I made \$450 in September and over \$600 in October 1935. It pays to be R-T-I Trained."

### MAIL FOR FREE BOOK

Ray D. Smith, President,  
RADIO AND TELEVISION INSTITUTE  
2150 Lawrence Ave., Dept. 42, Chicago, Ill.

Without obligation, send me a copy of "Radio's Future and Your Opportunity." I am interested in your training and the opportunities in the great field of Radio for the R-T-I Trained Man.

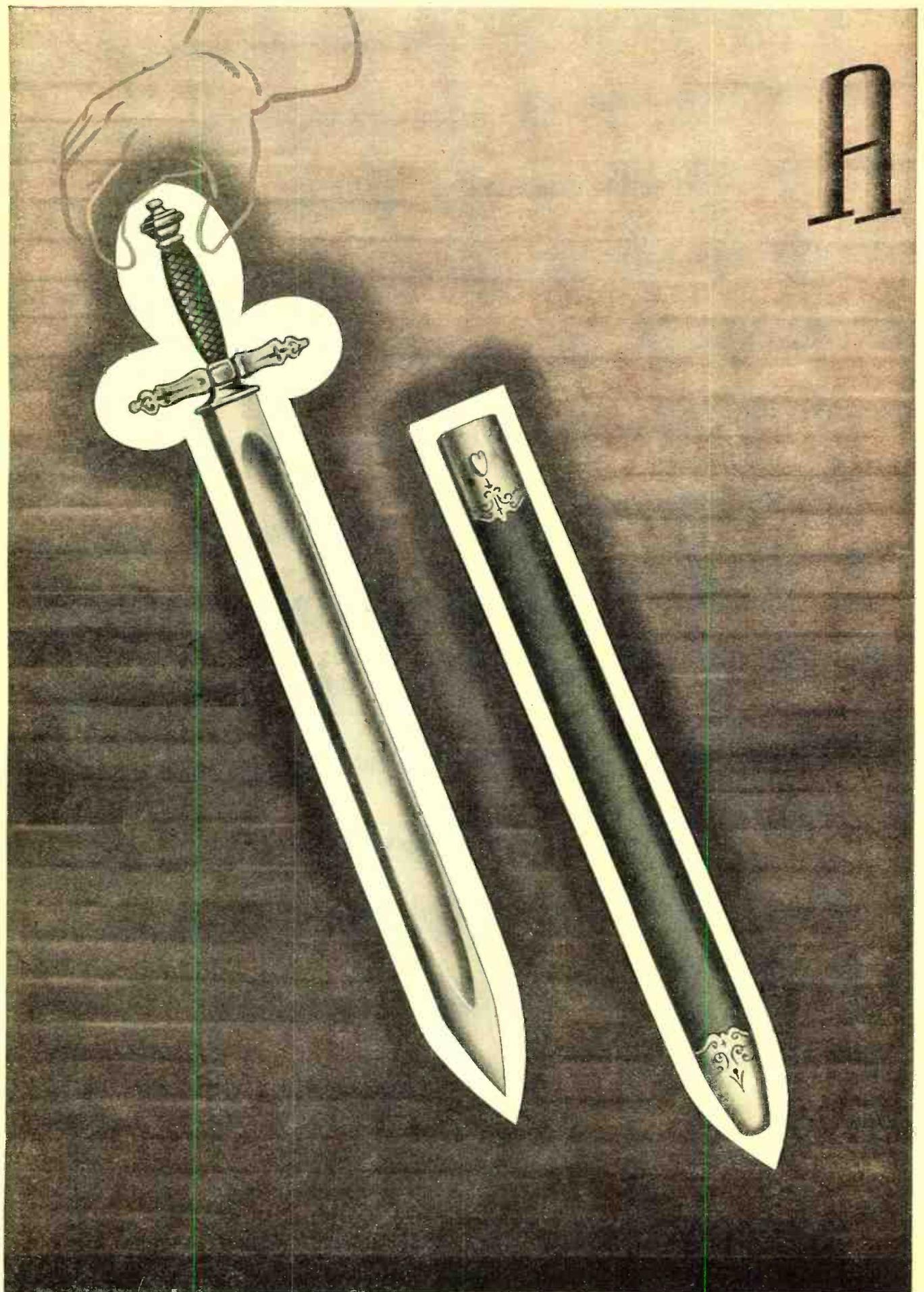
Name.....

Address.....

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



Dept. 42 • 2150 Lawrence Avenue • CHICAGO



# CHALLENGE

## TO THE RADIO WORLD

We believe the MASTERPIECE V is the finest receiver that can be built today! Let any unbiased, competent organization such as "Consumers Research Union" (to whom we have submitted a MASTERPIECE V for test and report) or any competent group of unbiased engineers, test the performance of the custom-built MASTERPIECE V side-by-side with any other receiver being made today!

Our engineers will go to the expense of building a MASTERPIECE V especially for operation in that location — just as they do when one is built individually and specifically for you.

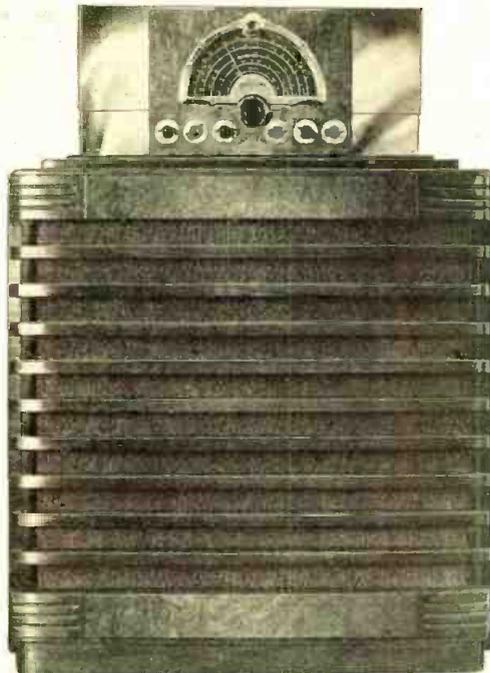
Then we will pay the cost of this same page in RADIO NEWS and tell the world exactly what the results of this test are! Or, better still, YOU make this test in YOUR HOME! We ask only that you then purchase the receiver that you find to be the finest that can be obtained. If that receiver is the MASTERPIECE V — and we have reason to believe it will be — we will gladly arrange your purchase on Easy Monthly Terms. To know what real custom-building means — hear a MASTERPIECE V!

### READ WHAT THE SHORT-WAVE EDITOR OF "RADIO NEWS" SAYS

"The fidelity of reproduction of the "Masterpiece V" receiver is so excellent that it at times seriously interfered with the conduct of the Listening Post tests of this receiver. Time and again the test periods would be devoted to listening to a program of fine music from a local broadcast station, the sheer enjoyment of which was too much to resist. Until the habit was formed of skipping the good locals when running tests, not much was accomplished either in the way of short-wave or DX listening."

"The reasons for this impressiveness was found primarily in the fact that the overall frequency response of the receiver is such that it exceeds the audio-frequency range of most broadcast stations.

In summary, it may be said that this receiver should meet the most exacting requirements of even the most critical radio listener as it combines excellent electrical design with beauty of appearance, ease of operation and all-wave coverage."



"WORLD'S ONLY TRULY CUSTOM BUILT RADIO"

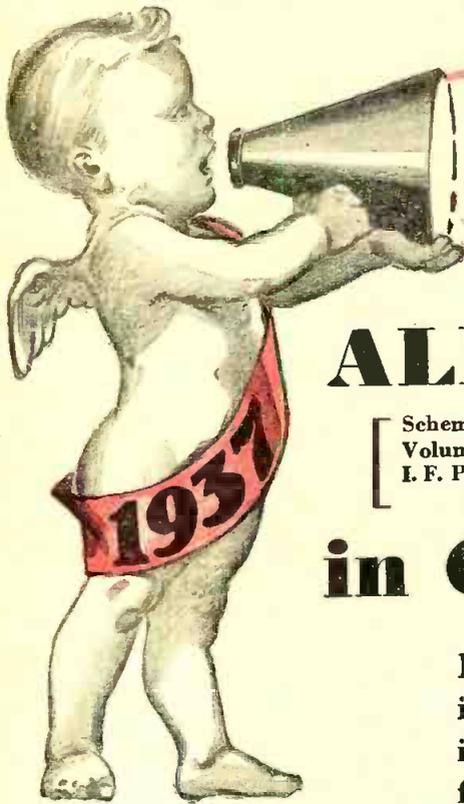
McMurdo Silver Corporation,  
2900-A South Michigan Blvd.,  
Chicago, Illinois, U. S. A.

Please send me full details on the custom-built MASTERPIECE V.

Name .....

Address .....

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



**Here's the Big News  
for 1937!!**

**ALL**

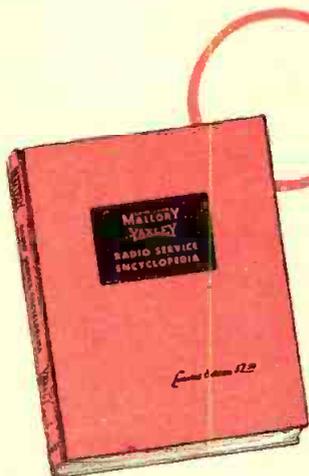
[ Schematics—Circuits      Condensers  
Volume Controls              Tubes  
I. F. Peak Frequencies      Vibrators  
Transformer Circuits ]

**in ONE book**

For the first time — under ONE Cover — all the information you need in servicing sets. Not only in *One* book but on *one* page, on *one* line, you find the answer for any servicing problem for any radio set. You bet! Over 12,000 different models are covered in this one compact, complete, authentic, up-to-the-minute compendium. The new

**MALLORY-YAXLEY**

**Radio Service Encyclopedia**



They said it couldn't be done — that any one would be crazy to try it. But Mallory-Yaxley invested \$75,000 in hard cash and years of painstaking investigation; corralled the experience of thousands of practical servicemen. And we have achieved the impossible.

For the first time, accurate, detailed instructions are given on the thousands of receivers that ordinarily are headaches to the most experienced Service engineers. No need now to worry about the dope on the tough ones. This book gives the correct answer always. What's that worth to you? Boy, the sky is the limit.

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.

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

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

February, 1937

## The Next TEN YEARS

will be

# “TELEVISION”

The radio industry has reached the united viewpoint that television will grow to a huge industry in the ten years starting with 1937; a great national industry encompassing broadcasting of sight and sound, a leader in the fields of entertainment, home movies and news distribution. The complexity of the new art makes it imperative that radiomen, technicians, servicemen and experimenters acquaint themselves with and learn all they can about the technical phases of this development to keep up-to-date

*By the Television Reporter*

**A**S our knowledge and employment of ultra-short waves increases, radio progress will be speeded up. *The most conspicuous of these advances during the next ten years will be the addition of sight to sound in the service of radio.*—David Sarnoff, president, Radio Corporation of America. With this statement before the Franklin Institute by the head of the logical firm to sound the television starting gun in the U. S. A., and with RCA-NBC television progress being revealed and demonstrated to the press and industry, the next decade can definitely be expected to feature television as radio's future and to convert the short wave playground of radio waves into the playhouse of radio waves!

### Monster Industry

Many experts believe that the commercialization of television and its mass public acceptance is just a matter of months; the next ten years will find the new art fully grown into a monster industry. The tingling sensation of a new enterprise is already running through

the industry's veins. Every branch of radio is preparing for the public demand as soon as the Federal Communications Commission grants commercial visual licenses—a move that cannot be placed too far off.

With Philco, Farnsworth and several other firms previously disclosing gigantic television strides and demonstrating them, it was the official demonstration of RCA progress that was awaited most anxiously by the industry. Not only is this firm of vital importance to the start of television through its holding of numerous patents, but its ownership of NBC puts it in a position to handle one vital phase of the new art's introduction—transmitting.

### WHAT YOUR RECEIVER WILL LOOK LIKE

*In the advancing television period the television receiver installed in a nook in your home and your use of it will be as commonplace as present-type radios are today. Photo shows an RCA television receiver.*



### Features Revealed

A series of RCA television demonstrations has already been given to various branches of the industry. They revealed several important features. The press showing was the first under practical working conditions. It included a complete program built for entertainment value as well as a demonstration of trans-



#### THE NEW ART OF TELEVISION "MAKE-UP"

*With television "here," broadcast artists must follow more closely the technique of movie actors' make-up for their presentations before the television camera and microphone.*



#### TELEVISION REPORTERS GET THEIR DOPE

*Scene at the RCA-NBC television demonstration, where television reporters for the technical magazines and daily newspapers obtained their data for articles in the press.*

mission. It also featured the initial exhibition of a new 12-inch cathode-ray tube yielding a 7½ by 10-inch screen—claimed by RCA to be the largest yet employed which is capable of commercializing.

The program embraced a balanced assortment of live and filmed subjects. One highlight was a tour of the television studios and the Empire State Building transmitter by the transmission of a film especially made for the occasion. Lenox R. Lohr, president of NBC, and Mr. Sarnoff were also seen and heard over the sight-and-sound transmitter.

The images were clear and commercially acceptable. There was a bit of interference, but at no time did it materially mar the program. In all, the forty-minute program was satisfactory enough for commercial home reception!

#### Coaxial Cable Used

A long line of television receivers was installed on the sixty-second floor of the RCA Building for the press demonstration. The programs, originating in the television studio in the NBC section of the structure, were conveyed by coaxial cable

to the transmitter atop the Empire State Building—about three-quarters of a mile away—and received through the air.

Definition of 343 lines was used in the test. This, however, according to company engineers, will be stepped up to 441 lines.

#### Presentation Technique

It was disclosed that engineers are daily putting tests on the air under "practical" service conditions; the program department is learning the new television technique of continuity writing, make-up, staging and other details and experiments with commercial programs to determine the effectiveness of television to sell goods are being made. Also, technicians are studying the economics of "networking," so that several stations may be linked by either coaxial cable or short-wave relays and are developing material for remote pick-ups.

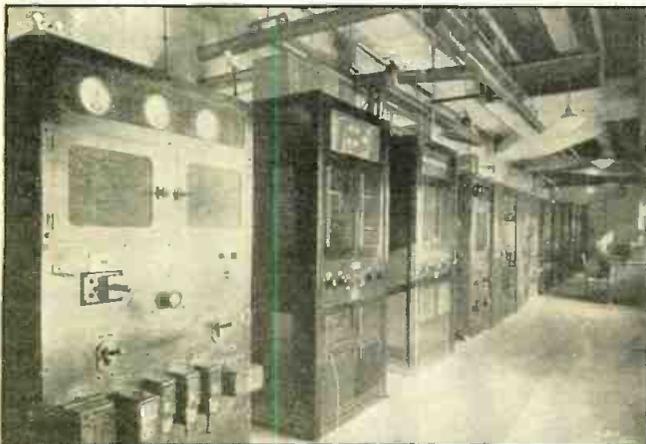
According to Mr. Sarnoff, the RCA development program is three-fold. "First," he declared, "we must develop suitable commercial equipment for television and reception; second, we must develop a program service suitable for network syndication; third, we must

also develop a sound economic base to support a television service." He emphasized that a major problem is that of network syndication. "Our present facilities," he said, "for the distribution of sound broadcasting cover the vast area of the United States and serve its 128,000,000 people. Similar coverage for television programs, in the present state of the television art, would require a multiplicity of transmitters and network interconnection by wire or radio facilities still to be developed." He held that, from the standpoint of research, laboratory development and technical demonstration, television progress in the United States continues to give us an unquestioned position of leadership in the development of the art. He held that in whatever form television progress may be evident in other countries, "we lead in the research which is extending the radio horizon, and in technical developments that have made possible a transmitting and receiving system that meets the highest standards thus far obtainable in field demonstration."

Comparison with progress in other countries was dealt with by the RCA head as follows: (Turn to page 498)

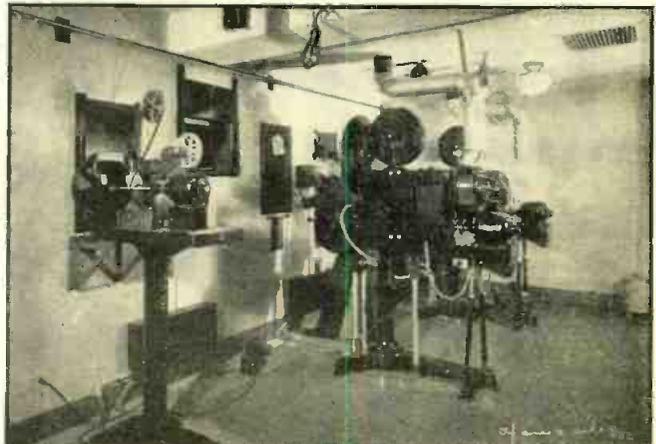
#### THE TELEVISION TRANSMITTING ROOM

*This is the complete RCA television transmitter for sight and sound installed in the Empire State Building, New York City. The call letters of this station are W2XBS.*



#### OF THE UTMOST IMPORTANCE!

*Experts have stated that the motion-picture pick-up will be one of the main features of television broadcasting, for news reels, educational reels and motion-picture plays by radio.*



# WHAT'S NEW in RADIO

By W. C. Dorf

## New Power Amplifier And Oscillator Tube

The Amperex Electronic Products, Inc., announces the type HF-100 low-voltage, high-frequency power amplifier and oscillator tube. Filament 10 volts, current 2 amps., ampl. factor 21. Maximum ratings at 30 mc. or lower: plate dissipation 75 watts, d.c. plate voltage 1500, d.c. plate current 150 ma., d.c. grid current 30 ma., grid-bias voltage for Class C operation —300, max. attainable plate power output 170 watts, overall length 7½ inches, bulb diameter 21/16 inches base Standard UX-4. Will operate at frequencies up to 120 megacycles or higher.

## New Batteries Feature Water- proof Construction

A recent announcement from the Burgess Battery Company tells about their new B battery which is effectively protected from leakage and outside moisture. Each cell is wrapped in three layers of moisture-resistant paraffin paper and in turn separated from other cells by a paraffin inner liner. They find that this type of construction gives maximum insulation between cells and prevents stray current losses which might cause noisy reception.

## Servicemen Will Want This Handy Tool Case

The handy leather pocket tool case made by the General Cement Mfg. Company provides a handy container for the essential radio service tools needed for small jobs. It resembles a large flat wallet and has two compartments for holding pliers, screw-drivers, and other small tools. It can be stowed away in your hip pocket or fastened to your belt.

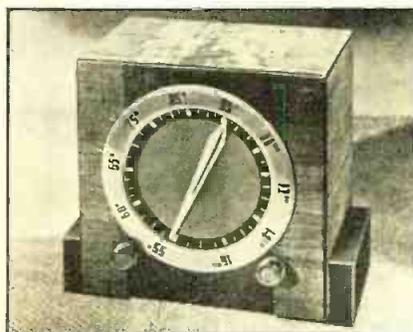


## NEW APPARATUS FOR TESTING "SICK" AUTO RADIOS

An up-to-the-minute auto-radio serviceman making a complete diagnosis of the troubles in an automobile radio receiver, as the owner looks on. The unit (Model 200) is the latest member of the growing family of Bendix test instruments. It will also test the car's ignition system and should be an excellent addition to the equipment of any modern service station.

## Attractive Little Receiver

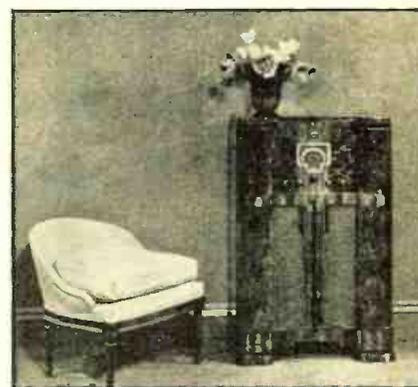
The International Kadette's tiny "Clock-ette" receiver shown below combines the tuning dial with the speaker grille and measuring only 8 inches high by 7½ inches wide by 5 inches deep, is approximately the size of a small desk clock. It operates



from either a.c. or d.c. current and has a tuning range from 540 to 1600 kilocycles.

## Covers From 5 to 2,000 Meters

This RCA model 15K five-band super-heterodyne receiver has a number of new features to recommend it to all radio enthusiasts. Its tuning range covers from 150 to 60,000 kilocycles, it is designed for high-fidelity reproduction, has a power output of 30 watts, and is equipped with a magic eye, automatic tone compensation and other advances. The fifteen tubes used include a 6K7 for r. f. stage, 6L7 first detector, 6J7 oscillator, two 6K7's as intermediate-frequency amplifiers, 6K7 magic



eye i. f., 6H6 second detector and a. v. c., 6H6 magic eye rectifier, 6C5 first audio, 6C5 driver stage, two 6L6's in the power-output stage, 6E5 magic eye and two 5Z4 rectifiers.

## Replacement Condensers

The Solar Mfg. Company announces an expanded line of replacement dry electrolytic condensers. The new series includes the universal cardboard tube units equipped with various mounting arrangements which are particularly applicable to the current radio receiver models.

## 10 Watt Mobile Sound System

This compact 6 volt public-address system recently introduced by the Webster Company is designed to deliver 10 watts power output and is adapted to numerous portable sound reproducing requirements including police traffic control and an-

(Turn to page 500)



### A STUDY IN MEDITATION

*This disconsolate gentleman has just discovered that a too-energetic twist of the on-off knob can break the power switch. Who, he ponders, should get the repair job?*

**C**ONTRARY to popular opinion, the percentage of radio servicemen who eventually will pass through the Golden Gate, there to listen to the eternal twanging of harps while the Heavenly Choir incessantly practices, is just as great as that of bank presidents, mail-carriers, or female swimming champions (with or without the benefit of Olympic committee excommunication). But reliable, dependable radio servicemen cannot invariably be located by frantically flipping through the classified sections of the telephone directory, by listening to the panegyrics of washerwomen, milkmen, or your next-door neighbor, nor by following the lure of cut-rate ads, which may lead to double-rate charges.

**T**HE suggestions to the public offered in this article are not based on untried theories nor have they been evolved as the result of a few scattered tests. Over a period of years thousands of radio owners have secured satisfactory service by following the methods to be described. Some have not. There can be no infallible "gyp-proof" system in any line of endeavor which rests so largely on individual honesty and competence. Diogenes had a tough time of it and there were no radios then. But far greater assurance of dependable work is obtained by following the plans outlined than will result from the usual haphazard methods of selection.

### Know Your Dealer

If the dealer from whom the receiver was purchased has given the buyer a square deal, he is logically the man to handle any service problems which may arise. If it is beyond his capabilities, he can call in a factory specialist. Often, however, the owner moves to a section far distant from the store or for other reasons finds it necessary to locate someone else to do the work.

The average set owner, if he gives the

radio owners will praise to the skies some serviceman who has perhaps done nothing more than replace a tube while a far more competent serviceman who has the bad luck to run into a difficult intermittent trouble which requires time and study to locate will often be condemned as inefficient.

The classified section of the telephone book is another favorite medium for locating good servicemen. Display ads abound, since most servicemen realize the value of this sort of advertising. Here, again, caution must be exercised. Too often the public feels that the largest display ads represent the largest and most reliable concerns. This is far from being true. During our tests one investigator tried to call at the office of one of the largest display advertisers but was unable to find any radio concern at the address given. Again the size of an organization is no indication as to its reliability.

### Other Precautions

While the telephone companies exercise censorship over the type of advertising as well as the concerns represented in display advertising, they cannot reject ads from companies or individuals they believe to be reputable until they are proved otherwise—often a difficult job in radio work. Especially, we want to point out, do not consider the listing of several phones in various parts of the city to be an infallible guide as to the reliability of the advertiser and the magnitude of his business.

There are a great many "official" service stations. Some are excellent. On the other hand, certain manufacturers are too lax about granting concerns and individuals the right to capitalize their good reputations. Abuses of this type were uncovered during last month's investigation.

The best policy for the set owner to follow, provided he has no acquaint-

# AVOIDING SERVICE

The exposures of racketeering practices in the first two articles of this series were not unmixed with constructive thoughts—but this month major attention is given to helping Mr. John Q. Public (and his wife) select a dependable serviceman

ance with first-class servicemen, is to communicate with the manufacturer's representatives of his make of radio in the city where he lives. They will gladly recommend someone whom they consider dependable. In New York City, it is possible to obtain radio service by calling the electric light company. Such calls are not handled directly by the electric light company but are passed on to manufacturers' representatives and thence to the authorized servicemen in the neighborhood. In the event of unsatisfactory results, the set owner not only has recourse to the serviceman but also to the concerns which have recommended him. And, needless to say, servicemen who abuse the trust reposed in them get no more recommendations.

### Have Tubes Tested

Before calling any serviceman, it is a good idea to remove the tubes from the receiver and take them to a dependable store to have them tested. Tubes which are weak should of course be replaced. But only brands with which you are familiar—not cut-rate products. Ask the dealer to tap the tubes while they are being tested. Tube checkers do not catch all the bad tubes. Noisy tubes may test O.K. but if the trouble is due to loose internal connections in the tube, other than loose mica, the reading will fluctuate when the tube is tapped. Gassy tubes sometimes cause trouble. Most tube checkers do not reveal this defect except when the tube is fairly new. Then they appear to give an excessively "good" reading. But, in spite of these limitations, having the tubes tested first will restore operation at minimum cost in a large number of cases.

### Find Model Number

It is well to find out the model number of your radio or, at least, the number and type of tubes used even though you plan to have the serviceman handle the tube testing. There are over 400 types of tubes made and the serviceman will appreciate your cooperation. Without some foreknowledge, figuring on a basis of 6 tubes per set and 8 calls per day, to supply each customer throughout a single day with a complete set of tubes under all possible contingencies, he would be obliged

# Cut-Rate "GYPS"

By John H. Potts  
Part Three

to start out on his calls with a stock of 19,200 tubes! Actually, only about 10% of this number will meet all ordinary requirements but even this amount is far more than most servicemen carry. His profit on tube sales is small. In many cases they represent a liability since he must guarantee them. Often, too, customers feel that charges for tubes are repair charges and expect the serviceman to assume responsibility for receiver breakdowns resulting from the installation of new tubes. It is not unusual for a weak condenser to blow out shortly after the replacement of a weak rectifier tube so it is well to request a thorough check-up of the receiver when tubes are replaced if it is more than two years old.

## "Fading" Troubles

The radio which gives trouble intermittently is often the hardest to fix. If you find the receiver "fading" on all stations some nights but not on others, better wait a week or so, or until it gets worse, before you call a serviceman. It is an unfortunate perversity of inanimate objects that the "fading" will almost invariably be absent when the serviceman calls. He may have to take the set away and spend a great deal of time to locate and correct the trouble, even though it be only a defective tube. On the other hand, if there is any odor when the set is turned on or after it has operated for a short period, it needs immediate attention and it is best to pull out the plug and not attempt to operate it.

In any case, if trouble is experienced, look over the power-line wiring and the antenna system. Make certain first that these are in good condition.

## Improved Service

Whether the repairs are to be done in the home or at the service shop should be left to the serviceman's judgment. Older sets require more attention regardless of the primary cause of failure, since other parts are just as old as the one which gave way.

Practically every radio can be made to give improved service, even new ones. The vibration from freight handling, the action of temperature and humidity changes all affect in some degree the performance of every receiver. There is an expert in most neighborhoods who can help you though more are sorely needed. Make his acquaintance and you will be well repaid in greater radio enjoyment.

His work involves both physical and

## The CLOUGH-BREngle CO.

Engineers and Manufacturers of Electrical Equipment  
2815 W. NINETEENTH ST., CHICAGO, U.S.A.  
PHONE LAWRENCE 3121 Cable Address: crncco  
November 30, 1936

Mr. S. Gordon Taylor,  
Teck Publications Inc.,  
461 Eighth Avenue,  
New York, N. Y.

Dear Mr. Taylor:

Please pardon the long delay in answering your letter of October 22nd, as the writer has been out of Chicago for the past month.

I have read this article carefully, and believe that it will be the beginning of a notable improvement in serviceman ethics.

Further, I would suggest that you get in touch with Mr. Ken Hathaway of the Institute of Radio Servicemen, who has a great deal of experience in regard to the eradication of such racketeers.

The writer feels that your treatment of the subject is most wise, since little or nothing can be done by direct contact with the individuals who are perverting an honest industry in this manner. However, a great deal can be done by exposing their practices to their fellow servicemen, and thus causing the finger of scorn to be placed upon the racketeers. No man will for long face ridicule and ostracism from his fellow workers in a given industry.

In closing, our organization wishes to offer you congratulations on this progressive step, and at the same time extends to you my co-operation that is possible to further this worthy program.

Sincerely yours,

The CLOUGH-BREngle CO.

*John D. Mark*  
General Sales Manager

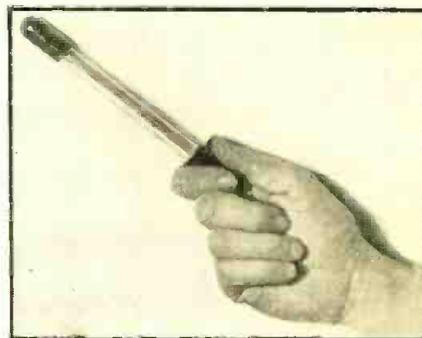
mental effort, therefore he must limit the number of jobs he undertakes. His equipment must be constantly revised and improved to follow the rapid changes in the art and for the same reason he can never stop studying. His

time is valuable. His charges may occasionally appear high but, far too often, they are less than they should be.

Let him help you. For the value given, his services will always be cheaper than those of "cut-rate" gyps.

## Magic Wand TUNING Indicator

By Everett Walker



A DEVICE designed to facilitate tuning the amateur transmitter recently was announced by the Sundt Engineering Company, of Chicago. Designated as the Senco Neon Tuning Wand, the unit combines a neon "stick" indicator and an inductive adjustment for tuning transmitters and receivers.

The wands are made in two styles, one for use with high powered transmitters and a more sensitive one for lower powered equipment. The tubes themselves are filled with neon gas. The caps on the ends are so designed that by inserting either one end or the other into the core of an inductance, it adds to, or increases the inductance of the coil. Thus, it is

possible to determine whether an L-C circuit is in resonance. If one end is inserted (they are marked "increase inductance" and "decrease inductance") they will throw the circuit in or out of resonance. If the plate current varies more with one end inserted than the other, the tuning control should be adjusted accordingly. If the plate current is the same when both ends are inserted in the coil field, the circuit is tuned correctly.

The neon stick has many applications. The larger one is 10 inches long; the smaller one six. Both are a half inch in  
(Turn to page 507)



Figure 4—This service shop vies with the Steel Pier as one of Atlantic City's show places. Only about one-third of the shop is shown here.

## THE SERVICE BENCH

Service Advertisements . . . Service Sales Promotion . . . Publicity . . . An Auto Radio Sideline . . . Service Kinks . . . Transformer Repairs . . . **SERVICING:** Philco, Brunswick, Columbia, Bulova, Montgomery Ward, Bosch.

Conducted by Zeh Bouck, Service Editor

### NOTES ON SERVICE SALES PROMOTION

**F**EW radio servicemen take full advantage of the advertising mat services offered by the set and tube manufacturers. Advertising mats are pieces of special cardboard into which advertisements have been pressed. The printer of your local newspaper pours molten type metal over the mat, and this, when cool, is in perfect form for printing. These advertisements are well laid out and written by professional advertising men. Embellished with appropriate art work, they provide highly attractive ads which the serviceman could not duplicate under twenty-five to fifty and more dollars! Room is left on the mat for the insertion of the serviceman's name, address and telephone number.

These ads are the serviceman's own advertisements. They are prepared pretty much as a large advertising agency would get them up for the serviceman. However, they invariably carry some mention of the manufacturer who supplies the mats—such as Philco, RCA, National Union or Hygrade Sylvania (the four major companies with a mat service to radio servicemen). These mats never cost more than a few cents, and often are supplied free-of-charge—either directly from the manufacturer or through his distributing set-up. Mats come

Figure 1—Manufacturers mats for service advertising are flexible in their uses, and full advantage should be taken of them.

### RADIO REPAIRS!

Call us for expert, guaranteed, service on any radio—any make, any model, any year! Latest testing equipment, rapid service and reasonable rates. We are members of Radio Manufacturers Service!



STANDARD TUNE-UP Only \$2

Telephone Number  
SERVICEMAN'S NAME  
and Address Here

in all sizes to fit the advertising budget, and are of both general all-year-round interest and specially prepared to obtain a radio angle on Election Day, the World Series, Holidays, Football, etc.

Servicemen sometimes object to the use of these mats on the grounds that their consistent employment advertises the manufacturer rather than the service retailer. This is only partially true. The serviceman will always benefit by identifying himself with a nationally advertised product such as a well-known radio tube or set. He is, in a sense, cashing in on the manufacturer's highly-expensive national advertising, rather than vice versa.

However, the serviceman's own advertisements should be used on occasions. And



Figure 2—This ad, designed and drawn by a serviceman, takes up little space and is yet effective.

even here the manufacturer's mats can still be of assistance to you. It is not necessary to use the entire mat. Any portion of it can be discarded or retained. For instance, only the decorative border and a catchy illustration may be salvaged, and completely new, highly-personalized copy set up in place of the original copy on the mat. There is nothing unethical in eliminating the manufacturer's name occasionally, even though he supplies the mats. The manufacturer benefits from every tube you sell and every satisfactory service job you do.

Figure 1 is an example of a quiet, dignified ad that is supplied in mat form by

Philco. To take full advantage of this mat, the sales message should be changed from week to week. Every once in a while it may be desirable to eliminate the Radio Manufacturers Service design, filling the space with additional copy.

Figure 2 shows a small ad designed by the serviceman himself—Chris L. Schultz, a familiar contributor to this department. While this is really a display ad, it is inserted in the classified section—at the lower classified rates—where it stands out definitely among the stereotyped advertisements.

The serviceman should not forget that practically all newspapers will be glad to supplement his paid advertising with publicity items in the news columns of the paper, particularly when a news angle can be secured on his service activities. Eugene J. Borsattino, of Gary, Indiana, runs a radio "Question Box" in his local paper, and finds the resulting publicity extremely beneficial. Most editors would be glad to give this a trial. Questions, until they are submitted by readers, will have to be made up by the serviceman. They should be of a general, non-technical radio nature, such as—"What is the best time of the day for European reception on 25 meters?"—"How can I reduce the noise in my set?" About 200 to 250 words is the right length for such a department.

### An Extra Auto Radio Service

O. C. Holaday, service sales manager of the Bendix Products Corporation (Bendix-Dayrad) points out the fact that the auto-radio installation is not merely an accessory, but, if the highest automotive and radio efficiencies are to be obtained, an integral part of the automobile's electrical system. It is therefore hardly logical that the radio serviceman should limit his attention to the radio section. Rather he should familiarize himself with the entire electrical system—battery, lights, charger (generator), starter, horns, electrically operated gauges, distributor, plugs, high and low tension circuits, condensers, etc. He should be able to recognize trouble in any portion of the system, and be capable of eliminating it. He should be able to file and adjust points, clean and adjust spark plugs, adjust the automatic retard, replace leaky high-tension leads, and have on hand a supply of distilled water for the battery. There will be few jobs, originally of a radio service nature, to which this added knowledge and ability cannot be applied to profitable advantage. In time, ignition service may well become a natural sideline contributing a lively tinkle to the cash register.

### The Advertising Blotter

The blotter reminder is one of the oldest and most reliable of advertising media. A blotter rarely lands in the trash-basket before it has outlived its utility and it puts over at least a portion of your sales message every time it is used. Figure 3 shows the blotter which Charles F. Helmuth, of (Turn to page 486)

Figure 3—One blotter succeeds in putting over no less than eight sales arguments without appearing too crowded!

THE MOST UP-TO-DATE EQUIPPED SERVICE STATION TO REPAIR YOUR RADIO

**RADIO SERVICE AND EQUIPMENT**

419 N. MASS. AVENUE ATLANTIC CITY, N. J.  
Phone 5-2087

Sets expertly repaired at reasonable rates. All work guaranteed.

All Repair Work Satisfy Cash	Philco Transistor Radio NO Down Payment! Ask Us!	Work done by trained technicians and 50% by self appointed engineers.
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MEMBER: Institute Radio Engineers, Radio Manufacturers Service, National Radio Institute, U. S. Marine School of Wireless, U. S. N. S. Assoc.

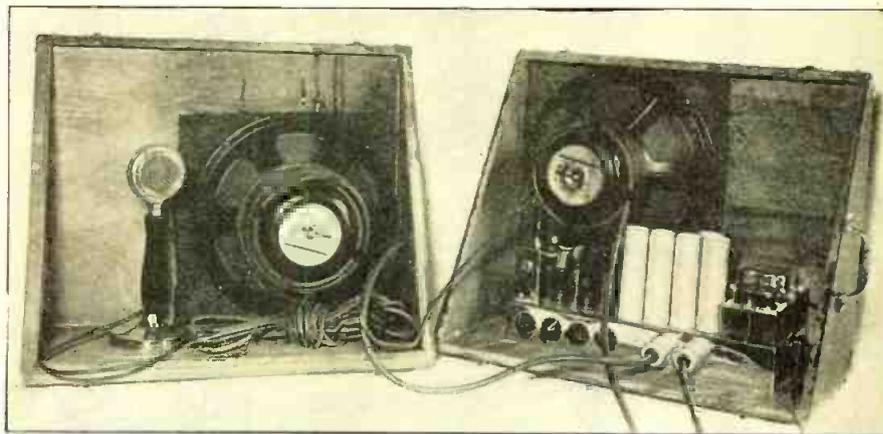


**PROVING ITS PORTABILITY**

*The case, with a loudspeaker mounted on each half, contains the amplifier, two 12-inch speakers, microphones, etc.*

**T**HE portable P.A. assembly described herewith has been developed to offer a special appeal to discriminating and experienced service men, both because it opens up new applications for portable sound systems, and because of its unusually attractive professional appearance, combined with "clean" power output adequate for almost any application.

The entire system is contained in a strong piano finished walnut case 21 inches long, 18 inches high, and 12½ inches deep, weighing 55 pounds, and sensibly made to be easily carried by means of a solid cast handle upon its smallest, not one of its largest, faces. While the piano finish may become scarred through rough use, a little care will always bring it to the shining and polished condition necessary to create an initially favorable impression on the renter. Most important, the heavy solid walnut case in addition to providing substantial baffles for the two 12-inch speakers, will not deteriorate and warp from adverse weather conditions as will the usual thin ply-wood cases to which leatherette covers are glued. Case corners are protected by substan-



# A Truly Self-Contained PORTABLE P. A. System

By **McMurdo Silver**

tial chromium corner angles, and the case is held together by convenient trunk clasps and rabbeting.

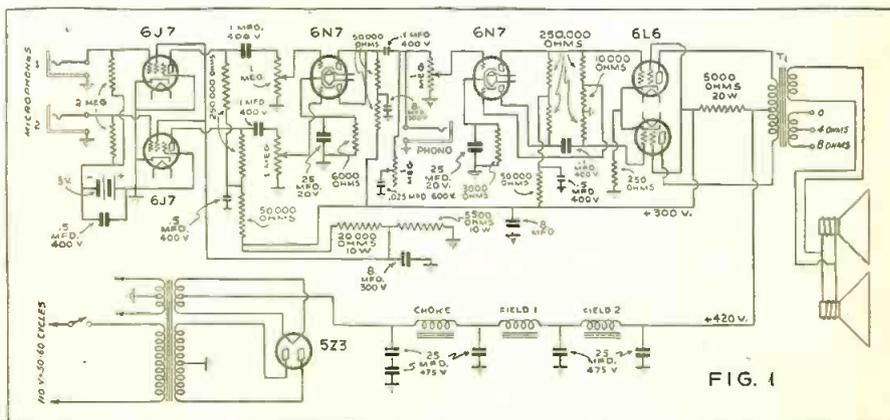
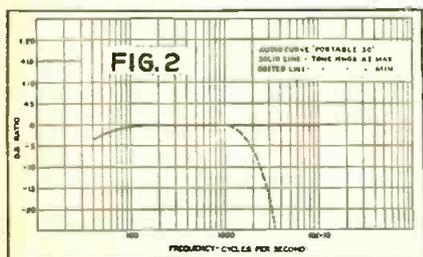
In one side of each half of the case is mounted a 12-inch high quality Jensen-Silver dynamic speaker, equipped with 25 feet of rubber covered cable and screw-locking plugs to fit the two amplifier sockets. When not in use these cables wind neatly upon the speaker pots, which are turned into spools by means of four stubs which prevent the cable slipping off.

The microphone supplied is a Shure 70 HK unit, with 25 feet of cable and combined hand and desk stand. The units can easily be shifted to a floor stand if desired. All of these units fit inside the two halves of the carrying case, as does the amplifier itself, which is held in place by two clamps. Loosening two wing nuts frees the amplifier, which can be placed where its two input jacks and controls are accessible. High gain amplifiers may not be operated in speaker cases, or microphonism will result: even in the present case

where the amplifier is cushioned upon pure gum rubber mounting feet.

The amplifier circuit is shown in Figure 1 and its frequency response curve in Figure 2. It is 15½ inches long, 6½ inches wide, and 7 inches high over tubes. It consists of 3 input jacks, 2 of which feed individual input volume control. Thus one microphone can be quickly faded into another without "clicks," or audible breaks, and as many input sources such as mikes, phono pickups or radio inputs can be reproduced one after another as the operator has hands to shift plugs. The third jack is for high-level pick-ups, radio inputs, etc. The 3 input packs and the pre-amplifier battery "bias cells" are all mounted in the separate shield above the chassis, since such high gain circuits are so sensitive to electrostatic and induction hum as to necessitate very complete shielding. Following the input circuits comes the amplifier itself, of 110 to 114 db. gain, ample for crystal, velocity or other "well down" mikes.

Starting at the (Turn to page 504)



# A Cathode-Ray "SCOPE" You Can Afford

By Gerard Kelley

**N**O serious experimenter, "ham" or serviceman can afford to be without some form of cathode ray equipment now that the low-priced 913 cathode-ray tube has been placed on the market by R. C. A. In fact it should now be possible for many persons to have, what heretofore was only a wild dream, two or three cathode ray units!

There are numerous qualitative analyses that can be made better with a cathode ray instrument. Lissajou's figures not only give a better picture of operating conditions than meter readings, but are also simple to secure and interpret. One picture corresponds to a number of meter reading analyses, which heretofore required numerous measurements and outside assistances. Also the cost of equipment using the new 913 is so reasonable that such units may be built in as permanent equipment in "ham" transmitters, P.A. and laboratory amplifiers, etc.

### Applications

While the 913 is small in size the quality of the figures secured are as good as obtained with larger tubes, though naturally, due to the small screen employed, not as large. But where necessary a magnifying glass may be used to secure a larger image. Although the 913 is mounted in a metal shell similar to the 6L6, care must be taken in handling to prevent distortion of the alignment of the deflecting plates. This metal shell acts as a shield, thereby lessening the shielding required for prevention of coupling to stray fields.

The 913 may be used to show modulation percentage, audio and amplitude distortion, regeneration in radio

and audio stages, character and amplitude of stray fields, etc. Also, in conjunction with a sweep circuit, r.f. resonance curves, audio frequency response curves and harmonic distortion may be studied.

In using a cathode ray tube, especially at r.f., it is desirable to have the leads of the deflector plates as short as possible in order to keep this capacity low. With this in mind, it was thought to place the 913 tube so that the deflector plate connections were at the back of the cabinet thereby securing the minimum length of leads, but the question of the power supply prevents this as it is desirable to have this as far from the placement of the deflector plates as is reasonably possible. This means that the power transformer and rectifier tube should be placed in back of the 913 tube. So in order to secure short leads, keep the power transformer at a reasonable distance from the tube, and still have a unit easy to assemble, the construction shown in the photographs was adopted.

### Simple to Operate

This also has the advantage that the controls are out of the way and may be adjusted once and left, the only variable being the potentiometer which regulates the control grid voltage. The on-off switch was placed on this unit in order to prevent short tube life due to misadjustment of this control while the unit is turned off.



### A HIGHLY PRACTICAL OSCILLOGRAPH

*This little unit, which can be built complete with the 913 cathode-ray tube for between \$12 and \$15, brings the oscillograph within the reach of all pocketbooks.*

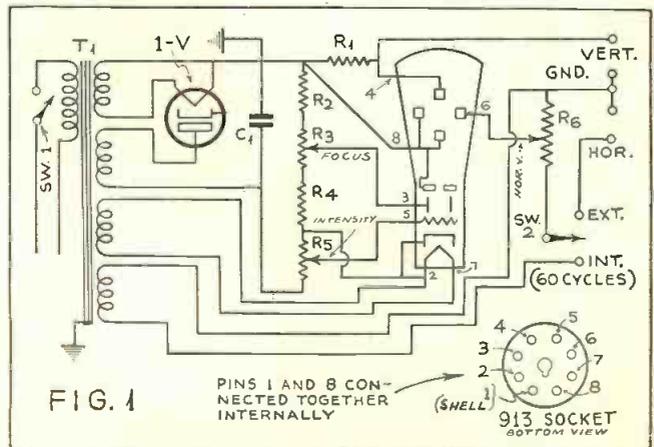
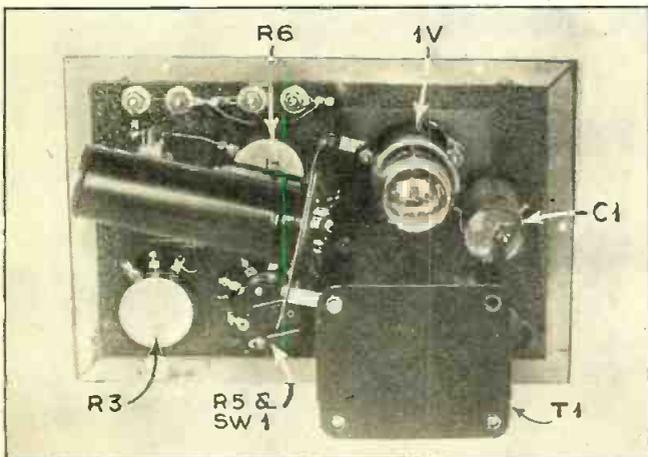
This control is so connected that the maximum negative voltage is applied to the control grid of the 913 in a counter-clockwise position or just before the switch turns the unit off. This voltage controls the brilliance of the tube and should be kept low in order to insure long life.

### Construction

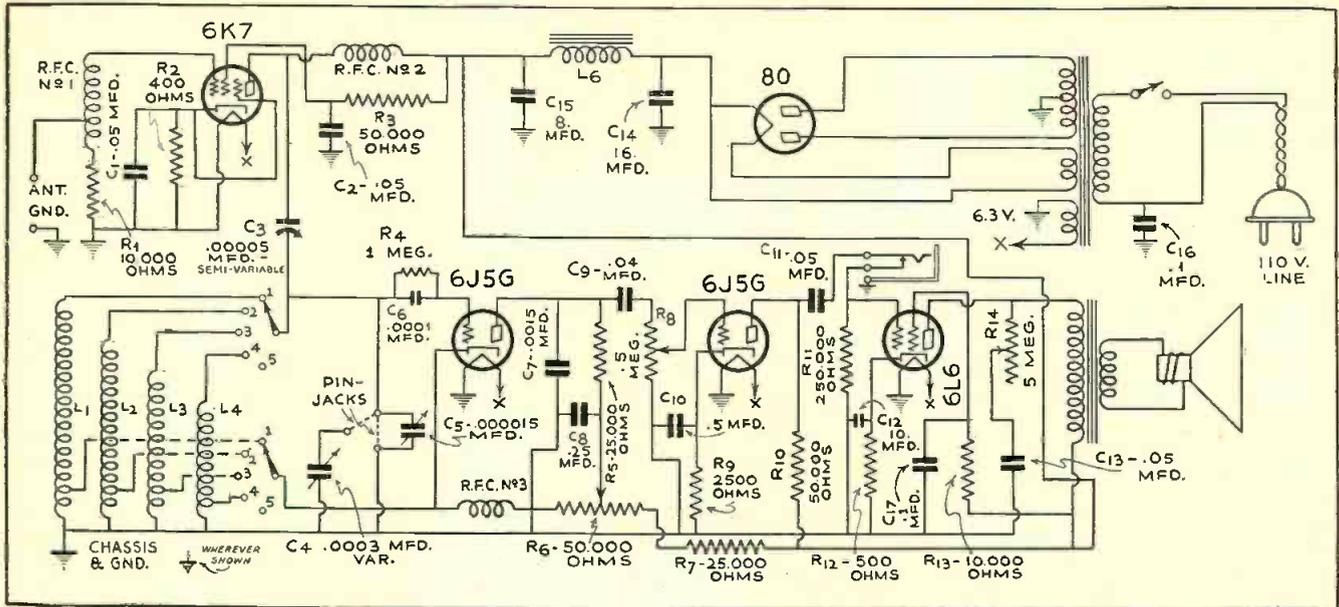
The power transformer (T1) is a Kenyon type T-207 which was especially designed for this tube. This transformer is small and well shielded and in addition to the necessary filament and plate voltages for the rectifier and 913, has a secondary to furnish a 60 cycle sweep which allows comparison of frequencies in multiples of 60 cycles.

In mounting the transformer and rectifier tube socket on the front panel of the Bud cabinet a sheet of thin bakelite is first laid against the back of the panel, then the socket and transformer are mounted on half inch bushings which are used as spacers to allow clearance for the connecting lugs. The small bakelite sheet avoids any possibility of these connections shorting to the panel.

The 913 tube is placed at a slight  
(Turn to page 504)







*Sailing the 5-550 Meter "Seas" with the*

# DX "CLIPPER"

The R-S-R (Regeneration-Super-Regeneration) Circuit here described in detail represents a truly modern application of regeneration principles. The model receiver gave a surprising account of itself during tests by the editors.

By A. J. HAYNES

**I**N this era of multi-tube receivers and high power outputs the short-wave enthusiast, who is primarily interested in good long distance reception, is liable to forget, or neglect, the underlying fundamental factor which limits DX work, regardless of how sensitive a receiver may be.

This limiting factor is the so-called *noise level*. At any given receiving station unless the signal is as strong as the local noise level disturbances, its reception is hopeless, no matter how powerful or sensitive the receiver. This is why the amateur with a two-tube regenerative receiver combined with a good aerial and location can often bring in stations half way around the world which many listeners, with multi-tube superheterodynes but less favorable locations (where more noise is present in proportion to the signal strength), are unable to hear.

### Regeneration Gives High Tube Efficiency

The regenerative receiver does provide a tremendous amount of radio-frequency amplification in proportion to the number of tubes and parts used, thus permitting good long distance reception at a minimum cost. High quality component parts can be employed and still keep the cost low, for they are few in

number. Moreover, as a minimum of tubes and parts are in use, the noise inherent in the receiver itself is extremely low.

The receiver design described here was developed by the writer for a manufacturer (Radio Constructors Laboratories) and is sold only in complete built-up form. However, the circuit is not complicated and should be of interest to many experimenters and all-wave listeners with limited financial resources who enjoy building their own equipment as it presents several unique features and takes advantage of the latest developments in vacuum tube design.

It has an extremely large tuning range, from the top of the standard broadcast band to below five meters. This includes practically every type of radio reception of interest to the experimenter. Moreover, its ultra-high frequency range (below 10 meters) is *not* a makeshift but can be used for serious communication work if desired; in this respect it stands quite alone among the all-wave commercial receivers which attempt to cover these extremely high frequencies. This is due to the use of super-regeneration below 10 meters while at 10 meters either super-regeneration or straight regeneration may be used.

### The Circuit and Constants

The circuit consists of one stage of untuned radio-frequency amplification using a 6K7 metal tube. Beside furnishing a substantial amount of r.f. gain this buffer amplifier stabilizes the regenerative detector action and eliminates dead spots due to antenna resonance. Moreover, this stage of r.f. is used on *all bands including 5 meters*.

The detector is a 6J5G; a high frequency super-triode recently developed by the Sylvania laboratories and particularly adapted to regeneration because of its combined high amplification factor, high mutual conductance and low inter-electrode capacities. A rather unusual combination of characteristics which are difficult to build into one tube.

The detector makes use of an unusually stable electron coupled circuit for both regeneration and super-regeneration. Smooth control of both types of regeneration is obtained by the 50,000 ohm potentiometer in the detector plate circuit. The cathode tap on the grid inductance is placed at only one or two turns from the grounded end, and this applies to the coils for all four bands from 22 megacycles to 550 kilocycles.

It will be noted that this circuit permits the rotors of the tuning condensers to be grounded which is a decided aid

to stability. In fact, the frequency control is so stable, and so independent of the regeneration control, that all bands may be accurately calibrated, exactly like a superheterodyne which is unusual in a regenerative receiver.

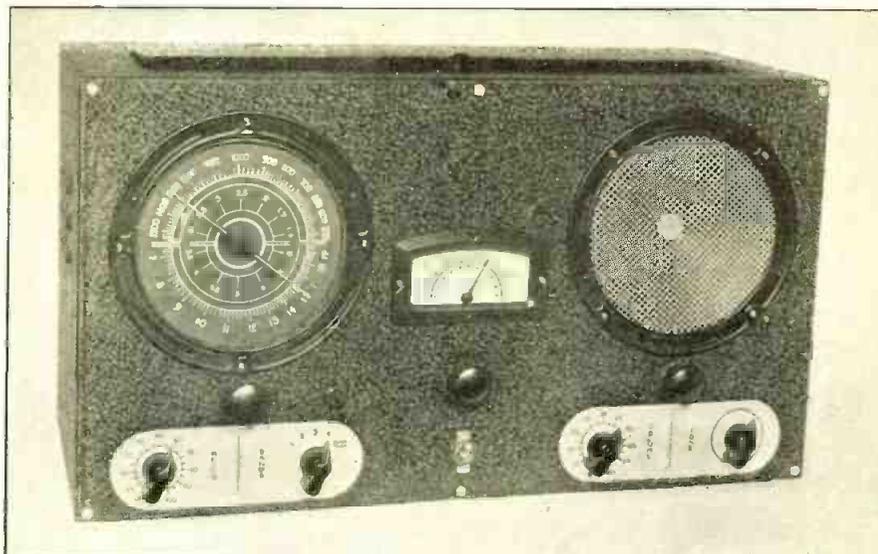
The r.f. amplifier is coupled to the detector grid circuit by the now familiar condenser and choke coupling arrangement which, incidentally, was first used by the writer and described in POPULAR RADIO about fifteen years ago. This form of coupling can be greatly abused, and often is. The values of the semi-variable coupling condensers and choke must be proportioned very accurately for the particular circuit and tubes used. The coupling condenser, C3 in this case, is used as a band set adjustment and when once properly adjusted, so that any one station falls on its correct calibration point on the dial, it may be left alone and all the calibrated frequencies will be found correct.

**Complete Band-Spread**

It will be noted that there are two tuning condensers: A .0003 mfd. tank condenser, which is controlled by the large calibrated dial to the left, and a small 3 plate, isolantite insulated, condenser which is tuned with the small center dial. The latter condenser serves two functions,—as the band-spread condenser on the four calibrated bands up to 22 megacycles, and as the high-frequency tuning condenser on the ultra-high frequency bands below 10 meters. Band switching (no plug-in coils) is used up to 22 megacycles, but in order to secure really effective results on the ultra-high frequencies, interchangeable air coils are used below ten meters and the large tank condenser, together with the band switch, is dropped out of the circuit. It is this feature which makes it practicable to use the same detector for regeneration, with band switching, over the longer wavelengths and with interchangeable coils and super-regeneration, over the very short-wave bands.

Shifting to the high-frequency super-regenerative circuit is accomplished by the arrangement of three pin-jacks lettered A, B and C in the diagram. For the usual all-wave (so called) reception from 22 megacycles to 550 kilocycles, a plain bus-bar jumper is plugged into pinjacks A and C. This places both condensers in parallel so that on positions 1, 2, 3 and 4 of the band selector switch the tuning frequencies are read directly from the big dial when the 3 plate condenser dial pointer is set in the middle, from which position it can be moved either right or left, acting as band-spread on both sides of the frequency which has been selected on the large dial.

On position 5 of the band selector switch (super-regeneration) all four coils are isolated from the circuit and the only cathode return is through the r.f. choke. If the jumper is now removed from pin-jacks A and C and a small high-frequency coil plugged into pin-jacks A and B, the circuit becomes an electron coupled super-regenerative one which will surprise you with its selectivity as well as sensitivity. All tuning is now done with the three-plate



**HIGH EFFICIENCY PER DOLLAR**

*The Haynes R-S-R "Clipper" offers operating refinements comparable with those of much higher priced superhets.*

condenser and stations can be accurately logged on its dial. Tuning is not at all critical on these ultra-high frequencies and the 50,000 ohm potentiometer still acts as regeneration control, only now it controls super-regeneration. The three pin-jacks, together with the semi-variable r.f. coupling condenser are mounted on a small hard rubber or Victron sub-panel on the chassis just behind the 3-plate tuning condenser and adjacent to the detector tube socket. (It is important that r.f. leads be kept short.)

**6L6 Beam Power Output**

The audio amplifier is quite conventional although it makes use of the most efficient tubes possible. Another 6J5G is used as first audio as it shows a slight improvement over the 6C5, and

the new 6L6 beam power tube with its high power sensitivity is used as the power amplifier. The power output is limited to about four watts which is as much or more than is useful with even the heavy-duty 6-inch dynamic speaker used here. With this limited output the 6L6 is almost distortionless and the tone quality is excellent. The 6L6, as used, draws about 30 milliamperes and the high voltage current of the whole set is less than 60 milliamperes so that a small power transformer is adequate.

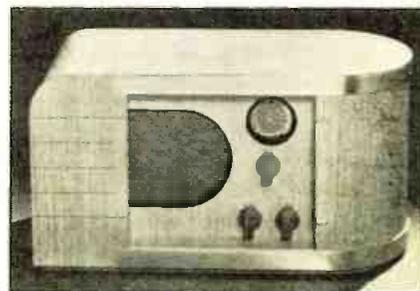
A tone control, volume control and stand-by switch are provided while a phone jack, which cuts out the speaker, is mounted in the back of the chassis.

The power supply is quite conventional using an 80 rectifier and the speaker field as a (Turn to page 504)

*Keeping Peace in the Family with*

**"SILENT"  
RADIO**

**By John Strong**

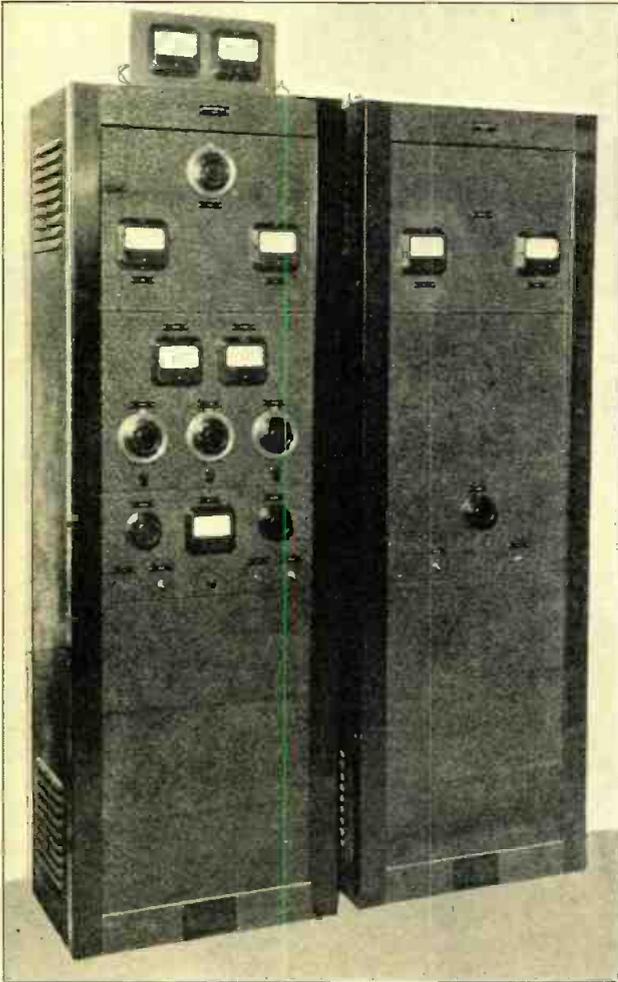


IT happens only too frequently that a radio program which is one man's pleasure is another man's annoyance. Very often one member of the family wants to hear a favorite program while another wants quiet for reading or sleeping. Or worse still, the other member may want to hear another program. The same problem comes up in hospitals, trains and other places where many people are together and inclinations are divided.

The demand for a radio receiver which can be adjusted so the program is audible only to one person, without disturbing any others, is fulfilled by the "Silent Radio" manufactured by the Dictograph Products Co. This receiver, illustrated above, con-

sists of a 6-tube superheterodyne housed in an attractive and unusual cabinet. Besides translating the radio signal into sound by means of the usual loudspeaker, it can also be switched so as to utilize a small unit called the "magic ear" working on the bone-conduction principle. This unit, which is somewhat larger than the bone-conduction "oscillators" used by the hard of hearing, can be placed under a pillow or in a breast pocket. The person whose head is resting on the pillow can clearly hear the program while it is inaudible to others. Similarly, when placed in the breast pocket,

(Turn to page 503)



*New*  
**TRANSMITTER**  
*for W2JCY*

A NEW amateur transmitter, designed especially for the Westchester Listening Post at North Pelham, New York, is now being installed by W2JCY. The photograph just above on this page shows the r.f. and modulator cabinets which stand 6½ feet high. The engineering features of this rig were worked out by the combined efforts of the Editor, Willard Bohlen, Chester Watzel and the engineers of a number of manufacturers whose parts were used in the lineup. The transmitter can operate on 10 and 20 meters, with controlled carrier optional by simply throwing a switch.

**The Layout**

The radio-frequency panel (which is shown at the left in the photograph of the transmitter) comprises the following: Three 40-meter crystals, selected by switch with frequencies of 7095, 7100 and 7105 kc. An RK34 crystal oscillator on 40 meters and doubler to 20 meters. An RK25 buffer-doubler for 20 and 10 meters. An RK28 driver on 10 or 20 meters. Push-pull H.F. 200's are used in the final stage—link coupled to 10 and 20-meter Johnson Q antennas. The power supplies for the r.f. unit are as follows: 450-volt supply for the RK34 and RK25. A 1200-volt supply for the RK28. A 2000-volt, 500-ma. supply for the H.F. 200's.

The A.F. modulator unit contains two push-pull 822's for the Class B modulators. The power supplies for the audio unit

are as follows: A 2000-volt, 500-ma. supply for the 822's. A 225-volt, 500 ma. bias power supply.

Controlled carrier is optional, using the UTC variator system. A complete relay system controls the entire transmitter with a remote push-button on the speech amplifier-receiver unit. The speech amplifier and an HRO receiver are mounted in a separate two-deck cabinet for desk mounting (not shown in the photograph).

The speech amplifier works out of a Brush Crystal mike with a 6N7 tube as two resistance coupled stages. The second section of a 6N7 tube is transformer coupled to another 6N7 as a push-pull driver stage, transformer coupled to push-pull 6L6's running Class AB1 with about 30 watts output. A 500-ohm line runs to the modulators. Two separate 6CS's, in parallel with the second section of the first 6N7 provide triple-channel electronic mixing.

The manufacturers cooperating in the design and construction of this transmitter are:

- Hammardlund—tuning condensers, sockets, RF chokes, coil forms
- UTC—all transformers and chokes
- Triplet—meters
- General Radio—dials, coil forms and knobs
- Johnson—antennas, insulators, sockets
- Raytheon—tubes, RK28, RK25, RK34, eight 866A's
- Taylor Tubes—two 822 modulators
- Amperex—two HF200's for final stage
- Parmetal Products—cabinets, panels and chassis
- Birnback—feedthrough and standoff insulators
- National—neutralizing condensers and final tank condenser

The '6 **HAM**'

Conducted by  
**Everett M. Walker**  
Editor for Amateur Activities

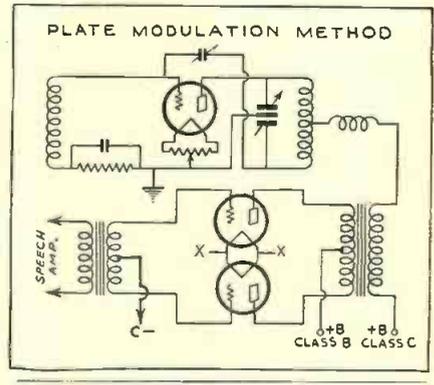
**Shack**

*Amateur's*  
**Modulation Problems**

WHAT method shall I use for modulation? This question is asked by every amateur who contemplates the transition from c.w. to phone as well as the newcomer who decides in favor of the phone. The answer is dependent on several questions each individual must ask: Is the transmitter to be used for phone exclusively, or is phone operation merely to supplement c.w.? Are the most watts-per-dollar to be obtained, or is expense an unimportant factor? Is the utmost in quality to be desired regardless of cost? What method may be the most easily and the least expensively adapted to the equipment already at hand?

To answer these questions the operator must take into consideration the flexibility of the various systems, the efficiency, and, in final analysis, what system offers the most watts-per-dollar. There are three basic systems of modulation: high-level plate, grid, and low-level modulation. Each may be divided into several classifications. For instance, high-level plate modulation may be accomplished with either of three classes of audio equipment: Class A, Class AB and Class B. Each of the two other basic systems may be subdivided into similar classifications, but usually the amount of audio power required is so small, Class

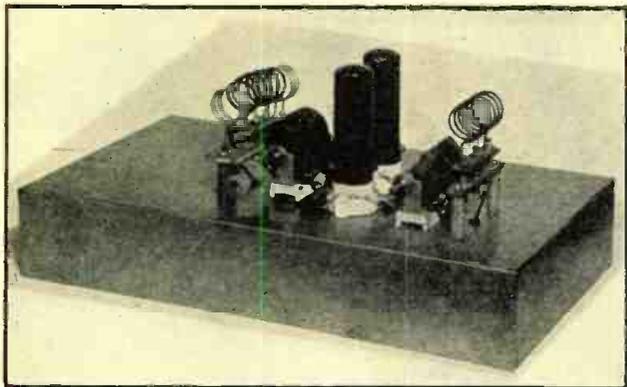
(Turn to page 508)



- Cornell-Dubilier—all bypass and filter condensers
- Ward Leonard—all resistors and relays and rheostats
- Leeds—three mounted crystals (Leeds type LD-5)

The transmitter is now being installed at the Listening Post and will probably be in operation while this issue is being read. The actual construction work was done by Bohlen and Watzel. A complete description of the transmitter with all circuit constants and operating data will follow shortly, in future issues.





**A COMPACT PUSH-PULL CLASS C 6L6 STAGE**  
*This illustrates the ship-shape layout for the buffer or final stage of the author's design, which is self-neutralizing.*

# Frank Lester Tells You How CRYSTAL Transmitter for

A 6L6 push-pull buffer or final r.f. month the oscillator, quadrupler and will clear up many of the troubles controlled-carrier transmitters, using

**By Frank Lester**  
*Part*

**W**E are now up to the point in this circuit, where parts layout, grounding and symmetry all play an important part. This push-pull stage, it was found, was the most critical, and it was here that the majority of time and trouble were spent in obtaining maximum performance. If you will refer to Figure 2, you will find a picture diagram of the tube-socket connections, which was mainly done to show the ground point and position of the screen by-pass condensers which are of vital importance. It was in this push-pull stage that many strange occurrences took place. These were so interesting that they are well worth mentioning at this time, for the benefit of those who have had similar experience and were not fortunate enough to be able to eliminate the various conditions that prevailed.

**Overcrowding Undesirable**

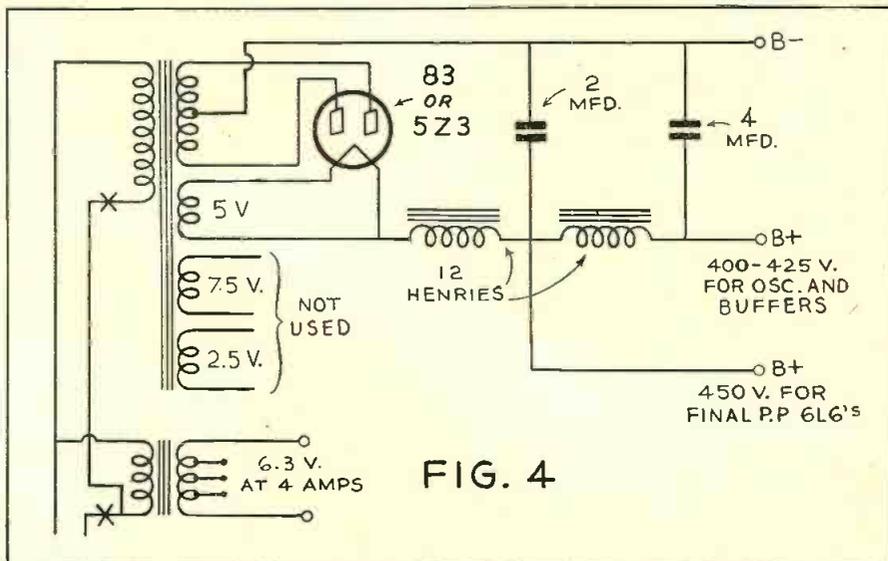
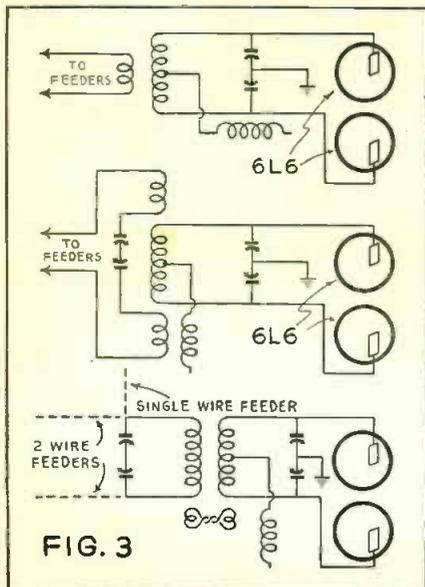
In the experimental set-up of this circuit, shown in the photograph, it will be noticed that the left-hand portion of the oscillator-doubler chassis has some available space. This was due to our desire to make this unit as small and compact as possible, and therefore the first set-up included the push-pull 6L6 stage on the same chassis and an un-

tuned grid coil was employed, inductively coupled to the split coil of the 6L6 doubler. Once again, due to our desire for multi-band operation and optimum performance, this idea was abandoned due both to the untuned grid coil which was found very critical, and the lack of available space which resulted in too much crowding and a compromise if the additional tuned circuit that link coupling requires was to be eliminated. In view of this, the final stage was mounted on another chassis, and link coupling was employed between the 6L6 doubler and pushpull 6L6's. This eliminated the critical grid coil at the expense of adding the additional tuned circuit which was found more than worth while, both from an efficiency standpoint and ease of multi-band operation.

**Proper Grounding**

The first set-up of the final stage was made using conventional point-to-point wiring short leads, with the screen by-pass condensers underneath the chassis. Using this arrangement, it was found that neutralization was necessary, whereupon the usual form of criss-cross neutralization was attempted. This resulted in the condition getting worse instead of better, for it was impossible to neutralize this stage. Not only was an

appreciable amount of r.f. found in the plate coil of this stage, without any screen or plate voltage applied, but the grid current would dip quite badly when plate-circuit resonance was tuned through under these conditions. By further experiment, it was found that the push-pull 6L6's could be neutralized. However, instead of using standard practice, this stage, under the conditions it was operating, had to be neutralized from the grid of one 6L6 tube to its own plate instead of to the opposite plate! Apparently, what was happening was that we were getting a complete phase reversal in the tube itself, or in other words, that the grid circuit of one tube was 180° out of phase with its own plate circuit, enabling us to neutralize in the fashion mentioned previously. The push-pull 6L6's would operate as an entirely perfect neutralized amplifier under these conditions, which, of course, as the reader can appreciate, we did not like very much. It was found that as soon as we would change the coils and go either to 10 or 20 meters, that the usual criss-cross neutralization would then apply, and that the phase reversal



# To Construct And Operate A CONTROL 5-10-20 Meters

stage is described this month. Last doubler were described. This series amateurs have had in getting these tubes, in 5-meter operation

## (Radio W2AMJ)

### Two

only took place on the 5-meter band. This immediately meant circuit complications for multi-band operation, possible erratic performance with different tubes, although several were tried with the same results, and also that something was "wrong in Denmark," which we set about to find out. This condition could be immediately corrected by ungrounding the tube shields; however, this required the stage to be neutralized in the normal fashion.

We also found that every slight change of ground connection or placement of by-pass condensers, etc., seriously affected the neutralization. It was also found that the phase reversal could be corrected by merely soldering a jumper between the top of the two 6L6's, or in other words, tying the two tube shields together again at this point. Under these conditions, the stage was almost neutralized and the dip in grid current when tuning through plate resonance was only about 5 mils. It was due to the fact that little changes in grounding and placement in parts affected the neutralization of the final stage, that we were sure if we could get the proper ground points and placement of condensers, that we would have a perfectly-neutralized stage, at least at 5 meters. We therefore set about to accomplish this fact and after quite a little work, the parts lay-out and grounding shown in Figure 2 and the photograph resulted in our obtaining a perfectly self-neutralized push-pull amplifier. There was no dip in grid current when the plate current was tuned through resonance with the plate and screen voltages not applied, and furthermore, the final stage would not oscillate without driving power.

### Duplicating Results

The reason we are bringing all of these points out at this time is to save the constructor of this transmitter several hours of time spent in duplicating our results, which means that the parts layout of the final stage, as well as the ground returns, which are really more

important, should be adhered to as closely as possible. We might also add, at this time, that there are a number of push-pull 6L6 5-meter amplifiers in use giving good performance, in spite of the fact that they are not neutralized. It was found that although there was a dip in grid current when tuning through plate resonance on an amplifier stage of this type, that it would not oscillate without excitation at the same setting of the grid and tank circuits.

On 10 meters, the usual criss-cross neutralization must be resorted to, as well as on 20 meters. The capacity required is exceptionally small, being obtained by the piece of push-back wire itself, coming from the plate of one

tube, being brought near to the grid-circuit wiring of the other tube. It was also found that a little different neutralization adjustment was required when bands were changed.

As to the output and efficiency of the push-pull 6L6 stage, it is unbelievably high. Plate efficiency of this stage, regardless of the three bands it was employed on, was always at least 70%. With 69 to 70 watts input, 45 to 50 watts output was obtained. This was with the 6L6's loaded to 150 mils combined plate-screen current at 450 volts. With the tubes loaded to 200 mils, it was possible to get 50 to 55 watts output with the same plate efficiency.

After all the (Turn to page 500)

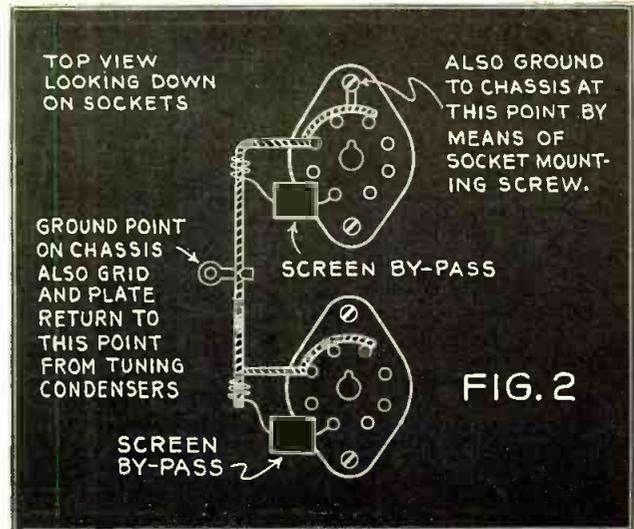


FIG. 2

## Amateur Radio

# COAST GUARD Station

By Robert Ames



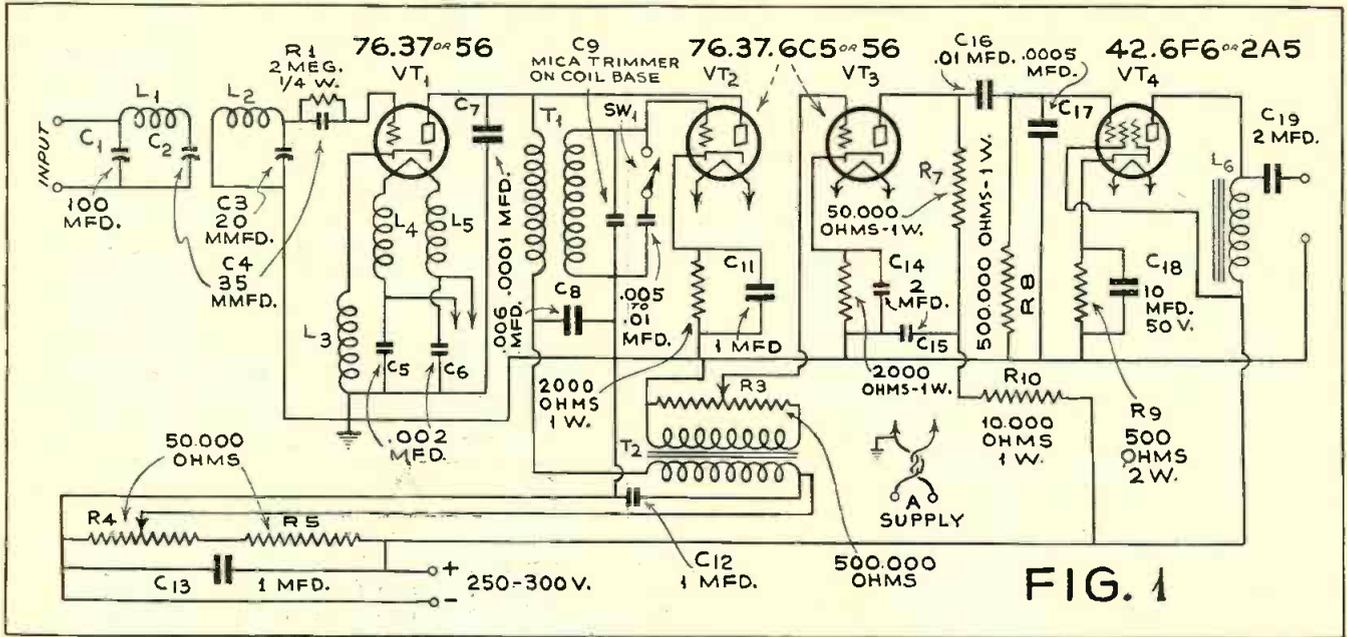
AMATEUR radio activity at the U. S. Coast Guard Academy has been in existence about three years. It is carried on by licensed officers and cadets as an extra-curricular activity, approved and encouraged by the Superintendent of the Academy. The station is under the control of the Instructor of Radio but its operation is not connected with the course in Radio, the latter being a treatment of Radio from its engineering aspect.

Cadets who hold amateur licenses are eligible to operate the equipment on their own free time, which, although limited, allows them to keep up their hobby. Other cadets who become interested are given every opportunity to obtain the license requirements. As the course in Radio is taken during the last year at the Academy, any previous contact with the subject arouses

the interest of the cadet, enabling a more complete grasp of the subject. To a Service in which radio communication is extremely important, amateur radio does much by developing in its personnel an interest in radio which may in later years lead to a desire to study radio engineering.

The amateur radio station W1JZT is located in the radio laboratory. There is no strict division in material between the amateur, experimental, and laboratory equipment. In this manner, duplication is avoided, and each branch has use of the complete lay-out. One complete phone and c.w. transmitter, however, was built by the amateurs for amateur communication alone. It utilizes a conventional circuit consisting of a '47 oscillator, two 865 doublers, 860 buffer and two 860's in push-pull Class C for the power amplifier. A condenser

(Turn to page 499)



*Here's The Dope You've Been Looking For On*  
**SUPER-REGENERATIVE**  
*Receivers for the U.H.F.*  
*(The WIEYM "Home" Set)*

An excellent receiver which was tested thoroughly by RADIO NEWS in both city and country locations and proved unusually sensitive and effective.

**T**HE successful 5-meter receivers have been designed to fulfill certain requirements in accordance with the principles outlined in the first article of this series. Receiver No. 1 is a four-tube set designed for operation at a fixed location, on an antenna using zepp. feeders, and on an a.c. power supply. Receiver No. 2 which will be described next month is a three-tube battery operated receiver designed for portable use on antennas using either one-quarter wave-zepp feeders or twisted pair. Receiver No. 1 was designed with the idea of obtaining the maximum sensitivity and flexibility of operation consistent with low cost. (Note: This excluded use of a 954 r.f. stage.) Receiver No. 2 was built along the lines of maximum sensitivity and noise reduction ability (for mobile use) consistent with low battery drain.

The circuit of the four-tube receiver is shown in Figure 1. The tubes are used as follows:  
 VT-1—Super-regenerative Detector.  
 VT-2—Quenching Oscillator.  
 VT-3—1st. Audio.  
 VT-4—Audio Power Output.  
 The input circuit, consisting

**By Nat Bishop (WIEYM)**  
**Part Two**

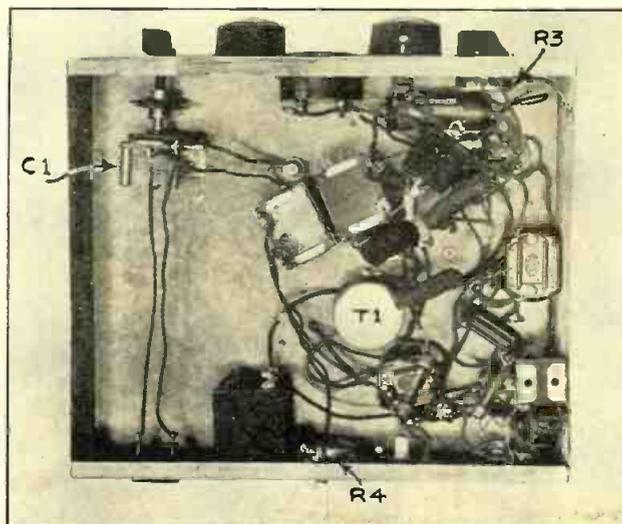
of C1, C2, and L2 performs a double function in this receiver. First, it allows an efficient match between feeders and the detector over a wide range of fre-

quencies and at the same time it provides efficient and smooth regeneration control. The detector plate voltage, determined by the original setting of R4, remains fixed after installation and all control over regeneration is provided for by the antenna coupling. In general C1 is set for the minimum capacity which will allow the set to go in and out of oscillation with an adjustment of C2. In practice, most tuning is accomplished with C2 and C3 but at certain points it may be necessary to increase C1 until C2 is effective in "knocking" the set in and out of oscillation. The coupling between L1 and L2 is adjusted for best results on any particular antenna.

In practice the input circuit is tuned on either the low or the high frequency side of the incoming signal. It is advisable to standardize the input tuning procedure, that is always approach resonance from the low frequency side or the setting of the main tuning condenser C3 will shift for any particular frequency. This shift in calibration with variable coupling is inherent in any closely coupled circuit but optimum sensitivity cannot be

**DETAILS OF THE CHASSIS LAYOUT**

*The photo shows the top view. Simplicity is a feature of the construction. The front view was shown last month.*



obtained without using optimum coupling. The choice lies between simplicity of control and maximum sensitivity. In this case, the writer leaned towards maximum sensitivity. The point is that the receiver will work with loose coupling and constant calibration, but weak signals will be passed up.

**Detector Operation**

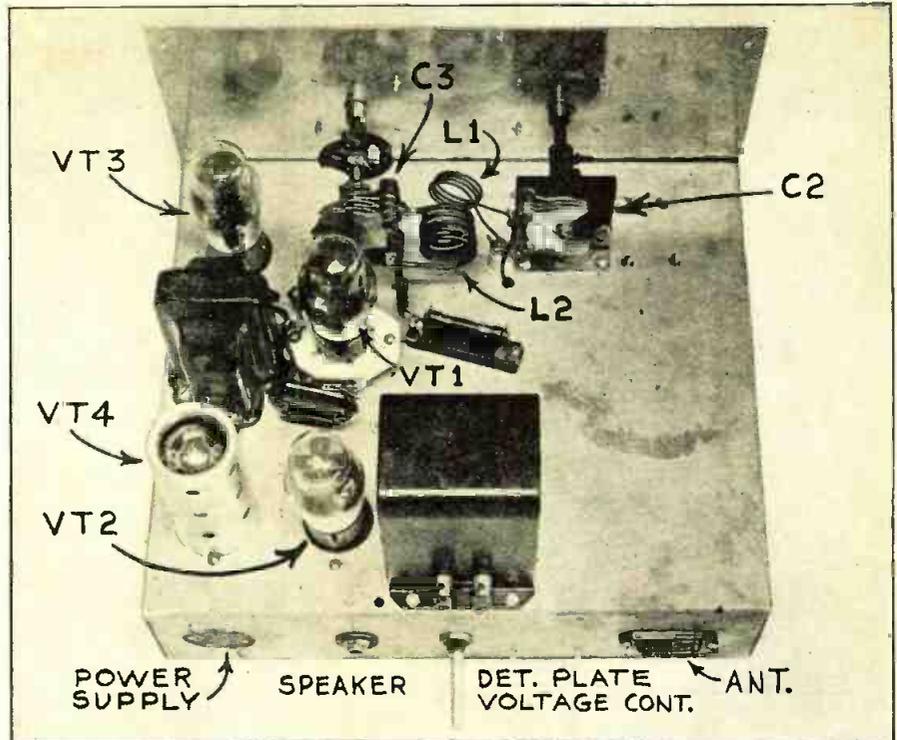
The detector circuit itself, after considerable experimental work, appears to be the smoothest and most sensitive circuit of all the various circuits tried. The plate is at ground potential to r.f. and the heater and cathode are above ground. The heater chokes are desirable due to the capacity between the cathode and heater. The circuit is cranky without the heater chokes due to r.f. in the heater supply circuit. It would be well here to mention one sure-fire test of how smoothly a separately quenched detector may be expected to operate. If the detector super-regenerates (self-quenches) when the i.f. oscillator tube is pulled out, it is certain that it will not operate smoothly when it is separately quenched. If it does self-quench, either the plate voltage is too high or the grid condenser C4 is too large or both. 35 mmfd. is ample for C4 and anything larger tends to make the circuit unstable. The grid leak is not critical but 2 megohms appears to be a good balance between sensitivity and detector output.

The detector is plate modulated at the interruption or quench frequency. The i.f. oscillator is conventional except for the switch allowing a choice of frequencies. When S1 is open the interruption frequency is about 175 kc. which affords very smooth operation and good quality on badly "wobulated" signals. This might be termed the fidelity position. With the switch closed, the interruption frequency is about 25 kc. This low i.f. gives higher selectivity and sensitivity and better ignition noise reduction. Selectivity is sufficient to cause distortion on badly wobulated signals.

**Low Plate Voltage**

Plate voltage for the detector is controlled by the voltage divider R4. In general, this should be set for the minimum plate voltage which will give smooth operation over the whole tuning range. Under no conditions should it be necessary to use more than seventy volts and in most cases fifty volts will be sufficient. This depends, of course, on the care used (short leads, etc.) in constructing the detector tuning circuit and how closely L1 and L2 are coupled. The closer L1 and L2 are coupled, the higher the plate voltage necessary and hence the stronger the radiated interference. It should never be necessary to couple L1 and L2 any tighter than one-half inch for good signal transfer. The meter shown on the front panel view last month in an 0-1.5 ma. meter in the B+ detector lead which serves as a tuning meter. It represents an added refinement which is by no means essential.

The audio circuit of this receiver is conventional and the gain is sufficient to drive the power stage to maximum power output. In most cases, the de-



**THE CONSTRUCTION BEHIND THE PANEL**

*The arrangement of the input tuning circuit is clearly shown. The layout is for efficiency rather than symmetrical appearances.*

tor could be worked directly into the output pentode, if a good interstage transformer is available. The power output will be sufficient for most purposes, but the extra stage makes the receiver somewhat more flexible. For example, where ignition noise is heavy, the set may be allowed to super-generate heavily, and the volume can be brought back by increasing the audio gain. However, greatest sensitivity and minimum hiss are provided when the

circuit is adjusted just on the verge of heavy super-regeneration. Under such circumstances, the hiss will not increase when the incoming signal goes off the air. This condition of operation also decreases radiated interference. Heavy super-regeneration is not necessary except where ignition noise is bad.

The main points to remember in constructing this receiver are:

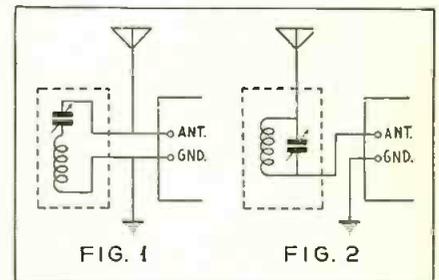
- (1.) Use good midget condensers in the r.f. circuits. (Turn to page 489)

# Reducing S. W. Interference

By E. S. Darlington

**T**HE author who is in charge of short-wave broadcasting from the General Electric stations W2XAF and W2XAD at Schenectady submits some worth-while suggestions for reducing interference from code or commercial telephone stations sometimes suffered by listeners whose shortwave receivers are tuned to W2XAF on 9350 kilocycles. While his suggestions primarily concern reception of this one station, they apply likewise to similar interference encountered in the reception of other short-wave broadcast stations.

—THE EDITORS.



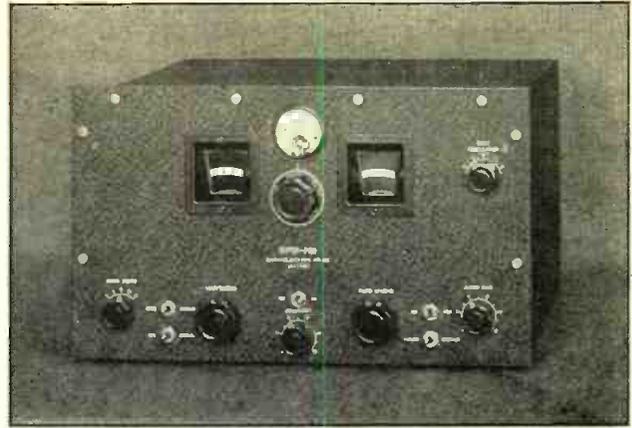
**S**EVERAL complaints have been recently received in Schenectady from listeners to International Broadcast Station W2XAF regarding the subject of code or telephone radio stations operating on or near the assigned frequency of W2XAF or 9,530 kilocycles.

Upon investigation, however, it was found that the stations mentioned as the cause of the interference were not operating within the 9500-9600 kc. broadcast channel, but were operating, in full accordance with the international agreements, on frequencies between 10,440 to 10,460 kilocycles which lie within the 9600 to 11,000 kilocycle band assigned for commercial fixed services.

(Turn to page 505)

# Further Advances In "SUPER" DESIGN (New Hammarlund SUPER-PRO)

By S. GORDON TAYLOR



THE NEW RECEIVER

Externally the receiver is similar to the model of last year except that two controls have been eliminated and all remaining controls move over calibrated scales. Instead of the separate r.f. and i.f. manual gain controls, a single one is now used, the extended a.v.c. system maintaining the correct balance of r.f. and i.f. gain for best signal-to-noise ratio.

WHILE the receiver to be described in this article is known as the new Super-Pro (Model PS-110), it is basically, particularly in mechanical design, the Super-Pro of last year with added refinements, simplified operation and further perfection of electrical details. In appearance and size it remains the same except that two of the front panel control knobs have been eliminated and the remaining controls have been provided with calibrated scales to facilitate tuning.

Eight of the fourteen glass tubes have been replaced by metal types. These include the tubes in the two t.r.f. circuits, the mixer and the oscillator. One advantage gained is that shorter grid leads are obtained and less variation is experienced from tube substitutions. By this is meant that any of these tubes can be replaced when necessary without affecting the r.f. alignment. More quiet operation has also been obtained. The three type 42 tubes employed in the a.f. amplifier have been replaced with 6F6's. This has resulted in a better audio system and still further improvement has resulted from the use of a new type of audio transformer.

### Manual Sensitivity Control

The new model has a single, manual sensitivity control, which replaces the separate r.f. and i.f. gain controls in the old receiver. To accomplish this it was necessary to redesign the a.v.c. system. With the new arrangement there can be no overloading, even with the sensitivity and audio gain controls set at maximum, whereas in the previ-

ous model it was necessary to retard the manual r.f. control on very strong local signals in order to avoid overloading.

The tuning system is identical with that of the older receiver. The main tuning dial is accurately calibrated over the five tuning ranges which provide unbroken coverage from 540 kilocycles to 20,000 kilocycles. The band-spread arrangement functions on all ranges except the regular broadcast band and gives the same excellent degree of band spreading as heretofore.

Perhaps the most radical changes have been several which affect the fidelity of reproduction. This has involved partial redesign of the r.f. and i.f. amplifiers as described in the following, as well as the improvements in the audio system as mentioned above.

### Variable Selectivity-Fidelity

The variable selectivity is obtained by varying the coupling in three of the twin-tuned i.f. transformers. These coupling controls are ganged together and controlled by the "Band Width" knob on the front panel. This knob moves over a calibrated scale and provides band widths varying from 3 kilocycles in the extreme narrow position to 16 kilocycles at the other extreme and has intermediate calibration points at 4, 6 and 10 kc. The control is continuously variable so that additional degrees of intermediate band widths are obtainable. This whole arrangement constitutes an excellent basic system of selectivity-fidelity control but there are factors other than variable coupling to be considered in providing true high-fidelity reproduction.

### Flat-top Characteristic

With the close coupling obtained when the Band Width knob is set for high fidelity, the i.f. amplifier will have a "double hump" characteristic. This is overcome by employing three fixed-tuned i.f. circuits which are tuned at the factory to fill (Turn to page 511)

### THE TUNER CHASSIS

Metal tubes and circuit advances have worked a marked improvement in the already excellent Super-Proof of last year.

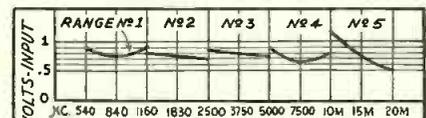
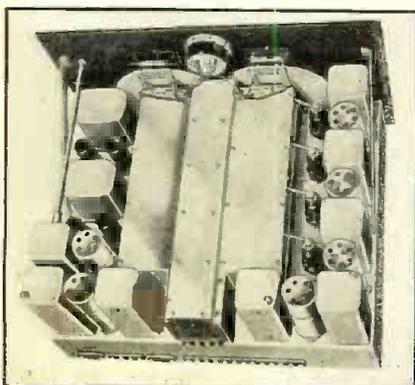


FIG. 1 SENSITIVITY  
A.F. GAIN SET FOR 1 MILLIWATT OUTPUT FROM UNMODULATED CARRIER. CURVES SHOW INPUT (MOD. 30%. 400c.p.s.) FOR 6 MILLIWATT OUTPUT.

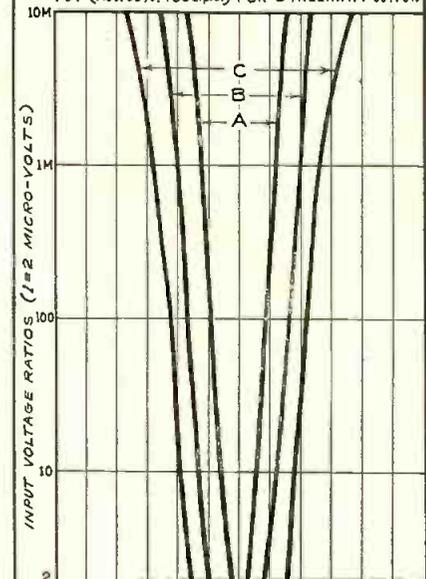


FIG. 2 OVERALL SELECTIVITY AT 1000 KC.  
BAND-WIDTH SWITCH SET AT: 3 KC. (CURVE A); 10 KC. (CURVE B); 16 KC. (CURVE C).

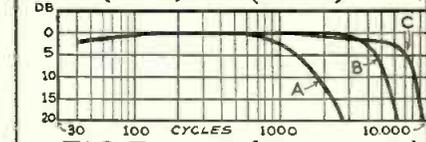


FIG. 3 FIDELITY (ANTENNA TO VOICE COIL)  
ZERO LEVEL = 4 VOLTS ACROSS 8 OHMS  
1000 KC. MOD. 30%  
BAND-WIDTH SWITCH SET AT: 3 KC. (CURVE A); 10 KC. (CURVE B); 16 KC. (CURVE C).

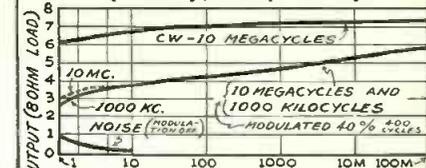


FIG. 4 A.V.C. CHARACTERISTIC RECEIVER ADJUSTED FOR: SENSITIVITY, MAXIMUM; SELECTIVITY, MAX.; A.F. GAIN, MAX.

# New Zealand—The DX'ers Paradise

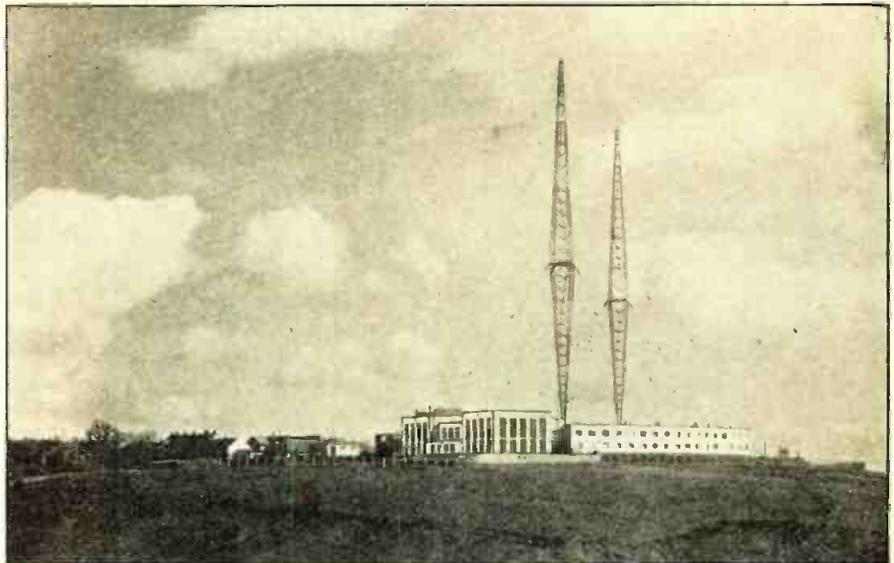
By L. C. McCormick

Correspondence Secretary, N. Z. DX Club, Southland Branch

**D**X'ING as a hobby in New Zealand is as old as radio itself and, although the N. Z. DX Club was not formed until 1928, there are many members who hold verifications from American stations dated several years before. So popular has the hobby become that the Club is now world-wide in representation and has almost 2,000 members.

**S**HORT wave DX is rapidly gaining popularity, but the N. Z. DX'er derives his greatest thrills from the broadcast band and that is easily understood when it is realized that it is quite an easy matter to DX the world from east to west under favorable conditions during the late autumn or early spring. The equipment used is by no means pretentious and usually consists of a 6- or 7-tube a.c. superheterodyne.

During the winter months, those who can, make a point of being at the dials before 3 p.m., particularly on Sunday afternoons when N. and S. Americans remain on the air for an hour or so longer than on weekdays. Sunday in N. Z. corresponds to late Saturday in the U. S. Between 2:30 and 5:30 p.m. it is a comparatively easy matter to log quite a number of South American stations and of these LR4, LR5, LR6, LR8, LS2, CX26 and YV1RC can practically be guaranteed. From 4:30 p.m. onward, the Mexican and North American transmitters begin to roll in and within an hour such stations as KFI, KOA, KNX, KMOX, KSL, WLW, WOAI, XENT, XEAW and many others, are often heard at R8 and are listened to regularly by a considerable number of N. Z. radio owners. However, the 50 kilowatt stations are regarded as too easy for the DX'er and are left for the beginners while the old hands reach out for the "hundred-wattlers." The Canadian transmitters are not at their best in winter but are heard more consistently in December or January (summer in N. Z.) between 11 p.m. and 2:30 a.m., N. Z. time. This fact also applies to those American transmitters which operate during daylight hours only, and quite a large number of them in addition to the old reliables are heard at good volume between 11 p.m. and 2 a.m. in summer. By 7 p.m. (in winter) the Australian and N. Z. stations have taken complete possession of the dial, although with a very selective receiver KGU and KGMB (Honolulu) can often be heard until 9 o'clock.



Courtesy—Official R. N. Observer Tomlinson

### ONE OF "THE MIGHTY EUROPEANS"

*The 150 kw. broadcast transmitter at Bisamberg, Austria. Stations such as this—and many of much lower power—span the 12,000-mile stretch to furnish thrills for New Zealand DX'ers.*

On Sunday nights our own stations close down at 10 p.m. It then requires little skill to bring in quite a number of Japanese stations and within an hour over twenty can be heard.

Another hour and the Australians begin to sign off and their places are taken by more Eastern stations. KZRM, the Philippine Island giant vies with XGOA in China, while MTCY, MTFY, XMHA, ZBW, ZILY and several more are there with their quaint Oriental music. As midnight approaches, these are deserted for DX of a more thrilling nature in the form of the Australian "hams" or "VK's" as they are more popularly known, who, after the main stations sign off, are permitted to operate between 1100 and 1500 kc. with power limited to 25 watts input, and it is astounding how many of these transmissions come over the Tasman to us, covering distances from 1500 to 3000 miles even under moderate conditions. The N. Z. DX'ers are prepared to remain at the dials under all sorts of conditions in the hope of adding more of these popular stations to their logs.

### In the "Wee-Sma" Hours

A run up the dial at 2 a.m. gives us a new supply of Orientals with HS7AJ and HSP1 (Siam) added to show that darkness is still speeding Westwards, although the Western Australian announcers still tell us it is "yesterday" over there.

One more hour is filled in by going for "VK's." Then we set out for India and hear VUB (Bombay) coming in well and VUC (Calcutta) can also be heard. Around 4 a.m., the air begins to quiet and at this stage, in mid-winter, the DX'er switches off and retires. In the autumn or spring, however, the dial becomes alive with carriers shortly after 5 a.m. The Europeans! Hurling their mighty voices with such power that they reach even to the far Antipodes—12,000 miles away. England, France,

Germany, Norway, Russia, Italy, Austria, Roumania, Spain—they are all there forming a veritable Tower of Babel. Eagerly we listen for call signs or identification signals, by which we can definitely identify them. To hear up to 40 of these European transmitters in one morning is by no means uncommon. It has been found that Spanish, Italian, French and North African stations are received best in August, those of Central Europe during September, and Northern Europeans (Denmark, Poland, etc.) in October.

Our world tour by radio—the modern magic carpet concluded, we adjourn, sleepy but well satisfied with our night's DX and ready to do justice to the tempting breakfast that is waiting.

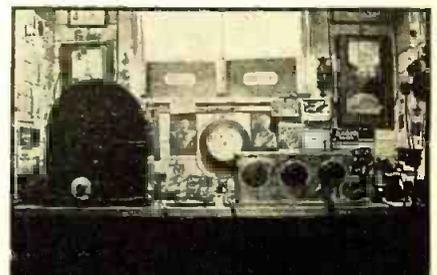
### —And So to Bed

Every six months the N. Z. DX Club offers a fine silver cup for the member entering the largest number of verified stations exclusive of call N. Z. and "A" class stations. The June, 1934, competition was won with a record log of over 600 verified stations, a fact which testifies to the excellent DX conditions that prevail in New Zealand.

If any readers of RADIO NEWS desire information concerning radio in N. Z. or our club, I will be pleased to hear from them. My address is 73 Baird St., Invercargill, New Zealand.

### A TYPICAL N. Z. "POST"

*Where F. C. Reynolds of Christchurch logs the B.B. and S.W. stations of the world*



To be produced on demand—NOT TRANSFERABLE. (See Condition 9 Overleaf.)

FEE  
10/- RECEIVING LICENCE BE 588832

WIRELESS TELEGRAPHY ACTS, 1904-1926.

(This Licence expires on the 30<sup>th</sup> Sept 1939 R)

Mr. RICHARD THOMAS COATES  
(Name in full to be spelt out in Morse Code)

of 54 Conyngham Rd  
(Address in full)

hereby authorised (subject in all respects to the conditions set forth on the back) for a period ending on the date shown above, to establish a wireless Station for the purpose of receiving messages in the premises occupied by the Licensee at above address  
(Address of Station)

The payment of the fee of ten shillings is hereby acknowledged.  
Dated 10 day of Feb 1935  
Issued on behalf of the Postmaster-General. W. Heister for Postmaster.

Stamp of Licensing Office: WINDSOR ONT CANADA FEB 10 1935

**Removals.**  
Any permanent change of address must be promptly communicated to the Head Postmaster of the district from which the Station is being removed. The serial number and date of expiration of the Licence should be quoted in all cases. Notice of a temporary change is not required.

**Renewals.**  
If it is desired to continue to maintain the Station and/or work the portable set after the date of expiration, a fresh Licence must be taken out within fourteen days. Heavy penalties are prescribed by the Wireless Telegraphy Act, 1904, on conviction of the offence of establishing a wireless Station or installing or working wireless apparatus without the Postmaster-General's Licence.

**Dangerous Use of Supply Mains.**  
If power for the working of the wireless receiving Station is taken from a public electricity supply, whether or not a battery eliminator is used, no direct connexion should be made between the supply mains and the aerial.

**A BRITISH LISTENERS LICENSE**

In England there are no advertising programs. Instead the broadcast stations are Government owned and maintained. Radio set owners pay an annual tax of 10 shillings which supports this activity and pays for programs. At the left is shown one of the licenses issued to set owners.

for 1936-37, a 2½ hour program over station WOR, commencing at 2 a.m. on January 17, 1937.

The novel feature of the broadcast will be the reproduction of the voices of NNRC members from all over the Western Hemisphere. Present plans include rebroadcasts of transmissions from LR5, Caracas, Venezuela; a station in England, CKLW in Windsor, Ont., and possibly a station in Cuba. From Buenos Aires, we hope to present our honorary member, Mr. A. B. Dougall, owner of LR5. From Caracas we will hear of our director, Jesus Maria Lander Garcia, an enthusiastic club worker. Milton P. Christa, our energetic Michigan director, will speak over CKLW. We also expect to include John Baxter, our English representative. All these will be of course heard on WOR's wavelength of 710 kc.

In addition there will be presented recordings of the voices of Vice-President Dora Newcomb of Oxnard, Calif., Vice-President Bill Applegate in Chicago, Director Roy Kimmons of Texas, Director Hank Tyndall of Vermont, and many others, representing North, South, East and West.

**DX Calendar**

Below are given lists of special DX broadcasts which are scheduled for January and February. 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
<b>JANUARY</b>						
2	2-2:30	1370	WGL	Ind.	.1	NNRC
	3-3:30	1370	KFRO	Texas	.1	NNRC
	3:30-4	1370	WFOR	Miss.	.1	NNRC
	4-4:30	1370	KTEM	Texas	.1	NNRC
	4:30-5:30	1370	KVL	Wash.	.1	NNRC
3	2-3	980	TIANRH	C.R.		NNRC
4	1-2	1310	XEFV	Mex.	.25	NNRC
	1:30-2:30	960	PRF3	Brazil		NRC
	2-3	960	PRF3	Brazil	5	NNRC
5	1-1:30	668	Jerusalem	Palestine	20	IDA
6	6-6:15	1270	WASH	Mich.	.5	NNRC
	6:15-6:30	1270	WOOD	Mich.	.5	NNRC
7	2-3	1160	CMHJ	Cuba	.2	R. NEWS
9	3-4	1210	KFXM	Calif.	.1	NRC
	4-4:30	570	KMTR	Calif.	.1	R. NEWS Atkins
10	1-2	1310	XEFV	Mex.	.25	NNRC
	3:30-5	1440	WMBD	Ill.	.5	R. NEWS Sahlbach
11	5-5:30	1450	KIEM	Calif.	.5	R. NEWS Atkins
13	3-6	1320	CMOX	Cuba	.2	NNRC
14	4:40-5:10	950	KHSL	Calif.	.25	R. NEWS Atkins
	5-5:20	1310	WTRC	Ind.	.25	NNRC
	5:10-5:30	740	KTRB	Calif.	.25	R. NEWS Atkins
15	1-1:30	668	Jerusalem	Palestine	20	IDA
	2:30-3	1370	WRJN	Wis.	.1	NNRC
	3-4	1370	KGKL	Texas	.1	NNRC
	4-5	1370	KFQG	Iowa		NNRC
	4-9	850	KIEV	Calif.	.1	R. NEWS Atkins
17	2-4:30	710	WOR	N. J.	50	NNRC
	3-5	1300	WHAZ	N. Y.	.5	ICCP
20	6-6:15	1270	WASH	Mich.	.5	NNRC
	6:15-6:30	1270	WOOD	Mich.	.5	NNRC

**THE DX CORNER**

S. GORDON TAYLOR

(For Broadcast Waves)

Official Radio News Listening Post Observers are now being appointed for 1937. Present observers who desire re-appointment should make this fact known promptly by post card. Other DX'ers who may desire appointments are invited to send in their applications. Those who are not affiliated with our Listening Post Organization will find an article describing it elsewhere in this issue.

**Something New in DX Broadcasts**

Observer Sahlbach has arranged a unique special which is to be dedicated to the RADIO NEWS DX Corner and directed particularly to observers and listeners in New Zealand.

Of this program Howard Dorsey, a member of the WMBD staff, writes: "The program will take place on January 10, from 2:30-4 a.m., Central time. Harry Hill's twelve-piece band, T. Timothy Twaddleputts (the fellow you think is so funny), the three Jills and a bevy of singers will all take part on the program with Milton Budd and myself announcing. We here at WMBD want to give you a real show and in return would like to hear from every state in the world. You can rest assured that the program for RADIO NEWS will be one of the finest DX programs you have heard.

"The program will originate from the Inglaterra Ballroom and the public will be invited. The management of the ballroom is going to serve coffee and doughnuts to all those who attend."

There is every indication that this will be an unusual program and WMBD, which is located at Peoria, Illinois, and operates on a frequency of 1440 kc., certainly rates a hand from observers and readers. So let us give it to them in the form of reports and thank you cards.

**KFVD Special**

Observer Atkins sends in a report which offers interesting possibilities. It is urged that anyone able to take part in this special program get in touch with him immediately. He reports as follows:

"KFVD has given me at least an hour, maybe more, for a RADIO NEWS-CDXR Special on January 23, beginning at 1 a.m., Pacific Time. We want to have this a live

talent program. Any DX'ers in the Los Angeles area or elsewhere who would like to take part in this broadcast are invited to get in touch with: Dudley Atkins III, 123 South Edinburg Avenue, Los Angeles, California, phone Whitney 4113."

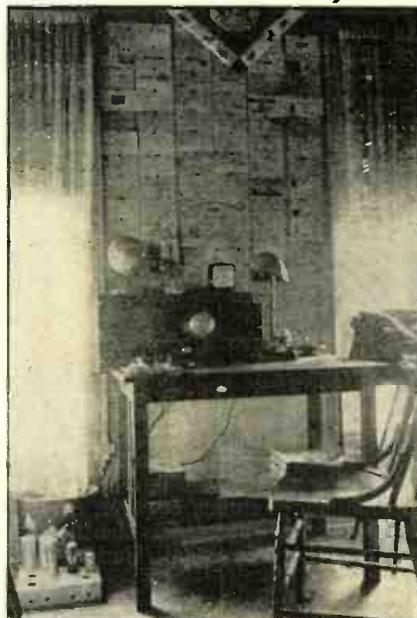
Observer Atkins has been very active in arranging broadcasts to be dedicated to RADIO NEWS. Through his co-operation stations KEHE, KFVD, and KFAC are dedicating weekly tips periods to the DX Corner. The hours of these and other special broadcasts arranged by him are given in the DX Calendar this month.

**Tune in This N.N.R.C. Special**

In line with its past policy of presenting a few outstanding DX programs over high powered stations each year, the Newark News Radio Club announces its headliner

**AN ILLINOIS LISTENING POST**

Observer Don C. Truax, Aurora, Ill., this season installed the new receiver shown on the table. Result—71 new stations added to his log.



21	5-6	1160	CMHJ	Cuba	.2						
23	3-4	1370	KFRO	Texas	.1	NNRC					
	3:30-4	1310	WEXL	Mieh.	.05	NRC					
	4-5	1000	KFVD	Calif.	.25	R. NEWS					
						Atkins					
	6-7	1310	WTRC	Ind.	.1	CDNR					
24	4-5	1310	KGEZ	Mont.	.1	NRC					
27	3-4	1400	KHBC	T. H.	.25	NNRC					
31	2-5	930	CFLC	Ont.	.1	NRC					
	3-5	1120	KFSG	Calif.	.5	R. NEWS					
						Atkins					

FEBRUARY

3	6-6:15	1270	WASH	Mieh.	.5	NNRC					
	6:15-6:30	1270	WOOD	Mieh.	.5	NNRC					
4	2-3	1160	CMHJ	Cuba	.2						
7	2-3	980	TIANRH	C. R.		NNRC					
8	5:30-6:30	1320	KGMB	Hawaii	1	NNRC					
10	6-7	1310	WTRC	Ind.	.1	NRC					
11	5-5:20	1310	WTRC	Ind.	.25	NRC					
13	4:30-5:30	1370	KVL	Wash.	.1	NNRC					
17	5:30-6	1350	WAWZ	N. J.	.5	NNRC					
	6-6:15	1270	WASH	Mieh.	.5	NNRC					
	6:15-6:30	1270	WOOD	Mieh.	.5	NNRC					
18	5-6	1160	CMHJ	Cuba	.2						
20	6-7	1310	WTRC	Ind.	.1	R. NEWS					
						F. Smith					
21	1-3	1300	WHAZ	N. Y.	.5	ICPP					
24	3-4	1400	KHBC	T. H.	.25	NNRC					
27	3-4	1370	KFRO	Texas	.1	NNRC					
28	2-5	930	CFLC	Ont.	.1	GCDXC					

PERIODIC

Fridays—

5 a.m. 1000 kc. KFVD. Los Angeles, Calif., 25 kw. (R. News) (tips)

Saturdays—

2:55 a.m., 780 kc., KEHE. Los Angeles, Calif., .5 kw. (R. News) (tips)

4:30 a.m., 1300 kc., KFAC. Los Angeles, Calif., 10 kw. (R. News) (tips)

Sundays—

12-6 a.m., 1210 kc., TGW, Guatemala City, 10 kw.

12:45 a.m., 1470 kc., WLAC, Nashville, Tenn., 50 kw. (tips)

1:15 a.m., 640 kc., KFI, Los Angeles, Calif., 50 kw., (tips)

Until 2 a.m., 1220 kc., PRE3, Rio de Janeiro, 10 kw.

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 (New England)—Observer Edlin; Column 2 (N. Y., N. J., Ontario, Pa.)—Observers Goss, Tomlinson, Gaiser, Smith, Schmarder, Cleaver and Routzahn; Column 3 (Maryland)—Observer Bauer; Column 4 (Illinois, Nebraska)—Observers Truax and Crawford; Column 5 (Texas)—Observer Davis; Column 6 (California)—Observers Sholin and Howald.

(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	1	2	3	4	5	6
550	2CR	6	-	-	-	-	-
560	MTCY	-	-	-	-	5	*
560	GWA	6	-	-	-	-	-
570	2YA	6	*	-	-	4	-
574	Stuttgart	2	-	-	-	-	-
580	3VV	6	-	-	-	-	-
590	JOAK1	-	-	-	-	5	5
600	4QN	6	-	-	-	-	-
610	JOJK	-	-	-	-	5	-
618.5	KZRM	-	-	-	-	-	6
635	RV32	-	-	-	-	-	5
640	5CK	-	-	-	-	5	-
648	Lyon-PTT	6	-	-	-	-	-
650	1YA	6	*	5	-	4	-
658	Cologne	2	-	-	-	-	-
660	XGOA	-	-	-	-	-	5
668	North Regional	6	-	-	-	-	-
670	LS4	-	-	-	-	7	-
670	2CO	-	-	-	-	5	-
680	JOBK1	-	-	-	-	2	5
680	XGOY	-	-	-	-	5	-
680	6WF	-	-	-	-	5	-
685	Paris-PTT	2	-	-	-	-	-
700	2NR	-	*	-	-	5	-
704	SBA	2	-	-	-	-	-
710	JODK	-	-	-	-	5	5
720	3YA	6	*	-	-	4	-
730	JOCK1	-	-	-	-	*	5
740	2BL	-	-	-	-	5	-
748	Marseille-PTT	2	-	2	-	-	-
750	KGU	-	-	-	3	2	-

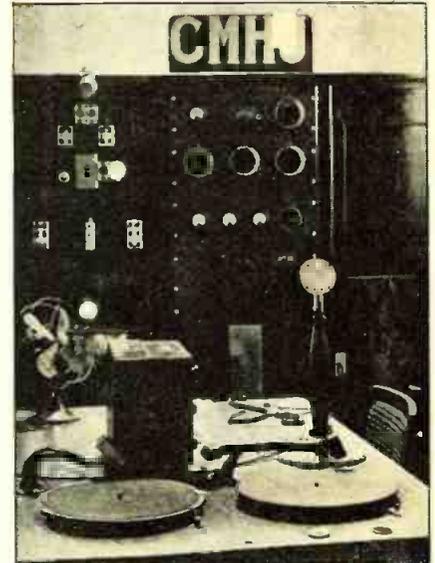
750	JFAK	-	-	-	-	5	5
770	JOHK	-	-	-	-	5	5
770	3LO	-	-	-	-	*	5
776	Toulouse-PTT	2	*	-	-	-	-
780	JOPK	-	-	-	-	-	-
780	JOJK	-	-	-	-	5	5
780	4YA	-	-	-	-	4	4
785	EAJ1	-	-	-	2	-	-
800	4QG	-	-	-	-	5	5
804	West Regional	-	-	-	-	-	-
810	JOJK	-	-	-	-	6	5
810	VUC	-	-	-	-	*	-
814	1M1	-	-	2	-	-	-
830	LR5	-	-	-	-	-	-
830	JOJK	-	-	-	-	5	-
830	3GI	-	-	-	-	-	-
870	LR6	-	-	-	-	6	-
870	JOAK2	-	-	-	-	6	3
877	London Regional	6	-	-	-	-	-
913	Radio-Toulouse	6	*	-	-	-	-
940	JOBK2	-	-	-	-	-	5
950	2UE	-	-	-	-	6	-
959	Poste-Parisien	2	-	-	-	-	-
959	RV54	-	-	-	-	-	6
970	JODK1	-	-	-	-	-	5
977	North Ireland Regional	-	-	-	-	-	-
990	LR4	-	-	-	-	-	-
990	JOCK2	-	-	-	-	5	5
990	2GZ	-	-	-	-	5	-
995	Hilversum	2	*	-	-	-	-
1020	2KY	-	-	-	-	-	5
1030	3DB	-	-	-	-	-	5
1031	CTIGL	-	-	-	-	-	-
1040	Rennes	2	*	2	-	-	-
1070	LR1	3	3	-	-	-	7
1077	Bordeaux-Lafayette	2	*	-	-	-	2
1095	EAJ7	6	-	-	-	-	-
1113	Radio-Normandie	2	2	2	-	-	-
1120	4BC	-	-	-	-	-	5
1140	1TO	-	-	-	2	-	-
1185	Nice-Cote d'Azur	6	-	-	-	-	-
1190	TGW	-	-	-	-	*	3
1190	LS2	-	-	-	-	*	7
1190	2CH	-	-	-	-	-	5
1213	Lille-PTT	2	*	2	-	-	-
1220	4AK	-	-	-	-	-	5
1222	1IBO	-	-	-	2	-	-
1225	TIVCA	-	-	-	8	-	-
1240	WKAQ	-	-	-	-	-	2
1275	YNLF	-	-	-	-	-	-
1290	WNEL	-	-	-	-	-	2
1294	Dornbirn	-	-	-	-	-	3
1320	KGMB	-	-	-	6	-	-
1320	3BA	-	-	-	-	-	5
1357	1M12	-	-	-	-	-	-
1380	4BH	-	-	-	5	-	-
1388	Radio-Lyon	-	-	-	-	-	10
1388	HII	-	-	-	-	-	-
1400	KHBC	-	-	-	-	4	3
1420	WPRP	-	-	-	-	-	2
1465	HAE4	-	-	-	-	-	-

A Good Chance To Log Trans-Oceanics

"The Bureau of Standards tests are being conducted again this year. There are not many stations on the tests, but more may appear later. The schedule as it now stands for January is as follows: WABC, 860 kc., each Monday, Wednesday and Friday nights from 7-8, 9-10 and 11-1 a.m. Rennes tests on 1040 kc. each Tuesday, Thursday and Saturday mornings from

A "GO-GETTER" IN N. Z.

The listening post of H. L. Moles, Wanganue, New Zealand; a DX trophy winner and holder of the Doctor of Degree Certificate in the 6000-12,500 Mile All-Wave Club.



A WELL KNOWN CUBAN

CMHJ, 1160 kc., Cienfuegos, put special DX broadcasts on the air from 2 to 3 a.m. E.S.T. the first Thursday of each month, and 5-6 a.m. the third Thursday of each month.

1-2:15 a.m. LR-1 also tests Tuesday, Thursday and Saturday mornings from 2:15-3:30 a.m. on 1070 kc. Belfast, Ireland, tests each Thursday morning from 1:30-3:30 a.m., on 977 kc.—Observer Routzahn.

European Programs in English

Observer Pellatt of England submits the following schedule of English language broadcasts from European stations. These transmissions are under the auspices of the International Broadcasting Club:

Station	Kc.	Time (G.M.T.)
Radio Luxemburg	232	Weekdays 9:15-9:45; 18:30-18:45 Sats. 9:30-9:45 Suns. 11:15-11:30; 13:13-30; 22:30-23
Radio Ljubljana	527	Fridays 21:30-22
Poste Parisienne	959	Weekdays 22:30-23 Suns. 18-19; 22:30-23
Radio Normandie	1113	Weekdays 18-1; 14-18; 24-1 Thursdays same but 14:30 instead of 14 Suns. 8-11:30; 14-19:30; 22-1

Emissora Nacional Lisbon

In the December DX Corner a photograph of this fine modern station was shown, but through error it was stated to be the station of CT1AA and the frequency was given as 690 kc. This error is very much regretted. The photograph actually showed the transmitter of the National Station in Barcarena, Portugal. Its operating frequency is 629 kc.

Changes In European Lists

Observer Pick (Germany) in commenting on the European station list in the November issue, says that four French stations are now on frequencies other than those shown in the list. These stations with their present frequencies are Agen, 832 kc.; Limoges, 895 kc.; Bordeaux S. O., 968 kc.; and Montpellier, 1339 kc. He also submits the following notes concerning new stations now being erected:

Burghead—100 kw. regional station for North Scotland, experimental broadcasts already started. (Observer Phillips of England reports that this station has been inaugurated and is sharing time with the Scottish regional station on 767 kc.)

Stagshaw—50 kw. for the Northeast of (Turn to page 511)

# Radio News LISTENING POST Organization

**E**ARLY in 1933 "The DX Corner" was established as a regular department in RADIO NEWS and in this department each month a Time-Table of short-wave broadcasting was incorporated, together with notes on short-wave station changes, additions, etc. Most of the information presented at that time was gleaned through the air at the RADIO NEWS Westchester Listening Post.

So great was the interest in this feature that it was decided to expand not only the department but also its scope. In order to present information which would be useful to listeners in all sections of the country—and even in all parts of the world—it became evident that the material presented in the department should be based on reports obtained from the listeners themselves. Plans were therefore worked out to call for voluntary observers and the first appointments were made in the autumn of 1933. In November 1933 the total number of observers was nineteen. Since that time applications have been coming in continuously with the result that there are now over 700 Official RADIO NEWS Listening Post Observers spread throughout the world.

## The Two DX Corners

The original "DX Corner" and Listening Post organizations were concerned primarily with short-wave reception but as time went on there was a growing demand on the part of broadcast-band DX'ers for a similar department and organization so beginning with the January 1934 issue of RADIO NEWS the DX Corner for Broadcast Waves was started and since that time the two DX corners have been appearing as regular features in RADIO NEWS each month.

The organization is built on a cooperative basis. As a result of the constant inflow of information in the reports which the observers submit monthly to the editors, the DX Corners have expanded until they now each month contain a wealth of information useful not only to readers who function as Official Observers but likewise to all readers who are interested in short-wave and broadcast band DX reception.

The only obligation as-

**A** GREAT many inquiries are received from newcomers among RADIO NEWS readers, concerning the RADIO NEWS Official Listening Post organization. So numerous have they become that this article is being written to provide comprehensive information for those who desire it but who have not as yet found the time to "take their pens in hand" to make their application

sumed by observers is an agreement to submit a monthly report containing information on station schedules, changes in frequency, etc., and any other information which an observer feels will be of interest to other listeners. Upon appointment an observer receives his Official DX Listening Post certificate, an 8½- by 11-inch certificate with his name and location lettered in by hand and sufficiently attractive that most observers frame them and hang them in their "Listening Posts". In addition observers are entitled to use their title "Official Radio News Listening Post Observer" in their correspondence with stations, etc.

Each year the entire list of observers is gone over carefully and those who have been active during the preceding year and who desire reappointment are again appointed for the ensuing year.

Any reader who desires appointment is invited to submit an informal application describing briefly the receiving

equipment which he uses and giving a few examples of his outstanding achievements in short-wave or DX reception. The application is then given careful consideration by the editors. If he is believed qualified he is appointed at once. If there is any question as to his qualification he is invited to submit monthly reports for two or three months to provide the editors with something more on which to judge his qualifications. At the end of this trial period he is either appointed or rejected as the case may be.

For the information of readers who may want to apply for appointment—and all readers who have either short-wave reception or broadcast-band DX reception for a hobby are cordially invited to do so—it might be said that there are no hard and fast rules as to the length of the required monthly report or the form in which it should be made. It is desirable, however, that in reporting stations, their frequency and best hour of reception be mentioned.

## Monthly Reports

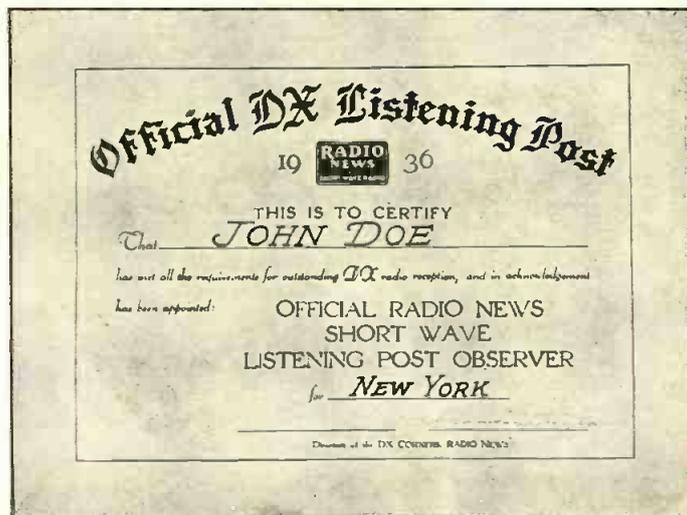
If information is being submitted for the short-wave time table, for instance, it is best to tabulate the material in the same form in which it is presented in the DX Corner. This same applies to any other information which lends itself to a tabulated presentation as it is much easier for the editors to go through tabular reports than it is to pick information from an ordinary letter. Where possible it is very helpful if reports are type-written and it also helps if only one side of the paper is used.

Monthly reports should be mailed in time to be in the editor's hands on the 30th of each month. This allows time to go over all reports carefully and include the information presented in the issue which comes out one month after that date. It is well for observers to bear this 30-day interval in mind in submitting announcement of future special feature broadcasts, etc. It sometimes happens that an observer in his monthly report will call attention to a special broadcast schedule to take place within two or

(Turn to page 503.)

## THE BADGE OF OFFICE

Each Official Observer receives a certificate like the one shown here. Its size is 8½ 11 inches and when framed it adds distinction to any listening post.



# RCA PRESENTS

## A Gift to the Nation!

*14 weekly Metropolitan Opera broadcasts  
direct from stage of Metropolitan Opera House over  
NBC's nationwide Blue network*

Radio is the greatest patron the noble art of music has ever had. Radio Corporation of America takes pleasure in presenting to music-lovers everywhere the Saturday matinee performances of the Metropolitan Opera Company, because these programs represent both a supreme musical achievement and a matchless demonstration of modern instrumentalities of radio broadcasting and reception.

The Metropolitan Opera program broadcasts have a special importance to the radio merchant. For—combining as they do the most magnificent range of vocal and orchestral effects—they offer the most exacting test

of tone reproduction known to radio.

The next best thing to an actual seat in the Metropolitan Opera House is the "front row seat" that an RCA Victor Magic Voice radio provides. This instrument reproduces all the vibrance, warmth and stirring realism of the stage performance. Because it's a product of RCA sound engineering . . . the same sound engineering that creates most of the nation's broadcasting equipment . . . the same sound engineering that has given the world so many great achievements in radio . . . the same sound engineering that some day will bring everyone radio *sight!*



**RADIO CORPORATION OF AMERICA**  
*Radio City • New York*

QRA 47°09'40" N 18°24'00" E	
<b>MAGYAR KIRÁLYI POSTA</b> <b>ROYAL HUNGARIAN POST</b> <b>SZÉKESFEHÉRVÁRHUNGARY</b> STATION OF THE ROYAL HUNGARIAN POST	
TO RADIO: <i>John M. Borst</i>	
UR CRD RECD: <i>Sept. 20th 1936</i>	
REMARKS: MANY THANKS FOR YOUR REPORT!	
TRANSMITTER OUTPUT: <i>19.30</i> KW	
QRG: <i>745</i> KC AERIAL: <i>Harris, Stabler</i>	
PSE QSL VIA: BUDAPEST	
RADIOLABOR HUNGARY	
JUSTICE FOR HUNGARY!	
	

"HATS OFF" TO STATION HAT  
 This is the verification card of Station HAT, received by Observer John M. Borst. The large lettering is in red and the striping in green with a real photograph of the station pasted in the box. Have you heard them?

THE forty-seventh 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!

#### Reappointment Reminder

WE wish to remind Listening Post Observers that if they desire to be reappointed for 1937 they should send in a separate card along with their report stating that they wish reappointment. No Observers will be carried over to next year unless such a request is made, so, fellows, don't forget to apply soon.

#### New Observer Appointments

Newly interested enthusiasts who would like to qualify for appointment as an Official Observer will find a one-page article elsewhere in this issue which gives the aims and details of this Organization of Listening Posts. Everyone with a real interest in this work is cordially invited to make application.



#### 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

DJQ, Zeesen, Germany, 15280 kc., daily 12 to 5 a.m. (Greaves); 8:15 to 11 a.m., 6 to 8 a.m. and 11:10 to 12:20 p.m., from veri). (Fallon, Dressler, Dittmann, Elcheshen).  
 DJC, Zeesen, Germany, 6020 kc., not transmitting daily to S. Africa now. (Greaves); 4:50 to 10:55 p.m., 11:35 to 4:30 p.m. (from veri). (Fallon, Stabler, Partner, Bower, Zarn, Piorko, Harris, Dittman, Alfred, Smith).  
 DJB, Berlin, Germany, 15200 kc., 4:50 to 10:45 p.m. Sundays 11:10 a.m. to 12:20 p.m. (Coover); 12:05 to 5:15 a.m. (from veri). (Fallon). On 6020 kc., synchronized with DJD, DJN and DJA. (Dressler).  
 DZH, Zeesen, Germany, 14460 mc., 3:45 p.m. (Mascarenhas); 4:45 to 5:15 p.m. (Dressler, Dittmann).  
 DJA, Zeesen, Germany, 9560 kc., nightly. (Alfred); 12:05 to 5:15 a.m., 5:55 to 11:00 a.m., 4:55 to 10:55 p.m. (from veri). (Fallon, Dressler, Piorko, Harris, Law).  
 DJN, Zeesen, Germany, 9540 kc.,

#### GREETINGS FROM NEW JERSEY

E. B. Mercer, Vice President of the Universal DX Club, sends greetings to other members of the DX Corner.

#### 'WAY UP IN THE NORTH

LPO and Mrs. E. W. Law of Edmonton, Alberta, Canada, rely on a 12-tube General Electric receiver for their short-wave contacts throughout the world and the editors know how well they report foreign stations.

# The DX for the

Conducted by

Laurence

nightly. (Alfred); 7 p.m. (Jensen); 12:05 to 5:15 a.m., 4:30 to 11 p.m. (from veri). (Fallon, Dressler, Edlin, Piorko, Harris).

DJP, Zeesen, Germany, 25.29 meters, news in English. (Law).

DZC, Zeesen, Germany, 10290 kc., 4:50 to 5:30 p.m., broadcast to S. America. (Shamleffer).

DJL, Zeesen, Germany, 15110 kc., daily 8 to 9 a.m. (Dressler, Dittman, Alfred, Shamleffer).

DJR, Zeesen, Germany, 15340 kc., daily 8 to 9 a.m. (Dressler, Hynck, Alfred).

DZA, Zeesen, Germany, 9675 kc., Saturdays 8 to 9 p.m., desires reports. (Stabler).

DJK, Zeesen, Germany, 24.93 meters, Sundays irregularly 12 to 3 p.m. (Westman).

DJD, Zeesen, Germany, 25.4 meters 9 a.m. (Coover, Dressler); 11770 kc. (Zarn, Piorko, Harris, Dittmann).

DJO, Berlin, Germany, 11800 kc., 2 p.m., Berlin calling N.B.C., very good reception. (Lopez).

DJE, Zeesen, Germany, 17760 kc., daily 7 to 12 noon. (Dressler).

GAU, Rugby, England, 18620 kc., broadcast to U. S. 11:15 a.m. (Jordan).

GSI, Daventry, England, 15260 kc., daily 12:15 to 3:45 p.m. (from announcement). (Dressler).

GSL, Daventry, England, 6110 kc., replacing GSP. (Fallon, Stabler).

GSP, Daventry, England, 15310 kc., Thursday 7 p.m. (Freeman).

GSO, Daventry, England, 15180 kc., with GSB from 12:15 to 2:15 a.m. (Partner, Law).

GSG, Daventry, England, 17790 kc., often 12:15 to 2:15 a.m. (Partner, Law).

GSA, Daventry, England, 6050 kc., schedule 6 to 8 p.m. (Partner).

GSD, Daventry, England, October 28 from 9 p.m. on. (Atherton). Synchronized with GSB 6 to 8 p.m. (Dressler).

GSH, Daventry, England, 21470 kc., daily 9 a.m. to 12:15 p.m., 6:00 to 8:30 a.m. (announcement). (Dressler, Partner); synchronized with GSG also, 9 to 12 noon; with GSF, 15140 kc.,



# Corner SHORT WAVES

M. Cockaday

G.S.B. 9510 kc. (Dressler, Law).

GSF, Daventry, England, 15140 kc., daily 6 to 8:30 a.m. and 9 a.m. to 12:15 p.m. (From announcement). (Dressler).

G.S.B., Daventry, England, 9510 kc., 9 to 11:30 a.m. (Dressler, Edlin, Partner); on transmission 5. (Jensen, Partner, Piorko, Harris); synchronized with GSC 6 to 8 p.m. (Dressler, Shamleffer).

G.S.C., Daventry, England, 31.32 meters, 8 a.m. (Coover); 9580 kc. on transmission 5. (Cowley, Atherton, Piorko, Harris, Dressler, Law).

G.M.B.J., S. S. Empress of Britain, 8840 kc., 2:55 a.m., ship was near the north-east coast of Sydney, Australia. (Chambers).

H.B.F., Geneva, Switzerland, 18450 kc., used for commercial point-to-point work. (Atherton); irregularly. (Fritsch).

H.B.H., Geneva, Switzerland, 18480 kc., used for commercial point-to-point work. (Atherton).

H.B.O., Geneva, Switzerland, 11400 kc., 1:30 a.m. on Wednesdays. (Edlin). Every Monday at 1:30 a.m. (Atherton). On Saturdays at 7 p.m. (Pilgrim).

H.B.P., Geneva, Switzerland, 7797 kc., (Bunch); Saturdays 5:30 to 6:15 p.m. First Monday in a month 7 to 8 p.m. (Atherton, Fritsch). Identified by a series of bugle calls. (Gaiser, Ralat).

H.B.J., Geneva, Switzerland, 20.64 meters, irregularly. (Fritsch); 14535 kc. (Hynek).

H.B.L., Geneva, Switzerland, 7797 kc., 7 to 10 p.m. (Gaiser); 9595 kc., (Bunch); Saturdays 5:30 to 6:15 p.m. First Monday in a month 7 to 8 p.m.



## SHORT WAVES

Send in to the Short-Wave DX Editor any accurate reports you have on distant short-wave stations you have heard.

(Atherton, Fritsch); 9580 kc. (Zarn).

E.P.G.I., Barcelona, Spain, about 7000, 7800 kc., irregularly, Spanish International March played as identification. (Piorko).

E.C.N.I., Barcelona, Spain, 1080 kc., irregularly. (Piorko).

U.F.T., Madrid, Spain, 9440 kc., 5 p.m. and after, temporary government station. (Piorko). Address: Union Federal de Trabajadores de Espana.

U.G.T., Madrid, Spain, 9419 kc., irregularly in evenings. (Ralat).

E.A.Q., Madrid, Spain, 9860 kc. (Bunch, Atherton); daily until 8 p.m. (Rodriguez, Sands, Lucas, Coover); on 10048 kc., same schedule (from announcement). (Dressler); 6 to 12 p.m. (Fallon, Freeman, Beck); 12:15 to 12:30 a.m. (Alfred, Piorko, Harris); interference reported on this station. (Hynek).

E.A.9.A.H., Spain, 6950 kc., 4 to 4:30 p.m. (Edlin). Poyuelo del Rey, Madrid, Spain, 20860 kc., used by Spanish government. (Styles).

E.A.I.A.Z., Coruna, Spain, 6985 kc., irregularly in evenings. (Rodriguez).

T.Y.A.Z., Paris, France, 9030 kc., 9 to 9:40 a.m. (Partner).

T.P.A.Z., Pontoise, France, 15244 kc., 4 to 10:45 a.m. (Dressler).

T.Y.A., Paris, France, 12215 kc., mornings calling ships. (Hynek).

T.P.A.4., Pontoise, France, 11720 kc., 6:15 to 9 p.m., 9:15 to 1 a.m. rather than that in time-table. (Dressler).

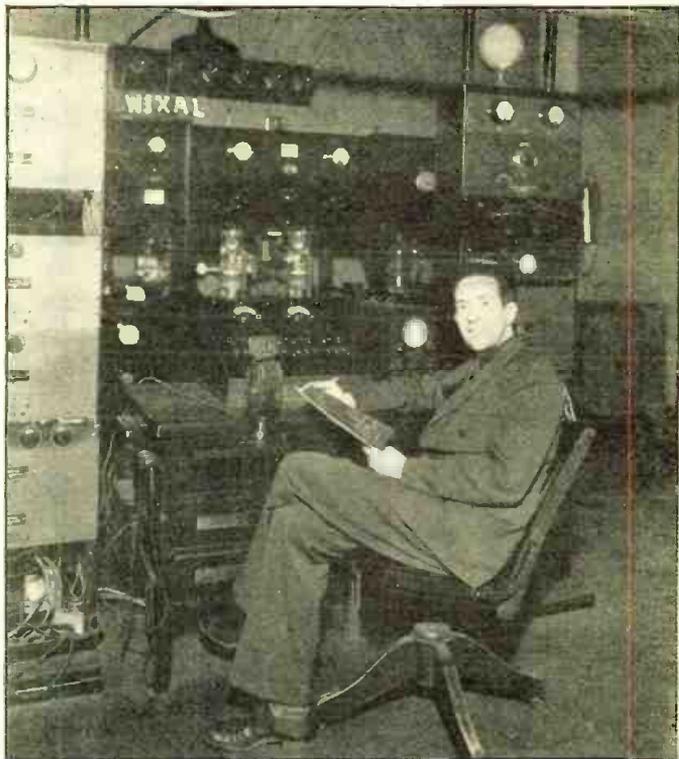
T.P.A.3., Pontoise, France, 11885 kc., 1:42 a.m. (Sands); on until 6 p.m. (Edlin, Dressler, Law).

S.P.W., Warsaw, Poland, 13653 kc., 12

## LPO FOR NEW YORK

A left: LPO E. Scala Jr., of the Bronx, New York, is a serious short-wave fan who knows his business from A to Z

TEXAS RANGER OF THE AIR Meet Roy E. DeMent of Plainsview, Texas, LPO for RADIO NEWS and official DX ace.



## HE LECTURES AT WIXAL

C. Davis Belcher, Staff Member of the Eastern Radio Institute and Commission, Operator-Instructor for the Massachusetts University Extension holds one of the blueprint charts used in the radio course broadcast from this station. The apparatus is shown in the background.

to 12:30 p.m., special program to N.B.C. (Lueth, Piorko); 5 p.m. (Gaiser).

R.I.O., Baku, U.S.S.R., 10170 kc., 10 a.m. (Gallagher, Elcheshen).

R.V.96, Moscow, U.S.S.R., 19.88 meters, Sundays 1 to 2 p.m., wants reports. (Fallon, Alfred); 15180 kc., National Anthem played after closing announcement. (Bower, Foshay, Jordan). Reported as RW96. (Hynek, Atherton, Dressler, Meares). Address: Radio Center, Moscow, U.S.S.R.

R.V.59, Moscow, U.S.S.R., 12000 kc., (Bunch, Piorko).

R.A.N., Moscow, U.S.S.R. 9600 kc., 7 p.m. Saturdays. (Self, Fallon); 5 p.m. (Olesen); daily 7 to 7:30 p.m., Markuson). Change: 9520 kc., 7 to 8 p.m. (Dressler, Geneve, Beyer, Alfred, Dressler, Ralat, Piorko, Beck, Meares). Address: Radio Center, Solyarcha, 12, Moscow, U.S.S.R.

R.N.E., R.K.I., Moscow, U.S.S.R., 17.44, 25, 19.81 meters, on various times, Sun., Mon., Wed. and Fri. (Alfred). (Turn to page 484)







# WORTH DOLLARS

But it's FREE!



**This New 1936-1937 Edition of Sylvania Auto Radio Installation and Servicing Booklet!**

More automobile radios installed this year than ever before! Are you set to get your slice of this profitable business? Be sure you are ready to meet it!

You can be prepared with this new Sylvania Booklet! Here are a few of the features contained in this valuable book:

Elimination of motor interference for every make of 1936 car... Tube complement chart for practically all models of automobile radio sets, with I.F. peak frequencies... Set and Antenna installation hints... Power supply hints, etc. These and hundreds of other problems you will meet in auto-radio installation and servicing are covered in this amazing book.

Fill out coupon below and mail it NOW! You will receive your free copy of this valuable book in a few days.

## SYLVANIA THE SET-TESTED RADIO TUBE

RN-27

**HYGRADE SYLVANIA CORPORATION**  
Emporium, Pa.

Please send without obligation your new service book, "Auto-Radio Installation and Servicing."

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 Serviceman  Employed by dealer  Independent   
 Member Service Organization.....

NAME.....  
 ADDRESS.....  
 CITY.....STATE.....  
 NAME OF JOBBER.....  
 ADDRESS.....

"Radio Club Océanien" Papeete, Tahiti  
 (ÉTABLISSEMENTS FRANÇAIS DE L'OcéANIE)  
 à Radio J. Cohen Heureux de confirmer notre QSO das monstret  
 à 4.5.5. GMTUR Sigs QSA - R - T - le

# F08AA

Transmetteur	Remarques	Récepteur
Power: 200 W	Experimental transmission	Announcement
Frequency: 7100 kc.	Wednesdays & Saturdays	in French
BY <u>IRVING COHEN</u>	<u>465 Rue de la</u>	<u>Tahiti</u>
<u>2 VILLET ST. NY</u>	<u>738 A.T. POKOI</u>	<u>President</u>

COURTESY C-12500 MILE CLUB

## The DX Corner (Short Waves)

(Continued from page 481)

Coover, Edlin); 12000 kc., begins Sunday at 10 a.m. (Cox, Zarn, Turner, Beck); 11 a.m. (Gallagher, Dressler).

CT1AA, Lisbon, Portugal, 9650 kc., Thursdays, Saturdays and Tuesdays 4 to 6 p.m. (Fallon); 25.32 meters on Saturdays. (Mascarenhas, Sands, Coover, Fritsch, Lopez, Ralat, Piorko); on 9780 kc. (Boves, Harris); or 9760 kc. 5 to 7 p.m. (from veri). (Dressler, Pickering, Mears, Alfred, Bishop, Elcheshen). Slogan: "Radio Colonel". Address: Estacao Radio CT1AA, Av. Antonio, Augusto d'Aguir, 144, Lisbon, Portugal.

CSW, Lisbon, Portugal, 9920 kc. (Edlin); 6:15 to 7 p.m. (Bird, Partner); on 30 meters at 4:30 p.m. (Mascarenhas, Bower); on 9546 kc., Mondays, Fridays and Saturdays. (Geneve, Self, Piorko). Frequency is 9930 kc. (from veri). (Stabler, Harris); 4 to 7:15 p.m. (from announcement); requests reports. (Dressler, Westman); Church bells ring hour (from veri and announcement). (Fallon). Frequency is 9940 (from announcement) (Dressler, Shamleffer, Alfred); 9930 kc., Thursdays and Saturdays 6 to 7 p.m., woman announces in English, veris requested. (Dressler). 9870 kc., 5 to 7 p.m. (Ralat). Address: National Broadcasting Station, Lisbon, Portugal.

TFJ, Reykjavik, Iceland, 12235 kc., Sundays 1:40 p.m. (Atherton, Alfred, Sahlbach, Pickering). Address: Icelandic State Broadcasting Service.

SM5SX, Stockholm, Sweden, daily 12 to 6 p.m. (Bower); on 11.71 mc., every Wednesday 5 to 6 p.m., testing for American listeners. (Geneve, Fallon, Atherton, Jordan). Address: Royal Technical University, Stockholm, Sweden.

I2RO, Rome, Italy, all N. A. programs on 9635 kc. (Fallon); announced to transmit on 31.13 meters and wants reports. (Messer, Bower, Dittmann, Sands); 6 p.m. (Coover): daily (from announcement), winter schedule on 11810 kc., also daily (from veri). (Lopez, Dressler); 6 to 8 p.m., 9640 kc. (Lueth, Partner, Fallon, Gaiser); on 11810 kc. at 6 to 10:30 p.m. daily. (Ralat, Zarn, Piorko, Dressler, Law, Styles, Dittmann, Black, Shamleffer, Dressler).

I2RO3, Rome, Italy, 9635 kc., Sundays at 3:15 p.m. (Turner, Markuson).

FROM THE SOUTH PACIFIC  
 A "veri" from F08AA, a prize which any short-wave fan should be proud of.

Bologna, Italy, 1222 kc., new station. (Pick).

HVJ, Vatican City, Italy, 15121 kc., 10:30 to 10:45 a.m.; 5969 kc., 2 to 2:15 a.m. (from veri); Sundays 10 a.m. on 5969 kc.; five minutes before, clock ticking and at intervals St. Peter's chimes. (Fritsch); 8 to 8:30 p.m. in French. (Shamleffer).

OLR, Prague, Czechoslovakia, 19,698 and 25.51 meters, verification received by Reilly; 5:05 to 5:45 p.m. (Coover); unheard by Fallon; on 15440 kc., at various hours. (Howald); Saturdays from 2:35 to 4:30 p.m. (Mascarenhas); 2 to 4 p.m. daily. (Geneve, Edlin, Rodrigues, Coover, Brown); daily 2:25 to 4:30 p.m. and Mondays and Thursdays 9 to 11 p.m. (from veri). (Fritsch); on 11880 kc., Sun., Mon., Thurs., Fri., Sat., 2:25 to 4:30 a.m. Mon., Sat., 4 to 6 a.m. (from announcement). (Holden, Atherton, veri received Bills, Partner, Fallon, Gaiser, Schuckman, Piorko, Hynek, Alfred); 15230 kc. (from veri). (Shamleffer, Atherton, Bishop). Address: Radiojournal Ceskoslovensk, Zpravodakstie, Radiotelefonical Spolecnost, S.R.O., Prague, Czechoslovakia.

HAT4, Budapest, Hungary, 9125 kc. (Bunch, Beyer); Sundays 6 to 7 p.m. (from veri). (Scala, Alfred, Sahlbach, Dressler, Foshay, Harris, Piorko). Address: Station of the Royal Hungarian Post, Radiolabor, Budapest, Hungary.

HAS3, Budapest, Hungary, 15270 kc., Sundays 7 to 10 a.m. (Self); 15370 kc., woman announcer usually. (Dressler, Foshay); Sundays 11 to 12 a.m. (Westman).

PHI, Huizen, Holland, 17775 kc., before 7 a.m. on Sundays. (Edlin).

PDK, Kootwijk, Holland, 10415 kc., Sundays at 4 p.m. (Edlin).

PCJ, Eindhoven, Holland, 15220 kc. and 9590 kc. (Bunch); Tuesdays 1:30 to 3:00 p.m.; Thursdays 7 to 10 p.m. (19.71 meters); 4:30 to 6 a.m.; Wednesdays 8 to 11 a.m. (from veri). (Alfred, Coover, Dressler, Sahlbach, Gaiser, Zarn, Piorko).

ORK, Brussels, Belgium, 10330 kc., daily 1:30 to 3 p.m. (Sands, Greaves, Piorko, Pickering, Alfred).

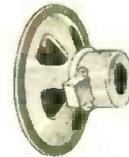
YTC, Belgrade, Yugoslavia, 6100 kc., 1 a.m., reports requested. (Self); daily 12:55 to 3 a.m. and 6:15 to 8:15

(Turn to page 492)

*America's Most Amazing Radios!*

**WITH  
THE  
AND**

**MAGNA-SPAN DIAL  
VITA-TONE SPEAKER**



Amazing new convenience, speed and accuracy in tuning.

Thrilling new fidelity, vitality, realism of tone.



WITH  
RCA TUBES  
**\$46.45**

**NEW *Knight* RADIOS**

**38 SENSATIONAL MODELS—AS LOW AS \$8.45!  
5-19 TUBES—SEE THEM IN ALLIED'S CATALOG!**

The new Knights—the marvels of the radio industry—offer sensational new developments to double radio enjoyment: The Giant Magna-Span Dial for quick, easy tuning on every band; heavy-duty Vita-Tone Dynamic Speakers for superb, life-like tone quality; beautiful cabinets—the products of the leading radio designers; perfected metal tubes; Flywheel Tuner; "Electric Eye"; Visual Wave-Band Indicator, and a host of other revolutionary improvements that again prove that only ALLIED can offer such tremendous values. Knight Radios give you more for your money—in tone, performance and beauty!

Choose from 38 great models—as low as \$8.45, complete with tubes and cabinet! All-Wave, Dual-Wave, and Short-Wave—5 to 19 tubes—for AC, AC-DC, 6 volt, 32 volt, battery and auto operation—a set for every purse and purpose! See all 38 models in the 1937 ALLIED Catalog!



COMPLETE  
**\$13.95**

**A Sensation! Knight  
5 Tube AC Superhet**

Tunes 2 full, live bands—43 to 150 and 175 to 550 meters—no "dead" spots on this dial! Advanced circuit actually achieves 8 tube efficiency—includes 8 tuned circuits, heavy-duty, rubber-floated tuning condenser, 6" electro-dynamic speaker. Handsome "Laydown" cabinet, big 5 1/2" Vernier dial—the Knight 5 is the answer to the widespread demand for a low-priced quality receiver! See back cover of ALLIED Catalog.

**1937's GREATEST VALUE!**  
**Knight 11 Tube All-Wave Superhet**  
Making radio history every day through its phenomenal sales, the Knight 11 offers more real value than any other 11 tube set—3 full bands to bring you the world—powerfully, dependably; 11" Magna-Span dial—includes 5 great features for accurate tuning by eye as well as ear; 12" Vita-Tone speaker; metal tube circuit—RCA and Hazeltine licensed—A.V.C.; Personal Tone Control; beautiful rolled-top console cabinet—never before such a quality 11 tube receiver at so low a price! See pages 8-9 of ALLIED's Catalog for complete details.

**ALLIED Offers Everything in Radio at Lowest Prices!**

**Newest Sound Systems**  
18 Watt High Gain System  
**\$63.85 COMPLETE**

One of the many exceptional values in sound systems offered in the ALLIED Catalog—a new Knight 18 Watt Public Address System using the latest dual-diaphragm type crystal microphone. Develops full 18 watts output with highest fidelity. Features 2 giant Knight 12" auditorium speakers, electronic mixer, 6B5 tubes. Priced amazingly low. You get more in dependability, high fidelity of tone and built-in durability from Knight P.A. Systems!

**BIG TEST EQUIPMENT VALUES!**

**TEST EQUIPMENT AND PARTS!**

10,000 exact duplicate and replacement parts: oscillographs, meters, tube-checkers, analyzers, testers, signal generators — you'll find all your service needs answered in the 1937 ALLIED Catalog!

**This Great Catalog Brings You Everything in Radio at Lowest Prices**  
**Parts—Test Equipment—Public Address—Amateur Gear—Kits**  
You need this Free Book, whether you sell, service or build radios, install P.A. Systems, or operate a "ham" station. ALLIED's Catalog shows everything in radio. Besides the 38 amazing new Knight Radios, its 152-pages include over 10,000 exact duplicate and replacement parts; the latest amateur transmitters, receivers and transceivers; the newest developments in tube-checkers, set-testers, analyzers, oscillographs, meters—all standard lines; latest Public Address equipment for every sound need—8-60 watts; permanent, mobile and portable, for 110 volts AC, 6 volts DC, and universal operation. For Set-Builders, dozens of new kits—new metal tube DX'er, Knight Metal Tube Super-Gainer, new 6 volt all-wave set, 5-meter transceiver and many others. Also Rurlpower units and Windchargers. They're all in ALLIED's great Catalog.

**FASTER SERVICE—LOWER PRICES—HIGHER QUALITY**  
ALLIED's huge stocks are complete under one great roof. You get your order when you want it; our central location means faster shipping; an efficient organization gives you finest personal service. Because we are able to buy in vast quantities we get lower prices, and sell for less. Every item tested and approved by ALLIED engineers—your assurance of highest quality always! To be sure of greatest values, fastest service and lowest prices, always order from the ALLIED Catalog. If you don't have the big 1937 Catalog, send the coupon now for your FREE copy!



See them in ALLIED'S Free Catalog →

**ALLIED RADIO CORPORATION**  
**833 W. JACKSON BLVD. CHICAGO**

Allied Radio Corp., 833 W. Jackson Blvd., Chicago, Ill., Dept. 1-B

Rush me a Free copy of your 152-page 1937 Catalog showing the 38 new Knight sets and complete Radio Supplies.

Name.....

Address.....

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

**"ELECTRAD CONTROLS  
Make Any Replacement  
A CINCH.....!"**



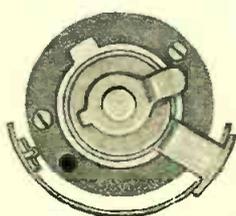
... says **MAC** the Service Man

• Electrad spends many thousands of dollars every year on engineering research—just to build a line of controls *mechanically and electrically* right for any receiver model.

• The result is that any service man who uses Electrad Controls can truthfully say—"Electrad Controls make any replacement a cinch." . . .

• Try an Electrad Control on your next replacement job. Long aluminum shafts are easily cut to required length, standard end covers are instantly interchangeable with power switch assembly. Every Electrad Control is noise tested at the factory and fully guaranteed.

• An Electrad replacement is a quick, accurate, *lastingly* satisfactory job—and Electrad's clean dealer policy assures a good profit every time. Send top flap of one Electrad Volume Control carton (showing Spec. No.) for new 1937 Guide. Address Dept. RN2.



Direct friction contact . . . self-cleaning, self-polishing . . . assures quiet stepless graduation . . . no noise, no gaps, no stuttering.



**"RESISTOR HEADQUARTERS"**

# THE SERVICE BENCH

Conducted by Zeh Bouck, Service Editor

(Continued from page 462)

Atlantic City, N. J. finds most effective. Note that it carries several sales arguments without crowding—reasonable prices—guaranteed work—expert technicians—modern equipment—radios on time—no down payment on Philco Transistones—terms cash—at least one of which is bound to catch the eye as the blotter is used.

That Mr. Helmuth can back up his ad is shown in Figure 4.

## THIS MONTH'S SERVICE SHOP

This photo shows only one of the two service benches in Mr. Helmuth's establishment. The other, across the shop, is for the heavier work and features a Black and Decker ½-inch drill press, grind stone, a 12-inch jig saw for cutting loudspeaker grills, panels, etc. and a bench saw for other wood-work. The bench in the illustration is 10½ feet long, 24 inches deep (from the panels to the front edge) and the back is 65½ inches high. Mr. Helmuth plans to extend this to the ceiling during this winter, as all but one of the blank panels shown in the photograph have been replaced with instruments since the photograph was taken. The remaining panel awaits an RCA oscilloscope. The bench is finished in plywood, the rear panels being stained black, with a penetrating stain, and polished. Except for the attractive grain, they closely resemble black bakelite.

Aside from several short-wave transmitters and receivers (the call letters are W3EOA) the equipment is fairly conventional—the usual oscillators, tube tester, condenser tester, a Solar bridge, analyzers and meters in all ranges of voltage, current and resistance. Weston meters are favored. The cabinets on each side of the Sessions electric clock (in the upper center panel) house the hardware jars and Rider Manuals. Adapters, analyzer cables, etc., are kept in the drawers on the upper tier. Small tools are conveniently at hand just under the center meter panel.

The walls of the shop are largely lined with show cases only part of one of which can be seen to the extreme right in Figure 4. Spare parts and tubes are on display here, in an impressive and attractive array.

Mr. Helmuth's radio education is thorough. He is a graduate of the National Radio Institute, R. C. A. Institutes, and of the U. S. Marine School of Wireless—not to mention his post-graduate work as an amateur.

Our congratulations to Mr. Helmuth!

## THE DAY'S WORK

Frank W. Bentley Jr., the serviceman who kodaks as he goes, sends us the following kink from Missouri Valley, Iowa—"The disassembling and reassembling of small radio parts, particularly where small but very tight screws must be loosened and vice versa, are jobs that call for much unspoken profanity when the nature of the part is such that a vise cannot be employed. The usual procedure is to steady the part close against the breast and rip bits of flesh from the fingers and hands as the screwdriver slips.

"My solution is a slab of porous rubber cleaning pad into which the part is pressed with one hand while the tool is wielded in the other as suggested in Figure 5. The



Figure 5

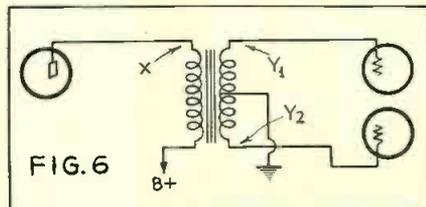
part will be snugly held, regardless of how oddly it may be shaped, and the tool can be safely and conveniently applied from almost any angle."

## Temporary A. F. Transformer Repairs

"Breaks in transformer windings continue to be a common ailment—particularly in push-pull a.f. circuits where there is one more terminal connection open to corrosion. Replacements may not be immediately at hand, and I have found the circuits shown in Figure 6, 7 and 8 to work out satisfactorily for emergency repairs.

"Figure 6 shows the conventional input push-pull arrangement. In the case of primary failure, at say X in Figure 6, the emergency circuit is shown in Figure 7. With a secondary open, at Y<sub>1</sub> or Y<sub>2</sub> in Figure 6, operation may be restored as indicated in Figure 8. The values of R and C as suggested will be correct in the majority of instances."—Stewart J. Robinson, Sacramento, California.

Amplification will be reduced in Figure 8 and also probably in Figure 7. In Figure 8, the open side of the secondary of course is not used. Some servicemen may question the phase relationship of the voltages applied to the grids in the circuit of Figure 7. However, the grids are still 180 degrees



apart. The secondary acts as an auto-transformer with a two-to-one ratio, the upper half functioning as the primary and the entire winding as the secondary, exactly as with a separate primary.

It occasionally happens that the break is in the center tap connection. In such instances, Figure 8 should be used, *with both grids connected to the usual posts and the center tap disregarded*. Only use these circuits in class A amplifiers.

## Philco Battery Sets

J. O. Roberts, of Roberts' Radio Service, St. Louis, Michigan, sends in the following data on three Philcos popular in rural districts: "Philco No. 30: The complaint was failure to play with an occasional burst of sound. The cause was finally located in a flexible wire running to

(Turn to page 506)

# From RCA come all these great products . . . To help you profit!

The more things you sell that add to the radio pleasure of your customers, the more money you are going to make for yourself. You'll sell more if you offer the public products that have won its confidence—products of RCA.



## RCA Victor Radios and Phonograph-Radios

### RADIO FEATURES

Magic Voice—Magic Brain  
 Magic Eye—Metal Tubes  
 World-wide coverage  
 Automatic Volume Control  
 Oversize Dynamic Speakers  
 High Frequency Tone Contro.  
 Automatic Tone Compensation  
 Music-speech control  
 Selector Dial  
 Edge-lighted Dial  
 Two-speed Tuning  
 As much as 30 watts Output  
 Antenna Wave Trap  
 And several more features

### PHONOGRAPH FEATURES

High Fidelity Tone  
 Dynamic Amplifier  
 High Frequency Tone Diffuser  
 Spring Balanced Tone Arm  
 Automatic Record Changer  
 And other features

## RCA Spider-Web Antenna FEATURES

1. Full frequency coverage—140 to 23,000 kcs.
  2. Factory assembled
  3. Requires small space
  4. Less noise
  5. More stations
  6. Sturdy construction
- Stock No. 9685. List price \$8.95



## RCA's New Universal Wave Trap, \$2.65 FEATURES

1. Extensive range of adjustment—430 to 1700 kcs.
  2. High degree of attenuation—30 db. or 32—1 in voltage.
  3. Universal mounting adaptability.
  4. Shielding of electrical elements
  5. Low loss—air dielectric—adjustable capacity
  6. Magnetite core coil—provides a high Q circuit
- List price \$2.65



## RCA Radio Tubes, Glass and Metal

1. The ideal tubes for replacement sales because they are recognized as the standard in the industry.
2. Used by leading set manufacturers.
3. Regular equipment in the largest broadcasting stations.
4. Have a 5-to-1 public acceptance.
5. Fully guaranteed.



MAIL THIS COUPON!

RCA Manufacturing Co., Inc.,  
 Camden, N. J., Dept. RN  
 Please send me information on RCA products I have checked:

Name \_\_\_\_\_  
 Street \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_  
 SETS     TUBES     WAVE TRAP

RCA presents the Metropolitan Opera every Saturday afternoon. And "The Magic Key" every Sunday, 2 to 3 P. M., E. S. T. Both on NBC Blue Network



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# RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

## Lesson 59 Filters

**I**N practice it is desirable to terminate a filter externally both at the load and at the source of power (Figure 1) in an impedance approximately equal to its characteristic impedance, for it is only then that the filter approaches in performance the type after which it was designed. If both the source impedance and the load impedance are known, this value is usually taken for the characteristic impedances in the above formulas. If either the load or the source impedance is known, this is taken as the characteristic impedance in the formulas, and then an impedance is connected at the other end so as to make it of the same combined impedance value, as will be illustrated in the example to follow.

If a certain ready-built fixed filter is to be employed, and it is desired to know what impedance to terminate it in, it may be found from the expression for the "characteristic" impedance at zero frequency which is,

$$Z_0 = \sqrt{\frac{L_1}{C_1}}$$

This is independent of the number of sections and, depends only on the inductance and capacitance used.

The filter therefore should be designed for 50,000 ohms, since it will terminate with this same impedance at both ends, We now have:

$$L_1 = \frac{0.3183 Z}{f} = \frac{0.3183 \times 50,000}{20,000} = 0.8 \text{ henries. ans.}$$

$$\text{and } C_1 = \frac{318,300}{f Z} = \frac{318,300}{20,000 \times 50,000} = 0.00032 \text{ microfarads. (approx.)}$$

The capacitance of the first and last condensers must each be equal to  $\frac{1}{2} C_1$ , or .00032  $\div$  2, or .00016 microfarads. It is not practical to obtain the exact values of  $L_1$  and  $C_2$  as computed above. In practice, values of commercially available coils and condensers as close as possible to these values should be used and the filter re-computed to see how much  $f$  and  $Z$  have changed.

In filter construction, the resistance should be kept as low as practicable since the effect of resistance is to introduce some attenuation in the passed band, and to round out the abrupt changes at cut-off.

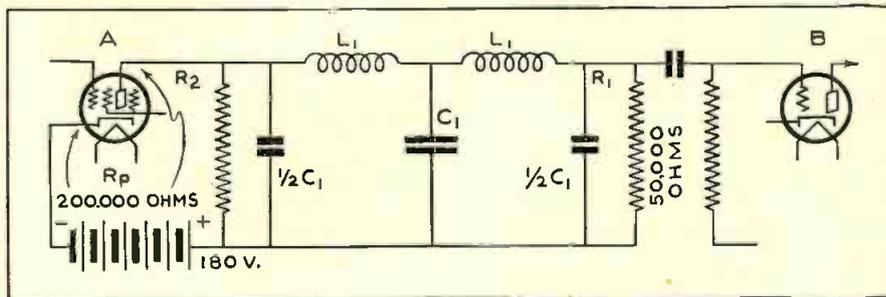


Figure 1—A practical low-pass filter used to filter high frequency (R-F) currents out of an audio amplifier.

tance and capacitance used. There is always one best load impedance for a particular filter. The best load is a pure resistance, and loads having reactance or resonant characteristics will upset the filter characteristics very much.

**Example:** The low-pass filter shown in Figure 1 is to be connected between two amplifying tubes as shown. Radio and audio frequencies are fed into the amplifier and it is desired to separate them and amplify only the audio frequencies. Assume 20,000 cycles (the limit of audibility) as the cut-off point. The internal plate circuit resistance of tube A is 200,000 ohms. Plate coupling resistor  $R_2$  into which the filter terminates is 50,000 ohms. Design the filter if it is of the type shown.

**Solution:** Since the terminating impedance  $R_1$  is 50,000 ohms, the input impedance to the filter should also be made equal to this value by connecting resistor  $R_2$  in parallel with the plate resistance  $R_p$  of the tube. Then since:

$$\frac{1}{R_{\text{total}}} = \frac{1}{R_2} + \frac{1}{R_p}$$

we have

$$\frac{1}{50,000} = \frac{1}{R_2} + \frac{1}{200,000}$$

from which  $R_2 = 66,666$  ohms.

If the inductors have iron cores and carry much current, they should be provided with an air gap so that their values will not change appreciably with changing current. They may also need to be magnetically shielded from one another, as any coupling between them may change the characteristics of the filter. In radio-frequency circuits, the choke coils should be of low-loss type.

It will be seen from an examination of the last two lessons that a two section T filter is quite similar to a two section "pi" filter at the center. Whether to use end sections of the "pi" or T type in any case, depends on the problem in hand and the rules already given are good ones to follow. The "pi" section of filter ends with a condenser and in some applications advantage may be taken of this fact to use this same condenser to by-pass any radio-frequency currents present. The sum total of capacitance and inductance used in both types is the same, for an equal number of sections. Of course, since every filter has some resistance, the filter always causes some reduction in the strength of the currents passed. Also the current suppressed by the filter is never reduced entirely to zero at any frequency, although the zero value may be approached by using a number of well designed sections.

## Super-Regeneration

(Continued from page 473)

- (2.) Keep all r.f. leads short.
- (3.) Mount L2 directly on the tuning condenser R3.
- (4.) Connect C7 direct to detector socket plate terminal.
- (5.) Keep filament and heater chokes away from chassis (they are "hot" at r.f.)
- (6.) Keep all r.f. circuits above chassis and all audio circuits underneath.
- (7.) Allow for adjustment of coupling between L1 and L2.

This receiver is designed for the amateur and experimenter, and not for the uninitiated. It will take two nights of operation for a good operator to become familiar with the adjustments necessary for best results. When properly built and operated it will pull in, however, signals inaudible on other types of super-regenerative receivers with single tuning controls, unless they use a good tuned r.f. stage ganged to the detector tuning.

As to antennas for this receiver, the main point is to get a half-wave vertical antenna as high as permissible and use the type of feeders which are best suited to the particular installation. If Zepp feeders are used and the antenna is end fed, the feeders should be an uneven number of quarter wave lengths long. Other feeders such as untuned spaced transmission line, twisted pair, or concentric line may be used with the input circuit shown, and in such cases, any adjustment of C1 while tuning is rarely necessary, once its best setting has been found.

### List of Parts

- L1—4 turns No. 12 enameled, 1-inch diam., spaced 1 diam., air core.
- L2—4 turns No. 12 enameled, 1-inch diam., spaced 1 diam., air core.
- L3—National r.f. choke, 2.5 millihenry.
- L4, L5—60 turns No. 20 enameled, 3/8 inch diam., close wound, air core.
- L6—30 henry output choke, 30 ma.
- C1—100 mmfd. midget variable.
- C2—35 mmfd. midget variable.
- C3—20 mmfd. midget variable.
- C4—35 mmfd. mica.
- C5, C6—.002 mfd. mica.
- C7—.0001 mfd. mica.
- C8—.006 mfd. mica.
- C10—.005—.01 mfd. paper.
- C11, C12, C13—1 mfd. paper.
- C14, C15, C19—2 mfd. paper.
- C16—.01 mfd. mica.
- C17—.0005 mfd. mica.
- C18—10 mfd., 50 v. electrolytic.
- R1—2 mag., 1/4 watt.
- R2—2000 ohms, 1 watt.
- R3—500,000 ohm volume control.
- R4—50,000 ohm potentiometer.
- R5, R7—50,000 ohms, 2 watt.
- R6—2000 ohms, 1 watt.
- R8—500,000 ohms, 1 watt.
- R9—500 ohms, 2 watt.
- R10—10,000 ohms, 1 watt.
- S1—Single-pole snap switch.
- T1—GE or RCA part No. 3637, 175 kc., i.f. transformer, coils closely coupled.
- T2—Good grade audio transformer: 1:3 ratio.

### Change in Frequency Allocations

Washington, D. C.—The F. C. C. adopted a rule to change the frequencies assigned to certain classes of stations and services.

The television band between 2000 and 3000 has been eliminated; this band will be reserved for intercity police communications.

A new broadcast band was created between the limits of 25,600 and 26,600 kc. Four frequencies in the band 40 to 42 mc. were assigned to experimental broadcasting especially for systems employing frequency modulation.

The frequencies from 1500 to 1600 kc. were added to the broadcast band.

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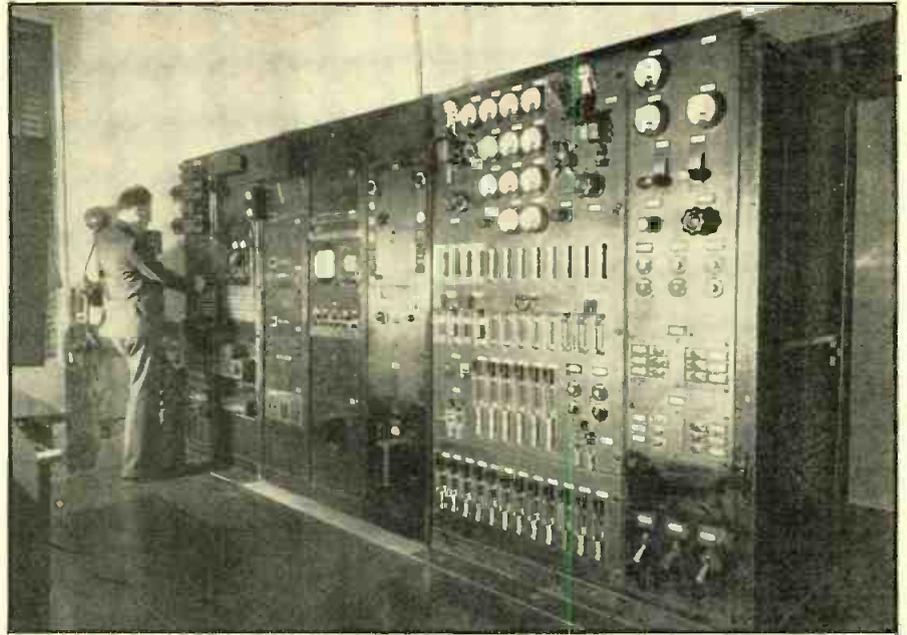
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## QRD? QRD? QRD?

CONDUCTED BY GY

ANOTHER reason for insisting on and having legislation enacted for the compulsory installation of radio transmitting and receiving apparatus, plus an adequate number of operators to man same, was proven recently by the foundering of the Mabel A. Frye, a vessel of 1115 tons displacement, with a crew of five and a Skipper. But for the timely arrival of the American Merchant, captained by Alfred M. Moore, another one of those Cyclops incidents would have been written into the history of Lloyd's register. The crew of the disabled boat were taken off in a thundering gale 450 miles SE off the coast of Newfoundland. It had floundered hopelessly for five days, seven feet of water in the hold, sails ripped to ribbons and its pumps clogged, before help came. Its timbers parted in the heavy storm and its sails were carried away. There was no radio aboard to get warning of the storm's approach and, of course, no way to call for help. This is the second ship which Captain Rodway of the Frye has lost. In each instance there was no radio aboard.

When television bursts forth commercially there will be a great demand for trained operators due to the fact that these transmissions must be "local." Many transmitters in many areas means many operators, what? Take a gentle hint and be prepared! See our heading this month which shows an op at the control panels of the RCA television transmitter in the Empire State Building, New York City.

Now that the West Coast strike has been called, we are wondering what effect, if any, this is going to have on the average radio operator. There is no doubt but that one hand washes the other and, perhaps, John Radioman should stand shoulder to shoulder with his brother dock workers, seamen and the rank and file who are backing up the fight of those men for the gains they made in last year's agreement with shipping interests. But with the op, consider that he was aided sufficiently to warrant him throwing away his billet for the paltry glory of keeping his word, even though he may be hurting himself for future aid. He hears on all sides that

this strike can't last. That the Big White Father at Washington is going to take a hand in the fray. And if "Uncle Sam" does, this will be a short and sweet strike. So would it pay a man to give aid when it would be of no use? The Navy could place more ops in one minute on board the vessels lying in and around the W.C. ports than can be found from the Great Lakes to the Gulf of Mexico. So, "What gaineth a man who has gained the whole world but has lost his good name."

Ye Ed has been doing some tall jumping around the country and at present is knocking out this page from the palm-fringed and sunny shores of San Diego harbor. There is nothing as beautiful as a day spent on the mountain top at Point Loma. Overlooking the vast expanse of blue Pacific away in the distance, miles upon miles of unbroken watery stillness, it stands as a sentinel of former glory before the advent of the gigantic towers of NPL radio station, which is situated back in the hills some fifteen miles East of this village (shhh . . . did Joe Milling hear me say that? Why, he even thinks San Diego originated the Avocado) known as Chollah heights. These transmitting towers are identically the same as the Navy NAA towers back East at Washington. This burst of poetry was brought about by the meeting up with old timer Roy Howard, who is back under the wing of "Uncle Sam" and who formerly did a swell brand of fist work with the tuna fleet out of Pedro Harbor. He says there is nothing like a sure three squares a day, vacation with pay, and the Eagle doing a somersault twice each month. Of course, he admits that regulations are occasionally irksome and, then, individuality wants to assert itself, but with admirable control things just slide off his head like water off a duck's back and he is his old self, getting three squares regularly. Which is nothing to sneeze at, say we.

Our West Coaster reports some dire happenings on his beat this month. Aviation is still on the uptrend. Quite a few jobs are being handed out and there are a few more going begging because ops are unable to pass the receiving code tests!

Some companies are expanding operations, especially in the overnight service to the East coast and this has created the unprecedented demand. . . . Now with the strike to hand, quite a bit of time in maneuvering for position is being consumed by the ship owners and the representatives of the seamen. Of course, radio ops in this area are for the seaman 100%, but only because of the support given to them in their own successful fight last year. Whether they will have to take part actively in whatever action is taken by the seamen is in the lap of the negotiations now being arbitrated by a neutral party presented to both sides by the U. S. Government Labor Relations Board. . . . Sometimes we wonder how some officials of an organization gain their seats. When a vote is taken and they win fairly because a majority of the members believe them to be best fitted for the seat to which they have been elected, we applaud with the rest and wish them luck. But sometimes they win because a previous candidate has not received enough votes for a majority and another member is nominated and voted in simply because by that time the voters are tired. In this way they sometimes elect one whose past performance does not entitle him to such a position. Then Hell pops loose! Not only does he not know his job, but his arrogance at winning causes him to misuse the small powers granted to him by the constitution. When that happens, the rest of the membership should rectify their error and remove him from his office and elect some one, if not more efficient, then more deserving than he. If more of the members would realize that their dues pay the salaries of some of these undeserving office-holders, they wouldn't be so negligent in electing second-rate men. They wouldn't pay a salary to an employee unless he worked for it and rated it!

The broadcast situation is as deplorable as ever. During the NRA most stations had to raise salaries, put on more men and cut working hours, but now Engineers are getting as low as \$80 per month, acting as Engineer, Control Man, Continuity Writer, Program Writer, Director, etc. ARTA has advised they would do something about this matter, but up to the present writing nothing has happened to change this condition. . . . Eddie Rice is back at KOTX and says he is glad to get back to work again after being away on his honeymoon for over a month. His "frau" is a former telegraph Morse railroader and they both should make a swell pair of "keying" doves, vying with each other over each one's ability to copy faster. Their children will truly be said to have been born with a telegraph key in their mouth. . . .

We hear that many more of the fishing barges are installing telephone receivers and xmtrs on board their vessels. Not a bad idea, and a radio op should be part of the equipment, also. We do say an op who knows his stuff would pay his way for a year if he repaired a broken xmtr but once in that time. Why should any crew man, from seaman to skipper, risk his life at sea without any life line to shore in the way of a radio operator? . . . And so, me hearties, we hope this, too, shall come to pass. With so many of our hopes for the betterment of the welfare of the radio op actually becoming realities, our faith in human nature continues. So cheerio, 73 . . . ge . . . GY.

**The New 6H6 Tube**

NEW YORK, N. Y.—The 6H5 is a new "magic eye" tube, recently announced by National Union and Raytheon. It is similar in characteristics to the 6G5 but the target current is limited by an extra grid, which is internally connected to the cathode.

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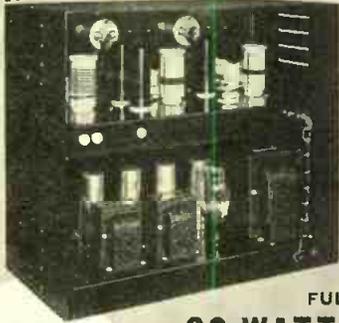
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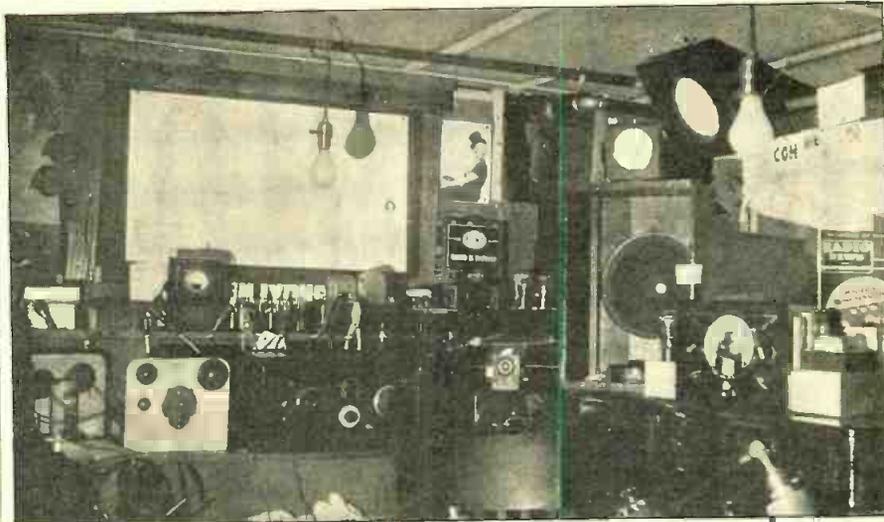


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## The DX Corner (Short Waves)

(Continued from page 484)

a.m. (Geneve, Smith, Piorko). Address: Poste de Radio a Ondas Courtes, 16 Milosa Velikog.

LZA, Sofia, Bulgaria, around 14970 kc. and 14.80 mc. (Geneve); Tues., Fri., Sun. commences at 12 noon. (Williams); woman announcer, 4 chords on piano at intervals. (Atherton, Piorko); daily 5 to 7 p.m. (Pickering, Mcarees); 8 a.m. (Smith).

Memel, Lithuania, 595 kc., new station. (Pick).

### NORTH AMERICA

CJRX, Winnipeg, Canada, 11720 kc., week days 6 to 10 p.m., Sunday 5 to 6 p.m., (Haggerty, Lucas, Rodriguez, Edlin, Coover), 6 to 11 p.m., (Alfred), Address: James Richardsen & Sons, Ltd., 157 Royal Alexander Hotel, Winnipeg, Canada.

CFCX, Montreal, Canada, 6005 kc., relays CFCF, (Alfred), Address: Canadian Marconi Co., Ltd., P.O. Box 1690, Montreal, Canada.

CRCX, Toronto, Canada, 6090 kc., relays CRCT, (Alfred), Address: Canadian Radio Broadcasting Commission, 805 Davenport Rd., Toronto, Canada.

CJRO, Winnipeg, Canada, 6150 kc., Sunday 5 to 6 p.m., daily 6 to 10 p.m., old call was VE9CL, (Haggerty), 6 to 11 p.m. (Alfred), Address: James Richardsen & Sons, Ltd., 157 Royal Alexander Hotel, Winnipeg, Canada.

CRCT, Toronto, Canada, 6090 kc., (Alfred), Address: Canadian Radio Broadcasting Commission, 805 Davenport Rd., Toronto, Canada.

CFU, Rossland, B. C., Canada, 5660 kc., testing with CFO, (Beck).

CFRPX, Toronto, Canada, 6070 kc., relays CFRB, (Alfred), Address: Rogers Majestic Corp., Ltd., 37 Bloor Street, West Toronto, Canada.

W1XAL, Boston, Mass., 49.67 meters, carried election returns, (Atherton, Piorko), 11790 kc. commences 4 p.m. Saturday. (Bower), 8:00 to 8:15 p.m. (Bishop). Address: W1XAL, c/o University Club, Boston, Mass.

W1XHM, Springfield, Mass., Springfield's P.O. call, lower end of 10 meter band, (Greenwood).

W1XK, Millis, Mass., 9570 kc., 7 a.m. and on, (Edlin).

### DX CORNER IN OHIO

This is the Listening Post of John C. Lyons of Springfield, Ohio, who relies on a Midwest receiver for short-wave work.

W1XL, Boston, Mass., 11790 kc., Sunday 10 to 11 p.m., (Lopez).

W9XAA, Chicago, Illinois, 49134 meters, carried election returns, (Atherton).

W9XF, Chicago, Illinois, 6100 kc., NBC, midnight, (Lopez), daily except Saturday, 11:05 to 1:00 a.m., (Wood).

W9XBS, Chicago, Illinois, 6420 kc., 1 a.m., (Gallagher).

W3XAL, Bound Brook, N. J., 6100 kc., Tuesday 7:10 to 8:00 p.m., (Bishop).

W2XE, Wayne, N. J., 13,345 kc., various speeches by president, (Beck), 11,830 kc., 5 p.m. and on, (Piorko, Law).

KFJM, Grand Forks, N. Dak., 1410 kc., changed from 1370 kc., (Olison).

W8XK, Pittsburgh, Pa., 15,210 kc., daily 9 a.m. to 7 p.m., from announcement. (Dressler, Fallon, Pioris, Lau).

W3XAU, Philadelphia, Pa., 6060 kc., 8 to 11 p.m., 12:00 to 7:45 p.m. 9590 kc., back on air with new power, (Partner, Lucas, Perry), 4 p.m. to 6 a.m., (Westman, Lau), interferences with foreigners. (Gallagher).

W2XAD, Schenectady, N. Y., 15,330 kc., daily 10 a.m. to 7 p.m., from log., (Pressler, Piorko).

W0EG, Duanesburg, N. Y., 2102 kc., portable experimental, 8:20 p.m., tests. (Bird).

W8XH, Buffalo, N. Y., 40 meters, (Freeman).

W2XHG, New York City, N. Y., 41,000 kc., (Bills), Address: NBC, 30 Rockefeller Plaza, N. Y. C.

W2XDV, New York City, N. Y., 31,600, 35,600, 38,600, 35,600 kc., (Bills), Address: CBS, 485 Madison Avenue, N. Y. C.

W9XPD, St. Louis, Mo., 31600 kc., 11 a.m. to 5 p.m., (Howald).

KGCX, Wolf Plains, Montana, changed from 1310 kc. to 1550 kc., great improvement, (Olisen).

WSPD, Toledo, Ohio, 1340 kc., daily 6:30 to 1:00 a.m., Sunday 8:30 to 11:00 a.m., from verification, (Greenwood).

KES, Bolinas, Calif., 10,410 kc., (Dressler).

KET, Bolinas, Calif., 9480 kc., (Dressler).

KKQ, Bolinas, Calif., 11,950 kc., irregular, (Jensen), testing with LSX,

8 to 8:30 p.m., (Alfred), 8:30 to 9:30 p.m., relaying KHJ. (Sesma).

KKL, Bolinas, Calif., 13,690 kc., 8 to 8:30 p.m., testing with LSX. (Alfred).

KEL, Bolinas, Calif., 10,400 kc., 8 to 8:30 p.m., testing with LSX. (Alfred).

KEJ, Bolinas, Calif., 33.29 meters, 10:40 p.m., (Atherton).

W6XKG, Los Angeles, Calif., 31,600 kc., relays KGFJ, is experimental with irregular schedule (Silvius).

KKZ, Bolinas, Calif., 13,780 kc., irregular. (Jensen).

KEX, Portland, Oregon, 2190 kc., signs at 1:30 a.m., (Cox).

W9XAV, Milwaukee, Wisc., 31,600 kc., evenings. (Perry).

WCKY, Covington, Ky., 7400 kc., 10,400 kc., irregular, (Alfred, Beck).

W8XWJ, Detroit, Mich., 9494 kc., (Styles).

XET, Monterrey, N. L., Mexico, testing at intervals. (Garcia).

XETU, Guadalajara, Jalisco, Mexico, 6075 kc., 8 to 9 p.m., (Geneve), Address: Ave. Hidalgo No. 579.

XECR, Mexico D.F., Mexico, 7380 kc., Sunday 11 to 12 a.m., (Beck).

XEUW, Vera Cruz, Mexico, 6020 kc., Avenida De La Independencia No. 98. (Lopez). "El Eco del Sotamento," (Foshay). Cuckoo calls at half hour intervals, (Beck).

XBC, Vera Cruz, Mexico, 6500 kc., 5 p.m., (Gallagher).

XEBT, Mexico, D.F., Mexico, 6000 kc., poor signal, (Alfred).

XOR, Mexico, D.F., Mexico, 7250 kc., 12 to 12:30 p.m., (Hartshorn).

XEXA, Mexico, D.F., Mexico, 48.55 meters, daily except Sunday 6 to 9 a.m., 1 to 2:45 p.m., 5 to 9 p.m., (Fallon), 6130 kc., sign at 11 p.m. with "March of the Toys," "Radio di fusora de Onda Corta," from verification, (Beck), 6190 kc., (Gallagher). Address: Dr. Genaro Angelis, Mexico, D.F., Mexico.

XEWI, Mexico, D. F., Mexico, 11900 kc., nightly, (Shea), entertaining programs, (Silvius), Monday 3 to 4 p.m., Tuesday and Thursday 7:30 to 8:45 p.m., 10:30 to 12:00, Wednesday 3 to 4 p.m., Friday 3 to 4 p.m., 9 to 12 p.m., Saturday 9 to 11 p.m., Sunday 1 to 2:15 p.m., (Geneve). (Alfred, Bower, Markerson, Gaiser), commence daily 6 p.m., (Gaiser), slogan—"Mi Voz Mundo Desde Mexico," Address: P. O. Box 2874.

**SOUTH AMERICA**

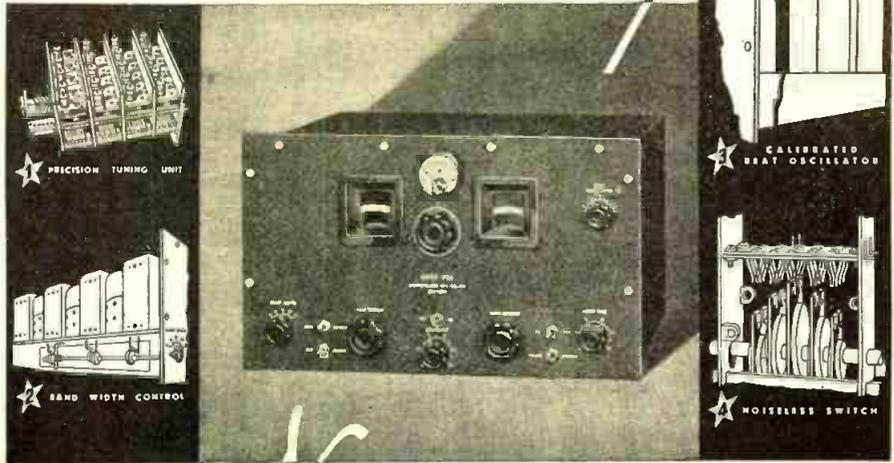
HJ2ABC, Cucuta, Colombia. 31.33 meters, reported heard in afternoon (Street, Coover), every evening 7 to 10 p.m. except Sunday on 9575 kc. (Foshay, Dressler) reported on 9.574 kc. (Sholin), 9572 (from announcement), (Stabler, Partner, Freeman, Gallagher, Fallon). Slogan: "La Voz de Cucuta."

HJ1ABP, Cartagena, Colombia, 9600 kc. from 7 to 8 a.m. besides Radio News schedule (Shea, Bower), daily 8 a.m. to 11 p.m. (Foshay), five songs (Alfred, Coover), reported 4,613 kc. (Brown), schedule is 10 a.m. to 10 p.m. (from announcement), (Leuth, Piorko, Atherton). Slogan: "Radiodifusora Cartagena, S. A." (Horwath). Address: P. O. Box 37 (Staley).

HJ1ABE, Cartagena, Colombia, changes to 9500 kc. (Shea, Alfred), daily except Sunday 6 to 10:30 p.m. (from announcement), (Dressler, Piorko, Black).

HJ2ABD, Bucaramanga, Colombia, changed from 5,990 kc. to 9,820 kc. same schedule (Geneve), heard in

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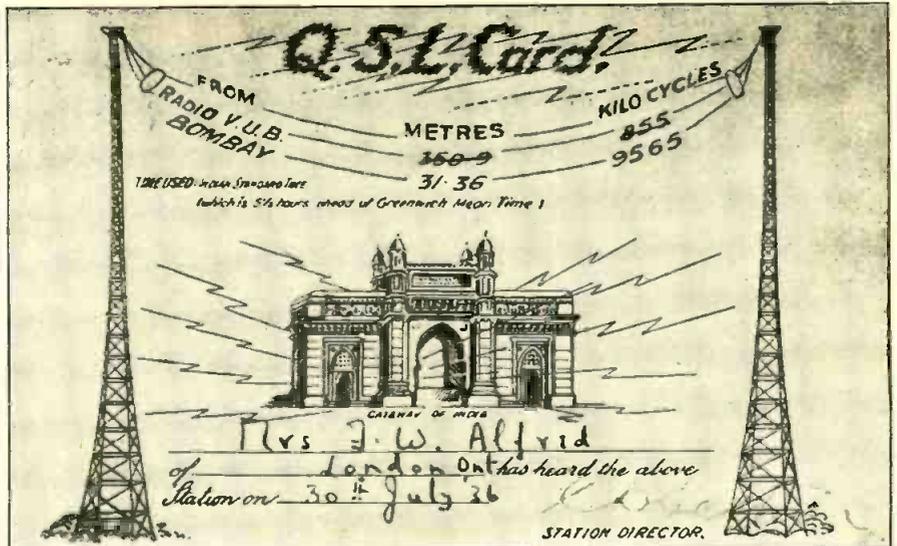
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**MONEY BACK GUARANTEE**



## The DX Corner (Short Waves)

(Continued from page 493)

early evening (Lopez) 7 to 10 every a.m. except Sunday (Foshay, Fallon) moved to 9620 kc., heard irregularly (Gallagher). Slogan: "La Voz de Bucaramanga."

HJ2ABB, Bucaramanga, Colombia, 9635 kc., heard regularly late in evenings (Ralat).

HJ1ABQ, Medellin, Colombia, 1320 kc. daily 8 a.m. to 11 p.m. (Foshay).

HJ4ABP, Medellin, Colombia, changes to 6030 kc. (Shea) American recordings heard 10:30 to 11 p.m. Signs off with "March of the Toys" (Alfred).

HJ4ABA, Medellin, Colombia, 9520 kc., 6 to 6:45 p.m. (Shamleffer).

HJ4ABD, Medellin, Colombia, 6-135 kc. daily except Sunday 6 to 10 p.m. (Foshay). Slogan: "La Voz de Catia."

HJ1ABG, Barranquilla, Colombia, 6,042.5 kc. daily 11 a.m. to 11 p.m. Sunday 11 a.m. to 8 p.m. (from veri), (Markuson).

HJ4ABH, Armenia Caldas, Colombia, 9520 kc., daily 6 to 11 p.m. (Foshay), heard later than 11 p.m. (Markuson, Bower, Pilgrim).

HJ4ABM, Armenia Caldas, Colombia, 1356 kc. (from announcement), (Gallagher).

HJ3ABX, Bogota, Colombia, 6122 kc. daily 10:30 a.m. to 2 p.m., 5:30 to 11:30 p.m. Slogan "La Voz de Colombia," Address: Apartado No. 26 to 55 (from veri), (Unknown S.W.L.).

HJ3ABD, Bogota, Colombia, 6006 kc. heard as late as 7 a.m. (Alfred).

HJN, Bogota, Colombia, 5,970 kc., daily 7 to 10 p.m. (Alfred), reported on 5,950 kc., 6 to 11 p.m. (Ralat, Beck).

HK3JA, Bogota, Colombia, 7,007 kc. experimental station, heard midnight (Lopez).

HKV, Bogota, Colombia, 8790 kc., 7 to 7:30 p.m. (Edlin), Monday and Thursday at same time (Ralat, Bishop).

HKE, Bogota, Colombia, 7,100 kc. at 8:33 p.m. (Elcheshen) reported on 7,405 kc. (Zarn).

HJB, Bogota, Colombia, 14900 kc. heard working WET at 8:30 p.m. (Gallagher).

HJ4AB, Manizales, Colombia, 6105 kc. heard 7:10 p.m. (from announcement), (Anca).

HJU, Buenaventura, Colombia, 9510 kc. heard 8:11 p.m., 12:2 p.m., Monday, Wednesday, Friday, (Staley, Beck, Ralat). Slogan: "La Voz del Pacifico."

HJ4ABU, Pereira, Colombia, 6140 kc., 6:30-

## AN INDIAN VERIFICATION

Mrs. F. W. Alfred of London, Ontario, received this card from Station WUB in Bombay. Can you do as well?

10 p.m. except Sunday, (Foshay), frequency 6,150 kc., also 9:30 a.m.—12 noon, (from veri), Foshay, Gallagher. Slogan: "La Voz de Pereira."

HJ4ABC, Ibague, Colombia, 6030 kc. heard very loud. (Elcheshen).

YVIRA, Maracaibo, Venezuela, 6360 kc., daily until 10:50 p.m. Slogan: "Philco Broadcasting." Address: P. O. Box 261, will verify. (Unknown S. W. L.).

YV5RMO, Maracaibo, Venezuela, 5850 kc., heard 9:15-10 p.m. (Sands); 8:45-9:45 a.m., 11:45-12:45 p.m. and 4:45-9:45 p.m.; Sunday 11:45-12:45 p.m., (Geneve, Lopez, Anca, Piorko). Slogan: "Ecos del Caribe" (Alfred).

YVIRH, YVIRF? YVIRG?. Maracaibo, Venezuela, 6,340 kc., excellent signal, (Beyer). Requests reports, signs off at 11:40 p.m., (Hartshorn), previously reported as YVIRG, (Atherton, Rodriguez, reported heard 9-10 p.m., also 11:20 kc., (YVIRG), (Foshay, Chambers, Gallagher), also 6260 kc., (Alfred, Pilgrim, Shamleffer). Slogan: "Ondas Largas" and "Emisora Philco" (Shea), Address: "Ondas del Lago, YVIRH, Apartado Correos 261, Maracaibo. (Honda, Geneve, Alfred, Sahlbach).

YVIRD, Maracaibo, Venezuela, requests reports, signs off at 11:50 p.m. (Hartshorn).

YV7RMO, Maracaibo, Venezuela, 6070 kc., heard until 5:45 p.m., on Saturday, (Sholin).

YV13RC, Maracaibo, Venezuela, 5,850 kc., very anxious for reports. (Beck).

YV15RB or YV16RB, Maracaibo, Venezuela, 5900 kc., heard around 1 a.m., (Gallagher). Slogan: "Emisora la Oratorio Franco Venezolano."

YVQ, Maracaibo, Venezuela, heard 8:18 p.m. relayed special program, (Beck), 13,350 kc., (Gallagher).

YVR, Maracaibo, Venezuela, 9,140 kc., heard 8:30 p.m., (Gallagher).

YV3RC, Caracas, Venezuela, 6,160 kc., heard daily, (per Time Table), (Cindel).

YV2RC, Caracas, Venezuela, 51.72 meters heard Sunday (Coover, Piorko), 5800 kc., relays YV1RC, (Beck).

YV6RV, Valencia, Venezuela, 6250 kc., daily 10:30 a.m.—1:30 p.m., 4:30-9:30 p.m., (Sands), reported on 6,520 kc., Sunday, 7:10 p.m. Slogan: "La Voz de Carababo" (Alfred, Brown).

YV11RB, Bolivar City, Venezuela, 6545, heard well 7-10 p.m., (Edlin).

YV13RV, Venezuela, 47.3 meters, heard at 8 p.m., (Gaiser).

YV8RB, Barquisimeto, Venezuela, 5880 kc., heard at 9:55 p.m., (Sands, Piorko, Gallagher).

VP3MR, Georgetown, British Guiana, 6001 kc., Tuesday, Saturday, signs off at 8:30 p.m., reported on 6010 kc. daily 5-9 p.m., (Foshay, Harris). Slogan: "The Voice of Guiana." (Alfred, Piorko). Address: British Guiana Broadcasting Company, VP3MR, Georgetown, (Alfred, Bower, Shamleffer).

VP3ME, Georgetown, British Guiana, 2080 kc., heard as early as 5 p.m., (Shea).

PZH, Paramaribo, Dutch Guiana, heard 7:05-8:20 p.m. on 7,000 kc. and 6:15-7:15 on 9,450 kc., (Beck).

HC2CW, Guayaquil, Ecuador, 8404 kc., (Kentzel).

PRA1, Rio Bamba, Ecuador, 6620 kc., heard Thursday 9-11 p.m., reported on 15450 kc., heard irregularly 5-9 p.m. (Partner, Ralat). Address: Apartado 98, (Alfred, Coover).

HC2JB, Guayaquil, Ecuador, 7454 kc., 9:30-10:30 p.m., (Call letters uncertain).

(Dressler), reported on 7854 kc. and heard 8-11 p.m. (Kentzel).

**HC2RL**, Guayaquil, Ecuador, 6668 kc., heard 6-7:30 p.m. Sunday, (Stiebler), heard irregularly until 11 p.m., besides Sunday 5:30-7:30 p.m. and Tuesday 9-11 p.m.; begins and ends with Ecuadorian anthem. (Beck). Slogan: "Quinta Piedad". Address: Dr. Roberto Levi, P. O. Box 739. (Alfred).

**HCK**, Quito, Ecuador, changed from 3750 kc. Monday 8:30-10:30 p.m. (Shea).

**HCJB**, Quito, Ecuador, changed from 8775 kc. to 8948 kc. daily except Monday, 7:30-9:30 p.m., (Geneve), reported on 8950 kc., irregularly Tuesday and Saturday. (Styles).

**PRF5**, Rio de Janeiro, Brazil, 31.58 meters heard from 4 p.m. (Williams), 9501 kc. daily 6:45-7:15 p.m. (Alfred).

**PVIDK**, Rio de Janeiro, Brazil, attractive card. (Beck).

**PSH**, Rio de Janeiro Brazil, 10220 kc., heard 9-10 p.m. (Horwath).

**CB954**, Santiago, Chile, 9532 kc., heard around 3 p.m. (Pilgrim).

**CB960**, Santiago, Chile, 31.25 meters heard 11 p.m.-1 a.m. (Williams), 9600 kc., heard 8 p.m. (Freeman).

**CEC**, Santiago, Chile, 10620 kc. daily 7-7:15 p.m., Thursdays and Saturdays 8:30-9 p.m. (from announcement), (Anca), reported on 10670 kc., (Hynek).

**LSX**, Buenos Aires, Argentina, 10350 kc., (Bunch, Lucas Macarenhas), at 5:35 p.m., (Bird), heard closing down on Friday at 7:20 p.m., (Smith, Street), heard at 9 p.m., (Staley) heard as early as 4:50 p.m.-10:30 p.m., schedule 6-7 p.m. (Edlin), on Monday and Friday (announcements) (Bower, Dressler) Sunday 1:40-2:30 p.m., (Pickering, Ralat, Foshay), requests reports, (Fallon, Black, Shanley, Shaffer, Beck). Address: San Martin 329, (Beck).

**LRU**, Buenos Aires, Argentina, 15290 kc., daily 7 a.m.-1:45 p.m. Daily schedule 3-5 p.m. (from announcement), (Dressler, Sahlbach), every Sunday morning, (Foshay, Dittmann, Fallon). Slogan: "Radio el Mundo." Address: Calle No. 555. (Geneve, Shea).

**LRX**, Buenos Aires, Argentina, 9600 kc., daily 5-11 p.m., heard Sunday, (Geneve, Edlin, Alfred, Fallon, Anca, Atherton), reported on 9580 kc., (Foshay, Bower, Law, Fallon, Shanley, Smith). Slogan: "Radio el Mundo." Address: Calle Maipu No. 555.

**LR1**, Buenos Aires, Argentina, 1070 kc., every Sunday morning, (Foshay).

**CENTRAL AMERICA**

**TG1X**, Guatemala City, Guatemala, 9,450 kc. 12-5 a.m. Sunday, (Alfred).

**TG2X**, Guatemala City, Guatemala, 5,940 kc., 12-5 a.m., Sunday, (Alfred), daily 4-6 p.m. and 10 p.m., Sunday 4-6 p.m. (Markuson).

**TGS**, Guatemala City, Guatemala, 5,713 kc., Sunday 6-8 p.m. (Shea).

**TGW**, Guatemala City, Guatemala, 9,450 kc., daily 7-9 p.m., Saturday and Sunday 10 p.m.-6 a.m. (Partner). Veri card has no "A" on call, (Sahlbach). Slogan: "Radiodifusora Nacional". (Beck).

**HRD**, La Ceiba, Honduras, daily 8-11 p.m., 6235 kc., Sunday 46-6 p.m., (Sands). Slogan: "La Voz de Atlantida." (Alfred, Markuson, Coover, Shanley, Beck).

**HRN**, Tegucigalpa, Honduras, 5875 kc., evenings until 11 p.m. (announcement), (Anca, Stahler, Beck, Elcheshen).

**YNLF**, Managua, Nicaragua, 9,655 kc., irregular (Rodriguez) daily 12-2 p.m., and 4-10 p.m. Slogan: "La Voz de Nicaragua." Address: 15 de Septiembre, No. 206. (Geneve, Alfred).

**TI8WS**, Punta Arena, Costa Rica, 7,550 kc., Saturday, 3:30-6:15 p.m., (Ralat, Smith).

**TIPG**, San Jose, Costa Rica, 9,595 kc., regular frequency is 6,410 kc., Saturday, (Foshay), changes to 9550 kc., (Shea) 10 p.m., (Atherton, Elcheshen, Piorko). Slogan: "La Voz de la Victor". (Foshay, Bishop).

**TIEP**, San Jose, Costa Rica, 6710 kc., 9 p.m., (Elcheshen), Chimes and clock strike 10 and 11 p.m., heard at 7:30 on about 6440 kc. (Beck). Slogan "La Voz del Tropico." (Alfred).

**TITG**, San Jose, Costa Rica, 9,410 kc. "La Voz de la Victor." (Lopez).

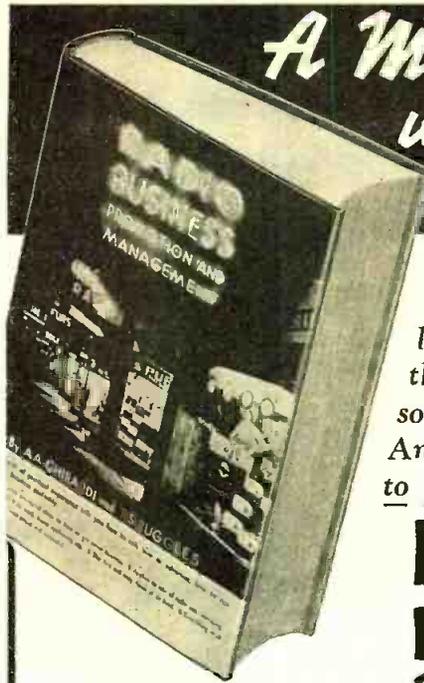
**TIGPH**, San Jose, Costa Rica, 5,830 kc. Now run by "X". (Self). Address: Apartado 800, San Jose.

**TI1PG** or **TI12PG**, San Jose, Costa Rica, 9590 kc., Saturday and Wednesday 8-9 p.m., (Dressler), heard on 6410 kc. 10:40 p.m., daily 6-11:30 p.m., (Sands), 6410 kc., (Edlin).

**TI4NRH**, Heredia, Costa Rica, 9670 kc., 1425 kc., daily 8-9 p.m. Saturday 11:30 p.m.-2 a.m. Sunday, bugle call and chimes between selections and on the hours (Alfred, Fallon, Ralat, Gaiser, Pilgrim) Slogan: "La Voz de Costa Rica.

**HP5L**, Panama City, Panama, 1360 kc. (Beck) Slogan: "La Voz de Panama". Address: Apartado No. 867.

**HP5J**, Panama City, Panama, 31.28 meters 7 p.m. (Coover) 9,500 kc. heard irregularly until 11 p.m., reported on 9,605 kc. 12-1:30 p.m., 6-10:30 p.m. (Hynek, Fallon) Slogan: "La Voz de Panama". Address: P. O. Box 867, Panama City (Alfred).



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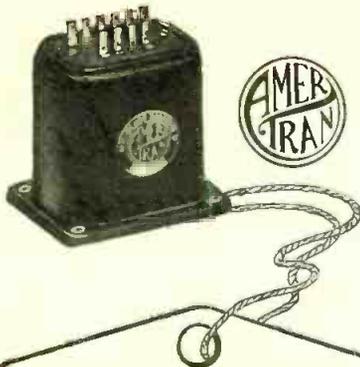
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## AFRICA

CNR, Rabat, Morocco, 12830 kc. signed off at 7:30 a.m. Sunday (Edlin).  
SUI GK, Alexandria, Egypt, "5 miles east of Alexandria" (Beck) "Tunis", Tunisia, 7624 kc., no call given at time of transmission (Kruger).  
"Radio Alger", Algiers, Algeria, 8960 kc. nightly phoning with Paris from midnight to 2 a.m. (Partner).  
IUC, Addis Ababa, Ethiopia, 11955 kc., 1 a.m. (Partner).  
ETA, Addis Ababa, Ethiopia, 18270 kc. "Imperial Ethiopian Radio Station", Wednesday, 1-4 a.m. (Geneve).  
IUG, Addis Ababa, Ethiopia, 15450 kc., 9-9:40 a.m. daily phoning (Partner).  
OPM, Leopoldville, Belgian Congo, 10140 kc., heard phoning Belgium daily, 7-11 a.m. (Partner).  
CR7AA, Lourenco Marques, Mozambique, 6,137 kc. Sunday 8-10:30 a.m. during October, (Geneve, Greaves).  
EHZ, Tenerife, Canary Islands, 10,370 kc. daily 5-7:30 p.m. Address: P. O. Box No. 2 (Geneve).  
EA8AB, Canary Islands, 7010 kc., 4 p.m. Fridays (Edlin).

## ASIA

HSP, Bangkok, Siam, 17,740 kc., 6 p.m., 11 a.m., 8 p.m. on different days phoning, (Gallagher).  
HS8P, Bangkok, Siam, 19,020 kc., Monday 9-11 a.m. then on 9,850 kc. at same time, requests reports, (Street), 10,950 kc., 9:25 a.m., Monday, (Bird, Silvius, Partner), 10,165 kc., (Sporn).  
PLP, Bandoeng, Java, 11,000 kc., 5:30 a.m. on, (Pickering, Gallagher).  
PLK, Bandoeng, Java, 20,42 meters, 2 p.m., (Westman).  
YDC, Bandoeng, Java, 15,150 kc., 6:20 a.m., (Shea), 5:30-10:30 a.m., from veri. (Partner), formally PLH, same schedule as PMK. (Pilgrim).  
PLX, Bandoeng, Java, 14,480 kc., 8 a.m.-2 p.m., (Partner).  
PMK, Bandoeng, Java, 11,500 kc., 5:30-10:30 a.m., from veri., (Partner), 6720 kc., daily except Saturday 1-4 a.m., Friday until 5 a.m., Saturday until 5:30 a.m. (Pilgrim).  
YDB, Semarang, Java, 9610 kc., 5:30 a.m. at RL, (Edlin), 10 a.m., (Gallagher).  
PLV, Bandoeng, Java, 9420 kc., 10 a.m., phone, (Gallagher), Calls Holland about 9:30 a.m., (Hynek, Black).  
PMH, Bandoeng, Java, 6720 kc., 10 a.m., (Gallagher).  
PLE, Bandoeng, Java, 18,830 kc., 8 p.m., (Gallagher).  
PMA, Bandoeng, Java, 19,300 kc., 10 a.m., phone, (Gallagher).  
PMN, Bandoeng, Java, 10,260 kc., irregular, (Alfred), 6-8 a.m., (Pickering, Gallagher), closing 12:30 p.m., (Smith).  
JVK, Tokyo, Japan, 15,160 kc., 4:00-4:30 p.m., (Pickering).  
JVH, Nazaki, Japan, 14,600 kc., Monday 4-5 p.m. and irregular, (Shea), Saturday and Sunday 10:30-12:00 p.m., (Geneve, Kashimoto, Jensen, Edlin), tests 4-5 p.m., Monday, Thursday, (Scala, Atherton, Zaru, Pickering), 12-1 a.m., (Sahlback, Law, Gallagher), Address: Same as JVM and JVN.  
JVM, Nazaki, Japan, 10,740 kc., Tuesday, Friday, 12:30-2:00 p.m., (Geneve, Bever, Kashimoto, Elcheshen), Address: Kokusai-Denwa Kaisha, Ltd., Osaka Bldg., Tokyo.  
JVE, Tokyo, Japan, 15,660 kc., 6-8:30 p.m., (Partner), 1 a.m. daily, (Edlin), Nazaki, Japan, 15,660 kc., 11 p.m., (Gallagher).  
JVT, Tokyo, Japan, 6,750 kc., best at 6 a.m., (Edlin), 12-1:30 a.m., (Pilgrim).  
JVF, Nazaki, Japan, 15,610 kc., 10:45 p.m., phone, (Gallagher).  
JVD, Tokyo, Japan, 18.9 meters, calling a Chinese station, (Staley), 1 a.m. daily, (Edlin), 15,860 kc., 4-8 p.m., (Partner, Gallagher).  
JZJ, Tokyo, Japan, 11,800 kc., schedule 4-5 p.m., on Tuesday, Thursday, (Alfred, Pilgrim, Fallon), Address: Chief Engineer, Japanese Broadcasting Co., Tokyo.  
JZK, Nazaki, Japan, 15,160 kc., schedule Tuesday, Thursday 4-5 p.m., (Alfred), new 50 kw. transmitters, (Sholin, Cox), 6-9 a.m., (Frost, Alfred), (Fallon), Address: Chief Engineer, Japanese Broadcasting Co., Tokyo.  
JZL, Tokyo, Japan, 9535 kc., Monday 6 p.m., (Jensen), Tuesday, Thursday 4-5 p.m., (Alfred) new 50 kw. transmitters, (Sholin, Cox) 7-9 a.m., (Frost, Alfred), (Fallon), Address: Chief Engineer, Japanese Broadcasting Co., Tokyo.  
JVN, Nazaki, Japan, 10,660 kc., 10 p.m.-1 a.m., (Partner, Bever), will operate on 50 kw., (from veri) (Kashimoto), tests 4-5 p.m., Monday, Thursday, interval chimes and gongs, (from veri), (Scala, Zaru), daily 8 a.m., (Pickering), Friday, Monday, (Sporn, Gallagher, Alfred), Address: Kokusai-Denwa, Kaisha Ltd., No. 3, 1-chome, Uchisaiwaicho, Kojimaichiku, Tokyo.  
JVG, Nazaki, Japan, 14,910 kc., 1 a.m. daily, (Edlin).  
ZBW, Hong Kong, China, 15,190 kc., 5-6

a.m., (Honda), 8750, 9525 kc., daily 9 a.m., (Bunch), 4:30-10:00 a.m. daily, (Partner), daily 6-9 p.m., lately irregular, (Alfred, Fallon, Williams, Edlin, Greenwood, Peyer, Styles, Gallagher, Pilgrim), always woodcast Big Ben chimes, 19.4 meters, new transmitter, daily 7-10 a.m., (Westman).  
XGN, Shanghai, China, 17,640 kc., phone 10 a.m., (Gallagher).  
XQAJ (XQAK?), Shanghai, China, 6480 kc. irregular, 1:45-2:15 a.m., (Gallagher).  
XGOX, Nanking, China, 6820 kc., schedule Monday to Saturday, daily 6:30-8:30 a.m., Sunday 6:30-9:30 a.m., (from veri.), (Scala, Frost, Sporn), 6850 kc., (Gallagher), 9585 kc., (Meares, Elcheshen), Address: Central Broadcasting Station, Nanking.  
ZBW3, Hong Kong, China, 9525 kc., daily 8:30 a.m.-9:15 a.m. (until fadeout), (Jensen, Styles), 3:15-5:00 a.m., (Elcheshen).  
ZBW2, Hong Kong, China, 6090 kc., 2 kw., (Styles).  
ZBW4, Hong Kong, China, 15190 kc., 2 kw., (Styles).  
ZBW5, Hong Kong, China, 17755 kc., 2 kw., (Styles).  
F31CD, Saigon, Indo China, 11,730 kc., daily 2-3:30 a.m., (Pilgrim), Slogan: "Philco Radio".  
VWY, Kirkee, India, 17,480 kc., 7-7:30 a.m., Sunday with scrambled speech., (Edlin, Elcheshen).  
VUB, Bombay, India, 9560 kc., schedule Wednesday, Saturday, 11:30-12:30 p.m. Sunday 7:30-8:30 a.m., (from veri.), (Scala), Address: Indian State Broadcasting Service, Bombay.  
JIB, Tyureki, Formosa, 10,350 kc., phone 10 a.m., (Gallagher).  
CQN, Macao, Asia, 9680 kc., various frequencies, (Edlin), 9585 kc., (Meares).  
ZHI, Singapore, F.M.S., 6010 kc., 10 a.m., (Gallagher).  
RV15, Khabarovsk, Siberia, 4273 kc., 5200 kc., (Bunch), 5730 kc., with very strong signal, (Howald), extends schedule to 10:30 a.m., 5170 kc., off 4:25 kc., (Partner), 6 p.m.-5:30 a.m., (Sholin), daily from 12:30 and on, (Gallagher).  
Clichibu-mara, 178,000 kc., 6:05 p.m., Japanese ship, (Chambers).

## WEST INDIES

ZFB, Hamilton, Bermuda, 10,055 kc. calls New York City in a.m. and p.m. (Hynek).  
ZFS, Nassau, Bahamas, 4,512 kc., 6-6:10 p.m. (Bishop).  
COKG, Santiago, Cuba, to 10:30 p.m. on 6215 kc. (Edlin) report 6150 kc., programs Saturday p.m. (Alfred, Elcheshen) reported on 6180 kc. (Gallagher), Schedule 8 a.m.-10:30 p.m. (from announcement), Address: P. O. Box 157 (Desires reports—Alfred).  
CO9JJ, Camaguey, Cuba, 8,665 kc. heard 5:30-6:30 and 8-9 p.m. except Saturday and Sunday (Sahlback).  
COKE, Santiago, Cuba, 6,180 kc. (Gallagher).  
COCO, Havana, Cuba, 9730 kc. on the air a good deal of the time (Sands, Street, Lucas) daily (Rodriguez) 7-1 a.m. (Shea, Hartshorn) has been changing between 9750, 9665, and 9800 kc. (Dressler, Edlin, Crowley, Coover, Williams, Self, Piorko, Harris, Beck, Gallagher, Hynek, Pilgrim), Address: Calle 25 No. 445, Vedado, Havana.  
COCK, Havana, Cuba, daily from 4-10 p.m. train sounds as identification (Sands) irregular (Rodriguez), 11,500 kc. (Shea, Hartshorn, Dressler, Piorko, Geneve), Heard 7-8:30 p.m. with good report (Belfonte, Horwath, Staley, Coover, Alfred), Apparent transmitter trouble (Dressler, Williams, Cox, Self), 5 p.m.-1 a.m. (Ralat, Piorko, Harris), Reported on 11,435 kc. (Sesma, Law, Pilgrim), Unheard lately (Horwath), Slogan: "La Voz de Radio Philco", Address: Apartado 32.  
COCO, Havana, Cuba, 6010 kc., consistent reception reported (Greaves, Rodriguez), Sign off at midnight and commence at 8 a.m. (Silvius, Coover) 11 p.m. (Freeman, Piorko) until 2 a.m. (Sesma, Smith) Sunday 7:30-8:15 (Shamleffer).  
COCH, Havana, Cuba, 11,500 kc., 9:28 kc., consistent reception reported (Greaves, Jensen, Coover) Election news programs heard with other various programs (Dressler, Piorko, Harris) 1790 kc. (Beck).  
COCA, Havana, Cuba, 26.4 meters heard well from 6 p.m.-1 a.m. daily except Sunday (Westman).  
COHD, (COHC?), Havana, Cuba, about 6,280 kc. one of these is a long wave station (Shamleffer).  
COCE, Havana, Cuba, 8,820 kc., 7-9 p.m. (Fallon).  
CO9WR, Sancti Spiritus, Cuba, 6280 kc., 9:50 p.m., daily from 4-6 p.m., 9-11 p.m., (Sands, Pilgrim, Sahlback), New call is COHB, Address: P. O. Box No. 85, Sancti Spiritus (Alfred).  
COCG, Cuba, 30.78 meters (Law).  
HIT, Trujillo City, Dominican Rep., 6,900 kc., heard calling Iceland at 7:25 p.m. (Alfred).  
HIG, Trujillo City, Dominican Rep., 6280 kc., 1-2:45 a.m. (Alfred, Bower).  
HIX., Trujillo City, Dominican Rep., changed from 5.98 mc. to 6,132 kc., Sunday 7:40-10:40 a.m., Tuesday and Friday 12:10-

1:10 p.m., 4:40-5:40 p.m. and 8:10-10:10 p.m. other days 12:10-1:10 p.m. and 4:40-5:45 p.m. (Geneve, Shea, Cindel). Power increased, (Styles), reported on 6340 kc.. (Alfred).

HI2D, Trujillo City, Dominican Rep., 6900 kc. 8-9 p.m.. (Ralat), 7:30-8:45 p.m., (Alfred) Slogan: "La Voz Catolica."

HI2H, Trujillo City, Dominican Rep. 11280 kc. 5-6 p.m., also on 6245 kc.. (Messier), 26.6 meters appears to be for Saturday use only. (Cassallo), daily 6-10 p.m.. (Geneve). Signs off with national anthem of Dom. Rep. (Westman), desires reports. (Beck, Piorko, Shamleffer, Smith). Slogan: "La Voz del Partido Dominicano." Address: Radio City, Trujillo City, Dom. Rep., (Sands, Coover, Sholin, Piorko).

HI2I, Trujillo City, Dominican Rep., 14925 kc. 4:30-5:00 p.m., Monday (Edlin).

HI2J, Trujillo City, Dominican Rep., 6316 kc., heard 9:30-9:45 p.m., (Brown, Piorko).

HI3U, Santiago City, Dominican Rep., changed from 6:38 mc. to 6.015 mc., daily 7:30-9 a.m., 12:2 p.m., 5-7 p.m. and 8-9 p.m. Address: P. O. Box No. 123. (Geneve).

HI5N, Santiago City, Dominican Rep., 6:15 mc. Often 6:40-9:10 p.m. (Geneve). Address: P. O. Box No. 125.

HI3C, La Romana, Dominican Rep., 6900 kc., about 7:15 p.m. (Shamleffer).

HI1S, Puerto Plata, Dominican Rep., 6420, kc. signed at 7:47 p.m., (Bishop).

HIH, San Pedro de Macoris, Dominican Rep. changes to 6796 kc.. (Shea).

HH2S, Port-au-Prince, Haiti, between 5910 and 5920 kc. and not on 6070 kc., daily except Sunday 7-9:45 p.m. (Geneve) 5915 kc. chimes like N.B.C.. (Alfred, Elcheshen, Fallon), heard several times as late as 9 p.m., (Turner, Beck). Address: P. O. Box No. A103.

HH3W, Port-au-Prince, Haiti, 9620 kc., signs off at 8:30 p.m., (Shea). Sundays 5:30 p.m., schedule is 1-2 p.m. and 7-9 p.m. (Edlin), heard daily. (Rodriguez), announces in French English and Spanish. (Fallon), heard Friday 9-9:30 p.m., (Alfred) heard on 9650 kc., (Stabler, Fallon, Freeman), also 9595 kc., (Ralat). Address: Societe Haitienne de Radio-diffusion, P. O. Box No. A103. (Alfred).

VRR4, Stony Hill, Jamaica, B.W.I., 25.87 meters heard working WNC at 5:20 p.m., (Atherton, Bird).

OCEANIA

KKP, Kahuku, Hawaii, 16030 kc., Sunday at 8:30 p.m.. (Jensen, Jordan), heard Tuesday,



NOW it's possible to operate microphone closer to speakers without objectionable howls caused by *feed-back*. Maintains constant volume level, whether announcer shouts into mike or speaks softly some distance away. *Volume Range Expander* brings new realism to recordings; makes it unnecessary for operator to raise volume at weak points of records. Read full details on pages 8 and 9 of Wards new Radio Catalog!

**Wards New 100-watt Super Power Amplifier**  
Operates up to 30 12-in. Magic Metal speakers. Uses 2 hi-impedance mikes of any type at once. Class A circuit... 100 watts sustained output! 135 watts peak. 19 latest type tubes. Other models also available down to 5 watts output.

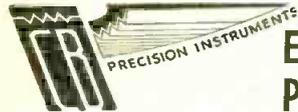
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**NEW—a low cost CLOUGH-BRENGLE Cathode-Ray Oscillograph**



Every Feature of Costly Instruments Plus Economy of the Type 913 Tube

**Employs Costly Circuit Features Necessary To Secure The Utmost Performance From This Small Tube**  
**Meets Every Need of Receiver Servicing, Transmitter Distortion and Modulation Measurements, and Countless Laboratory Applications**

Despite a revolutionary low price—C-B Engineers offer in the MODEL 105, every improvement developed after building many thousand oscillographs. Although the MODEL 105 Cathode-Ray Oscillograph is miniature in size and price—features such as these are incorporated:—

**BUILT-IN SWEEP CIRCUIT** affords a linear timing axis for studying voltage frequencies as high as 300,000 cycles. Uses the Type 885 Thyatron for electrical synchronizing of the image.

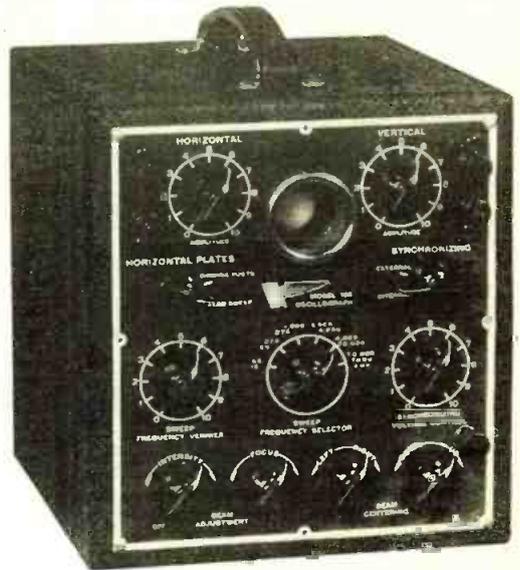
**HORIZONTAL and VERTICAL AMPLIFIERS** are provided to give extreme high sensitivity, .38 rms. volts per inch deflection in both directions. Output of sweep circuit is amplified to assure absolute linearity.

**BEAM CENTERING CIRCUIT** with controls on the front panel is an absolute necessity when using the Type 913 tube, to effectively

utilize every bit of the one-inch screen. **SPECIAL DESIGN FOR USE ON RADIO FREQUENCIES** eliminates capacitive losses and phase distortion frequently found in operation at these frequencies and adapts the MODEL 105 for transmission work.

**MECHANICAL** Features of the MODEL 105 are unique in every respect, from the new vertical type chassis that results in improved hum shielding, to the tube hood that may be extended out from the front panel for several inches to allow operation in bright light.

**PRICE**—So much value and performance for so small an investment! Write today or see your parts house for complete descriptive bulletin and price. Obtainable on the C-B Deferred Payment Plan, just a few dollars down and ten convenient payments.



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The MODEL 105 is designed for use with the MODEL OM-A "Inductor-Sweep" Type Frequency Modulated Oscillator or with the MODEL 81-A Frequency Modulator that adds at low cost every advantage of Calibrated Selectivity Curve alignment to your present oscillator. Write for new descriptive bulletin.

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# BRUSH Spherical Microphone



For remote pickup, "P. A." commercial interstation and amateur use. Low in price... but built to Brush's traditionally high mechanical and electrical standards. Wide frequency response. Non-directional. No diaphragms. No distortion from close speaking. Trouble-free operation. No button current and no input transformer to cause hum. Beautifully finished in dull chromium. Size only 2 1/2 inches in diameter. Weight 5 oz. Output level minus 66 D. B. Locking type plug and socket connector for either suspension or stand mounting at no extra cost. Full details, Data Sheet No. 13. Free. Send for one.

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For after dinner and convention speakers, lecturers, etc. Gives great mobility. The smallest, lightest microphone on the market. Size 1 1/2 x 1 1/4 x 3/8. Weight with coat attachment less than 1 oz. Special internal construction and rubber jacketed outer case insure quiet operation. No interference from breathing noises, etc. Typical Brush sound cell response and trouble-free operation. Details on request.



## TRANSMITTING CONDENSERS

AEROVOX standard oil-filled transmitting condensers are now offered in two popular types:

**Round Can:** Oil-impregnated oil-filled paper section. Hermetically sealed. High-tension pillar terminals. 1000, 1500 and 2000 v. 1, 2 and 4 mfd.

**Square Can:** Likewise an oil-filled job. Hermetically sealed in drawn-metal can. High-tension pillar terminals. 600, 1000, 1500, 2000 and 2500 v. 1, 2 and 4 mfd.

**New CATALOG:** More pages. More choice. Popular prices. Copy on request, with sample of monthly Research Worker.



(Kruger, Gallagher), heard 8:30-9 p.m. with good strength, (Shamleffer).

KKH, Kahuku, Hawaii, 7520 kc., relays KGMB, Tuesday 12-1 a.m., (Jensen), heard 10-12 p.m., (Sporn).

KIO, Kahuku, Hawaii, 25.68 meters, irregular schedule, (Street), 11680 kc., Wednesday, Thursday, 2-2:30 a.m., (Greaves, Beyer), relays KGMB, Tuesday, 12-1 a.m., (Jensen), heard 4-4:30 p.m., through KKQ, (Sesma, Gallagher).

VK5DI, Adelaide, Australia, 21.42 meters relays VK5AD, sometimes operates on 41.24 meters, belongs to the Adelaide S. W. Club, (Street).

VK3LR, Lyndhurst, Australia, 9580 kc., heard mornings, (Dittman), relays dance music from 3LO at 7:30 a.m., (DeMent), Daily 3:15-8:30 a.m. (Geneve, Beyer), heard 9:15-9:45 with experimental trans., (Hampshire) new schedule 11 p.m.-8:30 a.m., (Partner, Self, Freeman, Edlin, Low), heard 1-2 a.m., (Gallagher, Alfred).

VK2ME, Sydney, Australia, 9590 kc., Sundays 12:30-2:30 a.m., 2:30-8:30 a.m., 9:30-11:30 a.m. (Geneve, Beyer), Edlin, Freeman, Law, Styles).

VK3ME, Perth, Australia, 9590 kc., heard around 6 a.m., (Fallon, Law).

VK3ME, Melbourne, Australia, 9510 kc., heard well as late as 6:30 a.m., daily, (DeLoet), heard at 7 a.m., (Edlin, Sporn, Law), reported on 9480 kc., also (Alfred).

ZLT4, Wellington, New Zealand, 11000 kc., heard phoning at 1:30 a.m., (Cox).

ZLT, Wellington, New Zealand, 11050 kc., heard on phone at 7 a.m., (Gallagher).

KTR, Manila, Philippine Islands, 10910 kc., heard working KYW, (Black).

KAX, Manila, Philippine Islands, 15180 kc., heard evenings phoning Pacific Coast, (Alfred).

FO8AA, Papeete, Tahiti, 7,199 kc., Tuesday and Friday 11 p.m., to past midnight, signs off with "Aloha Oe," reported on the air Wednesday and Saturday, (Kruger, Cohen), announcements in French, (Gallagher). Address: Radio Oceania, Papeete, Tahiti, Friendly Islands, Oceania. (Scala).

VPD, Suva, Fiji Islands, 13075 kc., daily except Sunday 12:30-1:30 a.m., heard frequently in September, (Geneve, Beyer, Bunch), reported on 9540 kc., daily, 5:30-7:30 a.m., (Fallon) excellent QSL card received after five months, (Cox).

VPDQ, Suva, Fiji Islands, 9540 kc., daily 3:30-8:00 a.m., (Pickering).

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

Kenneth Dressler, Harold W. Bower, N. C. Smith, Leon Stabler, Grace M. Beck, Walter E. Bishop, Fred A. Pilgrim, E. Geneve, Stan Elcheshen, R. F. Shamleffer, Fred Atherton, Thomas Fallon, Jr., Louis J. Horwath, Peyton Black, Fred W. Alfred, M. J. Markuson, Jerry M. Hynek, G. C. Gallagher, G. L. Harris, Irving Sporn, Wade Chambers, E. W. Turner, Barry Sesma, Albert Pickering, Robert Gaiser, Morgan Foshay, Raymond W. Sahlbach, Anton J. Cindel, P. Piorko, H. Westman, Dixon C. Greenwood, Mike Kruger, Jorge Ralat, Eddie C. Zarn, J. Wendell Partner, Donald Freeman, Fred Cox, Harold J. Self, Edward DeLaet, L. E. Williams, Walter Lorig, George C. Sholin, Harry Lueth, Augusto Anca, Jose Lopez, O. Ingmar Oleson, J. Holden, Matthew Bills, Harold J. Self, Shokichi Yoshimura, Fred Webb, Thomas P. Jordan, J. R. Wood, Walter M. Foy, Ed. Nowak, Doc Davies, W. L. Schuckman, Harry E. Kentzel, Harry J. Potthoff, Jose Rodriguez R., John Hartshorn, Flavio Mascarenhas, Frank W. Edlin, Roy E. DeMent, Byron Silvius, Werner Howald, Paul C. Bird, Archwell T. Bower, F. T. Reilly, Edgar J. Vassallo, Baldomero P. Garcia, Jack Perry, H. Francis Shea, Arthur B. Coover, B. Kashimoto, M. Michaelson, Harry Honda, L. M. Jensen, J. G. Hampshire, Shirley Brown, Frank Andrews, A. Belanger, A. S. Haggerty, Clayton D. Sands, J. N. Street, Edward R. Greaves, Reginald Pick, G. T. Beyer, Richard V. Brian, R. C. Messer, E. L. Frost, David Brensilber, R. Muguet, A. Petitjean, Walter Alligood, Bob Sawada, Carl L. Horton, Stephen G. Spicer, J. O. Farris, Jr., William F. Hobbs, Charles W. Bunker, James C. Keithly, C. J. Burrell, Don Ronk, Wilbur Croston, Jack Young, Lee Chaney, Albert L. Bunch, James Lucas, E. Scala, Lionel White, L. R. Fritsch, Cliff Jones, Mr. and Mrs. E. T. Patten, Joseph A. Ryan, Harold E. Grey, Carl and Anne Eder, J. C. Kugler, Earle Drew, Vernon Pearson, Delbert Holden, Robert Halliday, O. O. Francis, Wallace Howe, Harold Treskunoff, James H. Nigh, Jr., Francis J. Nugent, James Robert Wood, Melvin Marsley, H. F. Hamilton, Lee Peterson, Warren McBirney, Loyd Hightower, Edward DeLaet, Erroll R. Birnie, Morris Harwood, George W. Bartlett.

### The Recent Sun Eclipse

WASHINGTON, D. C.—Radio observations during the solar eclipse on June 19 in Siberia will have little value according to the National Bureau of Standards. The world was struck by a magnetic storm before and during the eclipse.

## Television

(Continued from page 458)

"The distinction between television in this country and abroad is the distinction between experimental public services undertaken under government subsidy in countries of vastly smaller extent and the progressive stages of commercial development undertaken by the free initiative, enterprise and capital of those who have pioneered the art in the United States."

While he recognizes the problems of television as formidable, Mr. Sarnoff believes they will be solved. He holds that, with the establishment of a television service to the public "which will supplement and not supplant the present service of broadcasting," a new industry and new opportunities will have been created.

Speaking at the NBC tenth anniversary dinner broadcast a few days after the press demonstration, the RCA head declared that the only prophecy he would indulge in that night was that "during the coming ten years the millions who now listen in their homes to this celebration will be able to see, as well as to hear, by radio." RCA has also previously revealed its television progress to broadcasters and manufacturing licensees.

It seems quite likely that, at least at the start, television transmissions may be in the hands of present "sound" broadcasters. No doubt there will be much vying for the television channels, though, by many outside interests, particularly moving-picture concerns, newspapers and other organizations bidding for the video frequencies.

Although RCA intends to manufacture receivers at the RCA-Victor plant, its own property, the Television Reporter learns that licensed manufacturers—virtually the entire American industry, comprising 52 set and 12 tube makers—will be kept fully informed, with the granting of facilities to "start even" in competition with RCA. License fees will be on the same basis as the pre-television rates.

Now is the time for the entire industry, including the radio dealer, serviceman and experimenter, to start accumulating television data and acquiring knowledge and familiarity with the new art so as to be on the "inside" when the television programs will be the order of the radio day.

The excellent press demonstration made by Philco, in Philadelphia, and their field tests in that area were described in November RADIO NEWS. This company is ready to manufacture television receivers as soon as a commercial transmitting service starts.

### British Developments

The British television system, outlined in the January RADIO NEWS, was formally launched with considerable ceremony. Lord Selsdon, chairman of the BBC Television Advisory Committee, takes a contrasting stand to Mr. Sarnoff in holding that "technically, Britain leads today (in television)." He added: "We shall try, in the words of Sir Antony Gloster, to 'keep our light shining a little front of the rest.'"

British television leadership was also claimed by R. C. Norman, BBC chairman, who declared: "The foresight which secured to this country a national system of broadcasting promises to secure for it also a flying start in the practice of television. At this moment the British Television Service is undoubtedly ahead of the rest of the world. Long may that lead be held. You may rest assured that the BBC will be resolute to maintain it."

Major G. C. Tryon, the British Postmaster-General, declared: "Sound broadcasting has widened our outlook and increased our pleasure by bringing knowl-

edge, music and entertainment within the reach of all. The complementary art of television contains within it vast possibilities of the enhancement and widening of the benefits we already enjoy from sound broadcasting. On behalf of my colleagues in the Government, I welcome the assurance that Great Britain is leading the world in the matter of television broadcasting, and, in inaugurating this new service, I confidently predict a great and successful future for it."

The American industry can accept the British viewpoints as a challenge. The domestic radio firms are all in accord that the U. S. A. leads in the laboratory development of the new art of television. England deserves a hand for being the first to start a public program service, but now that American manufacturers have started field tests, it is the Television Reporter's guess that the U. S. A. will maintain the same leadership in visual broadcasting that it has established in sound transmission.

Radio enthusiasts have come to a new crossroad where the signposts read: "Go! Look! Listen!" The next ten years of radio will certainly be "Television."

## Coast Guard Station

(Continued from page 471)

microphone, two 230's as pre-amplifiers, two 56's and two 2A3's push-pull driving two 203-A's as a push-pull Class B modulator make up the audio frequency unit.

The transmitter is remotely controlled from a standard operator's position, including key, microphone, stop-start switches, and a receiver rack. The operator's position is located in another part of the same room. Two transmitters of commercial manufacture are also available. The first is a 200-watt c.w. phone transmitter used on the 80-meter band. The other is a 500-watt c.w. transmitter for 40, and 20 meter bands. Both of these transmitters are also operated from the position mentioned above.

In the ultra-high-frequency bands, the equipment has been mostly in the form of transceivers except for a 50-watt M.O.P.A. 5-meter transmitter. A crystal-controlled outfit is now being constructed, using 802's for oscillator and driver and 834's as power amplifier.

The receiving equipment consists of an HRO communication receiver, and a 1-10-meter ultra-high-frequency receiver, using acorn type tubes.

The laboratory is well equipped with meters, testing equipment, bridges, etc., for use in testing and making measurements. A cathode-ray oscillograph and a beat-frequency oscillator, with associated equipment, is available for checking modulation, distortion, etc. The necessary space and tools for constructing new equipment is also provided.

Considerable success in communications is evidenced by the large number of QSL cards received from all continents. Considering that the time spent in amateur work by the cadets is entirely their own it is apparent that much recreation is obtained in addition to practical experience in radio.

## A Radio Stethoscope

MOSCOW, U. S. S. R.—A physician is now enabled to listen in on the heartbeats of an aviator when the aviator is up in the air and the physician on the ground. The device consists of a stethoscope connected to a small radio transmitter in the airplane so the doctor can listen in without exposing himself to the influence of rarefied air or rapid dives and loops.

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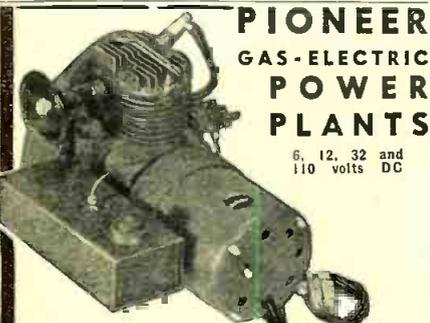
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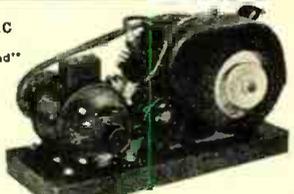
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## Crystal Control

(Continued from page 471)

measurements referred to above had been taken, it was decided to modulate the push-pull 6L6 tubes with the Lafayette B46 modulator using a pair of 46 tubes in Class B, as this was available and had the proper output impedance to modulate the 6L6 tubes at the input we were running them. This modulator was connected and a crystal mike employed. No trouble at all was experienced and it was here that we found that we had more than sufficient driving power for the pair of 6L6's even under extreme modulation conditions. As mentioned above, 6 to 8 mils of grid current through the 15,000 ohms bias resistor was found to be the optimum value. This resulted in the maximum output being obtained with plenty of grid drive for modulation peaks. An RCA oscillograph was then used to observe the modulation characteristics of the push-pull 6L6 tubes and almost a perfect trapezoidal picture was obtained. At no time under modulation did any of the plate screen current readings have any tendency to change, with the possible exception of the push-pull 6L6 plate-screen current, which, at 100% modulation, might tend to rise very slightly.

We were now ready to try the transmitter on the air, tuned up to 5 meters. All of the contacts on this band were made during the day and everyone remarked at the quality and stability of the signal that this transmitter put out. Due to the fact that there are only a very few stations active during the day, no great DX was accomplished, but at all times the reports concerning the signal were very flattering, to say the least. We might add, at this time, that due to the three-position crystal switch incorporated in the experimental set-up, we were able to make rapid shifts from one end of the 5-meter band to the other. The transmitter was thoroughly tested over the entire band from 60 to 56 megacycles with no apparent change in efficiency or stability. At all times, a pure d.c. crystal note was obtained, when the receiver was tuned in on an RCA ACR-175 receiver which was located a few hundred feet away from the transmitter. The quality of modulation and freedom from frequency modulation was also quite apparent on this receiver, which is very capable of showing up these defects, due to its very sharp tuning, overall selectivity, and the use of the cathode-ray tuning indicator.

When we believed we had obtained sufficient data insofar as the 5-meter operation of this transmitter was concerned, we tuned it up on 10 meters with the same results insofar as reception on the ACR-175 receiver was concerned.

Our next step was to tune up the transmitter on 20 meters, and for simplicity's sake, we chose an 80-meter crystal. This meant that the exciter was only called upon to double and that the second 6L6 driver would also be doubling. The reason we operated the circuit in this fashion was due to the fact that the 6L6 driver was designed primarily for doubling, in view of 5-meter operation. This also eliminated any change in the resistance values.

The construction details of this transmitter are almost entirely self-explanatory when the diagrams and photos are referred to. These clearly show the position of the various parts. The Hammarlund 100-mfd. oscillator tuning condenser, as well as the 35-mmfd. frequency-multiplier, plate-tuning condenser, are insulated from the chassis, and held at almost the same height above the chassis, insofar as the shaft center is concerned, as the double-spaced dual 35-mmfd.

split stator condenser. The tube sockets used were chosen for their ability to be mounted flush on the chassis, and not requiring any stand-off insulators. These sockets are of Isolantite insulation and make good contact to the tube prongs. When mounting these tube sockets, care should be taken in an effort to obtain the shortest possible leads. In the case of the frequency multiplier circuit, the 6C5 is mounted as close to the 6L6 as possible, making the cathode-to-control-grid connection very short. All of the r.f. chokes, by-pass condensers and resistors are mounted underneath the chassis. Single-point grounds should be employed in each stage of the transmitter to avoid circulating current through the chassis. By this we mean that all of the by-pass condensers and resistors returning to ground should be made at one point in each of the stages. This point should also be where the cathode and shield of the tube, as well as one side of the heater, are grounded. These three connections can be tied together right at the tube socket and one wire run from the tube socket to the ground point underneath the chassis. The .001-mfd. heater by-pass condenser was located near the 6L6 doubler driver tube socket, with another one located underneath the chassis of the push-pull 6L6. Three 4-terminal terminal strips were used to bring out the necessary meter leads, two of them being used on the driver chassis, and the other one on the push-pull 6L6 chassis.

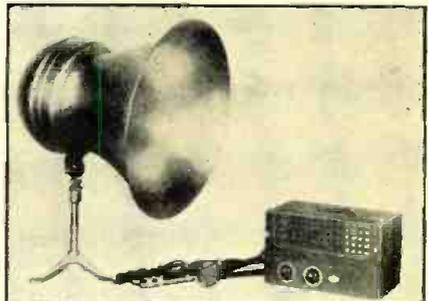
The coil mounting, as well as the crystal holder mounting, are elevated from the chassis by using a piece of 3/8-inch rod, which is cut to size, each end being drilled and tapped for a 6/32 screw. This method of stand-off is quite apparent in the two photographs illustrated in this instalment and in Part 1.

For those who desire to make this transmitter real compact, the necessary power supply may be mounted on either of the two chassis. Care should be taken to keep the chokes and power transformers as far out of the fields of the coils as is possible. The filament-heating transformer as well as the filter condensers may be mounted underneath the chassis, as there is plenty of room for these parts which will have to be mounted horizontally. It is possible to build this complete transmitter all on one chassis, which was done in the writer's own case, due to the lack of available space

## What's New in Radio

(Continued from page 459)

nouncing systems in bus terminals, yacht clubs, etc. It is complete with a permanent-type magnet speaker with exponential horn and a crystal microphone. The



tubes comprise one 6C6 and three 6A6's. The power supply employs a replaceable vibration type rectifier.

in his rack, which the accompanying photograph illustrates.

A complete list of all of the essential parts is included herewith, including the suggested power supply equipment. See Figure 4.

Antenna coupling may be accomplished using this transmitter by inductive coupling or conductive coupling, using an isolating condenser in series with each feeder. If a two-wire transmission line is to be used, a 2- to 4-turn pick-up coil may be employed for antenna coupling. This 2- or 4-turn pick-up coil is enmeshed between the turns of the plate coil of the push-pull 6L6's.

These two antenna coil connections are connected to the two stator sections, the rotor being grounded or ungrounded, as is desired, or determined by test to be the best for the particular antenna installation. This same coupling may be employed using a single-wire transmission line, in which case the rotor of the antenna-tuning condenser should be left ungrounded. Schematic diagrams will clarify the various methods of antenna couplings discussed. These are illustrated in Figure 3.

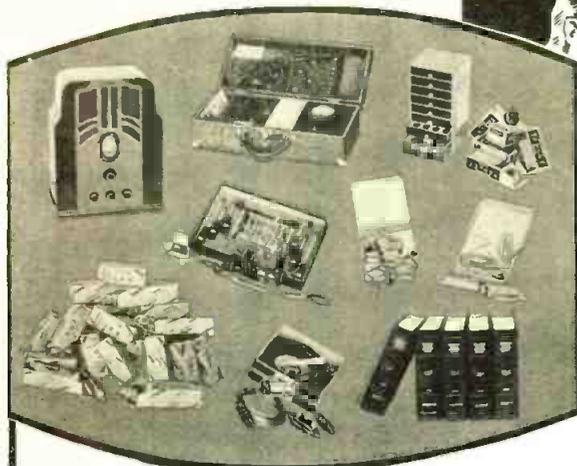
**Parts List**

- 3 Hammarlund dual 35 double-spaced conds., type MCD35MX, Cat. No. W8490.
- 1 Hammarlund 100 mmf. condenser, type MC100S, Cat. No. W8508.
- 1 Hammarlund 35 mmf. condenser, type MC353, Cat. No. W8504.
- 5 ICA octal base mtg. sockets, Insulex, Cat. No. M13089.
- 10 .001 mfd. 600 v. mica bypass condensers, Cornell Dub., Cat. No. YD3719.
- 1 .0001 mfd. 600 v. mica bypass condensers, Cornell Dub., Cat. No. YD3716.
- 3 Hammarlund 2.5 mh. r.f. chokes, 125 m.a. d.c. 1 2500 ohm, 10 watt, wire wound resistor.
- 2 15000 ohm, 10 watt, wire wound resistor.
- 2 75000 ohm, 2 watt, carbon or metallized resistor.
- 1 100,000 ohm, 2 watt, carbon or metallized resistor.
- 1 100,000 1 watt carbon or metallized resistor.
- 1 WRS 25000 ohm, 75 watt, bleeder resistor, Cat. No. W20819.
- 2 cadmium plated chassis, undrilled, 17" long, 11" wide, 2 1/2" deep, Cat. No. W22157.
- 2 black crystalline steel panels, 8 3/4" by 19", standard rack panel, Cat. No. W22161.
- 5 4" metal etched dials, Cat. No. W9858, marked as follows: Oscillator, 2-Buffer Doubler; 1-Amplifier Grid; 1-Amplifier Plate.
- 5 3" KK knobs for use with above, Cat. No. 13010.
- 3 4 terminal bakelite assembled terminal strips, Cat. No. 13142.
- 14 com. prod. buttons type CP19 button type feed through chassis insulators and condenser supports.
- 5 I.C.A. insulated shaft, flexible couplings, Insulex.
- Approximately 5 to 6 feet of Mycalex strip 1" wide by 1/4" or 3/16" thick for coil plug-in bases. Amount needed depends on number of plug-in coils desired.
- 16 banana plugs and jacks. More plugs required for extra coils.
- 3 12" lengths of 3/4" dia. insulating rods for coil standoffs. WRS catalog No. 12903.
- 20 bakelite lug mtg. strips for mounting parts insulated from chassis such as r.f. chokes, resistors, etc. WRS catalog No. 13133.
- 100 rubber grommets to fit 1/4" hole. WRS catalog No. 14765.
- 1 assortment of 6/32 screws, nuts, lugs and lockwashers.
- 1 mounted 40 meter crystal.
- 4 61.6 tubes.
- 1 6CS.

**Power Supply Parts List**

- 1 Thordarson power transformer: 1200 v. c.t. at 200 ma., 2.5 v. c.t. at 10 a., 5 v. at 3 a. for 83 or 5Z3, 7.5 v. c.t. at 3 a.
- 1 Jefferson type 464-221 filament trans. 6.3 v. or 5 v. c.t. at 4 a.
- 2 Thordarson filter chokes, 12 henrys at 250 m.a.
- 1 Cornell-Dubilier, 4 mfd. 600 v., type TD.
- 1 Thordarson power transformer: 1200 v. c.t. at 200 ma., 2.5 v. c.t. at 10 a., 5 v. at 3 a. for 83 or 5Z3, 7.5 v. c.t. at 3 a.
- 1 Jefferson type 464-221 filament trans.: 6.3 v. or 5 v. c.t. at 4 a.
- 2 Thordarson filter chokes, 12 henrys at 250 m.a.
- 1 Cornell-Dubilier, 2 mfd. 600 v., type TD.
- 1 Cornell-Dubilier, 4 mfd. 600 v., type TD.
- 1 4-prong wafer type socket for rectifier.
- 2 a.c. toggle switches, SPST, Cat. No. W12836.
- 1 chassis if desired, blank electroalloy, 10 by 12 by 3 inches. Cat. No. W22334.
- Necessary cord, plug, wire, etc.

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## THE TECHNICAL REVIEW

CONDUCTED BY THE TECHNICAL EDITOR

*Radio Field Service Data*; A. A. Ghirardi; Second Edition; Radio & Technical Publishing Co.; 1936. A book which aims to give the serviceman most of the data he needs. It contains numerous tables and lists, one of the most important ones being the "case histories" of various makes and models. Typical troubles often encountered in any particular model can be looked up immediately. The new edition has been enlarged, put in loose-leaf form and brought up-to-date.

The contents includes: a list of intermediate frequencies for numerous models; "case histories" or common troubles of various makes and models; remedies for stubborn cases of ignition interference; wiring diagrams of automobiles; battery polarity and other data on automobiles; trouble-shooting chart; tube socket diagrams and tube chart; data on resistance-coupled amplifiers; bias resistor chart; standard color codes, wire tables, etc.

*Short-Wave Wireless Communication*, by A. W. Ladner and C. R. Stoner; Third Edition; John Wiley and Sons; 1936. After the appearance of the third edition, this is still the only engineering textbook on short waves that ever came to this desk. The third edition has been revised and a new chapter added on "Commercial Wireless Telephone Circuits". The book treats the properties of propagation of short waves and the principles of operation of receivers, transmitters, feeders, antennas, especially applied to short-wave communication. Authors have used mathematics sparingly which greatly increases the number of readers who may profit by its study. The chapters on push-pull, on oscillators and modulators should be of great interest to amateurs. These chapters tell the story in a different way from the usual American texts which may help those who have not been able to obtain a clear understanding of the subject. There are also chapters on directional aerials, aerial arrays and ultra-short-wave communication.

*Telecommunications, Economics and Regulation*, by J. A. Herring and G. C. Gross; McGraw-Hill Book Co.; 1936. A book dealing with the economic and legal aspects of the communication industry (telegraph, telephone, both by wire or radio). Most textbooks on public industries have paid little attention to telecommunication services. The first four chapters deal with the development of the industries. These are followed by four chapters on the economics of these industries, dealing with the sources of revenues and the principal factors affecting costs, those affecting the communication rates, and the extent of combination in the communication utilities and the factors responsible for it. The remainder of the book is concerned with regulations (international, national and state), presenting the

background of Federal regulation of communications before 1934 and an analysis of the Communications Act of 1934. The problems involved in the regulation of radio broadcasting are treated at length.

*Giants in the Air*; published by N. W. Ayer & Son; 1936. This brochure briefly sketches the progress of radio from the layman's point of view. Consequently, the beginning is given as 1921 instead of 1896. It describes how better and better programs became available to the public and lists the contributions of new program types by this company.

### Review of the Proceedings of the Institute of Radio Engineers for November, 1936

*Electronic Music and Instruments*, by B. J. M. Miessner. A compilation of the progress in this field. The author discusses the various types of instruments made by workers here and abroad and describes his own instruments. A complete review of the subject also given bibliography.

*A Power-Amplifier for Ultra-High Frequencies*, by A. L. Samuel and N. E. Sowers. A description of a new double-pentode amplifier tube and associated circuits for use at ultra-high frequencies. Unusual construction features include the mounting of two pentodes in the same envelope with interconnecting screen and suppressor grids, complete shielding of input and output circuit with no common leads.

*This Matter of Contact Potential*, by R. M. Bowie. The term "contact potential" is used to include a combination of spurious voltages which affect the operation of the tube. The article points out that there are no less than four such voltages, acting in combination and discusses each in turn.

### Review of Contemporary Literature

This department calls attention to articles appearing in recent publications. They are not included in the free booklets. The name of the publication and the date is given for each article. Addresses of publishers will be furnished on request.

*Improvements in A.F.C. Circuits*, by R. L. Freeman, Electronics, November 1936. A simplified system of a.f.c. which requires but one secondary in the last i.f. transformer and employs a corrector tube as a variable reactance. The system works satisfactorily on the short waves, it is claimed.

*R.M.A.'s Recommendations on Allocation*, by L. C. F. Horle, Radio Engineering, November 1936. A copy of the engi-

neering report submitted to the F.C.C. by the engineering division of the R.M.A.

**Tensor Analysis of Multielectrode Tube Circuits**, by G. Kron, Electrical Engineering, November 1936. The method of tensors has been found a useful mathematical analysis of electrical systems. The article shows its application to the analyses of the characteristics of triodes, tetrodes, pentodes, etc.

**Methods of Testing Low-Voltage High-Capacity Condensers**, Aerovox Research Worker, September 1936. Showing two ways of measuring capacity, series resistance and power factor of condensers with capacities from 100 to 10,000 mfd.

**The Use of Mica Condensers in Transmitters**, Aerovox Research Worker, October 1936. Data showing the maximum allowable current and voltage for mica condensers when used at different frequencies.

**Losses in Audio-Frequency Coils**, The General Radio Experimenter, November 1936. Describing the properties of iron core and dust core coils, showing how Q varies for different types of coils and for different frequencies.

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The Wholesale Radio Service Company's special 8-page "Bargain Flyer" radio catalog listing test equipment, tubes, parts and receivers is now ready for distribution. Free copies are available to all readers. Send your request to RADIO NEWS, 461 Eighth Avenue, New York City.

**Speaker Bulletin**

Through the courtesy of Wright-De-Coster, Inc., this 4-page illustrated folder on speakers is offered gratis to all readers. It contains descriptive information on their new line of electro-dynamic reproducers with universal field and output, permanent magnet "Nokoil" speakers and allied sound reproducing accessories. To obtain a copy, simply send in your request to RADIO NEWS, 461 Eighth Avenue, New York City.



**New Instrument Catalog**

The Weston complete line of servicing equipment is thoroughly illustrated and described in their new circular R10-H, illustrated below. It contains information on the new model 772, test analyzer; model 771, Checkmaster; model 692, oscillator and other instruments. This folder is free to servicemen, dealers and engineers. Requests should be sent to RADIO NEWS, 461 Eighth Avenue, New York City.

**Free Condenser and Resistor Catalog**

The latest edition of the Aerovox catalog includes an unusually large assortment of condensers and resistors for all radio and allied applications. The feature of the new catalog is the section devoted to replacement condenser requirements for all popular makes of radio receivers. Servicemen will appreciate this new department. Write in for your free copy to RADIO NEWS, 461 Eighth Avenue, New York City.

**Latest Parts Catalog**

The large 8-page Centralab catalog listing their complete line of replacement con-

trols, power rheostats and their new selector switches is free to servicemen, dealers and engineers. The book also contains helpful information on fixed resistors, knobs and accessories. Send requests to RADIO NEWS, 461 Eighth Avenue, New York City.



**Latest Tube Manual**

The new Triad 12-page tube bulletin illustrated above contains complete specifications and technical data on all types of tubes. It is compiled in an efficient manner for easy and quick reference. The manual also gives tube-base pin connections and dimension drawings. Servicemen, dealers and engineers can obtain a free copy of the bulletin by sending in their requests on their letterhead to RADIO NEWS, 461 8th 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 August, September, October, November, December, 1936 and January, 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:

- A2—Modulation Booklet. United Transformer Corp. Free.
- A5—Amateur Radio Booklet. New York Wireless School. Free.
- S1—Catalog on Permanent Magnet Speakers Cinaudagraph Corp. Free.
- S3—Cornell-Dubilier Corp. Folder on New Service Condensers. Free.
- S4—Webster Company Catalog on Sound Systems and Accessories. Free.
- S5—Transformer Replacement Catalog. United Transformer Corp. Free.
- O2—Transformer Guide. Johnson Transformer Co. Free.
- N1—Transmitting Tube Guide. Free to Amateurs and Station engineers. Taylor Tubes, Inc.
- 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.
- Ja2—Free. Monthly booklet "Brush Strokes" published by Brush Development Co. Send request in on letterhead.

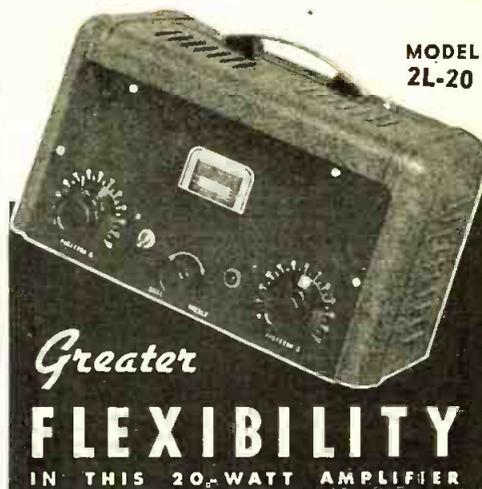
**Silent Radio**

(Continued from page 467)

it is audible only a few feet away. It is claimed that hard-of-hearing persons can also enjoy radio programs by this means.

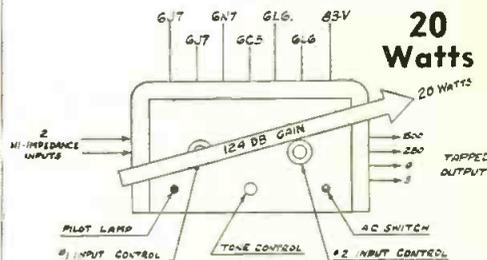
This bone-conduction unit differs from an ordinary headphone in its principle of operation. The sound of the 'phone is conducted by air and becomes weaker when passing through the pillow, while the bone-conduction unit sounds much better through the pillow than without it. In fact, it is necessary that it be loaded by putting some pressure on it, for otherwise it will rattle, acting like a motor without a load.

The receiver is so arranged that a group can listen to the program through the loud-speaker, or an individual through the "magic ear" or both.



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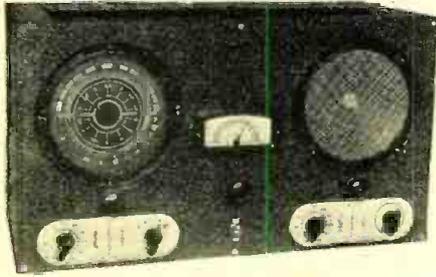
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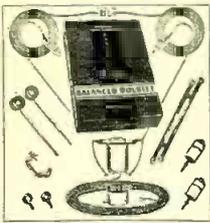
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## The DX "Clipper"

(Continued from page 467)

smoothing choke with two filter condensers of 8 and 16 mfd. The hum level is extremely low and no tunable hum is present. Do not omit the grounding condenser on the power transformer primary.

### Results

Those who have not used the modern tubes in a well-built regenerative set will be considerably astonished at the results which can be obtained with them. You will find that a heterodyne beat note on the 20-meter band for instance, is smooth and steady.

Reception of weak foreign stations is even easier than with many superheterodynes, due partly to the type of bandspread employed.

### Specifications

The values of the component parts shown in the schematic diagram are as follows:

Band Switch Coils—L1—88 turns No. 30 enamelled wire on 1/4-inch bakelite tube. Tapped at 2 turns from end.

L2—34 turns No. 26 enamelled wire on 1/4-inch bakelite tube. Tapped at 1 1/2 turns from end.

L3—33 turns No. 26 enamelled wire on 1/2-inch hard rubber rod. Tapped 2 turns from end.

L4—8 1/2 turns No. 24 cotton covered enamelled wire close wound on 1/2-inch hard rubber rod. Tapped at 1 1/2 turns from end.

Interchangeable air coils—Wound with hard drawn No. 14 tinned copper wire on 1/2-inch dowel and then removed. Ends are bent down at right angles to coil axis to plug into pin-jacks which are spaced 1 3/4 inches apart. Coils should be spread to this length.

10 meter coil 12 turns

7 1/2 meter coil 9 turns

5 meter coil 5 turns

R. F. Chokes:

R.F.C2—No. 31 enamelled copper wire; close wound on 3/8-inch dowel or hard rubber rod for a distance of 1 3/4 inches.

R.F.C1—30 turns No. 20 cotton covered enamelled copper wire; close wound on 3/8-inch dowel or rubber rod.

R.F.C3—47 turns No. 26 enamelled wire; close wound on 3/8-inch dowel.

## Cathode-Ray "Scope"

(Continued from page 464)

angle, set back from the end so that a paper or cardboard tube (an electrolytic condenser cardboard insulator is good for this) may serve as a shadow box. The cardboard tube slips over the metal shell of the 913 tube.

The mounting of the 913 tube at an angle and use of a shadow box was in order to allow ease of view when the metal cabinet is resting on a table. If same provision is not made to light shield the screen of the 913 tube it is necessary to run the tube too brilliant, which tends to shorten its life.

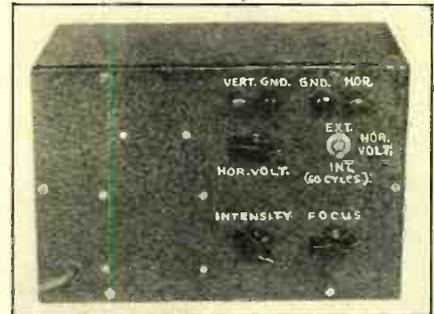
By means of the single-pole-double-throw switch the horizontal deflector plates may be connected to the internal 60 cycle sweep or to any external means, such as the modulator tube where the carrier is connected to the vertical deflector plates. In order to allow control of this voltage a .5 megohm volume control is used. For modulation percentage figures this control should be set at the maximum position.

The 1V has proven a very satisfactory rectifier for such service because of its low heater wattage requirement, there being no need of a heavy filament wattage for the extremely small plate current used (only 800 microamperes). The Cornell-Dubilier paper condenser should have a rating of 600 volts. It is important to remember that in cathode ray equipment the plus side of the high voltage is grounded. In the 913, the shell is connected to the

B plus and a good grounding should be secured to the metal case. In this model the case is not used as a means of connection, there being only one definite point of grounding. The deflector plates must be connected to the B plus by means of a resistor not greater than 10 megohms. Five megohms is a good value for general use. It is important that no more than 250 peak volts be applied between either deflector plate and No. 2 anode.

The 913 when used in the circuit as shown here (Figure 1) required 22 volts r. m. s., 60 c. p. s. for .25-inch vertical deflection, 44 volts for .5; 66 volts for .75; and 90 for 1 inch. A .5-inch deflection allows a very good picture to be secured. If desired a transparent scale may be placed in front of the 913 screen to allow quantitative measurements. This scale should, of course, be highly transparent.

No detailed construction has been given as the photographs clearly show the complete assembly.



### List of Parts

- C1—Cornell-Dubilier 1 mfd., 600 working volts, paper
- R1—I. R. C. 1 meg. 1/2 watt resistor
- R2—I. R. C. 400,000 ohm 1 watt resistor
- R3—I. R. C. 100,000 ohms volume control, "A" curve with line switch
- R4—I. R. C. 25,000 ohm 1 watt resistor
- R5—I. R. C. 50,000 ohm volume control, "A" curve with line switch
- R6—I. R. C. 500,000 ohms volume control, "A" curve with line switch
- T1—Kenyon T-207 transformer
- 4 Eby binding posts

## Portable P.A.

(Continued from page 463)

left of Figure 1 are the 6J7 high-gain voltage pre-amplifiers, feeding the high gain 6N7 second stage, which in turn feeds the 6N7 phase inverter. One triode of the latter 6N7 feeds one of the push-pull 6L6's. The second triode section is a gain-equalizing phase inverter which feeds the second push-pull 6L6.

The amplifier is resistance-capacity coupled throughout, thus eliminating induction hum, the hysteretic distortion of ordinary audio transformers, and providing the flat frequency response of Figure 2.

Resistance-capacity filtering is used throughout, not only to get hum down to 70 db. below maximum output, but to kill all regeneration possibilities.

Filtration consists of three main sections of choke and two speaker fields, plus the individual 6J7 and 6N7 resistance capacity plate filters.

Power output is 32 watts at not over 2% total harmonic distortion and is had with "distant pick-up" to the crystal mike, as in orchestra pickup. Extra output transformer secondaries of 4 and 8 ohms are provided for additional speakers, where they may be needed.

The whole amplifier is finished in polished chromium, pleasingly set off by black control scales and the black metal tubes.

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All my stuff emcy sad best pdubs obl. 73 Mac.

## S.W. Interference

(Continued from page 473)

There are several ways to reduce such interference in short-wave reception caused by stations operating near the image frequency of the receiver when tuned to a desired signal.

Methods for reducing this type of interference include the following:

1. A tuned preselector may be added for the high-frequency band used. This should reduce the interfering signal by a factor of 35 for receivers which have no r.f. amplifier. Adding such a device requires an additional tuning control.

2. By shifting the intermediate frequency of the receiver about 10 kilocycles either way. This will eliminate interference only from a particular signal, and requires careful re-alignment of all circuits of the receiver to hold substantially the same scale calibration. This change should be made by a competent service man who has the necessary instruments and equipment.

3. Probably the simplest method for reducing image frequency interference is to add a wave trap in the antenna circuit. This will be fairly effective if the intermediate frequency is 450 kilocycles or higher. The trap may consist of a good quality midget variable air condenser having a maximum capacitance of 100 micro-microfarads, and an inductance of about 4.5 microhenries. The inductance should be of the "low-loss" type. It has been found that a 1-inch diameter thin bakelite threaded form (12 turns per inch) wound with 14 turns of No. 18 B. & S. bare copper wire to be about right for tuning out interfering signals from 7000 to 18,000 kilocycles. Depending upon the antenna used and receiver coil constants, the trap may be connected with the coil and condenser in series from the antenna post to the chassis as in Figure 1. Or the coil and condenser may be connected in parallel, and this shunt circuit then connected in series with the antenna lead, as in Figure 2.

## Listening Posts

(Continued from page 478)

three weeks from the time his report is written. It is of course impossible to make the announcement in the DX Corner under these circumstances. It is well to remember that reports reaching the editors any time during one month are used in connection with the DX Corner in the issue which appears on the newsstands about the fifth of the second month following.

If an applicant is interested both in short-waves and broadcast DX he can apply for appointments in each of these fields. All applications for short-wave appointment should be addressed to the Short-Wave DX Editor and applications for broadcast DX appointments should be addressed to the Broadcast Band DX Editor. Also all reports should be addressed to the respective editors and if an observer is appointed in both branches he should submit separate reports each addressed as above.

Appointments for the year 1937 are now being made and any one reading this article who desires such an appointment need only make application as described above.

In a sense it might be said that this listening post organization is much like a DX club. However, it does not in any sense compete with existing clubs or organizations of any kind.



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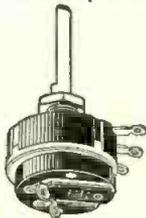
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How would you like to have this 20-tube modern all-wave receiver brought into your shop with the above complaint? The new receivers are getting more and more complex and the serviceman who still relies on "screwdriver tactics" will never work out the bugs. The serviceman who hopes to advance himself into a better job and better pay, must have adequate modern training NOW!

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# THE SERVICE BENCH

(Continued from page 486)

a control grid through a cloth covering. This was "open" most of the time. A check from condenser to ground shows okay, but a check from the *inside* of the rubber control-grid cap will disclose the open. It is a good idea to replace all control grid leads.

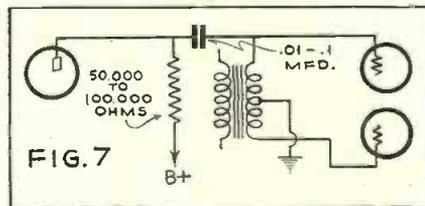
"Philco No. 34: This receiver drained the 'B' battery packs in rapid succession. With the switch "off," voltages could be read where they had no right to be. The trouble was finally located in the 3-point switch, one terminal of which is at ground potential, while the two remaining terminals connect A- and B- to C+ when correctly wired. However, there had been a slip in the assembly of this particular receiver and the wiring to the switch permitted a small but constant drain that depleted the battery. An ohmmeter and the Philco wiring diagram are all that is needed to discover and remedy the trouble.

"Philco No. 38: The oscillator fails to function with a good tube. The trouble is probably in the coil rather than in resistors, etc. Remove the oscillator coil and cook out the moisture in hot paraffin or coil dope. Set to cool and then dip in warm paraffin or dope. The chances are the results will be perfect. The coil dope I use is a fifty-fifty mixture of beeswax and paraffin."

The notes on the following six receivers are submitted by James L. Hoard, Providence, R. I.—

## Brunswick, Columbia and Bulova

"The Brunswick AC-10, Columbia C-31 and the Bulova 501 all employ the same chassis, and any one or more of the following characteristic troubles may develop: "The gang condenser occasionally short-circuits out on several plates. This condition will almost invariably be indicated by no reception on the low-frequency end. The 1 mfd. condenser will often become defunct. Watch out for an open-circuited volume control. The .0005 mfd. condenser from cathode to plate of the 24 detector may occasionally have to be replaced, as well as the screen by-passes."



## Montgomery Ward

"When the Airline models 62-177 and 62-196 show loss in volume accompanied with distortion, replacing the 6F6 tube (next to the 80 tube) will usually clear up the trouble. To secure a more positive dial-indicator action in these models, shorten the spring controlling the friction drive. As these sets are rarely installed by servicemen, make certain that the packing bolts have been removed—and also that the chassis is properly aligned so that neither the knobs nor shafts touch the cabinet. I have run into several customers who were dissatisfied with their sets because, in installing, they had neglected either or both of these precautions despite

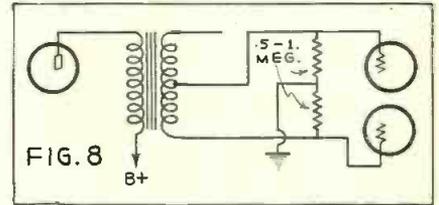


Figure 8—This circuit will work when one side of the secondary is open.

the fact that they are mentioned in the direction sheets accompanying the receivers.

## American Bosch

"When the Bosch model 812-CK vibro-power radio motorboats upon starting, and then develops a shrill whistle, replace the condenser having a brown lead from the 'can' with a 4 mfd. unit. Cut the lead close to the can, and connect the new unit from the voltage-divider strip to ground."

## Volume Expander

(Continued from page 465)

the radio set or ground binding post. Adapters are obtainable for connecting the volume expander to almost all sets without any wiring changes.

The schematic diagram of Figure 2 and the illustration should give sufficient information to the constructor. The usual precautions should be taken to minimize hum pickup and instability. All leads carrying a.c. should be twisted. All leads carrying signals should be as short as possible and kept away from the filament wiring. The latter precaution should also be taken in connecting the unit to the radio set.

After connecting the volume expander it is only necessary to adjust the volume level and expansion controls for any type of reproduction desired. The switch incorporated is so designated that it can cut out both the expander and its operating power at the same time, restoring the set to its former operation.

With the volume expander any radio set may be used for phonograph reproduction. The electrical phonograph pickup is simply connected to the input and common terminals.

Listeners hearing a single selection reproduced with the volume expander enthusiastically agree that it is a major advance in the art of high-fidelity reproduction. It offers real opportunities for building and selling.

## Tested in the R. N. Lab.

The Knight volume expander unit was built up from a kit and was tested in the Radio News Laboratory. First it was connected to the amplifier described in the series of articles for beginners, (August and September issues) and phonograph input was employed. The unit has to be connected before the power tube, rather than before the high-gain tube. In another test, an all-wave receiver was used, having a 42 output tube preceded by a 75. Here again, the unit had to be connected between the 75 and the 42. Enough expansion can be obtained to make the pianissimo passages barely audible, while reaching the maximum output of the tube

on the fortissimo passages. If adjusted to exceed this latter level grids will block and motor-boating start.

Readers who build this expander may find the following hints useful. The maximum expansion is obtained when a large enough signal is impressed on the grid of the 76 tube, but in order to have the lowest passages low enough, the input to the 6L7 must be small. Therefore, best results are obtained by setting the 6L7 volume control rather low, the expansion control all the way "on" and the receiver volume control somewhat higher than normal. After a little practice, the proper volume control settings will become simple.

When making comparisons of reproduction with and without expansion, it should be remembered that one must wait after throwing the switch either "off" or "on" until normal operating conditions are reached. Quicker comparisons are possible by turning the expansion control all the way to the left and right, at the same time readjusting the average level with the input volume control to the 6L7.

The use of the expander is especially effective on symphonic broadcasts and similar programs. It provides an element which was formerly lacking in making the radio program sound like the original.

## Tuning Indicator

(Continued from page 461)

diameter. When the wand is near the radio frequency field of any circuit in the transmitter, the gas will ionize. It requires about three watts of power for complete ionization. Inasmuch as ionization is instantaneous and the brightness is in direct proportion to the power, it may be used as a resonance indicator. The ionization action of course, is much quicker in indicating a change in power than a meter because of mechanical sluggishness. By using a wand in this manner it is possible to find the exact resonance point of a tuned circuit easily.

As a modulation indicator, the device may be calibrated with reasonable accuracy. The "stick" may be coupled to the modulated amplifier tank circuit so ionization occurs only in a part of the tube. It may be calibrated with some degree of accuracy against an oscilloscope. Once it is determined how much the ionization raises in the tube at 100 per cent modulation, it provides a relative measure of the modulation.

It also may be used in neutralizing a radio frequency amplifier.

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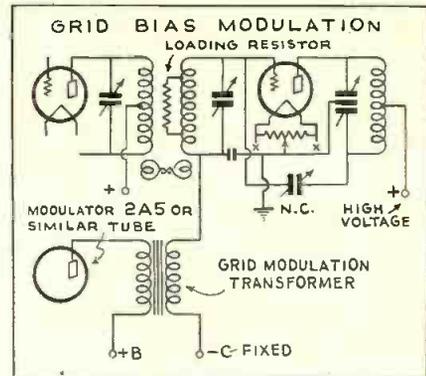
(Continued from page 468)

A modulation is used almost entirely with grid and low-level modulation systems.

In addition to the systems already mentioned, there is suppressor-grid modulation, which has been made possible by the introduction of the pentode-type tube. This method is not much unlike grid modulation, but it offers a number of advantages that are worth considering when contemplating a telephone transmitter.

High-level plate (Heising) modulation is almost universally used by amateurs today. It is the simplest to get operating properly and, in addition, affords the use of higher power under present amateur regulations than other systems. It amounts to superimposing an alternating current voltage on the direct current supplied to the plate of the modulated amplifier. The amplifier may be operated Class C, which naturally affords high efficiency with consequent high output. The normal efficiency of a properly-designed Class C amplifier varies somewhere between 60 and 80 percent and sometimes even higher, and is largely dependent on the efficiency of the circuit and the frequency used. The carrier thus obtained, therefore, is usually strong. When the legal maximum amount of input is used it may be as much as 800 watts.

But, high-level modulation is perhaps the most costly available to the amateur, although at the same time (with certain types of modulations) provides more watts-per-dollar than practically any other system. The chief item of cost is the high-powered audio amplifier necessary for 100-

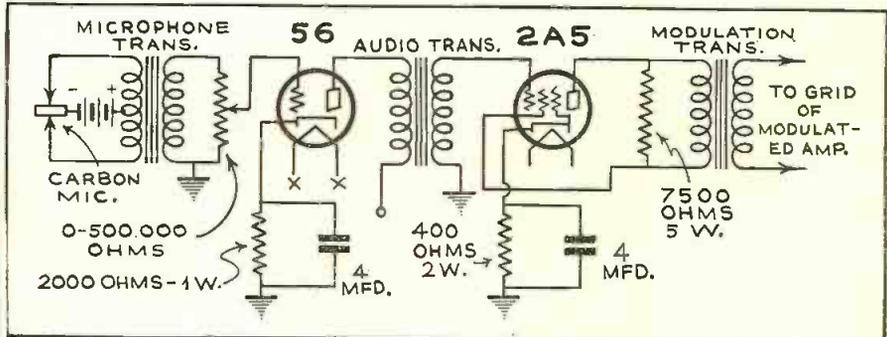


duced but at the same time additional transformer equipment and a more powerful speech amplifier to drive the modulator would be necessary. Also, because of the varying current requirements of audio tubes in these Classes during modulation, it would be advisable to separate the power supply for the modulators in order to get good quality.

Perhaps slightly better quality could be obtained from Class A modulation, but actually it figures out in dollars and cents that the cost for both systems for low-powered transmitters is about the same.

But in medium and high-powered transmitters, where high level modulation is employed, Class AB and B modulation systems are less expensive than Class A due to the high cost of tubes capable of delivering the audio requirements.

Therefore, the dollar-per-watt cost for high-level modulation would depend largely on the amount of power used. For the



percent modulation. The audio requirement is 50 percent of the class C input, i.e., if 1,000 watts of class C r.f. input is used, 500 watts of audio power is required for 100-percent modulation. However, the carrier obtained with say a 1,000-watt transmitter would be in the neighborhood of 800 watts. As the output increases 50 percent under 100-percent modulation, the peak output from such a transmitter would be 1,200 watts!

The choice of modulating equipment for high-level modulation depends entirely on the amount of power used. If less than 100 watts input is used on the plate modulated stage, the choice between Class A, AB and B modulators (from a cost standpoint) does not make much difference. Fifty watts of audio power would be required for such a transmitter. If Class A were to be used tube cost would be the principal item. Two tubes of the 845 type or the equivalent would be necessary. But at the same time if such tubes were used it would be practical to employ the same power supply as used on the modulated amplifier and the only extra equipment necessary would be a rather husky modulation choke.

If Class AB or Class B modulation were used to modulate a transmitter of this input, the tube cost would be greatly re-

duced but at the same time additional transformer equipment and a more powerful speech amplifier to drive the modulator would be necessary. Also, because of the varying current requirements of audio tubes in these Classes during modulation, it would be advisable to separate the power supply for the modulators in order to get good quality.

However, as the 100-watt input mark is reached, the curve of Class A cost turns sharply upward, while that for Class AB and B modulators tends to flatten off in the medium-power class, taking a turn upward in the high-power class but at the same time not approaching the Class A cost curve. Beyond 100 watts the cost of audio equipment, tubes and power equipment swings upward due to the higher voltages and more expensive tubes used. For instance suppose it is desired to modulate a Class C input of 500 watts. Two hundred and fifty watts of audio power would be necessary. The cost of equipment for such amounts of power would be in the neighborhood of 40 cents a watt. But at the same time a Class A modulator for such inputs would cost approximately \$1.00 per watt.

For the c.w. man who already has a c.w. transmitter and wants to go in for phone on a more or less permanent basis, high-level modulation, while the most costly in initial investment, will probably give the best all around satisfaction. It is

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Dept. 372

**Radio News**

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a simple matter to add such equipment, it being necessary to do nothing more than connect the audio output to the direct-current plate voltage on the final amplifier.

But for the amateur who wants to go in for phone on a part-time basis and already has a c.w. transmitter there are several methods that facilitate phone operation at small cost. The cheapest is grid modulation. This system requires only a small audio equipment, not more than 15 watts of audio power in any case. A simple two or three-stage unit will meet all of the requirements.

Grid modulation affords excellent quality in the output when operated correctly. Its chief drawback is that it is efficiency modulation, i.e., the efficiency of the modulated stage is varied under modulation. Carrier outputs in this system are limited by the plate dissipation of the tubes used. The efficiency of such modulated amplifiers is usually between 30 and 50 per cent, and sometimes less. The point is the normal carrier output is equal to one-fourth of the possible output when the same tube is used in a Class C circuit. For instance, assume a transmitter is capable of 100-watts carrier when operated Class C. As it is efficiency modulation it is necessary to reduce the carrier to one-quarter of its normal Class C rating (25 watts). This is done by cutting down the grid excitation, and in most types of tubes best suited to this method of modulation, the rectified grid current, under such conditions, will be only a few milliamperes. As the grid is swung with the audio voltage from the modulator, the excitation will increase and the efficiency will be increased with the result it is possible to reach a point at peak (100 percent modulation) where the carrier is 50 percent more than at zero modulation.

The principal advantage of this system is excellent linearity may be obtained when the modulated amplifier is adjusted properly. The bias requirement is quite important. The specifications recommended by the tube manufacturers should be followed to a "T" in order to obtain the maximum possible output.

The cost of installing modulating equipment for such a unit is surprisingly low. A medium-powered transmitter capable of between 60 and 100 watts of carrier may be modulated with as few as two small receiving tubes, viz, a single 56 driving a 2A5 or some other similar combination. Such an amplifier may be built for \$5 or \$6, or even less. Probably most amateurs have the necessary apparatus in their "junk boxes." As a typical example such a modulator may be used with a tube of say the RK-36 type. Such a tube will give about 60 watts of carrier when grid modulated. The cost of the modulator unit is about 10 cents a watt.

This system of modulation is ideal for the man who, now and then, wants to try the phone bands but prefers to do most of his operating on the c.w. bands. To install the modulating unit it is only necessary to reduce the excitation to the required amount to give 25 percent of the normal Class C output and plug in the modulator unit in the grid circuit. A jack and plug may be used for the latter and a carbon lamp or some non-inductive resistor may be shunted across the grid input coil to cut the excitation to the desired amount.

Next is the linear or Class B r.f. amplifier and the low-level modulated driver. This method of modulating is not very widely used by amateurs, but is quite common in broadcasting. As a matter of fact it is almost essential in high-powered broadcasting as high-level modulation here would be impractical. For instance, to



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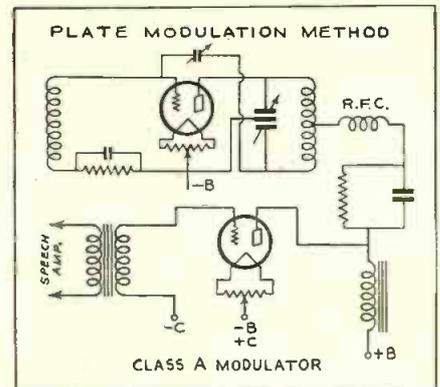
Lincoln Engineering School, 931-10 So. 37th St., Lincoln, Nebr.

modulate a 50,000-watt broadcasting station, it would be necessary to use 25,000 watts of audio power for 100 percent modulation. It has been done and is even being done in the case of one 500,000-watt station wherein it is operating quite effectively, but most broadcasting engineers do not favor this practice. They prefer low-level modulation wherein they obtain their high outputs in one or more linear amplifiers.

The cost of such a method of modulation is dependent on the system of modulation used on the driver stage ahead of the Class B r.f. amplifier. Here, in the low-level stage, either grid, suppressor grid or plate modulation may be used. The method of adjusting the linear stage is similar to that of the grid-modulated amplifier, and the efficiency is approximately the same. This is one reason why few amateurs use it; it is easier to modulate the grid than to modulate the driver and obtain linearity in the output. One reason for this is that the driving stage must be loaded in order to take the modulation, yet, at the same time the excitation of the Class B r.f. amplifier must be reduced to drop the carrier to 25 percent of its Class C value. This necessitates introducing some means of absorbing the surplus power developed by the modulated driver. A non-inductive resistor connected across the grid circuit usually is used.

In adjusting either the grid or low-level modulated units it is particularly advantageous to have an oscilloscope to observe the output characteristics. Adjustment is rather critical. Defects in adjustment will show up readily in the oscilloscope whereas they may not be detected in a monitor unless the quality is unusually bad.

Last, but not least, is suppressor-grid modulation. With the advent of the pentode transmitting tube his system of modulation has become quite popular. It is extremely easy to put in operating order and while performing about the same as grid-



bias modulation, it nevertheless is no more difficult to adjust than the plate or high level unit. It is also ideal for the c.w. man who wants to use phone now and then as well as the amateur who wants to use voice transmission as a regular diet.

These tubes are finding use more and more in amateur transmitters. One of their most desirable features is that they do not require neutralization. In this category there is the RK-23, RK-25, 802, RK-20, 803, RK-28 and several others. All are pentodes and may be suppressor modulated. For instance, with the RK-28 or the 803, both of which are about the same in ratings, a 60-watt phone carrier may be modulated 100 percent with the simple two-tube modulator mentioned above. The modulating unit is connected in series with the fixed suppressor supply, which usually is a battery. In order to reduce the carrier for this type of modulation it merely is necessary to apply a negative voltage on the suppressor. If full output without modulation is desired, the suppressor supply is reversed so a positive voltage is applied.

Considering the cost of modulating such a tube, if the audio equipment is considered alone, the cost will be less than 10 cents a

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watt. If it is necessary to purchase one of the new pentode tubes for such a transmitter of course the cost will be considerably more, but at the same time, if the transmitter is to be built from "scratch" this method should be given consideration. It might also be pointed out that if later on it is desirable to use high-level modulation with these tubes, it being necessary to modulate all of the positive elements simultaneously. These require an additional amount of audio power which add slightly to the cost of the modulator.

## The DX Corner (Broadcast Band)

(Continued from page 477)

England, Northumberland station in construction.

Warsaw—New regional station will be on the air in winter 1937-8.

Kaunas—Lithuania. New 60-70 kw. station planned to replace the old 7 kw. transmitter.

### Australian Changes

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**Additions—**  
700 kc., 2NR, Grafton, N. S. W. (Northern Rivers Regional), 7000 watts.

900 kc., 2LM, Lismore, N. S. W. (Richmond River Broadcasters, Ltd., Molesworth, St. Lismore), 500 watts.

1470 kc., 2RG, Griffith, N. S. W. (Murrumbidgee Broadcasters, Ltd., Box 388, Griffith), 50 watts.

1070 kc., 6WB Katanning, W. A. (W. A. Broadcasters, Ltd., Box 1079, Perth, W. A.), 2000 watts.

**Other Station Dope—**  
2XN, 1340 kc., 50 watts, has been closed down. 4QN is now on the air with a power of 7500 watts. 4AY, has changed frequency to 860 kc.

### Correction

In the list of European operating schedules presented last month the editor got himself all balled up in explaining the conversion of Greenwich Mean Time to Eastern Standard Time, etc. Actually, of course, when it is 1 o'clock G.M.T., the time in the eastern United States is 8 p.m. the previous day, instead of 6 a.m., as stated. Believe it or not, the DX Editor knows better—or does he?

### Correspondents

Kenneth M. Miller, a DX listener of 2215 Powell Avenue, Chicago, Illinois, would like to receive correspondence from DX'ers in other parts of the world.

## Advanced Super Design

(Continued from page 474)

up the hollow, thus converting the double hump to a flat-top characteristic.

At frequencies in the broadcast band the selectivity of a good two-stage t.r.f. amplifier is such as to result in some sideband cutting. Above approximately 1000 kilocycles r.f. selectivity is less and therefore side bands are not appreciably cut. In order to overcome this first condition and permit the same excellent quality of reproduction on all frequencies, the tuned r.f. circuits of the 540-1160 kilocycle range were damped by resistors. In this way the side-band cutting in this range was eliminated and the problem solved. Incidentally, this damping has no important effect on overall selectivity because it is the i.f. amplifier that provides all necessary usable selectivity.

By these means a surprisingly good over-

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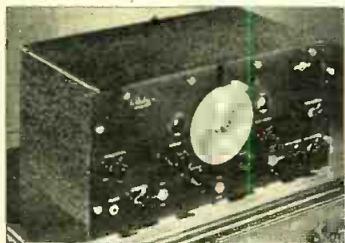
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all degree of fidelity is obtained as shown by Curve C of Figure 3.

Where high-quality reproduction is not important, as in amateur, commercial and DX reception, the band width passed may be greatly reduced by means of the Band Width knob. Thus in the extremely selective position (Curve A, Figure 3) a frequency range of only 30 to 1800 cycles is obtained (at 10 db. down). Not only does this provide unusually fine adjacent channel selectivity (see Figure 2) but by substantially eliminating all frequencies over about 2000 cycles, noise is radically reduced.

In addition to those described there were of course a large number of circuit changes, many of which were individually relatively unimportant, but in the aggregate resulted in a receiver which closely approaches perfection for every type of service. In fact this receiver might have as its slogan "All Things to All Men". It is simple enough in operation to appeal to the rankest B.C.L., yet on the other hand it meets every requirement of the most discriminating and critical amateur or commercial service.

The overall effectiveness of the receiver is best shown by the series of curves in Figures 1, 2, 3 and 4.

Figure 1 shows the *effective* sensitivity of the New Super Pro. These curves should not be confused with sensitivity curves as usually published because the latter do not take noise into consideration. The curves in Figure 1 represent the sensitivity at a signal-to-noise ratio of 6 to 1 which means that if a receiver were used in an ideal location where there is no natural or man-made static (Utopia indeed!) the loudspeaker output of the signal would be six times greater than the noise output with no signal tuned in. In other words, the noise would be a negligible factor even on signals so weak as to apply less than one microvolt input to the receiver.

In the normal receiving location external noise levels are seldom less than 5 to 10 microvolts and it is therefore obvious that this receiver provides more sensitivity than can be used in even the most excellent locations.

### Need for Selectivity

Selectivity is an increasingly important factor in present-day radio, particularly on the amateur bands and some of the short-wave bands.

In the broadcast band where stations are 10 kilocycles apart a station on the channel adjacent to the one on which you are listening would have to be much more than 10,000 times as strong as that to which you are listening in order to provide an equal response in the loudspeaker.

Curves B and C show the same sort of data for the medium and extremely broad positions of the Band Width switch. They are of interest primarily because of the relatively steep sides which permit a very fair degree of selectivity even when the receiver is adjusted for medium or high fidelity.

Figure 4 shows the excellent degree of automatic regulation of output obtained with the new a.v.c. system. With the manual sensitivity control set at maximum, an increase of the input signal from 1 microvolt to 100,000 microvolts will cause an increase in the voltage applied to the loud speaker of only 2 to 1. In other words a powerful local station will produce only twice as much output voltage as the weakest of DX stations.

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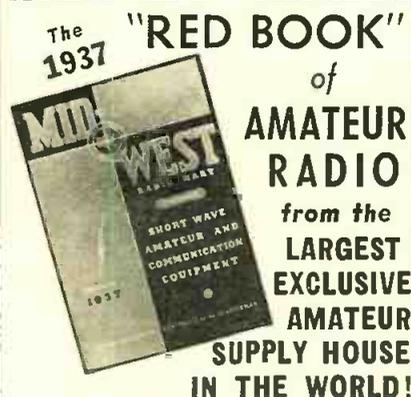
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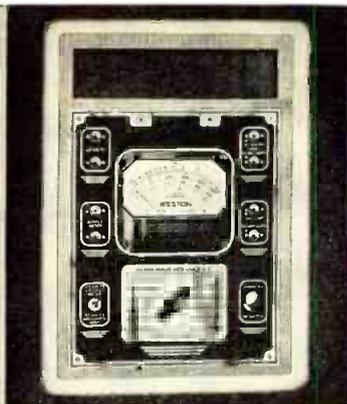
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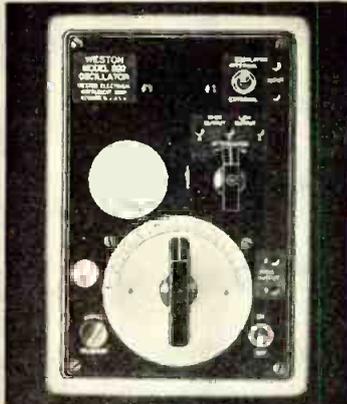
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